

LONDON
SCHOOL of
HYGIENE
& TROPICAL
MEDICINE



LSHTM Research Online

Tougher, S; Patouillard, E; Palafox, B; Goodman, C; Hanson, K; (2009) The private commercial sector distribution chain for antimalarial drugs in Benin - Findings from a rapid survey. Technical Report. LSHTM. <https://researchonline.lshtm.ac.uk/id/eprint/2869472>

Downloaded from: <http://researchonline.lshtm.ac.uk/2869472/>

DOI:

Usage Guidelines:

Please refer to usage guidelines at <https://researchonline.lshtm.ac.uk/policies.html> or alternatively contact researchonline@lshtm.ac.uk.

Available under license: Copyright the author(s)

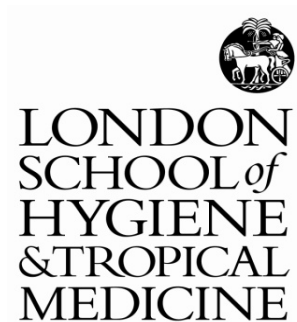
<https://researchonline.lshtm.ac.uk>

The private commercial sector distribution chain for antimalarial drugs in Benin

Findings from a rapid survey

November 2009

Sarah Tougher
Edith Patouillard
Ben Palafox
Catherine Goodman
Kara Hanson



Executive Summary

In November 2008, the Global Fund to Fight HIV/AIDS, TB and Malaria announced that it would administer the first phase of an ambitious scheme to increase the availability of effective treatment for malaria, the Affordable Medicines Facility – malaria (AMFm). Artemisinin-based combination therapies (ACTs) are highly-effective, but remain prohibitively expensive for those who are most vulnerable to malaria infection. AMFm aims to reduce significantly the price of ACTs by offering a co-payment for ACTs purchased by eligible buyers at the top of the supply chain.

Recognizing that the public and private sectors are important sources of antimalarials in most endemic countries, both public and private sector buyers will be entitled to purchase subsidized ACTs. The involvement of the private sector is an innovative element of AMFm, as many countries already have experience distributing ACTs in the public sector. To ensure that subsidized ACTs reach patients at the lowest possible cost, it is necessary to gain a better understanding of the private sector supply chains for antimalarials in each country participating in AMFm.

The objective of the rapid supply chain survey was therefore to assist Benin, which is one of the 11 countries invited to apply to the first phase of AMFm, in the development of an effective implementation plan by providing an understanding of the current supply chain for antimalarials, and the way in which subsidised ACTs are likely to travel through this chain to reach patients. This report presents the findings of a series of semi-structured interviews conducted with government officials and private suppliers of malaria treatment operating at the various levels of the chain.

At the time of the survey, antimalarial products sold in the private commercial sector were procured from international and domestic manufacturers by 3 active registered wholesalers and Benin's public sector procurement agent: the Centrale d'Achat des Médicaments Essentiels et des Consommables médicaux (CAME). Manufacturers do not have sole distributorship agreements for registered pharmaceuticals, or other special relationships with particular wholesalers. Consequently, each wholesaler regularly stocks a large proportion of the antimalarials registered in Benin. CAME is responsible for procuring the generic medicines on the National Essential Medicines List. In practice CAME procures and supplies antimalarials not included on the National Essential Medicines List, as it is currently out of date.

Patients in Benin access treatment for malaria in a diverse range of outlets. In the private commercial sector, these include 180 registered pharmacies, 279 pharmaceutical depots (as of 2008), and for-profit and non-profit private health clinics. Informal outlets, that is, unregistered stalls or shops that sell pharmaceuticals (often along with fast moving consumer goods), are the most common type of outlet that regularly stock antimalarials. The first round of the ACTwatch Outlet Survey found that informal outlets account for 74% of all outlets. Using this data, it can be estimated that there are 8,774 informal outlets selling antimalarials in Benin.

The prices of pharmaceutical products in the private sector are regulated to ensure that the entire population can buy medicines for the same price regardless of where they live. There was widespread agreement among key informants interviewed for the rapid analysis that the fixed price structure is well respected by registered wholesalers, pharmacies, and pharmaceutical depots.

With regards to the market share of antimalarial treatment types, sales records from Benin's registered private wholesalers describe the mix of products entering the formal private sector distribution chain. Wholesalers' sales are dominated by non-artemisinin monotherapies, which account for 56% of adult equivalent doses sold, while ACTs comprise 43% of the market share. Artemisinin monotherapies and non-artemisinin combination therapies respectively constitute only 1.0 and 0.3% of the volume of adult equivalent treatment courses sold.

Data from the ACTwatch outlet survey conducted in October 2008 shows the market share of antimalarials dispensed at the level of the outlet. Similar to the estimates of volumes produced from the records of the registered wholesalers, non-artemisinin monotherapies comprise the largest share of antimalarials sold by private sector outlets. Non-artemisinin monotherapies account for a total of 91% of full treatment courses sold. ACTs account for 8% of adult equivalent doses sold, while artemisinin monotherapies account for a very small proportion of adult equivalent doses sold in private sector outlets (0.8%). The outlet survey data has shown that Chloroquine dominates sales volumes at the outlet level. However, these antimalarials have an insignificant market share according to the wholesaler's sales records. The fact that these antimalarials are found primarily in informal outlets provides evidence that informal outlets use alternative supply sources.

Although the current distribution chain for antimalarials in the private formal sector is perceived to be well-organized and efficient, there are three potential barriers that could inhibit the distribution of subsidized ACTs in the private sector commercial sector in Benin. First, there is widespread concern among registered wholesalers and pharmacies that the mark-ups mandated under Benin's fixed price structure would be too low on a subsidized ACT to cover costs. Second, there is a relatively high risk that subsidized ACTs would leak into the informal market or be illegally exported into neighboring countries. Third, there are insufficient registered pharmacies and depots in rural areas to ensure that subsidized ACTs are accessible throughout Benin.

Based on current sales volumes and market shares, a range of scenarios were devised to estimate the uptake of an ACT subsidy under the AMFm. In all scenarios, there is a considerable reduction in the market share of ineffective antimalarial treatments, even in the cases where the overall volume of these treatments has increased. The most conservative scenarios, which assume a 30% substitution of all treatment types towards the subsidized product, resulted in a 30% market share of subsidized ACT; while the most ambitious scenario, which assumes a 70% substitution of ACTs, a 60% substitution of artemisinin monotherapies and a 40% substitution of non-artemisinin monotherapies towards the subsidized product, resulted in a 53% market share of subsidized ACT.

Contents

| | |
|--|----|
| Acknowledgements..... | iv |
| Abbreviations..... | v |
| 1. Context..... | 1 |
| 2. Methods..... | 1 |
| 3 Antimalarials in the private sector in Benin..... | 2 |
| 3.1 The structure of the antimalarial supply chain..... | 2 |
| 3.1.1 The importation of antimalarials in the private sector..... | 2 |
| 3.1.2 The distribution of antimalarials from wholesalers to patients in the private sector..... | 6 |
| 3.2 Antimalarial products in the private sector..... | 9 |
| 3.2.1 Antimalarial prices and mark-ups..... | 9 |
| 3.2.2 Volumes of antimalarial sales in the private commercial sector..... | 12 |
| 4. Barriers to widespread distribution of ACTs in the private sector..... | 15 |
| 4.1 Financial incentives..... | 16 |
| 4.2 Leakage to the informal sector..... | 16 |
| 4.3 Geographical accessibility..... | 16 |
| 5. Uptake of co-paid ACTs in the private commercial sector..... | 17 |
| 5.1 Estimating the uptake of the subsidy..... | 19 |
| 5.2 Estimating the potential financial impact of the ACT subsidy on registered wholesalers..... | 23 |
| 6 Recommendations..... | 27 |
| Annex 1: Volumes and prices of antimalarials sold by private wholesalers..... | 30 |
| Annex 2: List of antimalarials available for purchase by private sector buyers at CAME in 2008..... | 36 |
| Annex 3: Population data used to scale-up ACTwatch Outlet Survey Data to generate national estimates of retail provider numbers..... | 37 |
| Annex 4: Antimalarial doses used to calculate adult equivalent treatment doses..... | 37 |

Acknowledgements

This report was commissioned by the Clinton Foundation as part of their support to countries preparing proposals for funding under AMFm. We are grateful for the advice and input from Clinton Foundation staff in the development of data collection instruments and facilitation of data collection, and also for their valuable feedback on the content of the reports.

Many thanks also to the staff of Population Services International – Benin for providing administrative and logistical support, advice and feedback during the implementation of this rapid survey.

We acknowledge the important contributions from our interviewees from the Programme National de Lutte Contre le Paludisme, the Centrale d’Achat des Médicaments Essentiels et des Consommables médicaux, the Direction des Pharmacies et Médicaments, and the importers, wholesalers, retailers and non-governmental organizations who all gave us a share of their valuable time in participating in our interviews.

This study was undertaken as part of ACTwatch, a collaboration between Population Services International and the London School of Hygiene and Tropical Medicine, and funded by the Bill and Melinda Gates Foundation (www.actwatch.info). It draws on data collected by PSI for the first round of the Outlet Survey, conducted in October 2008. We are grateful to Kate O’Connell, ACTwatch Principal Investigator and Martine-Esther Tassiba, the Benin Country Programme Coordinator for facilitating use of these data.

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 London School of Hygiene & Tropical Medicine (LSHTM), by contacting Sarah Tougher (sarah.tougher@lshtm.ac.uk).

Abbreviations

| | |
|-------|--|
| ACT | Artemisinin-based Combination Therapy |
| AETD | Adult Equivalent Treatment Dose |
| AL | Artemether Lumefantrine |
| AM | Antimalarial drugs |
| AMFm | Affordable Medicine Facility For malaria |
| AMT | Artemisinin Monotherapy |
| CAME | Centrale d'Achat des Médicaments Essentiels et des Consommables médicaux |
| CF | Clinton Foundation |
| CFA | Franc de la Communauté financière africaine |
| CIF | Clearance, Insurance and Freight |
| CQ | Chloroquine |
| DHA | Dihydroartemisinin |
| DPAV | Dépôt paiement après vente |
| DPM | Direction des Pharmacies et du Médicament |
| LSHTM | London School of Hygiene and Tropical Medicine |
| Mef. | Mefloquine |
| nACT | Non-Artemisinin Combination Therapy |
| nAMT | Non-Artemisinin Monotherapy |
| NGO | Non-Governmental Organisation |
| OS | ACTwatch Outlet Survey |
| Pip. | Piperaquine |
| PGHT | Prix départ usine hors taxe |
| PNLP | Programme National de Lutte Contre le Paludisme |
| PSI | Population Services International |
| SP | Sulphadoxine Pyrimethamine |

1. Context

In November of 2008, the Global Fund to Fight HIV/AIDS, TB and Malaria announced that it would administer the first phase of an ambitious scheme to increase the availability of effective treatment for malaria, the Affordable Medicines Facility – malaria (AMFm). Artemisinin-based combination therapies (ACTs) are highly-effective, but remain prohibitively expensive for those who are most vulnerable to malaria infection.¹ AMFm aims to significantly reduce the price of ACTs by offering a co-payment for ACTs purchased by eligible buyers at the top of the supply chain.

Recognizing that the public and private sectors are important sources of antimalarials in most endemic countries, both public and private sector buyers will be entitled to purchase subsidized ACTs. The involvement of the private sector is an innovative element of AMFm, as many countries already have experience distributing ACTs in the public sector. To ensure that subsidized ACTs reach patients at the lowest possible cost, it is necessary to gain a better understanding of the private sector supply chains for antimalarials in each country participating in AMFm.

This report presents the findings of a rapid assessment of the private sector supply chain for antimalarials in Benin, which is one of the 11 countries invited to apply to the first phase of AMFm. It seeks to identify the strengths and weaknesses of Benin's supply chain, and describe how the private sector would respond to subsidized ACTs. The results of the rapid analysis are presented in three sections. First, the report explains the structure of the private sector supply chain for antimalarials in Benin, including a description of the business practices of key actors along the distribution chain. Second, it identifies potential barriers that could inhibit the distribution of subsidized ACTs in the private sector. Third, the rapid analysis concludes by estimating the level of uptake in the private sector.

This assessment was undertaken within the broader set of activities of ACTwatch, a collaboration between PSI and LSHTM which aims to provide evidence-based recommendations for policy makers on how to increase the availability of quality-assured artemisinin-based combination therapies for malaria. ACTwatch involves 3 main data collection activities: national level household and outlet surveys, both led by PSI; and a supply chain analysis which is led by the London School of Hygiene and Tropical Medicine. The analysis presented below draws on data collected in the first round of the Outlet Survey and data collection instruments developed for the supply chain analysis.

2. Methods

The rapid analysis of the private sector antimalarial supply chain in Benin used a mix of qualitative and quantitative methods.

First, primary data were collected during 18 semi-structured qualitative interviews with stakeholders operating at different levels of the supply chain. The interviewees were selected purposively through discussions with PSI-Benin and the Clinton Foundation staff working in Benin. Of the 18 interviews, 6 were conducted with key informants from governmental and non-governmental agencies that play an important role at the top of the supply chain. Key informants were asked questions about the overall supply chain for antimalarials in Benin; their perceptions of the effectiveness of regulations

¹ Nicholas White, "Malaria – Time to Act," *The New England Journal of Medicine*. 355 (2006): 1956-1957.

and other factors affecting the price and availability of antimalarials; and their view on the impact of AMFm on the market for antimalarials in Benin.

The remaining 12 in-depth interviews were conducted with private sector wholesalers and retailers² operating at all levels of the pharmaceutical supply chain. These respondents were asked questions about the structure of the market for antimalarials and their business practices, including their relationships with their suppliers and customers, stocking decisions, the level of competition and collusion in the market for antimalarials, and their perception of the appropriateness of regulations. In addition, respondents were questioned about how their businesses and the market for antimalarials would respond to subsidized antimalarials through the AMFm.

Second, the qualitative primary data collected for the purpose of the rapid analysis were supplemented with secondary data where possible. Data collected in October 2008 during the first round of the ACTwatch Outlet Survey (OS) in Benin were used to estimate key variables such as the number of informal outlets selling antimalarial drugs in the private sector. In addition, Benin's three registered private pharmaceutical importers provided sales volumes over a 1-year period to estimate the volume of antimalarials entering the top of the distribution chain.

3 Antimalarials in the private sector in Benin

3.1 The structure of the antimalarial supply chain

The general structure of the private sector pharmaceutical supply chain in Benin is illustrated in Figure 1 (refer to page 38). It is organized like a pyramid with a small number of wholesalers located at the top of the supply chain. Benin's pharmaceutical regulations define how pharmaceuticals should be distributed from wholesalers to the private sector outlets located at the bottom of the chain. The solid arrows in Figure 1 demarcate the distribution relationships permitted by legislative texts. Evidence suggests that these regulations are not adhered to in practice. The dotted arrows in Figure 1 show the unauthorized distribution relationships identified during the rapid analysis. In addition, Benin has a large informal private sector that plays a significant role in the distribution of medicines.

3.1.1 The importation of antimalarials in the private sector

Antimalarial products sold to private sector buyers are procured from international and domestic manufacturers by private sector wholesalers and Benin's public sector procurement agent; the Centrale d'Achat des Médicaments Essentiels et des Consommables médicaux (CAME).

Business practices of private sector wholesalers

In order to import and distribute antimalarials and other pharmaceutical products in Benin, wholesalers must be registered with the Direction des Pharmacies et Médicaments (DPM). Registered wholesalers must be owned and managed by pharmacists (at least 70% of capital held by pharmacists). Other conditions for registration include registration with the Registre de Commerce

² In-depth interviews were conducted with 3 private wholesalers, 5 registered pharmacies, 1 private clinic, 1 faith-based non-profit clinic, and 2 pharmaceutical depots.

et du Credit, the completion of a technical feasibility study, and the payment of a fee of 550 000 CFA (US\$ 1,227.68).³ Regulatory requirements also stipulate that registered wholesalers must maintain an operating capital of 100 000 000 CFA (US\$ 223,214.28), which can be reviewed every five years.⁴

Three of the four wholesalers registered with the DPM actively supply antimalarials in the private sector.⁵ Antimalarials purchased by the private sector wholesalers are primarily imported from international manufacturers. Supplies of unbranded generic formulations (quinine and SP) are also purchased from a domestic manufacturer.⁶ No domestic manufacturing capacity for artemisinin-based combination therapies (ACTs) exists in Benin.

All three registered wholesalers that supply antimalarials reported that they regularly stock a large proportion of registered antimalarials.⁷ This may be explained by the fact that regulatory requirements stipulate that wholesalers must hold stock of 90% of the pharmaceuticals registered in Benin.⁸ Consequently, manufacturers do not have sole distributorship agreements for registered pharmaceuticals, or other special relationships with particular importers. The manufacturers also do not have rules pertaining to sale prices, order volumes or embedded sales teams. (Refer to Annex 1 for a list of antimalarials sold by the private sector wholesalers).

Each wholesaler reported employing a logistician responsible for quantifying purchase volumes. Orders for antimalarials are not placed at specific intervals, but instead are based on sales volumes over the past 15 days to three months. All three wholesalers endeavor to maintain an inventory sufficient to cover sales for three months. One wholesaler stated that they adjust their order volumes so that they have a larger inventory of antimalarials in July and August to account for the high-transmission period. The lead time between placing an order and the receipt of antimalarials ranges from one to three months, depending on how quickly the manufacturer can fill the order and

³The average official exchange rate for 2008 (448 CFA per US\$) was used to convert prices expressed in CFA to US\$.

World Bank, *World Bank Development Indicators 2008*. Washington, DC: World Bank, 2009.

⁴Décret n° 2000-450 du 11 Septembre 2000. *Recueil des textes législatifs et réglementaires du secteur pharmaceutique*. 2^e édition. Décembre 2007.

⁵At the time of research, the fourth wholesaler was inactive due to financial difficulties, and a fifth wholesaler had submitted an application for registration.

⁶Only one of the two domestic pharmaceutical manufacturers registered with the DPM produces antimalarial treatments.

⁷All imported and domestically manufactured antimalarials must be registered by the Service d'Enregistrement, de Statistique et de Contrôle de Qualité (SESCQ) of the DPM. Each dosage form and presentation of an antimalarial product must be registered individually. Moreover, if a manufacturer would like to register an antimalarial that is essentially identical to one that is already registered, it must be at least 15% less expensive than the antimalarial already registered. The fee for registering a new product is 250 000 CFA (US\$ 558.04). Registrations must be renewed every 5 years for a fee of 100 000 CFA (US\$223.21).

Décret n° 97-632 du 31 December 1997. *Recueil des textes législatifs et réglementaires du secteur pharmaceutique*. 2^e édition. Décembre 2007.

⁸Décret n° 2000-450 du 11 Septembre 2000. *Recueil des textes législatifs et réglementaires du secteur pharmaceutique*. 2^e édition. Décembre 2007.

the type of transportation used (air versus sea). To clear imported antimalarials through customs, the wholesaler must present authorization from the DPM, and pay clearance taxes totaling 2.5%.⁹

All three wholesalers use their own fleet of vehicles to deliver antimalarials to registered pharmacies, while one wholesaler reported having contracts with inter-city public taxis to reach certain remote pharmacies. Supplies are delivered free of charge to all registered pharmacies regardless of where they are located. The frequency of deliveries ranges from 4 times per day in Cotonou and Porto Novo to three times per week for pharmacies located in more remote areas. Two wholesalers have regional warehouses (in Bohicon and Parakou) to facilitate distribution to pharmacies located outside of Cotonou and Porto Novo.

With regards to the private wholesalers' sales strategy, each wholesaler explained that they do not undertake activities to promote specific products. Instead, pharmaceutical manufacturers employ medical delegates either directly or through a third-party agency. The delegates are typically responsible for a specific territory and visit health facilities and other retail outlets (such as registered pharmacies) to promote the manufacturer's products. Several of the registered pharmacies visited for the purpose of this rapid analysis postulated that the medical delegates have a significant impact on doctor's prescription practices. The manufacturers previously offered free units when a minimum volume was purchased. However, this practice has since been banned, because it was believed to be an important source of leakage into the informal sector.

To attract and keep customers, the private wholesalers occasionally send staff to verify that their clients are satisfied with the service provided (for example, to check if orders are filled accurately and delivered promptly). To preserve customer loyalty, rebates are sometimes offered to customers that pay for orders in cash, repay credit on time, or purchase large volumes. Rebates of approximately 3-10% of the total value of an order or the total value of orders over a defined period of time (such as orders placed over the past year) are offered to these customers, since the unit costs of pharmaceuticals are fixed in Benin (refer to Section 3.2).

The rapid analysis identified three factors that limit the number of registered wholesalers in Benin. First, Benin's relatively small population (and consequently small market) is perceived to limit the number of importers that could be profitable. Existing wholesalers have well-established distribution networks and relationships with their customers.

Second, the segmentation of the private commercial sector for pharmaceuticals between the formal and informal is perceived to further limit the number of registered importers. Key informants at all levels of the supply chain cited the informal sector as a significant competitor for antimalarial drug sales. Informal providers are perceived as taking potential customers from the formal sector, and consequently reducing the demand for the products procured by the registered importers.

Third, regulations requiring wholesalers to have a minimum operating capital of 100 000 000 CFA (US\$ 223,214.28), maintain sufficient inventory for three months, and stock 90% of registered pharmaceuticals make an important contribution to ensuring that all registered pharmaceuticals are

⁹ The clearance tax is broken down as follows: Redevance Statistique: 1%, Prélèvement Communautaire de Solidarité: 1%; Prélèvement Communautaire: 0.5%. Medicines are exempt from the following taxes: Droit de Douane, Taxes sur Valeur Ajoutée, Droit fiscal, and Commission CNCB.

available in the private sector. However, these same requirements discourage the formation of smaller wholesalers.

The role of CAME in the importation of antimalarials for the private sector

As Benin's public procurement and distribution agent, CAME is responsible for procuring the generic medicines on the National Essential Medicines List.¹⁰ In principle, this list should dictate which antimalarial products are purchased by the public sector. However, the list has not been updated since 2003, and does not include the first- and second- line treatments for uncomplicated malaria currently recommended in Benin's national treatment guidelines for malaria.¹¹ CAME consequently procures and holds stocks of antimalarials not included on the National Essential Medicines List.

Since 1994, medicines procured by CAME may be purchased by private sector buyers. However, stock that is funded by donors, such as products intended for vertical disease control programs, cannot be purchased by private sector buyers. For example, CAME is responsible for storing and managing large volumes of Coartem financed by the World Bank and other donors on behalf of the National Malaria Control Program (PNLP). These stocks of Coartem cannot be purchased by private sector buyers.¹²

According to CAME's standard operating procedures, competitive tendering (opened or closed) should be the standard method for procuring supplies. However, CAME's antimalarial stocks that can be purchased by private sector buyers, in particular ACTs, are procured through consignment (DPAV). Under this practice, manufacturers deliver antimalarials or other pharmaceuticals to CAME's storage facilities. Supplies are not paid for until after they are sold, and unsold inventories are the property of the manufacturer, not CAME. Concern has been raised that these procedures are not transparent, and do not ensure that supplies are purchased at the lowest possible cost.¹³ Refer to Annex 2 for a list of antimalarials available at CAME for purchase by private sector buyers.

Pharmaceuticals procured by CAME are stored at the central level warehouse located in Cotonou. Medicines are delivered directly from the central warehouse to two major public health facilities located in Cotonou and two regional depots located in Parakou and Natitingou. CAME does not distribute pharmaceutical products beyond its regional depots.¹⁴ Private sector buyers collect orders directly from the central or regional warehouses. Orders must be paid for in cash, as credit is not available. The buyer must pay for any costs incurred to transport pharmaceuticals from the warehouse to their facilities.

¹⁰ Ministère de la santé. 2003. *Liste Nationale des Médicaments Essentiels sous Noms Génériques*. 5^e Edition. République du Bénin

¹¹ Diara, M., Derosena, M., Ndoye, T. 2008. *Revue de la Gestion des Produits Antipaludiques et Mise à Echelle des Combinaisons Thérapeutiques à Base d'Artémisinine au Bénin*. Soumis à l'Agence des Etas-Unis pour la Développement International par le programme Renforcement des Systèmes Pharmaceutiques. Arlington, V: Management Sciences for Health.

¹² A significant portion of the stock of Coartem currently being stored by CAME is at risk of expiry. To prevent these supplies from being wasted, the National Malarial Control program is considering distributing it to non-profit private health centers, particularly faith-based organisations.

¹³ Ndoye, T. et al. 2009. *Évaluation de la gouvernance, de la transparence et des opérations de la Centrale d'Achats des Médicaments Essentiels du Bénin, décembre 2008*. Arlington, VA: Management Sciences for Health.

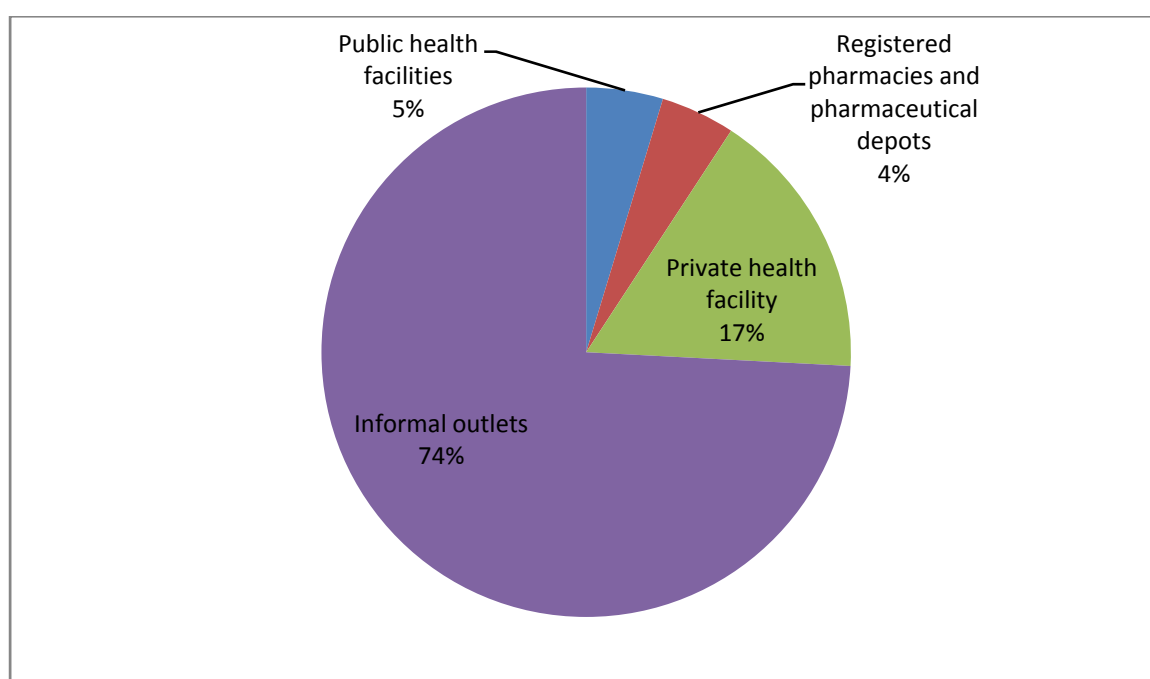
¹⁴ On request CAME can make its vehicular fleet available to buyers that place large orders on a cost-recovery basis.

3.1.2 The distribution of antimalarials from wholesalers to patients in the private sector

Patients in Benin access treatment for malaria in a diverse range of outlets in the public and private sectors.

Round 1 of the ACTwatch Outlet Survey conducted by PSI in October 2008 confirmed that private formal and informal outlets are a significant source of antimalarial treatment in Benin. The ACTwatch Outlet Survey used a census approach in 19 Arrondissements to identify all outlets that provide antimalarials. A total of 1,096 outlets were identified, of which 752 had antimalarials in stock at the time of the survey. An additional 93 outlets had no antimalarials in stock at the time of the survey, but had antimalarials in stock in the past three months.¹⁵ Figure 2 shows the distribution of outlets that had antimalarials in stock when visited by the ACTwatch Outlet Survey.

Figure 2: Providers of antimalarials by type in 19 arrondissements¹⁶



Source: ACTwatch Group. 2009. Outlet Survey Report (Baseline), Benin 2008.

From this figure, it is evident that public health facilities represent a small portion of the locations where antimalarials are available in Benin. The role and business practices of the main types of providers in the private commercial sector, namely registered pharmacies, pharmaceutical depots, private clinics, and informal outlets will now be discussed

Registered Pharmacies

There are a total of 180 registered pharmacies in Benin. Registered pharmacies are owned and managed by a pharmacist. They sell a variety of prescription and over-the-counter pharmaceuticals, as well as nutritional supplements and cosmetic products. Registered pharmacies are concentrated

¹⁵ ACTwatch Group. 2009. Outlet Survey Report (Baseline), Benin 2008. <http://www.actwatch.info/results/>

¹⁶ In the ACTwatch Outlet Survey Report, the informal outlets are classified as 'other outlets,' which is made up of 762 outlets located in a stall or shop located in or outside of a market, 86 itinerant medicine seller, and 13 'other' outlets that could not otherwise be classified.

in urban centers. For example, 48% of registered pharmacies are in Cotonou, and a further 8.3% are located in Porto Novo.¹⁷

The registered pharmacies visited for this rapid analysis stock a wide-range of antimalarial products, including ACTs, non-artemisinin combination therapies, and monotherapies. Pharmacies stock multiple brands, strengths and dosage forms of most compounds. Pharmacies decide whether or not to stock a particular antimalarial based on demand. Interviewed pharmacists indicated that demand for specific antimalarials depends largely on the prescribing patterns of nearby health facilities, consumer preferences, as well as individual pharmacist's preferences. These pharmacies maintain a small inventory of antimalarials that is sufficient to cover their sales for one week to one month.

Registered pharmacies procure antimalarials directly from private wholesalers or CAME. Respondents indicated that the quantification of their orders is based on recent sales volumes (sales of the past day to the past two weeks). The frequency of placing orders depends on the business practices of each individual pharmacy, but ranges from twice per day to two times per month among the pharmacies visited for this study. For orders placed with private wholesalers, lead times range from two hours (for pharmacies located in Cotonou or Porto Novo) to two days (for pharmacies further North). Pharmacies located in Cotonou indicated that most orders are filled the same day or early the next morning if the order was placed late in the afternoon. Orders placed with CAME are also often ready for pick-up the same day. Pharmacies purchasing stocks from CAME must pay cash for their orders, and cover transportation costs. In contrast, private wholesalers provide credit for 15-30 days on all orders, and do not charge pharmacies for deliveries.

Registered pharmacists indicated that they typically purchase most of their antimalarials from one preferred private wholesaler, but will buy stock from other wholesalers in cases of stock outs. This preference is not based on competition in terms of prices or available products, because wholesalers stock the same products at the same price (Benin's system for fixing prices will be explained in greater detail in Section 3.2). Instead, owners of registered pharmacies are often shareholders in a private wholesaler, and consequently prefer to purchase supplies from that wholesaler. The quality of a wholesaler's customer service and the speed that they can fill orders were also mentioned as important factors that influence the selection of supply sources. Most registered pharmacies also purchase supplies of generic antimalarials from CAME.

Pharmaceutical depots

Since registered pharmacies are almost exclusively located in large centers, antimalarials may also be purchased at pharmaceutical depots. Pharmaceutical depots were created to increase the geographical accessibility of pharmaceuticals. As of 2008, there are 279 depots registered in Benin. They must be located at least 10 km away from a registered pharmacy, and must close if a pharmacy opens in the area. Depots must sign a memorandum of understanding with a registered pharmacy. The depot must purchase pharmaceuticals¹⁸ directly from this pharmacy, rather than purchase supplies from public or private sector wholesalers.

¹⁷ Calculated from the list of registered pharmacies provided by the Ordre des Pharmaciens du Benin

¹⁸ Depots are not permitted to sell all registered pharmaceutical products; they are banned from selling narcotic and psychoactive drugs.

Depots stock fewer antimalarials and hold much smaller inventories relative to registered pharmacies. The depots visited for this rapid analysis reported that they often have stock outs of antimalarials. They explained that they are not able maintain larger inventories, because they do not have access to credit. The length of these stock-outs may be exacerbated by the fact that suppliers do not deliver stock to depots.

In practice, depots often procure antimalarials from multiple sources. To take advantage of lower purchase prices, depots sometimes buy antimalarials directly from private wholesalers or CAME. Since depots are not authorized to purchase supplies from either private or public wholesalers, the depots interviewed explained these purchases were facilitated by personal connections. Depots also purchase supplies from registered pharmacies with whom they have not signed a memorandum of understanding.

Private clinics

In addition to registered pharmacies and pharmaceutical depots, antimalarials are also available in clinics in the private sector. Private clinics include both private for-profit clinics and non-profit religious health centers. Many clinics in the private sector are not registered with the Ministry of Health. A 2005 study of private health practices in Borgou, Alibori, Mono, and Couffou found that only 12% were authorized by the Ministry of Health.¹⁹

Private clinics are not supposed to sell pharmaceuticals to patients, but are able to charge patients for medicines used during hospitalization. For outpatient visits, the clinic should write a prescription to be filled at a registered pharmacy or pharmaceutical depot. However, there is a widespread perception that some private clinics, particularly those that are unregistered, do not follow this rule and supply pharmaceuticals directly to patients.

Larger private clinics primarily procure antimalarials from CAME. Some private clinics also buy supplies from private wholesalers,²⁰ but the private wholesalers do not deliver products or offer credit to private clinics. Horizontal trading among private clinics is common. Small clinics that do not have access to a public or registered private wholesaler buy their antimalarials supplies from larger clinics. This is especially true for small faith-based health centers. Private clinics also purchase antimalarials from registered pharmacies or pharmaceutical depots.

Informal outlets

While the exact size of the informal sector in Benin is unknown, it is widely believed that a large proportion of patients acquire antimalarials from informal drug sellers. A 2003 study in Cotonou by the Fondation Pierre-Fabre found that 40% of the 600 households interviewed had purchased medicines from informal sellers.²¹ Outlets include mobile drug sellers, stalls and stores in markets, and stalls and stores outside of markets. Informal outlets often sell fast moving consumer goods, as

¹⁹ Cited in Adeya, G. et al. 2007. *Évaluation rapide du système de santé du Bénin*. Arlington, VA: Management Sciences for Health.

²⁰ Private wholesalers are not authorized to sell medicines to private health facilities.

²¹ Bernagou, P. 2008. La contrefaçon des médicaments et les moyens d'y remédier au Bénin. *C. R. Biologies*. 986-990.

well as some medicines (primarily antipyretics). Re-analysis of ACTwatch Outlet Survey data indicates that there are 8,774²² informal outlets selling antimalarials in Benin.

Not much is known about the distribution channels that supply medicines sold in the informal sector. The ACTwatch Supply Chain Study in Benin will address this gap by mapping out the formal and informal private sector distribution chains for antimalarials. Nevertheless, key informants interviewed for the rapid analysis identified two possible distribution networks for antimalarials sold in the informal sector. First, the informal sector is supplied by illegal imports from neighboring countries. Benin's porous borders and proximity to Lomé and Lagos are perceived to exacerbate this problem. Second, the informal sector is supplied by leakages from the formal public and private pharmaceutical supply chains. For example, ACTs designated for the public sector were recently found in the informal market.²³

Moreover, additional analysis of data from Round 1 of the ACTwatch Outlet Survey emphasizes the importance of Benin's open-air markets in the distribution networks that supply antimalarials to Benin's informal outlets. Each outlet visited during the Outlet Survey was asked to provide details on their two most important supply sources for antimalarials. Of the informal outlets that provided information on their suppliers,²⁴ 85% identified one of Benin's informal markets as their top supply source, while the Marché Dantokpa located in Cotonou was named the most frequently.²⁵ Preliminary evidence from the ACTwatch Supply Chain Survey indicates that the wholesalers operating in these markets do not deliver medicines to the outlets that they serve.

3.2 Antimalarial products in the private sector

3.2.1 Antimalarial prices and mark-ups

The prices of pharmaceutical products in the private sector are regulated to ensure that the entire population can buy medicines for the same price regardless of where they live.

The basis for calculating the prices of antimalarials bought from private wholesalers is the manufacturer's price before taxes (PGHT). This price excludes all taxes, transportation and insurance costs. The wholesaler's selling price is calculated by multiplying the PGHT by a coefficient of 1.36. Similarly, the retail price is calculated by multiplying the PGHT by a coefficient of 1.78. Pharmaceutical depots are able to purchase products from registered pharmacies at a discount of 8% from the retail price. Public health facilities are able to purchase products from wholesalers at a

²² This estimate was produced by multiplying the number of informal outlets found to have antimalarials in stock at the time of the ACTwatch Outlet Survey by the inverse of the survey's sampling fraction. The first round of the ACTwatch Outlet Survey identified 862 informal outlets or other outlets, of which, 64.3% (554) were found to have antimalarials in stock at the time of the survey.

Refer to Annex 3 for the calculation of the ACTwatch Outlet Survey's sampling fraction.

ACTwatch Group. 2009. Outlet Survey Report (Baseline), Benin 2008. <http://www.actwatch.info/results/>

²³ Ndoye, T. et al. 2009.

²⁴ In the 19 sub-districts visited during Round 1 of the ACTwatch Outlet Survey, 20% of the informal outlets surveyed either did not know their top supplier for antimalarials or refused to answer the question.

²⁵ ACTwatch Group. 2009.

discount of 13% from the retail price.²⁶ To ensure that prices are stable, at the time a pharmaceutical is registered the manufacturer must provide a detailed explanation of product's cost structure and set the PGHT for a period of five years.²⁷ After five years, the manufacturer can apply to the Commission Tarifaire des médicaments et spécialités pharmaceutiques to adjust the PGHT.²⁸

Tables 1-3 shows a range of wholesaler purchase prices, wholesaler selling prices, and retail prices for a selection of antimalarials (in tablet form) sold by private sector wholesalers. The prices presented in these tables were calculated from sales records provided by the three registered wholesalers, and adjusted to express the price per adult equivalent treatment dose (AETD).

Annex 1 provides the wholesale selling price per package and volumes for all antimalarials sold by the registered private wholesalers.

Table 1: Wholesale and retail selling prices per AETD²⁹ of common artemisinin monotherapies in CFA and (US\$)

| | PGHT | | | Wholesaler's selling price | | | Retail price | | |
|------------|------------------|------------------|--------------------|----------------------------|-------------------|--------------------|------------------|-------------------|--------------------|
| | Low | High | Mean ³⁰ | Low | High | Mean ³⁰ | Low | High | Mean ³⁰ |
| Artemether | 2256 (\$5.04) | 4019 (\$8.97) | 3112 (\$6.95) | 3068 (\$6.85) | 5466 (\$12.20) | 4233 (\$9.45) | 4015 (\$8.96) | 7154 (\$15.97) | 5540 (\$12.37) |
| Artesunate | 735 (\$1.64) | 1982 (\$4.42) | 1465 (\$3.27) | 999 (\$2.23) | 2696 (\$6.02) | 1992 (\$4.45) | 1308 (\$2.92) | 3529 (\$7.88) | 2608 (\$5.82) |

Table 2: Wholesale and retail selling prices per AETD²⁹ of common ACTs in CFA and (US\$)

| | PGHT | | | Wholesaler's selling price | | | Retail price | | |
|---------------------------|------------------|-------------------|--------------------|----------------------------|--------------------|--------------------|------------------|--------------------|--------------------|
| | Low | High | Mean ³⁰ | Low | High | Mean ³⁰ | Low | High | Mean ³⁰ |
| Artemether – Lumefantrine | 1300 (\$2.90) | 2426 (\$5.42) | 1669 (\$3.73) | 1768 (\$3.95) | 3345 (\$7.47) | 2270 (5.06) | 2314 (\$5.17) | 4378 (\$9.77) | 2970 (\$6.63) |
| Artemisinin – Napthoquine | 1482 (\$3.31) | 1482 (\$3.31) | 1482 (\$3.31) | 2016 (\$4.50) | 2016 (\$4.50) | 2016 (\$4.50) | 2639 (\$5.89) | 2639 (\$5.89) | 2639 (\$5.89) |
| Artesunate – Amodiaquine | 1148 (\$2.56) | 9971 (\$22.26) | 2648 (\$5.91) | 1561 (\$3.48) | 13560 (\$30.27) | 3601 (\$8.04) | 2043 (\$4.56) | 17748 (\$39.62) | 4714 (\$10.52) |
| Artesunate – Mefloquine | 2165 (\$4.83) | 3279 (\$7.32) | 2276 (\$5.08) | 2944 (\$6.57) | 4460 (\$9.96) | 3095 (\$6.91) | 3853 (\$8.60) | 5837 (\$13.03) | 4051 (\$9.04) |
| Artesunate – SP | 1968 (\$4.39) | 2794 (\$6.24) | 2095 (\$4.68) | 2676 (\$5.97) | 3800 (\$8.48) | 2849 (\$6.36) | 3502 (\$7.82) | 3228 (\$7.21) | 3728 (\$8.32) |
| DHA - Piperavaquine | 1804 (\$4.03) | 2617 (\$5.84) | 2377 (\$5.31) | 2453 (\$5.48) | 3559 (\$7.94) | 3232 (\$7.21) | 3211 (\$7.17) | 4658 (\$10.40) | 4231 (\$9.44) |
| DHA – SP | 800 (\$1.79) | 800 (\$1.79) | 800 (\$1.79) | 1088 (\$2.43) | 1088 (\$2.43) | 1088 (\$2.43) | 1424 (\$3.18) | 1424 (\$3.18) | 1424 (\$3.18) |

²⁶ Arrêté Interministériel n° 006/MICPE/MSP/MFE/DC/DCCI du février 2002 *Recueil des textes législatifs et réglementaires du secteur pharmaceutique*. 2^e édition. Décembre 2007.

²⁷ Décret n° 97-632 du 31 December 1997

²⁸ Arrêté Interministériel année 2003 n° du 029/MICPE/MSP/DC/SG/DC/DCCI/DPED 18 juin 2003. *Recueil des textes législatifs et réglementaires du secteur pharmaceutique*. 2^e édition. Décembre 2007.

²⁹ Refer to Annex 4 for the assumptions used to calculate AETD conversion factors.

³⁰ Figures in this column are the weighted mean of the price per AETD of all antimalarial products of a particular type sold in tablet dosage form.

Table 3: Wholesale and retail selling prices per AETD²⁹ of common non-artemisinin monotherapies in CFA and (US\$)

| | PGHT | | | Wholesaler's selling price | | | Retail price | | |
|--------------|------------------|--------------------|--------------------|----------------------------|--------------------|--------------------|------------------|--------------------|--------------------|
| | Low | High | Mean ³⁰ | Low | High | Mean ³⁰ | Low | High | Mean ³⁰ |
| Amodiaquine | 152 (\$0.34) | 875 (\$1.95) | 326 (\$0.73) | 206 (\$0.46) | 1190 (\$2.66) | 443 (\$0.99) | 270 (\$0.60) | 1558 (\$3.48) | 580 (\$1.29) |
| Chloroquine | 57 (\$0.13) | 426 (\$0.95) | 410 (\$0.92) | 78 (\$0.17) | 580 (\$1.29) | 558 (\$1.25) | 101 (\$0.23) | 759 (\$1.69) | 730 (\$1.63) |
| Halofantrine | 1800 (\$4.02) | 3100 (\$6.92) | 2168 (\$4.84) | 2448 (\$5.46) | 4216 (\$9.41) | 2949 (\$6.58) | 3204 (\$7.15) | 5518 (\$12.32) | 3859 (\$8.61) |
| Quinine | 1100 (\$2.46) | 10323 (\$23.04) | 3749 (\$8.37) | 1495 (\$3.34) | 14039 (\$31.34) | 5099 (\$11.38) | 1957 (\$4.37) | 18375 (\$41.01) | 6673 (\$14.89) |
| SP | 54 (\$0.12) | 2100 (\$4.69) | 300 (\$0.67) | 74 (\$0.17) | 2856 (\$6.38) | 408 (\$0.91) | 97 (\$0.22) | 3738 (\$8.34) | 534 (\$1.19) |

There was widespread agreement among the key informants that this fixed price structure is well respected by the private wholesalers, registered pharmacies, and pharmaceutical depots.

Products bought from CAME have a different pricing structure. CAME's selling price is calculated by multiplying the total price of the product once it reaches the central warehouse (including freight, insurance, clearance, and other charges) by a coefficient of 1.2. The retail price is calculated by multiplying CAME's selling price by a coefficient of 1.5. If this is higher than the price that is obtained by multiplying the identical product's PGHT x 1.78, the final price must be reduced to this level. Refer to Table 4 for a comparison of the price structures for products purchased from CAME with products purchased from private wholesalers.

Table 4: Comparison of price and mark-up structures for antimalarials purchased from CAME and private wholesalers

| | Medicines bought from private wholesalers | Medicines bought from CAME |
|-----------------------------|---|--|
| Wholesale price | PGHT X 1.36 | Price after taxes, international and local transport X 1.2 |
| Retail price | PGHT X 1.78 | Wholesale price X 1.5 |
| Wholesaler mark-up | 36% | 20% |
| Pharmacist's mark-up | 31% | 50% |

The pricing structure created for CAME's products is not applied uniformly. The regulation that established the pricing structure applies to public and private health facilities only.³¹ There is ambiguity on how registered pharmacies and pharmaceutical depots should price products procured from CAME.

³¹ Arrêté Interministériel n^o11063/MS/MDEF/DC/SGM/CTJ/DPM/SA du 26 octobre 2006. *Recueil des textes législatifs et réglementaires du secteur pharmaceutique*. 2^e édition. Décembre 2007.

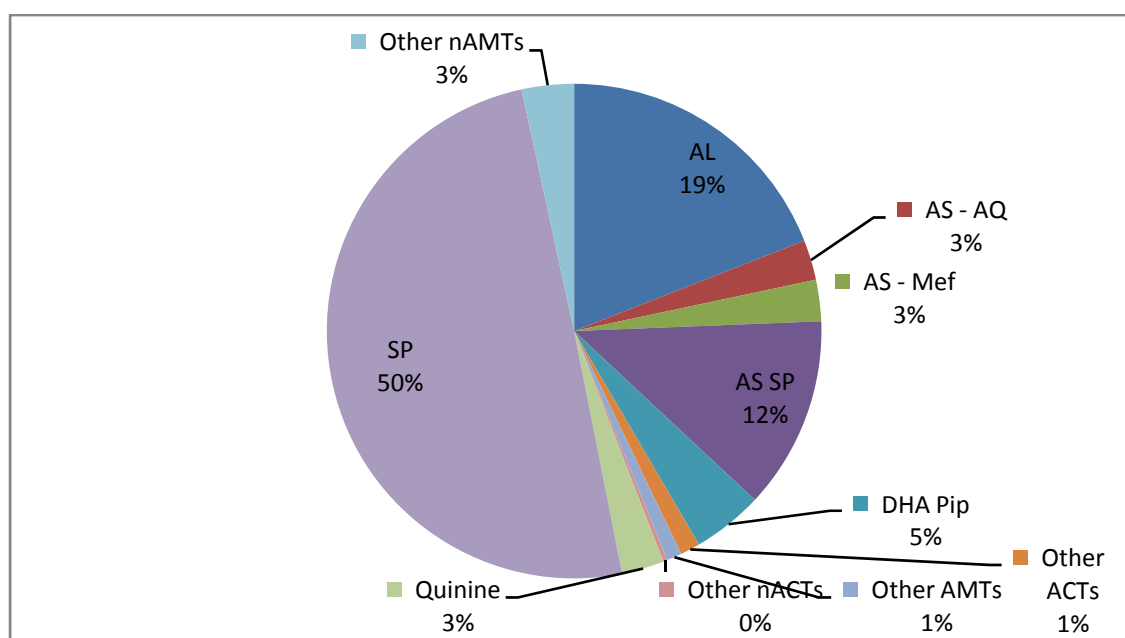
3.2.2 Volumes of antimalarial sales in the private commercial sector

Two sources of data are available to analyse the volumes of antimalarials in the private commercial sector in Benin. Sales records from Benin’s registered private wholesalers collected during the rapid assessment describe the mix of products entering the private sector distribution chain, while data from the ACTwatch Outlet Survey show the market share of antimalarials across the range outlets from which patients access treatment. Both data sources were analyzed for the rapid survey to provide a thorough understanding of how antimalarials flow through the private sector distribution chain.

Each registered wholesaler was asked to provide the total sales volume of each antimalarial product that they sell over a period of one year. Due to differences in the wholesalers’ record management systems, it was not possible to get data for an identical timeframe from all three wholesalers (one wholesaler provided sales figures for 2008, while the others provided figures for the past 12 months). These sales figures were used to approximate the total volume of adult equivalent doses for each antimalarial sold in tablet form.³²

In terms of volumes of adult equivalent doses sold, the wholesaler’s sales are dominated by non-artemisinin monotherapies. Together, non-artemisinin monotherapies account for 56% of adult equivalent doses sold by Benin’s registered wholesalers. Sales of ACTs account for 43% of adult equivalent doses sold. The most popular ACTs are Artemether + Lumefantrine, followed by Artesunate + SP, which respectively contribute to 19% and 12% of sales volumes. Artemisinin monotherapies account for 1% of adult equivalent doses sold, while non-artemisinin combination therapies account for 0.28% of adult equivalent doses sold. Refer to Figure 3.

Figure 3: Private wholesaler antimalarial sales volumes by treatment type



Source: Wholesaler sales records

³² Refer to Annex 4 for the assumptions used to calculate AETD conversion factors.

During the ACTwatch Outlet Survey conducted by PSI-Benin in October of 2008, each outlet visited was asked to recall the volume of each antimalarial sold over the preceding week.^{33 34}

Similar to the estimates of volumes produced from the records of the registered wholesalers, non-artemisinin monotherapies comprise the largest share of volumes sold. Non-artemisinin monotherapies account for a total of 91% of full courses of adult treatment sold by these outlets. In contrast to the registered wholesalers' sales records, we find that at the level of the outlet Chloroquine emerges as the most popular treatment type. Chloroquine accounts for 54% of full courses of adult treatment, while Quinine and SP respectively make-up 29% and 8% of sales volumes. ACTs account for 8% of adult equivalent doses sold. Artemisinin monotherapies account for a very small proportion of adult equivalent doses sold in private sector outlets (0.8%).³⁵

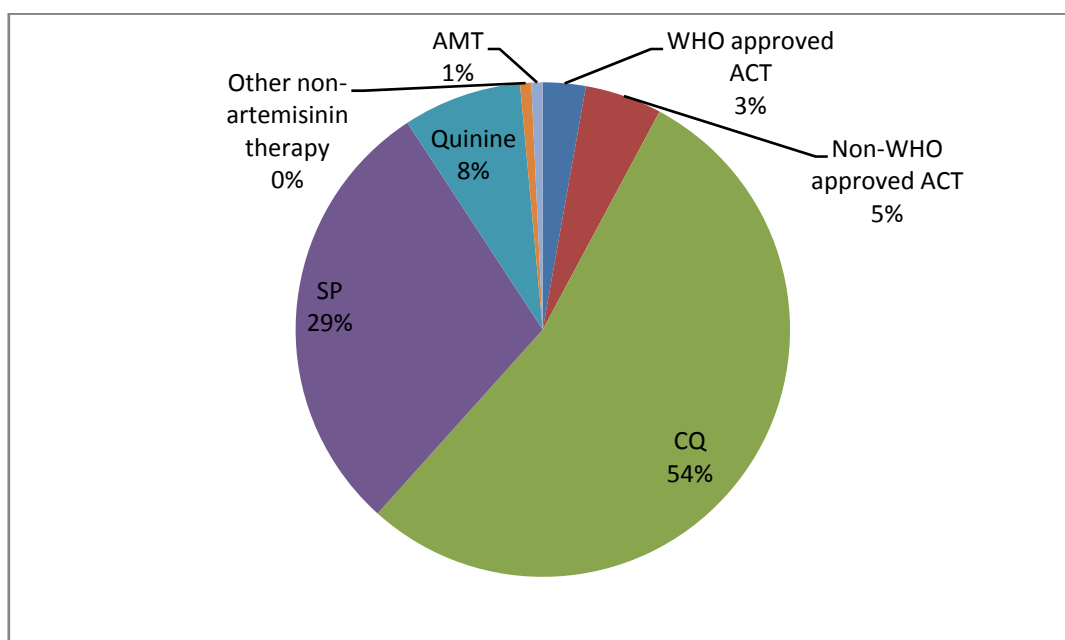
Figure 4 illustrates the share of recalled sales volumes by antimalarial type among outlets in the private sector.

³³ In this analysis, private outlets include: registered pharmacies, rural pharmaceutical depots, private clinics, health centres run by non-governmental organizations or faith-based organizations, stalls and shops located in or outside of markets, itinerant medicine sellers, and a small number of other outlets that could not be classified in the aforementioned categories (as reported in the Baseline ACTwatch Outlet Survey Report for Benin).

³⁴ The recalled sales volumes presented in the Baseline ACTwatch Outlet Survey Reports estimate the number of full courses of adult treatment distributed in the past week. These estimates exclude antimalarials that were not in a tablet dosage form, as well as tablet pediatric formulations.

³⁵ ACTwatch Group. 2009.

Figure 4: Private outlet antimalarial sales volumes by treatment type³⁶



Source: ACTwatch Group. 2009. Outlet Survey Report (Baseline), Benin 2008.

In terms of volumes, the market share of antimalarials varies by outlet type. Figure 5 shows the distribution of recalled sales volumes collected from Round 1 of the ACTwatch Outlet Survey by antimalarial and outlet type.³⁷ Public health facilities are responsible for distributing 46% all ACTs,³⁸ but 68% of WHO-ACTs. Volumes of ACTs sold in Benin's numerous informal outlets have thus far been relatively low.³⁹

In contrast, the market for non-artemisinin monotherapies is dominated by informal outlets. While the volumes of antimalarials sold in each individual outlet are on average very small, the sheer number of informal outlets implies that when combined these sales volumes are important. Informal outlets sold 76% of all chloroquine distributed in the previous week, and 60% of all non-artemisinin monotherapies.⁴⁰ Artemisinin monotherapies were found to be sold almost exclusively in registered

³⁶ The ACTwatch November 2008 Outlet Survey report for Benin presents four ACT categories throughout: First line treatment, WHO approved ACT, Nationally registered ACT, Non-WHO/nationally registered ACT. Because first three categories are not mutually exclusive, for the purpose of the rapid assessment, we have retained the category of WHO approved ACT, as well as a second category, non-WHO approved ACT. The category of non-WHO approved ACT estimates the volume of ACTs distributed in the past week that are not approved by the WHO, regardless if they are nationally registered or not. We calculated volume of non-WHO approved ACTs by adding the volume of Nationally registered ACTs to the volume of Non-WHO/nationally registered ACTs and subtracting the volume of WHO approved ACTs distributed, as they were reported in the ACTwatch baseline Outlet Survey Report.

³⁷ Refer to footnote 34 and 36 for a description of the assumptions used to estimate the volumes of antimalarials sold over the previous week.

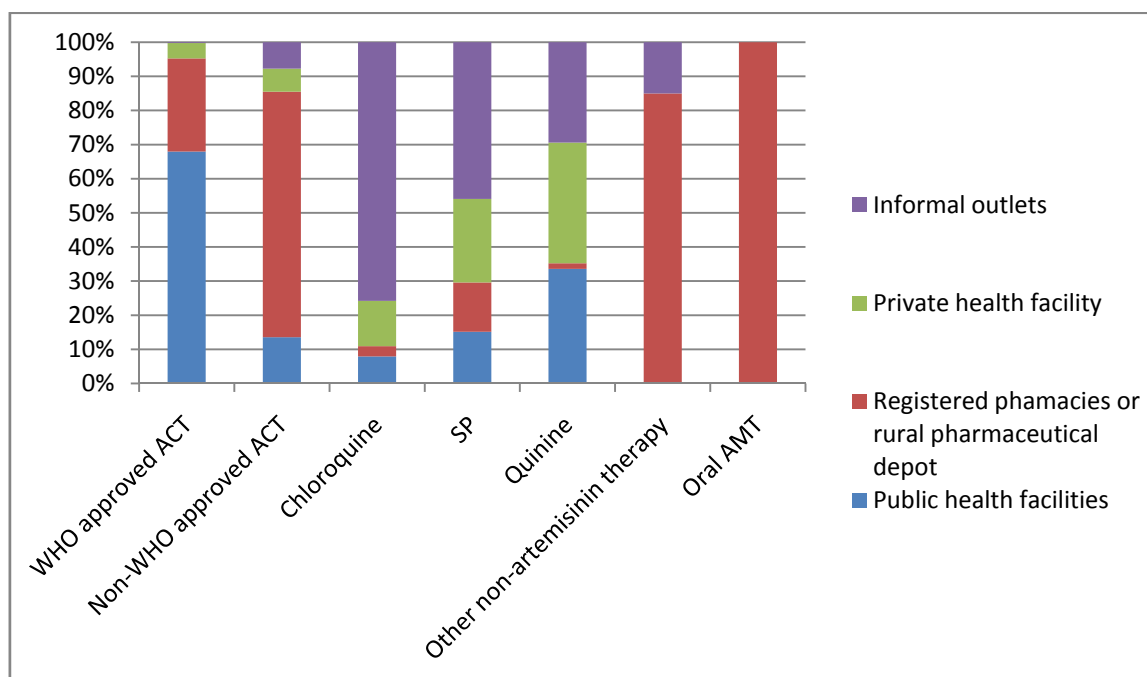
³⁸ For the purpose of this analysis, all ACTs refers to WHO-approved plus non-WHO approved ACTs. Refer to footnote 36 for a description of how the volume of non-WHO approved ACTs was calculated.

³⁹ ACTwatch Group. 2009.

⁴⁰ *Ibid.*

pharmacies and pharmaceutical depots. 100% of the recalled sales volumes of oral artemisinin monotherapies were from registered pharmacies and pharmaceutical depots.⁴¹

Figure 5: Market share of antimalarial sales volumes by outlet type and treatment type



Source: ACTwatch Group. 2009. Outlet Survey Report (Baseline), Benin 2008.

Analysis of volume data at the top and the bottom of the distribution chain has revealed that non-artemisinin monotherapies dominate antimalarial sales in the private commercial sector, followed by artemisinin combination therapies. Although the data sets are not directly comparable (they are from different time periods and use different measures of volumes), divergences between the data sets provide important insights into the distribution chain for antimalarials in the private sector. In particular, the outlet survey data has shown that Chloroquine dominates sales volumes at the outlet level. However, these antimalarials have an insignificant market share according to the wholesaler's sales records. The fact that these antimalarials are found primarily in informal outlets provides evidence that informal outlets use alternative supply sources.

4. Barriers to widespread distribution of ACTs in the private sector

Interviewees generally asserted that AMFm would positively impact the private-sector market for antimalarials in Benin. The current distribution chain for antimalarials in the private formal sector, especially between the private wholesalers and registered pharmacies, is perceived to be well-organized. Stock-outs of antimalarials in registered pharmacies were reported to be rare, because lead times on orders are short, wholesalers maintain relatively large inventories, and products can be sourced from multiple wholesalers. The wholesalers and registered pharmacists interviewed for this rapid analysis were consequently pleased that AMFm would operate within the structure of the current supply chain.

⁴¹ *Ibid.*

Nevertheless, three potential challenges that could inhibit the availability of ACTs in the private sector were identified: the lack of financial incentives, leakages to the informal sector, and geographical accessibility of subsidized ACTs.

4.1 Financial incentives

The primary concern raised by wholesalers and pharmacies is that the absolute mark-ups on the subsidized product would be too low. It is currently estimated that a full treatment course for an adult would be made available to first-line buyers at a price of 25 CFA. If the current pricing structure is applied to this price, a private sector wholesaler's selling price would be 34 CFA, and the retail price would be 44.5 CFA. Private sector actors were concerned that these margins (9 CFA for wholesalers and 10.5 CFA for pharmacies) would not be sufficient to cover costs. They reasoned that the increase in volumes may not be sufficient to offset losses of revenue. There was considerable interest in adjusting margins to encourage the uptake by the private sector.

4.2 Leakage to the informal sector

There is also widespread concern that the subsidized ACTs would leak into the informal market in Benin and its neighboring countries. With regards to the domestic informal market, AMFm was seen as a potential opportunity to reduce the demand for medicines purchased in the informal sector. If a significant proportion of formal private sector outlets choose to participate in AMFm, the availability of low-cost treatment for malaria could attract patients into formal outlets. A widespread communication campaign was perceived as an important mechanism to reduce domestic demand for antimalarials purchased in the informal sector, and attract patients to formal structures to purchase subsidized ACTs. In addition, to reduce the supply of medicines available in the informal sector, a more active suppression of the informal drug markets, particularly the Dantokpa market in Cotonou, was frequently suggested as an important means to reducing leakages of subsidized ACTs into the informal market.

Illegal exports to neighboring countries are perceived to be much more difficult to control. Benin's borders are considered to be porous, and key informants postulated that individual exports would be small in size and difficult to trace. Many interviewees postulated that Nigeria's participation in AMFm would substantially reduce illegal exports of subsidized ACTs.

4.3 Geographical accessibility

The geographical accessibility of subsidized ACTs was seen as a final potential barrier to the widespread availability of ACTs in the private sector. Registered pharmacies have reliable supplies of antimalarials, and would likely participate in the AMFm if the absolute margin was sufficiently high. However, registered pharmacies are concentrated in urban areas. Pharmaceutical depots are an important mechanism to increasing the availability of ACTs in remote areas. However, Benin's 2001 Demographic and Health Survey found that 80% of urban populations, but only 15% of rural populations lived within 5 km of registered pharmacy or depot.⁴² The number of pharmacies and depots has increased since 2001, but there are not enough depots and pharmacies to ensure complete coverage of subsidized ACTs.

⁴² Cited in Adeya, G. et al. 2007. *Évaluation rapide du système de santé du Bénin*. Arlington, VA: Management Sciences for Health.

The margin on subsidized ACTs would be prohibitively low for depots. Under the current pricing structure, pharmaceutical depots would be able to purchase subsidized ACTs for approximately 40.94 CFA leaving a margin of 3.56 CFA per complete adult treatment sold. Moreover, the depots interviewed for the rapid analysis reported having problems maintaining sufficient inventories of stock, due to problems accessing credit.

5. Uptake of co-paid ACTs in the private commercial sector

Respondents were generally positive about participating, especially if Benin's pharmaceutical pricing structure is modified to create financial incentives for participation. Nevertheless, participants interviewed for the rapid analysis did not expect full substitution toward the subsidized product, because of consumer preferences for certain monotherapies, patient perceptions that higher prices signal higher quality products, and the fact that some patients report adverse reactions to ACTs. Pilot private sector ACT subsidy projects have found that substitution to the subsidized product is incomplete. Preliminary results from the ACT Leaf programme in Uganda show that the subsidised product has achieved approximately 30% share of the market for malaria treatment,⁴³ while in Tanzania, the Clinton Foundation pilot achieved nearly 50% market share in some of the studied areas.⁴⁴

In addition, the decreased price of the subsidized product combined with the supporting interventions that are planned to accompany AMFm, are expected to lead to an increase in the aggregate demand for antimalarials in participating countries. Although no published studies estimate the own-price or cross-price elasticity of demand for antimalarial treatments, a modeling exercise by Laxminarayan, Over and Smith examining whether a subsidy for ACTs would delay the emergence of resistance to artemisinin assumes that a 10% decrease in the price of ACTs will result in a 2-5% increase in total antimalarial use.⁴⁵

Using evidence from previous studies on subsidies for ACTs and information provided by respondents interviewed for the purpose of this rapid analysis, nine scenarios have been identified for estimating the uptake of co-paid ACTs by the private commercial sector in Benin. Figure 4 summarizes the assumptions made in the nine scenarios.

The nine scenarios use three different assumptions on the rate of substitution towards the subsidized product.

First, scenarios A1, B1, and C1 assume that 30% of all treatment types will be substituted towards the subsidized product. These are the most conservative scenarios, and are based on the preliminary results of Uganda's ACT Leaf subsidy scheme.

⁴³ From discussions with staff from Medicines for Malaria Ventures in April 2009

⁴⁴ Sabot OJ, Mwita A, Cohen JM, Ipuge Y, Gordon M, et al. (2009). Piloting the Global Subsidy: The Impact of Subsidized Artemisinin-Based Combination Therapies Distributed through Private Drug Shops in Rural Tanzania. *PLoS ONE* 4(9): e6857

⁴⁵ Laxminarayan R, Over M, and Smith, D (2006). Will a global subsidy of new antimalarials delay the emergence of resistance and save lives? *Health Affairs*. 25(2): 325-336.

Second, scenarios A2, B2, and C2 assume that 50% of ACTs and AMTs and 30% of nAMTs will be substituted towards the subsidized product. These scenarios are based on the authors' assumption that nAMTs will have a lower cross-price elasticity of demand than ACTs and AMTs.

Third, scenarios A3, B3, and C3 assume that 70% of ACTs, 60% of AMTs and 40% of nAMTs will be substituted towards the subsidized product. As above, these scenarios are based on the authors' assumption that nAMTs will have a lower cross-price elasticity of demand than ACTs and AMTs.

The nine scenarios also use the following three assumptions about the subsidy's impact on the overall quantity of antimalarial treatments consumed:

First, scenarios A1, A2 and A3 assume that there is no change in the aggregate demand for antimalarials.

Second, scenarios B1, B2 and B3 assume that there is 19% increase in the total volume of antimalarials sold. This is based on the projection that the subsidy will decrease the end-user price of the subsidized product by approximately 95%,⁴⁶ and the assumption that a 10% decrease in the price of ACTs will result in a 2% increase in total antimalarial use.

Third, scenarios C1, C2 and C3 assume that there is 47.5% increase in the total volume of antimalarials sold. This is based on the projection that the subsidy will approximately decrease the end-user price of the subsidized product by 95%, and the assumption that a 10% decrease in the price of ACTs will result in a 5% increase in total antimalarial use.

⁴⁶ It is anticipated that the retail price of the subsidized product will be reduced from \$7-8 to \$0.30-0.40. Laxminarayan R, and Gelband H. (2009), A Global Subsidy: Key to Affordable Drugs for Malaria. *Health Affairs*. 28(4): 949-961.

Figure 6: Matrix of possible scenarios for the uptake of co-paid ACTs by the private commercial sector in Benin

| | | |
|---|--|---|
| <p>Scenario A1</p> <ul style="list-style-type: none"> • 30% substitution of all therapies towards the subsidized product • No change in aggregate demand for antimalarials | <p>Scenario A2</p> <ul style="list-style-type: none"> • 50% substitution of ACTs & AMTs, and 30% substitution of nAMTs towards the subsidized product • No change in aggregate demand for antimalarials = 0 | <p>Scenario A3</p> <ul style="list-style-type: none"> • 70% substitution of ACTs, 60% substitution of AMTs, and 40% substitution of nAMTs towards the subsidized product • No change in aggregate demand for antimalarials = 0 |
| <p>Scenario B1</p> <ul style="list-style-type: none"> • 30% substitution of all therapies towards the subsidized product • Aggregate demand for antimalarials increases by 19% | <p>Scenario B2</p> <ul style="list-style-type: none"> • 50% substitution of ACTs & AMTs, and 30% substitution of nAMTs towards the subsidized product • Aggregate demand for antimalarials increases by 19% | <p>Scenario B3</p> <ul style="list-style-type: none"> • 70% substitution of ACTs, 60% substitution of AMTs, and 40% substitution of nAMTs towards the subsidized product • Aggregate demand for antimalarials increases by 19% |
| <p>Scenario C1</p> <ul style="list-style-type: none"> • 30% substitution of all therapies towards the subsidized product • Aggregate demand for antimalarials increases by 47.5% | <p>Scenario C2</p> <ul style="list-style-type: none"> • 50% substitution of ACTs & AMTs, and 30% substitution of nAMTs towards the subsidized product • Aggregate demand for antimalarials increases by 47.5% | <p>Scenario C3</p> <ul style="list-style-type: none"> • 70% substitution of ACTs, 60% substitution of AMTs, and 40% substitution of nAMTs towards the subsidized product • Aggregate demand for antimalarials increases by 47.5% |

5.1 Estimating the uptake of the subsidy

The 9 scenarios were applied to the baseline estimates of total sales volumes of antimalarials presented in Table 5.⁴⁷ Although these estimates do not include antimalarials imported in the informal sector (which likely account for a significant proportion of antimalarials consumed in the country – refer to Section 3.2.2), they provide a good basis for calculating the uptake of an ACT subsidy in Benin as the registered wholesalers would likely be eligible first-line buyers under AMFm.

⁴⁷ The baseline estimates are produced from the wholesaler’s records of the total volume of each antimalarial product sold over a one year period. Due to differences in the wholesalers’ record management systems, it was not possible to get data for an identical timeframe from all three wholesalers (one wholesaler provided sales figures for 2008, while the others provided figures for the past 12 months). These sales figures were used to approximate the total volume of adult equivalent treatment doses for each antimalarial sold in tablet form. Refer to Annex 4 for the assumptions used to calculate adult equivalent treatment doses.

Table 5: Estimated wholesaler sales volumes, mean mark-up & net revenue, by treatment type in adult equivalent treatment doses

| | Volume ⁴⁶ | Mean Wholesale Mark-up (CFA) | Mean Wholesale mark-up less CIF (CFA) | Net revenue (CFA) | Net revenue (US\$) |
|------------------------|----------------------|------------------------------|---------------------------------------|-------------------|--------------------|
| AL | 190,428 | 601 | 417.25 | 79,456,083 | 177,357.33 |
| Artemisinin Nap | 8,160 | 534 | 370.5 | 3,023,280 | 6,748.39 |
| AS – AQ | 26,240 | 953 | 662 | 17,370,880 | 38,774.29 |
| AS – Mef | 26,988 | 819 | 569 | 15,356,172 | 34,277.17 |
| AS SP | 125,855 | 754 | 523.75 | 65,916,556 | 147,135.17 |
| DHA Pip | 46,127 | 855 | 594.25 | 27,410,970 | 61,185.20 |
| DHA SP | 4,810 | 288 | 200 | 962,000 | 2,147.32 |
| Artemether | 739 | 1111 | 778 | 574,942 | 1,283.35 |
| AS | 9,010 | 527 | 366.25 | 3,299,913 | 7,365.88 |
| AQ | 16,915 | 117 | 81.5 | 1,378,573 | 3,077.17 |
| CQ | 1,505 | 148 | 102.5 | 154,263 | 344.34 |
| Halofantrine | 13,630 | 781 | 542 | 7,387,460 | 16,489.87 |
| Mefloquine | 58 | 3926 | 2726.25 | 158,123 | 352.95 |
| Proguanil | 1,994 | 1350 | 937.5 | 1,869,375 | 4,172.71 |
| Quinine | 27,629 | 1350 | 937.25 | 25,895,280 | 57,801.96 |
| SP | 496,834 | 108 | 75 | 37,262,550 | 83,175.33 |
| CQ Prognil | 2,684 | 1404 | 975 | 2,616,900 | 5,841.29 |
| Total ACT | 428,608 | | | 209,495,941 | 467,624.87 |
| Total AMT | 9749 | | | 3874854.5 | 8,649.23 |
| Total nAMT | 558,565 | | | 74,105,623 | 165,414.34 |
| Total nACT | 2,684 | | | 2,616,900 | 5,841.29 |
| Total | 999,606 | | | 290,093,318 | 647,529.73 |

In the nine scenarios, the market share of the subsidized product ranges from 30% in Scenarios A1, B1, and C1, 39% in Scenarios A2, B2, and C2, to 53.06% in Scenarios A3, B3, and C3 (refer to Table 6). The market share for all ACTs (subsidized plus non-subsidized ACTs) reaches approximately 60% in all scenarios, other than scenarios A3, B3, and C3 where the market share of all ACTs reaches 66%.

In terms of the volumes of antimalarials purchased, in the scenarios where the subsidy increases the total antimalarial use, the volumes of artemisinin monotherapies and non-artemisinin monotherapies generally decrease. The exception occurs when the rate of substitution towards the subsidized product is smaller than the rate at which the total use of antimalarials increases. For example, in Scenario C1, 30% of all treatment types are substituted towards the subsidized product, but there is a 47.5% increase in total antimalarial use. Although the market share for non-artemisinin monotherapies decreases from 56% to 39% of all adult equivalent doses sold, the total volume of non-artemisinin monotherapies increases by 3% relative to the baseline scenario. The market share for artemisinin monotherapies decreases from 1% to 0.7% of all adult equivalent doses sold, but the total volume of artemisinin monotherapies increases by 3%.

We have shown that the potential uptake of the subsidy is substantial. In all scenarios, there is a considerable reduction in the market share of ineffective antimalarial treatments, even in the cases where the overall volume of these treatments has increased.

Table 6: Scenarios for estimating uptake of subsidized ACT & impact on market share of other product types

| | Baseline | Scenario A1 | | Scenario A2 | | Scenario A3 | | Scenario B1 | | Scenario B2 | | Scenario B3 | |
|--------------------|-------------------|-------------------|--------------|-------------------|--------------|-------------------|--------------|-------------------|--------------|-------------------|--------------|-------------------|--------------|
| | Total Vol. (AETD) | Total Vol. (AETD) | Market Share | Total Vol. (AETD) | Market Share | Total Vol. (AETD) | Market Share | Total Vol. (AETD) | Market Share | Total Vol. (AETD) | Market Share | Total Vol. (AETD) | Market Share |
| Co-Paid ACT | 0 | 299,882 | 30.00% | 387,553 | 38.77% | 530,375 | 53.06% | 356,859 | 30.00% | 461,188 | 38.77% | 631,146 | 53.06% |
| Other ACT | 428,608 | 300,026 | 30.01% | 214,304 | 21.44% | 128,582 | 12.86% | 357,030 | 30.01% | 255,022 | 21.44% | 153,013 | 12.86% |
| AMT | 9,749 | 6,824 | 0.68% | 4,875 | 0.49% | 3,900 | 0.39% | 8,121 | 0.68% | 5,801 | 0.49% | 4,641 | 0.39% |
| nAMT | 558,565 | 390,996 | 39.11% | 390,996 | 39.11% | 335,139 | 33.53% | 465,285 | 39.11% | 465,285 | 39.11% | 398,815 | 33.53% |
| nACT | 2,684 | 1,879 | 0.19% | 1,879 | 0.19% | 1,610 | 0.16% | 2,236 | 0.19% | 2,236 | 0.19% | 1,916 | 0.16% |
| Total | 999,606 | 999,606 | 100.00% | 999,606 | 100.00% | 999,606 | 100.00% | 1,189,531 | 100.00% | 1,189,531 | 100.00% | 1,189,531 | 100.00% |

| | Scenario C1 | | Scenario C2 | | Scenario C3 | |
|--------------------|-------------------|--------------|-------------------|--------------|-------------------|--------------|
| | Total Vol. (AETD) | Market Share | Total Vol. (AETD) | Market Share | Total Vol. (AETD) | Market Share |
| Co-Paid ACT | 442,326 | 30.00% | 571,641 | 38.77% | 451,166 | 53.06% |
| Other ACT | 442,538 | 30.01% | 316,098 | 21.44% | 189,659 | 12.86% |
| AMT | 10,066 | 0.68% | 7,190 | 0.49% | 5,752 | 0.39% |
| nAMT | 576,718 | 39.11% | 576,718 | 39.11% | 823,883 | 33.53% |
| nACT | 2,771 | 0.19% | 2,771 | 0.19% | 3,959 | 0.16% |
| Total | 1,474,419 | 100.00% | 1,474,419 | 100.00% | 1,474,419 | 100.00% |

5.2 Estimating the potential financial impact of the ACT subsidy on registered wholesalers

As explained in Section 4.1, the respondents interviewed for the purpose of this rapid analysis were concerned that under Benin's pharmaceutical pricing scheme, the absolute mark-ups of the subsidized product would be insufficient to cover the costs related to wholesale and retail distribution of the product.

The potential financial impact of the ACT subsidy on Benin's registered wholesalers is estimated under two potential conditions:

- (1) Benin's current pricing structure is applied to the first line buyer's purchase price of 25 CFA (\$0.06) per adult equivalent dose. Registered wholesalers would sell the subsidized ACT for 34 CFA (0.08 US\$) per adult equivalent dose.
- (2) The absolute mark-up of Chloroquine under Benin's fixed pricing scheme is applied to the first line buyer's purchase price of 25 CFA. Registered wholesalers would sell the subsidized product for 173 CFA (0.39 US\$).⁴⁸

In both cases, we assume that the registered wholesalers will pay a clearance tax of 2.5%, but will not have to pay for freight and insurance for subsidized ACTs. For non-subsidized products, the wholesaler will pay the 2.5% clearance tax plus freight and insurance (CIF), which we assume equals 8.5%.⁴⁹

Using the 9 uptake scenarios described in Section 5, the two potential pricing scenarios were applied to the baseline estimates of the wholesalers' sales volumes presented in Table 7.

Table 7 illustrates the potential financial impact of the ACT subsidy on the registered wholesalers' net revenue assuming that Benin's fixed price structure is applied to the first line buyer's price of 25 CFA (0.06 US\$). The registered wholesalers would be able to sell each adult equivalent dose for 34 CFA (0.08 US\$). After clearance taxes are paid, the registered wholesalers would receive a mark-up of 8 CFA (0.02 US\$) for each full adult treatment course sold.

⁴⁸ Based on sales volume data from Benin's three registered wholesalers, the mark-ups on a full adult dose of Chloroquine from the PGHT to the retail price ranged from 44–333 CFA (US\$ 0.10–0.74), and the weighted mean mark-up equaled 320 CFA (US\$ 0.71) (refer to Table 3). Assuming that a full-course of adult treatment is available to first line buyers at a price of 25 CFA, if the weighted mean absolute mark-up of Chloroquine is added to co-paid ACTs, the retail price would be 345 CFA (US\$ 0.77). The wholesaler selling price would be 173 CFA (US\$ 0.39). Registered wholesalers and pharmacies would respectively earn mark-ups of 148 CFA (US\$ 0.33) and 172 CFA (US\$ 0.38) for each adult dose sold.

⁴⁹ This assumption is based on research by Dalberg Global Development Advisors in Burkina Faso, Cameroon, Kenya and Uganda, which found that the average cost of clearance charges, insurance and freight equals 11%.

In all but one scenario, the wholesalers' total net revenue, that is total revenue minus the purchase price, and costs related to clearance, insurance and freight,⁵⁰ decreases relative to the baseline scenario. The decrease in total net revenue ranges from 16% in Scenario B1 to 60% in Scenario A3. These declines in total net revenue are observed because of the substantial differences in the absolute margins of unsubsidized ACTs relative to the subsidized product (refer to Table 7 for a comparison of the weighted mean wholesale mark-up by antimalarial type).

The only scenario where the introduction of the ACT subsidy results in an increase of total net revenue is Scenario C1, where total net revenue is projected to increase by 5%. Under this scenario, we model a moderate level of substitution towards the subsidized product (30% of all therapies), and an increase in the total volume of antimalarials sold equal to 47.5%. This scenario is undesirable from a public health perspective. Although the market share of ACTs relative to other therapies increases in this scenario, the total volume of ineffective antimalarial treatments increases.

The analysis presented thus far substantiates the concerns raised by respondents that increases in sales volumes may be insufficient to offset losses of revenue resulting from substitution. Table 8 illustrates the potential financial impact of the ACT subsidy using an alternative pricing structure. In these scenarios, the absolute mark-up of Chloroquine under Benin's fixed pricing scheme is applied to the first line buyer's purchase price of 25 CFA. Registered wholesalers would sell the subsidized product for 173 CFA (0.39 US\$) per adult equivalent dose.⁵¹ After clearance taxes are paid, the registered wholesalers would receive a mark-up of 147 CFA (0.33 US\$) for each full adult treatment course sold.

Even with a higher mark-up, the registered wholesalers' total net revenue is projected to decrease relative to the baseline case in most scenarios. The declines in total net revenue are nevertheless significantly smaller, and range from -5.33% in Scenario C3 to -34.99% in Scenario A3. Increases in total net revenue are observed in 3 scenarios: B1, C1 and C2.

⁵⁰ This modeling exercise assumes that under AMFm, registered wholesalers will be reimbursed for freight and insurance charges associated with the international distribution of co-paid ACTs.

⁵¹ Refer to footnote 47 on page 21 for a detailed description on how this price was derived.

Table 7: Scenarios for estimating the potential financial impact of the ACT subsidy under Benin’s fixed price structure

| Treatment Type | Baseline | | Scenario A1 | | Scenario A2 | | Scenario A3 | | Scenario B1 | | Scenario B2 | |
|--------------------------------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|
| | Total Vol. (AETD) | Net Revenue | Total Vol. (AETD) | Net Revenue | Total Vol. (AETD) | Net Revenue | Total Vol. (AETD) | Net Revenue | Total Vol. (AETD) | Net Revenue | Total Vol. (AETD) | Net Revenue |
| Co-Paid ACT | 0 | 0 | 299,882 | 2,511,510 | 387,553 | 3,245,758 | 530,375 | 4,441,887 | 356,859 | 2,988,697 | 461,188 | 3,862,452 |
| Other ACT | 428,608 | 209,495,941 | 300,026 | 146,647,159 | 214,304 | 104,747,971 | 128,582 | 62,848,782 | 357,030 | 174,510,119 | 255,022 | 124,650,085 |
| AMT | 9,749 | 3,874,855 | 6,824 | 2,712,398 | 4,875 | 1,937,427 | 3,900 | 1,549,942 | 8,121 | 3,227,754 | 5,801 | 2,305,538 |
| nAMT | 558,565 | 74,105,623 | 390,996 | 51,873,936 | 390,996 | 51,873,936 | 335,139 | 44,463,374 | 465,285 | 61,729,984 | 465,285 | 61,729,984 |
| nACT | 2,684 | 2,616,900 | 1,879 | 1,831,830 | 1,879 | 1,831,830 | 1,610 | 1,570,140 | 2,236 | 2,179,878 | 2,236 | 2,179,878 |
| Total | 999,606 | 290,093,318 | 999,606 | 205,576,833 | 999,606 | 163,636,922 | 999,606 | 114,874,125 | 1,189,531 | 244,636,431 | 1,189,531 | 194,727,937 |
| % change in total net revenue | - | - | - | -29.13% | - | -43.59% | - | -60.47% | - | -15.67% | - | -32.87% |

| Treatment Type | Scenario B3 | | Scenario C1 | | Scenario C2 | | Scenario C3 | |
|--------------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|
| | Total Vol. (AETD) | Net Revenue | Total Vol. (AETD) | Net Revenue | Total Vol. (AETD) | Net Revenue | Total Vol. (AETD) | Net Revenue |
| Co-Paid ACT | 631,146 | 5,285,846 | 442,326 | 3,704,477 | 571,641 | 4,787,493 | 451,166 | 3,778,512 |
| Other ACT | 153,013 | 74,790,051 | 442,538 | 216,304,559 | 316,098 | 154,503,256 | 189,659 | 92,701,954 |
| AMT | 4,641 | 1,844,431 | 10,066 | 4,000,787 | 7,190 | 2,857,705 | 5,752 | 2,286,164 |
| nAMT | 398,815 | 52,911,415 | 576,718 | 76,514,055 | 576,718 | 76,514,055 | 823,883 | 109,305,794 |
| nACT | 1,916 | 1,868,467 | 2,771 | 2,701,949 | 2,771 | 2,701,949 | 3,959 | 3,859,928 |
| Total | 1,189,531 | 136,700,209 | 1,474,419 | 303,225,828 | 1,474,419 | 241,364,460 | 1,474,419 | 211,932,351 |
| | - | -52.88% | - | 4.53% | - | -16.8% | - | -26.94% |

Table 8: Scenarios for estimating the potential financial impact of the ACT subsidy using the absolute mark-up of Chloroquine

| Treatment Type | Baseline | | Scenario A1 | | Scenario A2 | | Scenario A3 | | Scenario B1 | | Scenario B2 | |
|--------------------------------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|
| | Total Vol. (AETD) | Net Revenue | Total Vol. (AETD) | Net Revenue | Total Vol. (AETD) | Net Revenue | Total Vol. (AETD) | Net Revenue | Total Vol. (AETD) | Net Revenue | Total Vol. (AETD) | Net Revenue |
| Co-Paid ACT | 0 | 0 | 299,882 | 44,195,080 | 387,553 | 57,115,653 | 530,375 | 78,163,957 | 356,859 | 52,592,146 | 461,188 | 67,967,627 |
| Other ACT | 428,608 | 209,495,941 | 300,026 | 146,647,159 | 214,304 | 104,747,971 | 128,582 | 62,848,782 | 357,030 | 174,510,119 | 255,022 | 124,650,085 |
| AMT | 9,749 | 3,874,855 | 6,824 | 2,712,398 | 4,875 | 1,937,427 | 3,900 | 1,549,942 | 8,121 | 3,227,754 | 5,801 | 2,305,538 |
| nAMT | 558,565 | 74,105,623 | 390,996 | 51,873,936 | 390,996 | 51,873,936 | 335,139 | 44,463,374 | 465,285 | 61,729,984 | 465,285 | 61,729,984 |
| nACT | 2,684 | 2,616,900 | 1,879 | 1,831,830 | 1,879 | 1,831,830 | 1,610 | 1,570,140 | 2,236 | 2,179,878 | 2,236 | 2,179,878 |
| Total | 999,606 | 290,093,318 | 999,606 | 247,260,403 | 999,606 | 217,506,817 | 999,606 | 188,596,194 | 1,189,531 | 294,239,880 | 1,189,531 | 258,833,112 |
| % change in total net revenue | - | - | - | -14.77% | - | -25.02% | - | -34.99% | - | 1.43% | - | -10.78% |

| Treatment Type | Scenario B3 | | Scenario C1 | | Scenario C2 | | Scenario C3 | |
|--------------------------------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|
| | Total Vol. (AETD) | Net Revenue | Total Vol. (AETD) | Net Revenue | Total Vol. (AETD) | Net Revenue | Total Vol. (AETD) | Net Revenue |
| Co-Paid ACT | 631,146 | 93,015,108 | 442,326 | 65,187,743 | 571,641 | 84,245,588 | 451,166 | 66,490,534 |
| Other ACT | 153,013 | 74,790,051 | 442,538 | 216,304,559 | 316,098 | 154,503,256 | 189,659 | 92,701,954 |
| AMT | 4,641 | 1,844,431 | 10,066 | 4,000,787 | 7,190 | 2,857,705 | 5,752 | 2,286,164 |
| nAMT | 398,815 | 52,911,415 | 576,718 | 76,514,055 | 576,718 | 76,514,055 | 823,883 | 109,305,794 |
| nACT | 1,916 | 1,868,467 | 2,771 | 2,701,949 | 2,771 | 2,701,949 | 3,959 | 3,859,928 |
| Total | 1,189,531 | 224,429,471 | 1,474,419 | 364,709,094 | 1,474,419 | 320,822,554 | 1,474,419 | 274,644,373 |
| % change in total net revenue | - | -22.64% | - | 25.72% | - | 10.59% | - | -5.33% |

6 Recommendations

Any supporting interventions related to AMFm should ensure that the current distribution system in the formal private sector is not disrupted. In particular, initiatives seeking to repackage subsidized ACTs should intervene at the level of the manufacturer to avoid creating lengthy lead times. Possible strategies for addressing the barriers identified above that would not disrupt existing distribution channels, include:

- **Amend the pharmaceutical pricing structure for co-paid ACTs**

Respondents interviewed for the rapid analysis suggested the following three approaches for pricing ACTs subsidized by the AMFm:

1. The absolute margin of Chloroquine under Benin's fixed price scheme could be applied to subsidized ACTs. Until recently, high volumes of Chloroquine were sold by the private sector wholesalers and pharmacies. This implies that at adequately high volumes the absolute margin of Chloroquine is sufficient to induce registered wholesalers, pharmacies, and pharmaceutical depots to sell an antimalarial product.

Based on sales volume data from Benin's three registered wholesalers, the mark-ups on a full adult dose of Chloroquine from the PGHT to the retail price ranged from 44–333 CFA (US\$ 0.10–0.74), and the weighted mean mark-up equaled 320 CFA (US\$ 0.71) (refer to Table 3). Assuming that a full-course of adult treatment is available to first line buyers at a price of 25 CFA, if the weighted mean absolute mark-up of Chloroquine is added to co-paid ACTs, the retail price would be 345 CFA (US\$ 0.77). The wholesaler selling price would be 173 CFA (US\$ 0.39). Registered wholesalers and pharmacies would respectively earn mark-ups of 148 CFA (US\$ 0.33) and 172 CFA (US\$ 0.38) for each adult dose sold.

2. The absolute margin of the least expensive brand of Artemether-Lumefantrine under Benin's fixed price scheme could be applied to subsidized ACTs.

The mark-up from the PGHT to the retail price of the least expensive full adult dose of Artemether + Lumefantrine is 1014 CFA (US\$ 2.26). If this absolute margin is applied to target price of 25 CFA, the wholesaler's selling price would be 493 CFA (US\$ 1.10) and the retail price would be 1039 CFA (US\$ 2.32). Registered wholesalers and pharmacies would respectively earn mark-ups of 468 CFA (US\$ 1.04) and 546 CFA (US\$ 1.29) for each adult dose sold. This mark-up would be sufficient to cover the costs of registered wholesalers, pharmacies, and pharmaceutical depots, and would induce formal outlets to encourage substitution from monotherapies to ACTs. However, the retail price prevailing under this scheme would likely be prohibitively expensive for a large proportion of the population.

3. Several key informants reasoned that the private sector has a responsibility to promote public health. Since pharmaceutical outlets are not obliged to sell subsidized ACTs and will be free to sell other non-subsidized antimalarial products, these key informants argued that subsidized ACTs should be priced at the lowest-possible price that covers the direct and indirect financial costs incurred by selling antimalarials.

A detailed costing exercise of registered wholesalers, pharmacies, and pharmaceutical depots would be necessary to determine the appropriate pricing structure. This exercise would need to examine a wide range of enterprises, as the business practices, product mix, and consequently costing structure differed substantially among the respondents visited for the rapid analysis.

It should be noted that the private sector respondents consulted for the rapid analysis expressed considerable interest in revising the overall pricing structure of Benin's pharmaceutical products. Efforts to determine the appropriate price of ACTs co-paid under the AMFm could provide the opportunity to address deficiencies identified in the broader pricing policy of pharmaceutical products in Benin. First, transportation and other costs have purportedly increased since the coefficients were set in 2003. Second, the current pricing scheme does not explicitly describe how generic medicines purchased from CAME by private sector buyers should be priced, nor does it incentivize registered wholesalers or pharmacies into supplying generic pharmaceutical products.

- **Harmonize the price of co-paid ACTs in the public and private sectors**

Patients can purchase a full adult dose of Coartem for 4085 CFA (US\$ 9.12) in registered pharmacies and pharmaceutical depots, but must only pay 600 CFA (US\$ 1.34) in public health facilities. The significant difference between these prices promotes the proliferation of Coartem in the informal sector.

Preliminary evidence from in-depth interviews conducted as part of the ACTwatch Supply Chain Survey suggests that Coartem originally designated for the public sector (not necessarily from Benin) is increasingly available in the informal sector. A full adult dose can often be found for a price of 1200 CFA (US\$ 2.68). Patients that are unaware of the price in public health facilities often believe that they are saving money by purchasing treatment from informal drug sellers.

The price difference also encourages leakage into the informal sector. One pharmaceutical retail-wholesaler operating in a market in Porto Novo reported that they visit many public health facilities to purchase small quantities of Coartem. Stocks are then resold for approximately double the purchase price. Harmonizing the price between the public and private sectors is consequently a potential strategy to reduce demand for treatment in the informal sector and decrease the leakage of co-paid ACTs into the informal sector.

- **Implement a major information and communications campaign**

Preliminary evidence from the ACTwatch Supply Chain Survey suggests that the current communications activities of the Ministry of Health and other partners are already increasing demand for ACTs. In-depth interviews with several wholesalers operating in informal markets have indicated that clients are increasingly specifically asking for ACTs. Some of these wholesalers have indicated that Coartem has now replaced Chloroquine as their top-selling antimalarial product.

On-going communication activities can be enhanced to sensitize the population to the availability of low-cost effective antimalarial treatment in both the public and private sector. The communication activities should specify the exact price of co-paid ACTs to ensure that the fixed prices are observed in all public and private outlets. A widespread communications campaign is an integral mechanism to reduce domestic demand for antimalarials purchased in the informal sector, and attract patients to formal structures to purchase subsidized ACTs

- **Monitor the volumes of subsidized ACTs purchased by first line buyers**
- **Increase the number of pharmaceutical depots in rural areas**

Annex 1: Volumes and prices of antimalarials sold by private wholesalers

Table 1.1: Volume and prices of ACTs sold by registered private wholesalers

| Brand | Active Ingredients | Strength | Manufacturer | Dosage Form | Package Size | PGHT ¹ | WS sell price ¹ | Retail price ¹ | Vol. ² |
|-----------------------|----------------------|--------------|---------------------|-------------|--------------|-------------------|----------------------------|---------------------------|-------------------|
| Alaxin | Dihydroartemisinin | 160 mg | Bliss GVS | Tablet | 3 | 800 | 1088 | 1424 | 1405 |
| | Sulfadoxine | 500 mg | | | | | | | |
| | Pyrimethamine | 25 mg | | | | | | | |
| Alaxin | Dihydroartemisinin | 160 mg | Bliss GVS | Tablet | 2 | 800 | 1088 | 1424 | 3405 |
| | Sulfadoxine | 500 mg | | | | | | | |
| | Pyrimethamine | 25 mg | | | | | | | |
| Arco | Artemisinin | 125 mg | Kunming Pharma Corp | Tablet | 8 | 1482 | 2016 | 2639 | 8160 |
| | Napthoquine | 50 mg | | | | | | | |
| Artemiam | Artesunate | 20 mg | Odypharm | Tablet | 12 | 1902 | 2587 | 3386 | 1678 |
| | Amodiaquine | 120 mg | | | | | | | |
| Artefan | Artemether | 20 mg | Ajanta Pharma | Tablet | 16 | 1640 | 2230 | 2919 | 658 |
| | Lumefantrine | 120 mg | | | | | | | |
| Artefan | Artemether | 20 mg | Ajanta Pharma | Tablet | 24 | 2427 | 3301 | 4320 | 639 |
| | Lumefantrine | 120 mg | | | | | | | |
| Artefan | Artemether | 40 mg | Ajanta Pharma | Tablet | 12 | 2427 | 3301 | 4320 | 713 |
| | Lumefantrine | 240 mg | | | | | | | |
| Artefan | Artemether | 40 mg | Ajanta Pharma | Tablet | 16 | 3247 | 4416 | 5780 | 1008 |
| | Lumefantrine | 240 mg | | | | | | | |
| Artefan | Artemether | 80 mg | Ajanta Pharma | Tablet | 6 | 2229 | 3032 | 3968 | 4960 |
| | Lumefantrine | 480 mg | | | | | | | |
| Artefan | Artemether | 180 mg/60 ml | Ajanta Pharma | Suspension | 60ml | 1837 | 2498 | 3269 | 4800 |
| | Lumefantrine | 1080 m/60mlg | | | | | | | |
| No brand/ unknown | Artemether | 20 mg | Unknown | Tablet | 24 | 1300 | 1768 | 2314 | 132 |
| | Lumefantrine | 120 mg | | | | | | | |
| Artequin | Artesunate | 300 mg | Mepha | Tablet | 6 | 1640 | 2230 | 2919 | 5394 |
| | Mefloquine | 375 mg | | | | | | | |
| Artequin | Artesunate | 600 mg | Mepha | Tablet | 6 | 2165 | 2944 | 3853 | 24291 |
| | Mefloquine | 750 mg | | | | | | | |
| Artequin pédiatrique | Artesunate | 50 mg | Mepha | Granules | 3 | 1968 | 2676 | 3502 | 9840 |
| | Mefloquine | 125 mg | | | | | | | |
| No brand/ unknown | Artesunate | 50 mg | Unknown | Tablet | 24 | 1600 | 2176 | 2848 | 60 |
| | Amodiaquine | 153.1 mg | | | | | | | |
| Asunatedenk 100 plus | Artesunate | 100 mg | Denk pharma | Tablet | 6 | 1312 | 1784 | 2335 | 1404 |
| | Sulfamethoxypyrazine | 250 mg | | | | | | | |
| | Pyrimethamine | 12.5 mg | | | | | | | |
| Asunatedenk 200 plus | Artesunate | 200 mg | Denk pharma | Tablet | 6 | 1968 | 2676 | 3502 | 11747 |
| | Sulfamethoxypyrazine | 500 mg | | | | | | | |
| | Pyrimethamine | 25 mg | | | | | | | |
| Co-Arinate Adulte | Artesunate | 200 mg | Dafra pharma | Tablet | 6 | 2001 | 2721 | 3561 | 80376 |
| | Sulfamethoxypyrazine | 500 mg | | | | | | | |
| | Pyrimethamine | 25 mg | | | | | | | |
| Co-Arinate Enfant | Artesunate | 100 mg | Dafra pharma | Tablet | 6 | 1351 | 1837 | 2404 | 17504 |
| | Sulfamethoxypyrazine | 250 mg | | | | | | | |
| | Pyrimethamine | 12.5 mg | | | | | | | |
| Co-Arinate FDC Adulte | Artesunate | 200 mg | Dafra pharma | Tablet | 3 | 2152 | 2927 | 3831 | 21248 |
| | Sulfamethoxypyrazine | 500 mg | | | | | | | |
| | Pyrimethamine | 25 mg | | | | | | | |
| Co-Arinate FDC Enfant | Artesunate | 100 mg | Dafra pharma | Tablet | 3 | 1397 | 1900 | 2487 | 6060 |
| | Sulfamethoxypyrazine | 250 mg | | | | | | | |
| | Pyrimethamine | 12.5 mg | | | | | | | |
| Coarsucam | Artesunate | 25 mg | Sanofi Aventis | Tablet | 3 | 1246 | 1695 | 2218 | 4037 |
| | Amodiaquine | 67.5 m | | | | | | | |
| Coarsucam | Artesunate | 50 mg | Sanofi Aventis | Tablet | 3 | 1371 | 1865 | 2441 | 8194 |
| | Amodiaquine | 135 mg | | | | | | | |
| Coarsucam | Artesunate | 100 mg | Sanofi Aventis | Tablet | 6 | 2184 | 2970 | 3887 | 15085 |
| | Amodiaquine | 270 mg | | | | | | | |
| Coarsucam enfant | Artesunate | 100 mg | Sanofi Aventis | Tablet | 3 | 1561 | 2123 | 2779 | 6098 |
| | Amodiaquine | 270 mg | | | | | | | |
| Coartem | Artemether | 20 mg | Novartis | Tablet | 24 | 2296 | 3122 | 4086 | 23903 |
| | Lumefantrine | 120 mg | | | | | | | |

Table 1.2: Volume and prices of ACTs sold by registered private wholesalers

| Brand | Active Ingredients | Strength | Manufacturer | Dosage Form | Package Size | PGHT ¹ | WS sell price ¹ | Retail price ¹ | Vol. ² |
|-------------------|--------------------|----------------|--------------|-------------|--------------|-------------------|----------------------------|---------------------------|-------------------|
| Co-Artesiane | Artemether | 180 mg/60 ml | Dafra Pharma | Suspension | 60 ml | 2250 | 3060 | 4005 | 21411 |
| | Lumefantrine | 1080 mg/60 m | | | | | | | |
| Co-Artesiane | Artemether | 360 mg/120 ml | Dafra Pharma | Suspension | 120 ml | 3798 | 5165 | 6760 | 3072 |
| | Lumefantrine | 2160 mg/120 ml | | | | | | | |
| Cofantrine | Artemether | 20 mg | EGR Pharma | Tablet | 24 | 1968 | 2676 | 3502 | 8048 |
| | Lumefantrine | 120 mg | | | | | | | |
| Cofantrine | Artemether | 80 mg | EGR Pharma | Tablet | 6 | 2034 | 2766 | 3620 | 1860 |
| | Lumefantrine | 480 mg | | | | | | | |
| Cofantrine | Artemether | 180 mg/60 ml | EGR Pharma | Suspension | 60 ml | 2034 | 2766 | 3620 | 10958 |
| | Lumefantrine | 1080 mg/60 m | | | | | | | |
| Duo-Cotexin | Dihydroartemisinin | 40 mg | Holleypharm | Tablet | 8 | 2617 | 3559 | 4658 | 29361 |
| | Piperaquine | 320 mg | | | | | | | |
| Larimal FD Adulte | Artesunate | 50 mg | IPCA | Tablet | 6 | 1935 | 2632 | 3445 | 60 |
| | Amodiaquine | 153.1 mg | | | | | | | |
| Larimal FD Junior | Artesunate | 50 mg | IPCA | Tablet | 3 | 1410 | 1918 | 2510 | 24 |
| | Amodiaquine | 153.1 mg | | | | | | | |
| Lonart | Artemether | 20 mg/ 60 ml | Bliss GVS | Suspension | 60 ml | 1804 | 2453 | 3211 | 384 |
| | Lumefantrine | 120 mg/ 60 ml | | | | | | | |
| Lonart Forte | Artemether | 40 mg | Bliss GVS | Tablet | 12 | 1705 | 2319 | 3035 | 1200 |
| | Lumefantrine | 240 mg | | | | | | | |
| Lufanter | Artemether | 20 mg | IMEX Health | Suppository | 6 | 1935 | 2632 | 3445 | 2658 |
| | Lumefantrine | 120 mg | | | | | | | |
| Lufanter | Artemether | 40 mg | IMEX Health | Tablet | 12 | 2263 | 3078 | 4029 | 13756 |
| | Lumefantrine | 240 mg | | | | | | | |
| Lufanter | Artemether | 180 mg/60 ml | IMEX Health | Suspension | 60 ml | 2230 | 3033 | 3970 | 8729 |
| | Lumefantrine | 1080 mg/60 m | | | | | | | |
| Lufanter | Artemether | Unknown | IMEX Health | Tablet | 8 | 1377 | 1873 | 2451 | 200 |
| | Lumefantrine | Unkown | | | | | | | |
| Lumartem | Artemether | 20 mg | Cipla | Tablet | 24 | 1410 | 1918 | 2510 | 90356 |
| | Lumefantrine | 120 mg | | | | | | | |
| Lumartem | Artemether | 20 mg | Cipla | Tablet | 8 | 499 | 679 | 889 | 21884 |
| | Lumefantrine | 120 mg | | | | | | | |
| Lumet Forte | Artemether | 40 mg | Cipla | Tablet | 12 | 1443 | 1963 | 2569 | 22809 |
| | Lumefantrine | 240 mg | | | | | | | |
| Lumet Forte | Artemether | 40 mg | Cipla | Tablet | 6 | 721 | 981 | 1284 | 6211 |
| | Lumefantrine | 240 mg | | | | | | | |
| Lumiter | Artemether | 20 mg | Macleod's | Tablet | 24 | 1640 | 2230 | 2919 | 11596 |
| | Lumefantrine | 120 mg | | | | | | | |
| Macsunate Plus | Artesunate | 50 mg | Macleod's | Tablet | 24 | 1148 | 1561 | 2043 | 798 |
| | Amodiaquine | 153.1 mg | | | | | | | |
| Macsunate Plus | Artesunate | 50 mg | Macleod's | Tablet | 12 | 853 | 1160 | 1518 | 292 |
| | Amodiaquine | 153.1 mg | | | | | | | |
| Macsunate Plus | Artesunate | 50 mg | Macleod's | Tablet | 6 | 656 | 892 | 1167 | 350 |
| | Amodiaquine | 153.1 mg | | | | | | | |
| Malacur | Dihydroartemisinin | 40 mg | Elder | Tablet | 8 | 1968 | 2676 | 3502 | 15608 |
| | Piperaquine | 320 mg | | | | | | | |
| Malacur | Dihydroartemisinin | 90 mg/60 ml | Elder | Suspension | 60 ml | 1968 | 2676 | 3502 | 6744 |
| | Piperaquine | 720 mg/60 ml | | | | | | | |
| Malmed | Artesunate | 25 mg | Medinomics | Tablet | 6 | 532 | 723 | 946 | 480 |
| | Amodiaquine | 75 mg | | | | | | | |
| Malmed | Artesunate | 50 mg | Medinomics | Tablet | 6 | 695 | 945 | 1237 | 696 |
| | Amodiaquine | 100 mg | | | | | | | |
| Malmed | Artesunate | 100 mg | Medinomics | Tablet | 6 | 1351 | 1838 | 2406 | 132 |
| | Amodiaquine | 300 mg | | | | | | | |
| Macsunate FDC | Artesunate | 50 mg | Macleod's | Tablet | 12 | 1214 | 1651 | 2161 | 1976 |
| | Amodiaquine | 200 mg | | | | | | | |
| Macsunate FDC | Artesunate | 50 mg | Macleod's | Tablet | 3 | 722 | 982 | 1285 | 612 |
| | Amodiaquine | 200 mg | | | | | | | |
| Macsunate FDC | Artesunate | 50 mg | Macleod's | Tablet | 6 | 820 | 1115 | 1459 | 516 |
| | Amodiaquine | 200 mg | | | | | | | |

Table 1.3: Volume and prices of ACTs sold by registered private wholesalers

| Brand | Active Ingredients | Strength | Manufacturer | Dosage Form | Package Size | PGHT ¹ | WS sell price ¹ | Retail price ¹ | Vol. ² |
|----------|--------------------|--------------|--------------|-------------|--------------|-------------------|----------------------------|---------------------------|-------------------|
| P-Alaxin | Dihydroartemisinin | 40 mg | GVS Labs | Tablet | 8 | 1804 | 2453 | 3211 | 1158 |
| | Piperaquine | 320 mg | | | | | | | |
| P-Alaxin | Dihydroartemisinin | 80 mg/80 ml | GVS Labs | Suspension | 80 ml | 2099 | 2855 | 3737 | 289 |
| | Piperaquine | 640 mg/80 ml | | | | | | | |

Table 2: Volume and prices of artemisinin monotherapies sold by private wholesaler

| Brand | Active Ingredients | Strength | Manufacturer | Dosage Form | Package Size | PGHT ¹ | WS sell price ¹ | Retail price ¹ | Vol. ² |
|---------------------|--------------------|--------------|--------------|----------------|--------------|-------------------|----------------------------|---------------------------|-------------------|
| Ametherdenk 40 | Artemether | 40 mg | Denk pharma | Tablet | 6 | 1378 | 1874 | 2453 | 1047 |
| Arinate pédiatrique | Artesunate | 50 mg | Dafra Pharma | Tablet | 6 | - | - | - | 295 |
| Artemal S | Artesunate | 50 mg | Plethico | Tablet | 12 | 1299 | 1767 | 2313 | 1032 |
| No brand/unknown | Artemether | 20 mg/1 ml | Cipla | Liquid Inject. | 10 amp. | 2960 | 4025 | 5268 | 116 |
| No brand/unknown | Artemether | 80 mg/1 ml | Codip | Liquid Inject. | 5 amp. | 2283 | 3105 | 4064 | 1428 |
| No brand/unknown | Artemether | 80 mg/1 ml | Tongmei | Liquid Inject. | 6 amp. | 2401 | 3265 | 4273 | 119 |
| Artenam | Artemether | 50 mg | Arenco | Tablet | 14 | 2256 | 3068 | 4015 | 380 |
| Artenam Injections | Artemether | 100 mg | Ebewe | Liquid Inject. | 7 amp. | 4231 | 5754 | 7531 | 63 |
| Artésiane | Beta-Artemether | 20 mg | Dafra Pharma | Liquid Inject. | 3 amp. | 1482 | 2015 | 2637 | 488 |
| Artésiane | Beta-Artemether | 20 mg | Dafra Pharma | Liquid Inject. | 10 amp. | 3103 | 4220 | 5523 | 1125 |
| Artésiane | Beta-Artemether | 40 mg | Dafra Pharma | Suppository | 6 | 1646 | 2239 | 2930 | 1279 |
| Artésiane | Beta-Artemether | 80 mg | Dafra Pharma | Liquid Inject. | 5 amp. | 3000 | 4080 | 5340 | 4927 |
| Artésiane | Beta-Artemether | 160 mg | Dafra Pharma | Suppository | 6 | 3496 | 4755 | 6223 | 121 |
| Artésiane | Beta-Artemether | 180 mg/60 ml | Dafra Pharma | Suspension | 60 ml | 1397 | 1900 | 2487 | 3900 |
| Artésiane | Beta-Artemether | 300mg/100ml | Dafra Pharma | Suspension | 100 ml | 1800 | 2448 | 3204 | 8677 |
| Arthesis | Artesunate | 50 mg | Cipla | Tablet | 12 | 1312 | 1784 | 2335 | 3304 |
| Gsunate | Artesunate | 50 mg | Bliss GVS | Suppository | 6 | 1391 | 1892 | 2476 | 28 |
| Gsunate | Artesunate | 100 mg | Bliss GVS | Tablet | 6 | 1699 | 2311 | 3025 | 12 |
| Gsunate | Artesunate | 200 mg | Bliss GVS | Suppository | 6 | 2453 | 3336 | 4366 | 5 |
| Gvither | Artemether | 80 mg/1 ml | Bliss GVS | Liquid Inject. | 6 amp. | 5097 | 6932 | 9073 | 27 |
| Gvither | Artemether | 80 mg/1 ml | Bliss GVS | Liquid Inject. | 10 amp. | 3582 | 4872 | 6377 | 180 |
| Gvither | Artemether | 300 mg | Bliss GVS | Suspension | 100 ml | 1797 | 2444 | 3199 | 36 |
| Malather | Artemether | 80 mg/1 ml | IMEX Health | Liquid Inject. | 5 amp. | 2624 | 3569 | 4671 | 274 |
| Malather | Artemether | 300mg/100ml | IMEX Health | Syrup | 100 ml | 1745 | 2373 | 3106 | 170 |
| Plasmotrim | Artesunate | 50 mg | Mepha | Suppository | 6 | 1214 | 1651 | 2161 | 10704 |
| Plasmotrim | Artesunate | 50 mg | Mepha | Suppository | 30 | 4985 | 6780 | 8874 | 184 |
| Plasmotrim | Artesunate | 50 mg | Mepha | Suppository | 150 | 19941 | 27120 | 35495 | 39 |
| Plasmotrim | Artesunate | 200 mg | Mepha | Suppository | 6 | 1968 | 2676 | 3502 | 5078 |
| Plasmotrim | Artesunate | 200 mg | Mepha | Tablet | 6 | 2435 | 3312 | 4335 | 3003 |
| Plasmotrim | Artesunate | 200 mg | Mepha | Tablet | 30 | 6297 | 8564 | 11209 | 1 |

Table 3: Volume and prices of non-artemisinin combination therapies sold by private wholesalers

| Brand | Active Ingredients | Strength | Manufacturer | Dosage Form | Package Size | PGHT | WS sell price ¹ | Retail price ¹ | Vol. ² |
|----------|--------------------|----------|-----------------|-------------|--------------|-------|----------------------------|---------------------------|-------------------|
| Malarone | Atovaquone | 250 mg | GlaxoSmithKline | Tablet | 12 | 21324 | 29000 | 37956 | 84 |
| | Proguanil | 100 mg | | | | | | | |
| Savarine | Chloroquine | 200 mg | GlaxoSmithKline | Tablet | 28 | 3900 | 5304 | 6942 | 2684 |
| | Proguanil | 100 mg | | | | | | | |

Table 4.1: Volume and prices of Non-artemisinin monotherapies sold by private wholesalers

| Brand | Active Ingredients | Strength | Manufacturer | Dosage Form | Package Size | PGHT ¹ | WS sell price ¹ | Retail price ¹ | Vol.* |
|-----------------------------|--------------------|--------------|--------------------|----------------|--------------|-------------------|----------------------------|---------------------------|------------|
| No brand/ unknown | Amodiaquine | 200 mg | Unknown | Tablet | 100 | 2296 | 3123 | 4087 | 10 |
| No brand/ unknown | Amodiaquine | 200 mg | Unknown | Tablet | 150 | 2528 | 3438 | 4500 | 96 |
| Amodiaquine QT | Amodiaquine | 200 mg | Unknown | Tablet | 12 | 216 | 294 | 385 | 8478 |
| Amodiaquine QT | Amodiaquine | 50 mg/5ml | Unknown | Suspension | 60 ml | 407 | 553 | 724 | 3416 |
| A-Quin | Amodiaquine | 50 mg/5ml | Plethico | Suspension | 60 ml | 649 | 883 | 1156 | 171 |
| A-Quin | Amodiaquine | 50 mg/5ml | Plethico | Suspension | 60 ml | 650 | 884 | 1157 | 361 |
| Arsiquinoforme | Quinine | 250 mg | Cipharma | Tablet | 15 | 2599 | 3535 | 4627 | 507 |
| Camoquin | Amodiaquine | 200 mg | Pfizer | Tablet | 75 | 7294 | 9920 | 12984 | 468 |
| Camoquin sirop | Amodiaquine | 50 mg/5 ml | Pfizer | Syrup | 60 ml | 1004 | 1365 | 1787 | 29428 |
| Chloroquine | Chloroquine | 100 mg | Tongmei | Tablet | 1000 | 3801 | 5170 | 6767 | 1 |
| Clip | Chloroquine | 25 mg/5ml | Opalia | Syrup | 150 ml | 800 | 1088 | 1424 | 3360 |
| Combimal | Sulfadoxine | 500mg/2.5ml | Ajanta Pharma | Liquid Inject. | 3 amp. | 807 | 1098 | 1437 | 499 |
| | Pyrimethamine | 25 mg/2.5ml | | | | | | | |
| Combimal (Deconditioned) | Sulfadoxine | 500 mg | Ajanta Pharma | Tablet | 3 | 271 | 368 | 482 | 15705 2 |
| | Pyrimethamine | 25 mg | | | | | | | |
| Combimal | Sulfadoxine | 500 mg | Ajanta Pharma | Tablet | 150 | 13500 | 18360 | 24030 | 2211 |
| | Pyrimethamine | 25 mg | | | | | | | |
| Duliquine | Chloroquine | 50 mg/5 ml | Medicale Pharma | Suspension | 60 ml | 525 | 714 | 935 | 1133 |
| Duliquine | Chloroquine | 300 mg | Medicale Pharma | Tablet | 6 | 512 | 696 | 911 | 1199 |
| Fansidar | Sulfadoxine | 500 mg | Roche | Liquid Inject. | 2 amp. | 1344 | 1828 | 2393 | 10744 |
| | Pyrimethamine | 25 mg | | | | | | | |
| Fansidar | Sulfadoxine | 500 mg | Roche | Tablet | 3 | 577 | 785 | 1027 | 23628 |
| | Pyrimethamine | 25 mg | | | | | | | |
| Fansidar | Sulfadoxine | 500 mg | Roche | Liquid Inject | 30 amp | 19152 | 26047 | 34091 | 128 |
| | Pyrimethamine | 25 mg | | | | | | | |
| Fansidar | Sulfadoxine | 500 mg | Roche | Tablet | 150 | 14400 | 19584 | 25632 | 239 |
| | Pyrimethamine | 25 mg | | | | | | | |
| Fansidar | Sulfadoxine | 500 mg | Roche | Tablet | 3 | 288 | 392 | 513 | 1997 |
| | Pyrimethamine | 25 mg | | | | | | | |
| Flavoquine | Amodiaquine | Unknown | Sanofi Aventis | Suspension | 90 ml | 1117 | 1519 | 1988 | 3132 |
| Halfan | Halofantrine | 100 mg/45 ml | Glaxo | Suspension | 45 ml | 2200 | 2992 | 3916 | 9405 |
| Halfan | Halofantrine | 233 mg | Glaxo | Tablet | 120 | 36000 | 48960 | 64080 | 313 |
| Halfan | Halofantrine | 233 mg | Glaxo | Tablet | 6 | 3100 | 4216 | 5518 | 3859 |
| Halfan (deconditioned) | Halofantrine | 233 mg | Glaxo | Tablet | 6 | 1800 | 2448 | 3204 | 204 |

Table 4.2: Volume and prices of Non-artemisinin monotherapies sold by private wholesalers

| Brand | Active Ingredients | Strength | Manufacturer | Dosage Form | Package Size | PGHT ¹ | WS sell price ¹ | Retail price ¹ | Vol. ² |
|-----------------------|--------------------|---------------|---------------------------|----------------|--------------|-------------------|----------------------------|---------------------------|-------------------|
| Halfan HOP | Halofantrine | Unknown | Glaxo | Tablet | Unknown | 1800 | 2448 | 3204 | 3307 |
| Lariam | Mefloquine | 250 mg | Roche | Tablet | 8 | 17448 | 23729 | 31057 | 36 |
| Madar | Sulfadoxine | 500 mg | Caplin | Tablet | 3 | 215 | 292 | 382 | 6420 |
| | Pyrimethamine | 25 mg | | | | | | | |
| Malaquin | Amodiaquine | 500 mg/5 ml | unknown | Suspension | 60 ml | 407 | 553 | 724 | 3416 |
| Malareich | Sulfadoxine | 500 mg | Medreich Sterilab Limited | Tablet | 3 | 230 | 313 | 410 | 1750 |
| | Pyrimethamine | 25 mg | | | | | | | |
| Malareich | Sulfadoxine | 500 mg/5 ml | Medreich Sterilab Limited | Suspension | 10 ml | 197 | 268 | 351 | 454 |
| | Pyrimethamine | 25 mg/5 ml | | | | | | | |
| Malarix | Quinine | 250 mg | Gracure | Tablet | 12 | 1315 | 1788 | 2340 | 1122 |
| Malarix | Quinine | 400 mg/4 ml | Gracure | Liquid Inject. | 10 amp | 1279 | 1740 | 2277 | 167 |
| Malarix | Quinine | 400 mg /4 ml | Gracure | Liquid Inject. | 100 amp | 12790 | 17395 | 22767 | 204 |
| Malastop | Sulfadoxine | 500 mg | Sterop Laboratories | Tablet | 3 | 354 | 481 | 630 | 1141 |
| | Pyrimethamine | 25 mg | | | | | | | |
| Malastop | Sulfadoxine | 500 mg | Sterop Laboratories | Tablet | 24 | 1968 | 2676 | 3502 | 553 |
| | Pyrimethamine | 25 mg | | | | | | | |
| Maloxine | Sulfadoxine | 500 mg/2.5 ml | Exphar | Liquid Inject. | 2 amp | 750 | 1020 | 1335 | 6614 |
| | Pyrimethamine | 25 mg/2.5 ml | | | | | | | |
| Maloxine | Sulfadoxine | 500 mg | Exphar | Tablet | 3 | 282 | 356 | 466 | 128983 |
| | Pyrimethamine | 25 mg | | | | | | | |
| Maloxine | Sulfadoxine | 500 mg | Exphar | Tablet | 150 | 13118 | 17841 | 23351 | 736 |
| | Pyrimethamine | 25 mg | | | | | | | |
| Metakelfin | Sulfametopyrazine | 500 mg | Pfizer | Tablet | 3 | 544 | 740 | 969 | 240 |
| | Pyrimethamine | 25 mg | | | | | | | |
| Palidar | Sulfadoxine | 500 mg | Phyto-Riker | Tablet | 150 | 8724 | 11865 | 15529 | 5 |
| | Pyrimethamine | 25 mg | | | | | | | |
| Paludoxin | Sulfadoxine | 500 mg | Unknown | Tablet | 150 | 11807 | 16058 | 21017 | 22 |
| | Pyrimethamine | 25 mg | | | | | | | |
| Paludoxin | Sulfadoxine | 500 mg | Unknown | Tablet | 3 | 236 | 321 | 420 | 940 |
| | Pyrimethamine | 25 mg | | | | | | | |
| Paludoxin | Sulfadoxine | 500 mg/? ml | Unknown | Suspension | 10 ml | 408 | 555 | 726 | 395 |
| | Pyrimethamine | 25 mg/? ml | | | | | | | |
| Paludrine | Proguanil | 100 mg | Astra Zenca | Tablet | 56 | 3750 | 5100 | 6675 | 1994 |
| Paluject | Quinine | 400 mg/? ml | Sanofi Aventis | Liquid Inject. | 72 amp | 7779 | 10580 | 13847 | 545 |
| Paluject | Quinine | 400 mg/? ml | Sanofi Aventis | Liquid Inject. | 6 amp | 1082 | 1472 | 1927 | 49 |
| Plecidar | Sulfadoxine | 250 mg/5 ml | Plethico | Suspension | 10 ml | 426 | 580 | 789 | 432 |
| | Pyrimethamine | 12.5 mg/5 ml | | | | | | | |
| Quinimax | Quinine | 125 mg | Sanofi Aventis | Tablet | 18 | 1843 | 2507 | 3281 | 13070 |
| Quinimax | Quinine | 250 mg/2 ml | Sanofi Aventis | Liquid Inject. | 25 amp | 6553 | 8912 | 11664 | 578 |
| Quinimax | Quinine | 250 mg/2 ml | Sanofi Aventis | Liquid Inject. | 3 amp | 983 | 1137 | 1750 | 543 |
| Quinimax | Quinine | 500 mg | Sanofi Aventis | Tablet | 9 | 2893 | 3934 | 5149 | 4731 |
| Quinimax | Quinine | 500 mg/4 ml | Sanofi Aventis | Liquid Inject. | 25 amp. | 11487 | 15622 | 20446 | 1028 |
| Quinimax | Quinine | 500 mg/4 ml | Sanofi Aventis | Liquid Inject. | 3 amp. | 1725 | 2346 | 3071 | 1634 |
| Unbranded/ unknown | Quinine | 100 mg | CP Pharma | Tablet | 150 | 1559 | 2120 | 2775 | 175 |
| Unbranded/ unknown | Quinine | 100 mg | Pharmaquick | Tablet | 30 | 372 | 506 | 662 | 23248 |
| Unbranded/ unknown | Quinine | 300 mg | Pharmaquick | Tablet | 1000 | 26180 | 35605 | 46601 | 136 |
| Unbranded/ unknown | Quinine | 300 mg | Pharmaquick | Tablet | 20 | 714 | 971 | 1271 | 19096 |
| Unbranded/ unknown | Quinine | 600 mg/2 ml | Philco Pharma | Liquid Inject. | 10 amp. | 1653 | 2248 | 2942 | 682 |
| Unbranded/ unknown | Quinine | 400 mg/? ml | Sedapharm | Liquid Inject. | 72 amp. | 5760 | 7834 | 10253 | 10720 |

Table 4.3: Volume and prices of Non-artemisinin monotherapies sold by private wholesalers

| Brand | Active Ingredients | Strength | Manufacturer | Dosage Form | Package Size | PGHT ¹ | WS sell price ¹ | Retail price ¹ | Vol. ² |
|-------------------|--------------------|-------------|--------------|----------------|--------------|-------------------|----------------------------|---------------------------|-------------------|
| Unbranded/unknown | Quinine | 100 mg | Unknown | Tablet | 1000 | 9075 | 12342 | 16154 | 138 |
| Unbranded/unknown | Quinine | 300 mg | Unknown | Tablet | 100 | 2750 | 3740 | 4895 | 1298 |
| Unbranded/unknown | Quinine | 400 mg/? ml | Unknown | Liquid inject. | 100 amp. | 7115 | 9676 | 12664 | 522 |
| Unbranded/unknown | Quinine | 500 mg/4 ml | Sedapharm | Liquid inject. | 100 amp. | 9426 | 12819 | 16778 | 3 |
| Unbranded/unknown | Quinine | 600 mg/? ml | Unknown | Liquid inject. | 100 amp. | 10055 | 13675 | 17898 | 24 |
| Unbranded/unknown | Quinine | 600 mg/2 ml | Unknown | Liquid inject. | 10 amp. | 913 | 1242 | 1626 | 932 |
| Quininject | Quinine | 300 mg/2 ml | Medreich | Liquid inject. | 10 amp. | 2493 | 3390 | 4437 | 174 |
| Quininject | Quinine | 600 ml/2 ml | Medreich | Liquid inject. | 10 amp. | 2493 | 3390 | 4437 | 12 |
| Unbranded/unknown | Sulphadoxine | 500 mg | Pharmaquick | Tablet | 3 | 255 | 347 | 454 | 4485 |
| | Pyrimethamine | 25 mg | | | | | | | |
| Unbranded/unknown | Sulphadoxine | 500 mg | Unknown | Tablet | 75 | 5641 | 7672 | 10041 | 136 |
| | Pyrimethamine | 25 mg | | | | | | | |
| Unbranded/unknown | Sulphadoxine | 500 mg | Unknown | Tablet | 3 | 2100 | 2856 | 3738 | 57 |
| | Pyrimethamine | 25 mg | | | | | | | |
| Unbranded/unknown | Sulphadoxine | 500 mg | Unkown | Tablet | 100 | 18150 | 24684 | 32307 | 5 |
| | Pyrimethamine | 25 mg | | | | | | | |
| Surquina | Quinine | 250 mg | Innotech | Tablet | 600 | 27229 | 37031 | 48467 | 4 |
| Surquina | Quinine | 250 mg | Innotech | Tablet | 18 | 1325 | 1802 | 2359 | 2327 |
| Surquina | Quinine | 250 mg | Innotech | Tablet | 6 | 273 | 371 | 486 | 399 |
| Surquina | Quinine | 490 mg | Innotech | Liquid inject | 3 | 1325 | 1802 | 2359 | 4 |

¹The PGHT and retail prices were calculated from the wholesaler selling prices provided by the private sector wholesalers. As a result of rounding and minor discrepancies (ranging from 1-5 CFA) among the prices provided by the wholesalers, there may be small deviations in the prices reported here and the true values of the PGHT and the retail prices.

²The volumes presented in these tables estimate the total number of full packages sold by Benin's three private wholesalers over the course of one year. The figures presented are an approximation only; it was not possible to get data for an identical timeframe from all three wholesalers (one wholesaler provided sales figures for 2008, while the others provided figures for the past 12 months).

Annex 2: List of antimalarials available for purchase by private sector buyers at CAME in 2008⁵²

| Brand Name | Generic Name | Strength | Form | Manufacturer |
|-------------------------|---------------|-------------|--------------|--------------------|
| Unbranded | Artemether | 40 mg | Tablet | Cipla |
| | Lumefantrine | 240 mg | | |
| Unbranded | Artemether | 20 mg | Tablet | Cipla |
| | Lumefantrine | 120 mg | | |
| Artésiane | Artemether | 20 mg | Amp. inject. | Rotex Medica |
| Artésiane | Artemether | 80mg | Amp. inject. | Rotex Medica |
| Unbranded | Artesunate | 25 mg | Tablet | Sanofi Aventis |
| | Amodiaquine | 67.5 mg | | |
| Unbranded | Quinine | 100 mg/ 1ml | Amp. inject. | ZR Pharmaceutical |
| Unbranded | Quinine | 300 mg | Tablet | Pharmaquick |
| Unbranded | Quinine | 100 mg | Tablet | Pharmaquick |
| Unbranded | Quinine | 100 mg | Tablet | Pharmaquick |
| Unbranded | Quinine | 300 mg | Tablet | Pharmaquick |
| Unbranded | Quinine | 300 mg/ 1ml | Amp. inject. | Wuhan Grand Pharma |
| Unbranded | Quinine | 600 mg/2 ml | Amp. inject. | Wuhan Grand Pharma |
| Unbranded | Sulfadoxine | 500 mg | Tablet | Ajanta |
| | Pyrimethamine | 25 mg | | |
| Unbranded | Sulfadoxine | 500 mg | Tablet | Pharmaquick |
| | Pyrimethamine | 25 mg | | |
| Unbranded | Sulfadoxine | 500 mg | Amp | IPCA |
| | Pyrimethamine | 25 mg | | |
| Co-Artesiane suspension | Artemether | 180 ml | Susp. | MPF BV Netherlands |
| | Lumefantrine | 1080 ml | | |
| Co-Arinate FDC Adulte | Artesunate | 200 mg | Tablet | Pharma Italia |
| | Sulfadoxine | 500 mg | | |
| | Pyrimethamine | 25 mg | | |
| Co-Arinate FDC Junior | Artesunate | 100 mg | Tablet | Pharma Italia |
| | Sulfadoxine | 250 mg | | |
| | Pyrimethamine | 12.5 mg | | |

⁵² These products can also be purchased by public sector buyers. This list does not include supplies of Coartem managed by CAME on behalf of the PNL that can only be distributed in the public sector.

Annex 3: Population data used to scale-up ACTwatch Outlet Survey Data to generate national estimates of retail provider numbers

| | |
|---|------------------|
| Total population from Benin 2002 census | 6,762,989 |
| Population of 19 arrondissements visited for the ACTwatch Outlet Survey | 427,073 |
| Adjustment factor to scale up Outlet Survey data | 15.83 |

Annex 4: Antimalarial doses used to calculate adult equivalent treatment doses

| Drug | Treatment regimen |
|---------------------------|--|
| Amodiaquine | 9 X 200 mg 11 X 153.1 mg |
| Artemether | 14 X 50 mg 7 X 100 mg |
| Artemether – Lumefantrine | 24 X 20 mg / 120 mg 12 X 40 mg / 480 mg |
| Artemisinin –Naphthoquine | 8 X 125 mg / 50 mg |
| Artesunate | 14 X 50 mg 7 X 100 mg |
| Artesunate - Amodiaquine | 12 X 50 mg + 12 X 153.1 mg 6 X 100 mg + 12 X 270 mg |
| Artesunate – Mefloquine | 12 X 50 mg + 6 X 250 mg 6 X 100 mg + 6 X 250 mg |
| Artesunate – SP | 3 X 200 mg + 3 X 500 mg/25 mg 6 X 100 mg + 6 X 500 mg/25 mg 3 X 200 mg/500 mg/25 mg 6 X 200 mg/500 mg/25 mg |
| Chloroquine | 15 X 100 mg 10 X 150 mg |
| DHA – Piperaquine | 8 X 40 mg/320 mg 12 X 30 mg/225mg |
| DHA – SP | 3 X |
| Halofantrine | 6 X 233 mg |
| Quinine | 18 X 100 mg 6 X 300 mg |
| SP | 3 X 500 mg/25 mg |

Figure 1: The private for-profit sector supply chain for antimalarials

