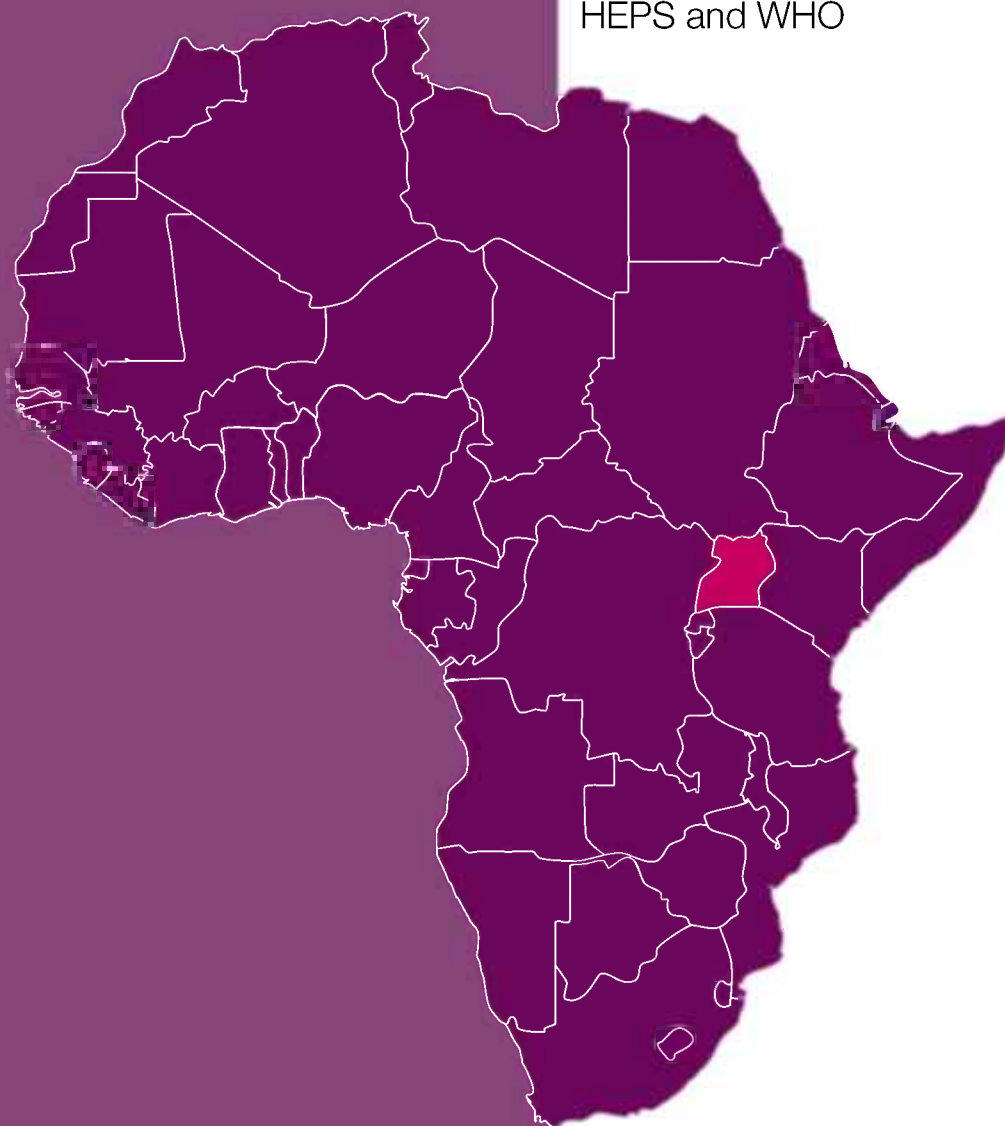# Understanding the Antimalarials Market: Uganda 2007

An overview of the supply side

A study by Medicines for Malaria Venture,
in collaboration with Ministry of Health Uganda,
HEPS and WHO

In collaboration
with

THE REPUBLIC OF UGANDA

HEPS
FOR HEALTH RIGHTS

Medicines for Malaria Venture

Understanding the Antimalarials Market: Uganda 007 – an overview of the supply side
A study by Medicines for Malaria Venture, in collaboration with Ministry of Health Uganda,
HEPS and WHO

Contents

Overview of findings

Access to free public sector treatment

only 16%

Of the number of outlets located in Kamuli/Kaliro and Kamwenge offered public sector care - 84% being private for profit

Bar chart — Proportion outlets located offering public sector care:

- Mubende/Mityana: 24%
- Kamwenge: 16%
- Kabarole: 25%
- Soroti: 24%
- Pallisa/Budaka: 52%
- Kamuli/Kaliro: 16%
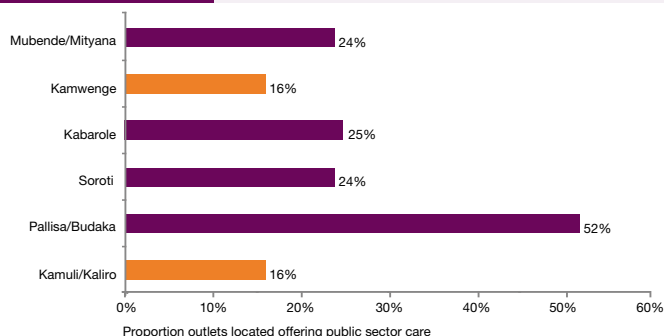
only 50%

Of public health facilities in Kamwenge had any pack-size of the first-line recommended treatment, artemether-lumefantrine

Bar chart — Proportion public sector outlets stocking any pack size of artemether-lumefantrine:

- Pallisa/Budaka: 95%
- Kabarole: 94%
- Mubende/Mityana: 88%
- Soroti: 75%
- Kamuli/Kaliro: 73%
- Kamwenge: 50%
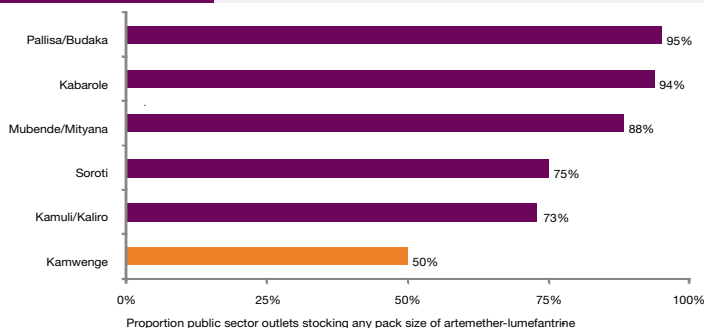
Access to licensed outlets

45%

Of outlets located in Kamuli/Kaliro were not licensed to sell medicines (informal)

Bar chart — Proportion unlicensed to sell medicines:

- Mubende/Mityana: 7%
- Kamwenge: 28%
- Kabarole: 20%
- Soroti: 12%
- Pallisa/Budaka: 15%
- Kamuli/Kaliro: 45%
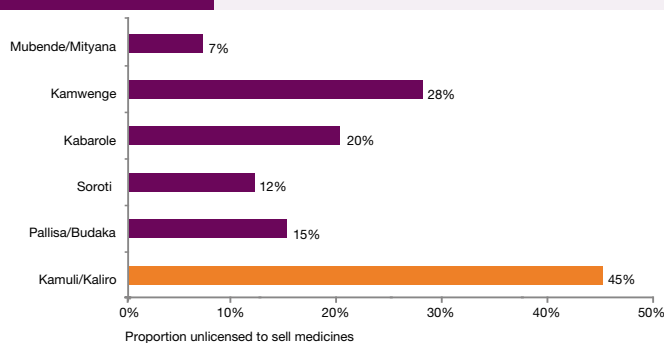
Effective medicines are expensive

Up to 60 times

More expensive to purchase a recommended ACT compared to a more ineffective non-artemisinin based medicine

Chart: Price (USh)

- typical high price
- typical low price

Medicine	High	Low
ACT	20,000	9,000
Artemether monotherapy	27,500	10,000
Amodiaquine	800	400
Chloroquine	500	200
Quinine	4,200	
Sulphadoxine-pyrimethamine	1,000	500
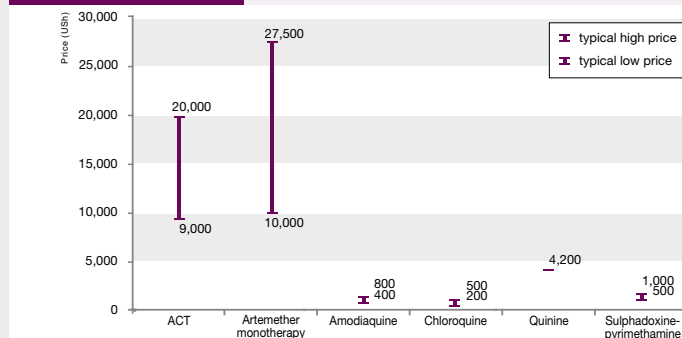
11 days

Average household income to purchase a single course of artemisinin combination therapy for a 5 year old child

Treatment	Number of days income for a single course of treatment
Artemisinin monotherapy (injectables)	17
ACT (Artemether-lumefantrine tabs 20/120mg)	11
Quinine	3
Sulphadoxine-pyrimethamine	0.6
Amodiaquine	0.5
Chloroquine	0.3

Number of days income for a single course of treatment
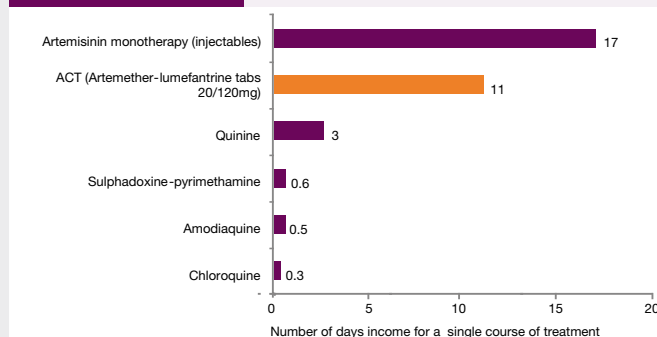
Full courses are not purchased

only 50%

Of patients purchased a full course of even the low priced (ineffective) antimalarial medicines

All antimalarials are unaffordable to the majority of the populations

90 months

Of primary schooling costs for each child to buy a family's annual needs for malaria using artemether-lumefantrine from the private sector

Drug	Number of months primary schooling
Artemisinin monotherapy (injection)	184
ACT (Artemether-lumefantrine tabs 20/120mg)	90
Quinine	25
Amodiaquine	8
Sulphadoxine-pyrimethamine	5.7
Chloroquine	5.1
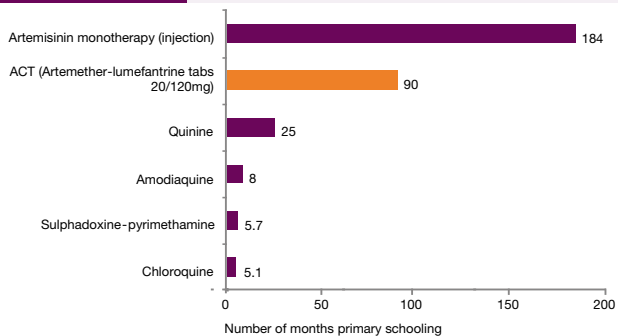
62 days

Of a household's basic food needs to buy the household's annual needs for malaria using artemether-lumefantrine from the private sector

Drug	Number of days basic food need for the family
Artemisinin monotherapy (injection)	139
ACT (Artemether-lumefantrine tabs 20/120mg)	62
Quinine	24.2
Amodiaquine	4.4
Sulphadoxine-pyrimethamine	3.2
Chloroquine	2.8
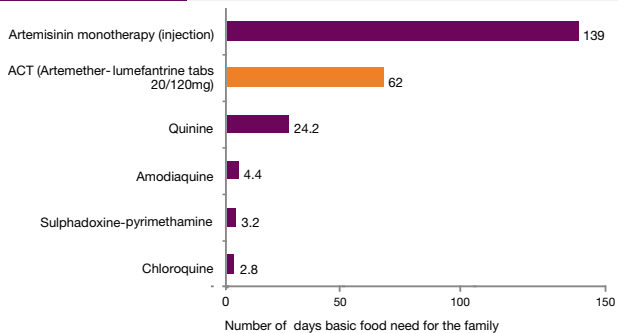
91 days

Of average household income needed to purchase artemether-lumefantrine for the household from the private sector

Drug	Number of days income for families malaria needs
Artemisinin monotherapy (injectables)	205
ACT (Artemether-lumefantrine tabs 20/120mg)	91
Quinine	24
Amodiaquine	8
Sulphadoxine-pyrimethamine	6
Chloroquine	5
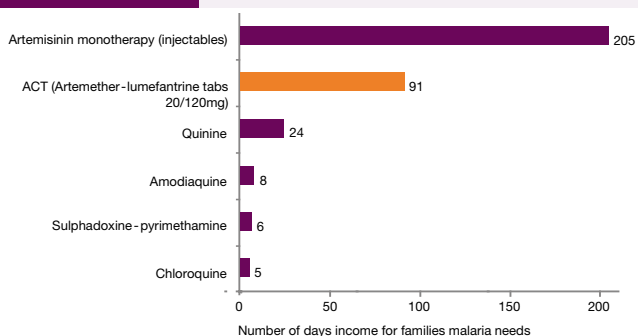
Numerous antimalarials are available for sale

174

Different antimalarial medicine formulations and strengths were found on the market

Pie chart of antimalarial medicines:
- Sulphadoxine-pyrimethamine 16%
- Artemisinin monotherapy 18%
- Quinine 20%
- Chloroquine 23%
- Artemisinin combination therapy 10%
- Arnodiaquine 7%
- Others 6%

6-9 or more

Different antimalarial medicines were found in outlets providing or selling antimalarial medicines

Bar chart — Number of medicines by outlet type (Pharmacy, Drug shop, Clinic, NGO/mission, Retail store, Public sector, Market/vendor, CDD) across regions:
- Kamuli/Kaliro
- Pallisa/Budaka
- Soroti
- Kabarole
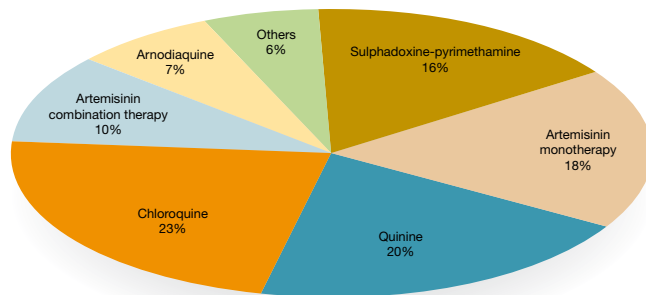- Kamwenge
- Mubende/Mityana
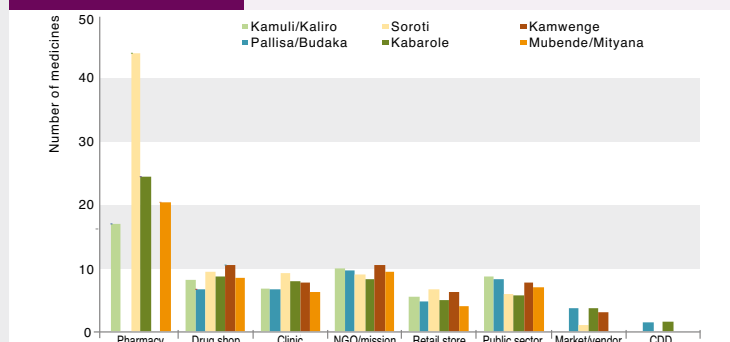
ACTs are not available in the private sector

As few as 4%

Of private sector outlets in Kamwenge are stocked with artemisinin combination therapies - the first-line recommended treatment in Uganda for malaria

Bar chart — Proportion private sector outlets selling and ACT:
- Kabarole 14%
- Soroti 13%
- Mubende/Mityana 7%
- Pallisa/Budaka 7%
- Kamuli/Kaliro 6%
- Kamwenge 4%
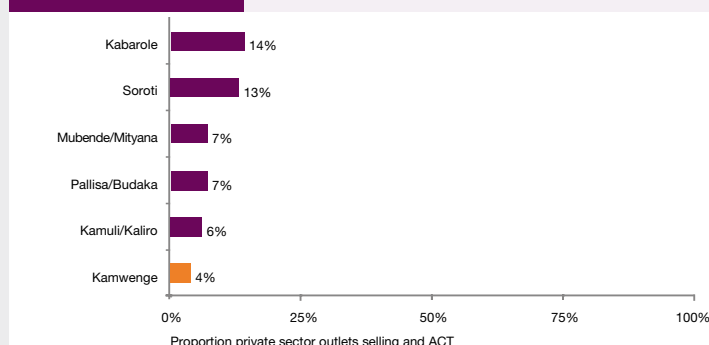
Mark-ups vary widely between products, sectors and locations

As little as 8%

Of the final patient price can be the manufacturer's selling price

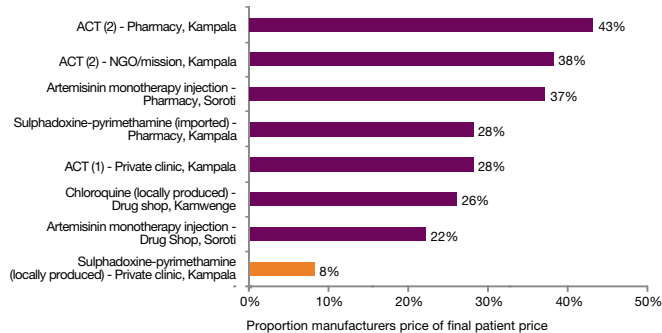| Product	Proportion
ACT (2) - Pharmacy, Kampala	43%
ACT (2) - NGO/mission, Kampala	38%
Artemisinin monotherapy injection - Pharmacy, Soroti	37%
Sulphadoxine-pyrimethamine (imported) - Pharmacy, Kampala	28%
ACT (1) - Private clinic, Kampala	28%
Chloroquine (locally produced) - Drug shop, Kamwenge	26%
Artemisinin monotherapy injection - Drug Shop, Soroti	22%
Sulphadoxine-pyrimethamine (locally produced) - Private clinic, Kampala	8%

Proportion manufacturers price of final patient price

As much as 90%

Of the final patient price can be the retail mark-up

Product	Proportion
Sulphadoxine-pyrimethamine (locally produced) - Private clinic, Kampala	90%
Chloroquine (locally produced) - Drug shop, Kamwenge	68%
Sulphadoxine-pyrimethamine (imported) - Clinic, Soroti	63%
ACT (1) - Private clinic, Kampala	50%
Sulphadoxine-pyrimethamine (imported) - Pharmacy, Kampala	46%
Artemisinin monotherapy injection - Pharmacy, Kampala	45%
ACT (1) - NGO/mission, Kampala	34%
ACT (2) - Pharmacy, Kampala	27%
Artemisinin monotherapy injection - Drug Shop, Kamwenge	22%

Proportion manufacturers price of final patient price

Executive summary

This study, led by Medicines for Malaria Venture in collaboration with the Ministry of Health Uganda, HEPS and WHO, was conducted in 9 districts of rural Uganda.

It identifies the following aspects of the market: types of anti-malarial medicine available on the market, availability of product by outlet type, range of prices, affordability, supply-chain structure, and price mark-ups.

Replacing older classes of drugs with ACTs (artemisinin combination therapies) is critical to ensure appropriate treatment of malaria, a disease that has grown resistant to a number of drugs, such as chloroquine (CQ) and sulphadoxine-pyrimethamine (SP). However, the study indicates that switching to ACTs potentially leaves a gap in access to effective treatment, as many people continue to buy CQ and SP from private sector outlets that do not sell ACTs.

Antimalarials are unaffordable to a significant proportion of the population in the 9 study districts. If products are not available in the public sector, people have to turn to the private sector and are faced with the hard choice of spending their little disposable income on either basic needs like food and education or the treatment of malaria.

Through a comprehensive survey, this study presents a better understanding of the antimalarial market. It provides an evidence base for policy makers in Uganda and internationally to guide initiatives to replace older, ineffective medicines with high quality ACTs – contributing to tackling a major, unacceptable health problem in Africa.

Malaria is a significant health problem in Africa, most particularly in Uganda. A considerable proportion of the country's mortality (20-23%) is attributable to malaria-related illnesses. The disease accounts for 50% of the ill population. Addressing the malaria burden is therefore a major challenge for Uganda and forms a major component of the National Health Policy and Strategic Plans.

National and international willingness and ability to tackle malaria is at an unprecedented level. New funding, tools, and leadership have emerged, and a new class of drugs, artemisinin combination therapies (ACTs), has been developed to replace failing medicines. The development of new ACTs is an opportunity to improve management of malaria and reduce mortality and morbidity. However, ACTs are expensive for governments, which deliver medicines through public (government run) health facilities. Since 2004,

there has been a strong commitment in many countries to making these products available in the public sector. Unfortunately, as with all essential medicines, ACTs may suffer from problems of funding for purchase, procurement and gaps in supply chain management.

An additional complication is the fact that, at the household level, treatment for malaria is often sought through the private sector. This requires private (household) funding. In Uganda, 31% of the population – nearly 8.4 million people – live below the poverty line, the majority of whom live in rural areas[1]. The cost of ACTs, many times more than older classes of drugs such as chloroquine (CQ) and sulphadoxine-pyrimethamine (SP), make them unaffordable for the majority of the population especially when they are purchased out-of-pocket from private sector shops and pharmacies.

---

[1]   Uganda National Health Survey 2005/6

With this in mind, the Ministry of Health Uganda and Medicines for Malaria Venture[2] (MMV) collaborated to carry out the first ever availability, affordability and pricing study specific to antimalarial medicines. Implemented in 9 districts from May to September 2007, the study examined the supply, price, availability and affordability of antimalarial medicines and 14 other essential medicines.

The results of this study will serve not only to develop an evidence base for national and international policy makers with an interest in expanding access to effective, affordable, high quality ACTs in malaria-endemic countries such as Uganda, but also as a template for similar studies in other countries. By mapping the reality of the antimalarials market and existing incentives for the supply of different classes of antimalarial medicines, the report will also provide useful evidence for donors interested in contributing to the achievement of the Millennium Development Goals and the improvement of health indicators in Africa. Finally, it is hoped that this report will also prove useful to manufacturers and suppliers of high quality ACTs in assessing the potential for overall expansion of the ACT market in the medium term.

■ Objective of the study

The principal objective of the study was to understand the "supply-side" of the manufactured antimalarial medicines market in Uganda through:

- Characterisation of outlets used for sale or distribution of antimalarial medicines into 8 types (grouped into public/private and formal/informal sectors)
- Geographic mapping of outlets, using GIS (Geographic Information Systems) coordinates
- Identification of range of products (antimalarials and others)
- Identification of prices
- Mapping product flows
- Understanding sources of information available to distributors and dispensers.

■ Methodology

The methodology used was adapted from the WHO/HAI[3] Medicine Prices methodology[4]. The adaptation was necessary because the study focused on a single therapeutic group; studied a much longer list of medicines; included a greater than normal number of sectors – including the informal sector; took a census approach to study all antimalarial medicines found; and surveyed all outlets that could be located within a defined geographic area. In addition, the location of the outlets was spatially mapped using GIS/GPS (Global Positioning System) coordinates. For a list of the types of outlets surveyed, see table on page 12.

The study used a survey approach, based on a pre-tested questionnaire (available on the MMV website www.mmv.org/access) to assess the price, availability and affordability of medicines. The price components section was based on semi-structured interviews with key informants. The list of informants was guided by the WHO/HAI methodology mentioned earlier.

The study was carried out in nine districts of Uganda[5]: In June 2007, it was implemented in 5 eastern districts/district groupings: Kamuli/Kaliro, Pallisa/Budaka and Soroti; and, in September 2007, in 4 western districts: Kabarole, Kamwenge and Mubende/Mityana. The selection of two different regions took into account the two main malaria transmission settings, high and medium, in Uganda.

---

2   Medicines for Malaria Venture (MMV) is a public-private partnership whose mission is "to discover, develop and deliver new antimalarial drugs through effective public-private partnerships". MMV has recently expanded its work in R&D to include access (post-registration delivery activities). www.mmv.org

3   World Health Organization and Health Action International; see www.who.int and www.haiweb.org for more information on these organisations

4   The methodology described at www.haiweb.org/medicineprices. In the Uganda survey, some aspects of the 2008 revised WHO/HAI methodology were used

5   Selected by the Ministry of Health as intervention/control districts for the MoH-MMV intervention to study the impact of providing a highly subsidized ACT through the private sector: 3 districts located in the east of Uganda and 3 districts in the west. The selection criteria were: different transmission settings (high and low/medium); no other major malaria pilot on-going; district borders within Uganda; not over-studied areas; homogeneous populations with similar dialects (for IEC materials); predominantly rural populations – for more information: http://www.mmv.org/article.php3?id_article=439

Map of Uganda with study areas - 5 eastern & 4 western districts (indicated as district groupings)

Sudan

DRC

Mubende/Mityana

Kamwenge

Kabarole

Soroti

Pallisa/Budaka

KAMPALA

Kamuli/Kaliro

Kampala

Kenya

Tanzania

Rwanda

■ Findings

OVERVIEW OF MARKET STRUCTURE

What outlets were found to be selling antimalarials?

Antimalarial medicines were found in a wide range of outlets. These outlets were categorised into 8 types and are described in the table below.

- A total of 789 outlets were identified in the 9 districts surveyed.
- The balance between different sectors varied per district, indicating that it is not possible to create a 'one size fits all' policy response to increase access to ACTs.
- The private sector was generally significantly more important as a source of antimalarials than "public/ not-for-profit" outlets (government, NGO and community health workers).

- "Public/not-for-profit"[6] outlets accounted for 16-25% of outlets located in all the districts except for Pallisa/ Budaka where they were twice as many, at 52%.
- The importance of the informal sector (unlicensed – in terms of selling medicines)[7] varied from 7-15% of the total number of outlets (in Pallisa/Budaka, Soroti and Mubende/Mityana) to up to 45% (Kamuli/Kaliro).

The differences between sectors requires a variety of different interventions addressing: affordability of ACTs, improvement in supply chain management, and training of dispensers (some of whom may not have any healthcare background) in the correct dispensing and use of ACTs.

Classification of outlets selling antimalarial medicines			
Types of Outlets	**Description**	**Public/ private sector**	**Formal/ informal sector**
1. Public facility	Public sector health facility managed by the Ministry of Health – ranging from clinics to hospitals	Provide "public /not-for-profit" services	Formal licensed outlets/ providers
2. Community Drug Distributor (CDD)	Community based distributor implementing home-based management of fever (HBMF) for the Ministry of Health		
3. NGO/mission	Private, not-for-profit sector operating clinics and hospitals, collaborating with and supported by the Ministry of Health [8]		
4. Retail pharmacy	Licensed by the National Drug Authority (NDA) within the last 3 years	Private for-profit	
5. Drug shop	Licensed by the National Drug Authority (NDA) within the last 3 years		
6. Private clinic	Licensed by the Medical and Dental Practitioners Council within the last 3 years		
7. Retail store	Fixed structure unlicensed retail outlets selling medicines		Informal (unlicensed) outlets [9]
8. Market/vendor	Temporary/mobile structures/individuals		

---

[6]   Public, community drug distributor, NGO/mission

[7]   Retail store, market/vendor

[8]   To date that has involved the distribution of Homapak (pre-packaged chloroquine plus sulphadoxine-pyrimethamine)

[9]   In terms of the supply of medicines

Where were the outlets located?

- Outlets were generally well dispersed across districts with clustering around trading centres.
- In most survey areas, outlets were present within 2.5 to 5 km of the each other[10].
- Drug shops were widely present in all districts. This sector provided greatest access to antimalarials across all the districts except Kamuli/Kaliro which had a greater number of unlicensed retail stores.
- A noteworthy proportion of the unlicensed outlets comprised formerly licensed drug shops that could relatively easily be regularised – especially in Kamuli/Kaliro.

The combination of GIS mapping[11] of outlets alongside indication of sector type for each outlet permits policy makers to understand the impact of increasing or removing permission to sell medicines for any specific sector.

How many antimalarial medicines do the outlets stock?

- The number of medicines[12] found in each outlet type was quite similar across the 9 districts – except in the retail pharmacy division; most formal sector outlets stocked on average 6 to 9 antimalarial medicines.
- Retail pharmacies sold a significantly higher range of antimalarials – with an average of 44 medicines across the two pharmacies in Soroti.
- The public sector and mission facilities would be expected to stock 8 antimalarial medicines[13].

REGULATION OF MEDICINES

Which antimalarial medicines are registered in Uganda?

182 antimalarial medicines were listed on the May 2007 National Drug Authority (NDA) register.

- Artemisinin monotherapy, ACT, CQ, quinine, and SP each account for 15-20% of the number of registered entities.
- Local manufacturers are listed as producing 24 of the 182 antimalarial medicines (13%) registered in Uganda: these are almost exclusively oral formulations (tablets and syrups) of amodiaquine, CQ, quinine and SP.

The study reviewed the degree of consistency between NDA registration of products and what was found on the market:

- Across the nine districts/district groupings, 20 medicines (10%) found on the market were not on the May 2007 NDA register. Of these were:
  - 12 chloroquine formulations
  - 2 locally-produced chloroquine products.
- 29 medicines on the May 2007 National Drug Authority (NDA) register were not found on the market. Of these were:
  - 10 of 27 registered ACTs (37% of all ACTs), 7 of which were artesunate + amodiaquine (AS+AQ) co-packaged ACT formulations.
  - 6 of 35 registered SP brands.

Comparison with other studies indicates that the Ugandan Regulatory Authority has a relatively higher control on the concurrence between the registration of products and what is found on the market, but that more could be done to improve data management of the register of medicines.

At which outlets can antimalarial medicines be legally sold?

Countries "schedule" medicines by setting qualifications and standards required from the person who dispenses the medicine. Although this restricts the distribution and sale of certain medicines, it is done to achieve a balance between the levels of control required to ensure access and availability of medicines, while at the same time protecting public health and safety. 'Scheduling' medicines ensures that the person dispensing has sufficient knowledge of the use and impact of the drug.

In Uganda, all antimalarial medicines except oral CQ and SP are legally scheduled and can only be supplied through public and NGO/mission health facilities, pharmacies, and clinics.

---

[10] Maps indicating the spread of outlets are available in the full report on the MMV website www.mmv.org/access
[11] GIS mapping results are available in the full report
[12] Each generic entity/dosage form/strength/brand/manufacturer permutation = 1 medicine
[13] Artemether-lumefantrine x 4 age packs(1st line); quinine tablets (1st trimester of pregnancy); sulphadoxine-pyrimethamine (IPT); quinine injection (severe/complicated); quinine syrup (children<5Kg)

AVAILABILITY OF ANTIMALARIAL MEDICINES

The core arsenal of antimalarial treatments in most endemic countries, including Uganda, comprises ACT as first-line treatment for uncomplicated malaria, quinine for the treatment of severe malaria and SP for intermittent preventive therapy (IPT) for pregnant women and infants.

Which antimalarial medicines were available in the public & NGO/mission sectors?

- Artemether-lumefantrine (AL - the first-line ACT), quinine and SP were available in both the public and NGO/mission sectors, but stocks were low or very low, indicating an imminent risk of stock-out.
- In a stock-out situation, public sector healthcare workers resort to using other medicines, or people turn to the private sector to purchase the drugs required.
- Availability of quinine injection (for severe malaria) was low in the public sector in 6 districts in both the eastern and western regions. In the NGO/mission sector the situation was much better than in the public sector, in Pallisa/Budaka, Soroti and Mubende/Mityana.
- Availability of quinine tablets (second-line treatment and for use in the first trimester of pregnancy) was low in 5 districts in the public sector and 2 districts in the NGO/mission sector.
- Availability of SP was better in most districts, being registered as very low in only one district.

Which antimalarial medicines were available in private sector outlets?

Quinine, SP and chloroquine were widely available in all sectors, while the presence of ACTs was generally limited.

- ACTs were found in 50 out of 539 private sector outlets across the 9 districts (9%); however, 30 of these 50 outlets (60%) were concentrated in 2 districts – Kabarole and Soroti.
- Artemether-lumefantrine (AL) was the most commonly found ACT; AS+AQ was only found in 1.3% (7 of 539) private sector outlets.
- Artemisinin monotherapies were not widely available – artemether tablet 50mg was the most common.
- Drug effectiveness studies indicate that SP and CQ are no longer effective medicines to treat malaria in Uganda. However they remain universally available. Amongst the reasons for this is their low price, the perception among the general population that they are still effective, and the low levels of confidence in the public and NGO/mission sector to continue to provide supplies of AL.

- AQ was less available than CQ, quinine and SP.
- Quinine is widely used as first choice for treatment although it is only recommended for second-line or severe malaria (depending upon dosage form).

Implications of availability and supply chain management

- The major public health issue in terms of drugs stocked related not to the *number* of products stocked, but the *types* of products – drug shops, retail stores and vendors generally stocked antimalarials with lower efficacy which should preferably be replaced by affordable ACTs in order to maximise health impact.
- Public sector outlets had greater issues with stock-outs (supply chain management) than private sector outlets. This affects both the treatment decisions within the public sector facilities as well as general confidence in the public sector healthcare system.
- ACTs are unlikely to become more widely available in the types of private sector outlet most frequented (drug shops and retail stores) until they are rescheduled for sale at this level by NDA, and prices drop significantly, probably through a subsidy.

Suggested recommendations

- Improve quantification and supply chain management and reduce leakage to address risks of public sector stock-out of key medicines.

- Recognise the potential of the existing supply chain and improve understanding of the incentives currently in place to deliver different classes of products.

- Review the possibility of facilitating the upgrade of unlicensed drug shops to bring them into line with regulatory and quality requirements.

- Explore the possibility of differentiated messaging and training (by sector) to ensure appropriate distribution processes and maximise the potential of different levels of the existing supply chain.

- Increase efforts to communicate messages about the effectiveness of different classes of drugs, including the difference between ACT and CQ / SP.

PRICE OF ANTIMALARIAL MEDICINES

> *Exchange rate: 1 United States dollar =*
> *1680 Uganda Shillings (28 April 2007)*

What is the price of a course of treatment of different antimalarial medicines?

Price varies enormously from the cheapest CQ and SP for adults at USD 0.12 to the most expensive artemisinin monotherapy for adults at USD 6.50. The not-recommended artemisinin monotherapies were often the most expensive antimalarials available, the most expensive of which was a paediatric course priced at USD 24.00.

- For adults, a course of ACTs was around 30-60 times the price of ineffective non-artemisinin therapies. Typical prices of a course of oral treatment for adults:
  - Amodiaquine, chloroquine and SP: USh 200 – 1,000[14] (USD 0.12 – 0.60)
  - Artemisinin combination therapy (ACT): USh 9,000 – 20,000 (USD 5.40 – 12.00)
  - Artemisinin monotherapy: USh 10,000 – 27,500 (USD 6.00 – 16.50)
  - Quinine: almost universally USh 4,200 (USD 2.50)

- For a child of 5 years, a course of ACTs was around 5-10 times the price of ineffective non-artemisinin therapies. Typical prices of a course of treatment for a child of 5 years:
  - Amodiaquine, chloroquine and quinine (syrups): USh 1,000 – 1,500 (USD 0.60 – 0.90)
  - SP (tablets): USh 300 – 600 (USD 0.18 – 0.36)
  - ACT: USh 5,000 – 15,000 per course (USD 3.00 – 9.00)
  - Artemisinin monotherapy: USh 5,000 – 40,000 per course (USD 3.00 – 24.00)

For the non-artemisinin antimalarials, the cost of treatment for a child is greater than the cost of treatment for an adult if syrups are used – this is because syrups are sold in pack sizes with large volumes that contain many treatment courses.

The cost of a treatment course varied widely for some medicines between and within districts, sectors and location but did not vary at all for other medicines. This implies a need for better understanding of the supply chain and drivers of cost in order to best influence consumer price.

AFFORDABILITY OF ANTIMALARIAL MEDICINES

How affordable are the recommended antimalarials?

All antimalarials, let alone the expensive ACTs, are unaffordable to the average household, which has little or no disposable income left after purchase of food and other essential expenditures. An average household is assumed to have 2 adults, 3 children (aged 15, 7 and 2 years)[15] and an annual income of USh600,000 (USD 3,600). More than 40% of households live on less than this amount.

- It would require between 3 – 6 days' income to buy SP and 112-205 days' (over half a year) income for injectable artemisinin monotherapy for a household on an average annual income of USh 600,000.
- 14-25% of total annual income for an average household would be required to cover the family's antimalarial medicines needs using the first-line recommended treatment of AL purchased in the private sector.
- The equivalent of just over 2 – 3 days of basic food needs for the household would be required to buy

an average household's antimalarial medicine needs using SP; injectable artemisinin monotherapy would cost the equivalent of 2 – 4 months of basic food needs for the household; the first-line recommended ACT (AL) would cost 1.5 – 2 months' basic food needs.

- With food prices increasing globally in 2008[16], families will have to spend more of their income on food; even based on food prices during the survey, around 40% of the population was earning a third less than the basic food needs alone, which would now mean that they would only have enough income to purchase half their basic food needs with not much left for even the lowest-priced, ineffective antimalarials.
- The equivalent of 3 – 6 months of primary schooling costs for each child would be required to purchase the household's antimalarial medicine needs using SP; injectable artemisinin monotherapy would cost the equivalent of 14 – 15 years of primary schooling costs for each child; the first-line recommended ACT (AL) would require 6 – 7 years primary schooling costs.

---

[14] In public sector, community drug distributor and NGO/mission outlets
[15] Information from Uganda Bureau of Statistics (UBOS)
[16] Information from news stories indicates that food prices have increased by around 30% from 3rd quarter 2007 to end April 2008

Suggested recommendations

- Pilot alternative approaches to encourage the private sector to move from supplying older, ineffective classes of drugs to ACTs, while offering sufficient incentive to maintain supplies.

- Gather further information on the direct and indirect incentives in the supply chain to understand what drives outlets' decisions on which products to sell and how they are priced.

- Consider alternative ways of increasing public awareness on 'recommended' price levels for different pharmaceutical products, while respecting national price liberalisation policies.

THE SUPPLY CHAIN

How are antimalarial medicines managed and sold by the providers?

The study revealed that providers often did not sell a full course of antimalarials, responding to consumers' purchasing power. In addition, it provided more information on the drivers of stocking decisions and highlighted the poor storage conditions in many outlet types notably drug shops, retail shops and markets.

- Only around half the clients reportedly purchased a full course of antimalarials, even when buying low-priced medicines; the private sector typically prices individual tablets rather than the full dose, thus affecting the sale of full courses and raising issues of compliance.
- Customer demand, price and recommendation by a health professional were the most frequent reasons given for deciding which medicine to stock and sell.
- Generally, very limited amounts of leaked public sector AL were found in private sector outlets.
- Storage conditions were an issue in most retail stores and a minority of other outlet types; poor storage conditions compromise product quality and integrity.
- Expired antimalarial medicines were relatively frequently found in some sectors and some districts.

How is the supply chain structured – where do outlets obtain their supplies?

The existing supply chain effectively delivers antimalarials to a wide range of outlets throughout Uganda. Outlets obtained their supplies from Kampala, regionally and locally. The structure of the supply chain depends on the type of outlet and its location. This impacts the quality of supply, final consumer cost and the type of product delivered. The supply chain is effective in ensuring the supply of CQ and SP at a very local level. This proves that the supply chain in the private sector can work, but must be encouraged to switch to ACT as soon as possible.

- The antimalarials supply chain in Uganda is not always linear. A traditional European structure would move from manufacturer to importer to wholesaler to retailer to consumer. In Uganda, wholesalers and retailers sometimes trade among themselves, adding complexity and cost.
- Importation costs typically add 20 – 70% to the ex-factory price. The lower amounts relate more to multi-sourced products and higher amounts to single, limited or premium-brand sourced products.
- Local manufacturers (of non-artemisinin based antimalarials) also perform wholesaling transactions.

Wholesale distribution
- Wholesalers and retail pharmacies are the main or only wholesale source for the private sector.
- Retail pharmacies operating wholesale businesses were the most-often stated source of supply outside Kampala.
- The wholesale market in Kampala is competitive, but less so outside Kampala - thus impacting prices.
- The antimalarial supply chain is significantly more complex outside Kampala with wholesale trading between districts and between retail outlets, adding to costs.
- The wholesalers and retail pharmacy network does not cover all districts. In this case, outlets in non-served districts have to travel to neighbouring districts to procure their medicines.
- The role of wholesalers outside Kampala acting as both wholesalers and retailers indicates their potential for becoming focal points for information and distribution of quality products.

Wholesale prices

- Wholesale mark-ups are not high, generally at around 5-10%; for limited source products, mark-ups tend to be higher at the importer and wholesaler level.
- Where wholesale prices fluctuate, higher wholesale prices are absorbed through a relatively lower retail price/mark-up.
- Wholesalers reported that low demand, high expiry and highly-priced products have a small mark-up that increases when there is a shortage on the market

Cost to patient

- Public health facilities and community-directed distributors (CDD) provide medicines free of charge to patients; running costs of clinics come from the Ministry of Health (MOH) budget.
- Some medicines are provided free of charge in NGO/ mission health facilities. Others have mark-ups similar to the private sector. Some running costs of these facilities are subsidised by MOH.
- Retail pharmacy mark-ups average 110% (from less than 110% - 500% depending on product).
- Private clinic mark-ups average 300% (less than 300% to more than 900% depending on product).
- Drug shop mark-ups average 100% (from less than 100% - 400% depending on product).
- Wholesale mark-ups are perhaps 7% higher and retail pharmacy mark-ups around 10% less outside Kampala; private clinic mark-ups are perhaps 5% higher outside Kampala.

■ Conclusions and further research

This study highlights the critical need for improved data on the size and structure of the antimalarials market in key malaria-endemic countries, if we are to make serious inroads into expanding access to high quality ACTs for those who need them.

The study confirms the perception that only 40-60% of all treatments are currently provided through the public/not-for-profit sectors, leaving a significant part of the population to turn to the private sector to access medicines. At the same time, the private sector market efficiently provides antimalarials – albeit older, less effective ones such as chloroquine and SP - down to the village level. Thus, there is a need to further understand how different incentives in the market can drive the replacement of older classes of drugs with high quality ACTs. This is an ambitious goal, particularly given the difficulty of successfully influencing markets in the long term. However, unless this is achieved, millions of people in Africa will not benefit from the progress in drug development and the health impact this can bring.

This 'supply side' study was developed in parallel to a 'demand side' (household) survey, probing further into the drivers of treatment-seeking behaviour and household preferences for sector and drug type. By matching these two key aspects of the market – supply and demand – at the same time in the same populations, the studies provide a unique insight into drivers of choice in the delivery of antimalarial treatment.

Medicines for Malaria Venture will continue to work with the authorities in Uganda to further understand the structure of the antimalarials market there, to gather data on the size and incentives driving this market, and to identify solutions for contributing availability of high quality ACTs.

Background

RATIONALE FOR THE STUDY

Malaria is a significant health problem in Africa, most particularly in Uganda where high malaria transmission occurs for most of the year. In fact, malaria accounts for 50% of the ill population. The infant mortality rate is estimated at 86 deaths/1,000 live births and the average life expectancy at birth is 45.3 years. A considerable proportion of the mortality (approximately 20-23%) is attributable to malaria and malaria-related illnesses. Addressing the malaria burden is therefore a major challenge for Uganda and forms a major component of the National Health Policy and Strategic Plans.

National and international willingness and ability to tackle malaria as a major health burden is at an unprecedented level. New funding, tools and leadership have emerged, and a new class of drugs has been developed to replace failing medicines. The development of new artemisinin combination therapies (ACTs) is an opportunity to improve management of malaria and reduce the malaria burden in endemic countries such as Uganda.

However, ACTs are expensive for governments, which deliver medicines through public (government run) health facilities. Since 2004, there has been a strong commitment to making these products available in the public sector in many countries. Unfortunately, as with all essential medicines, ACTs may suffer from problems of funding for purchase, procurement and gaps in supply chain management.

An additional complication is introduced by the fact that, at the household level, treatment for malaria is often sought through the private sector. This requires private (household) funding. In Uganda, 31% of the population – nearly 8.4 million people – live below the poverty line, the majority living in rural areas[17]. The cost of ACTs, many times more than older classes of drugs such as chloroquine (CQ) and sulphadoxine-pyrimethamine (SP), make these drugs unaffordable for the majority of the population, especially when they are purchased out-of-pocket from private sector shops and pharmacies.

With this in mind, Medicines for Malaria Venture[18] (MMV) and the Ministry of Health Uganda have collaborated to carry out the first-ever availability, affordability and pricing study specific to antimalarial medicines. Implemented in 9 districts from May to September 2007, the study examined the supply, price, availability and affordability of antimalarial medicines and 14 other essential medicines.

Alongside the main study, a price components study was carried out in Kampala and two of the study districts, and indicates the composition of the final patient (consumer) price. As medicines move along the supply chain, from manufacturer to the patient, additional costs such as costs for freight, import tariffs, taxes, mark-ups, distribution and dispensing fees are added to the manufacturer's selling price (MSP). The study examined the supply chain and the main price components added at each level, starting from the MSP.

This study of the antimalarials market contributes to national and international awareness on possible measures to be undertaken, in parallel with consumer information measures, to improve access to high quality and effective antimalarial medicines. It fills a significant gap in our collective understanding of the structure of the antimalarials market in malaria-endemic countries.

The study has not only developed an evidence base for addressing access to affordable antimalarials in Uganda, but could also serve as a template for similar studies in other countries.

---

[17]   Uganda National Health Survey 2005/6

[18]   Medicines for Malaria Venture (MMV) is a public-private partnership whose mission is "to discover, develop and deliver new antimalarial drugs through effective public-private partnerships". MMV has recently expanded its work from R&D to include access (post-registration delivery activities). www.mmv.org

Study objectives

PRINCIPAL OBJECTIVE

The principal objective of the study was to understand the "supply-side" of the manufactured antimalarial medicines market in Uganda through:

- Characterisation of outlets used for sale or distribution of antimalarial medicines into 8 types (further grouped into public/private and formal/informal sectors)
- Geographic mapping of outlets, using GIS coordinates
- Identification of range of products (antimalarials and others)
- Identification of prices
- Mapping of product flows
- Understanding of sources of information available to distributors and dispensers.
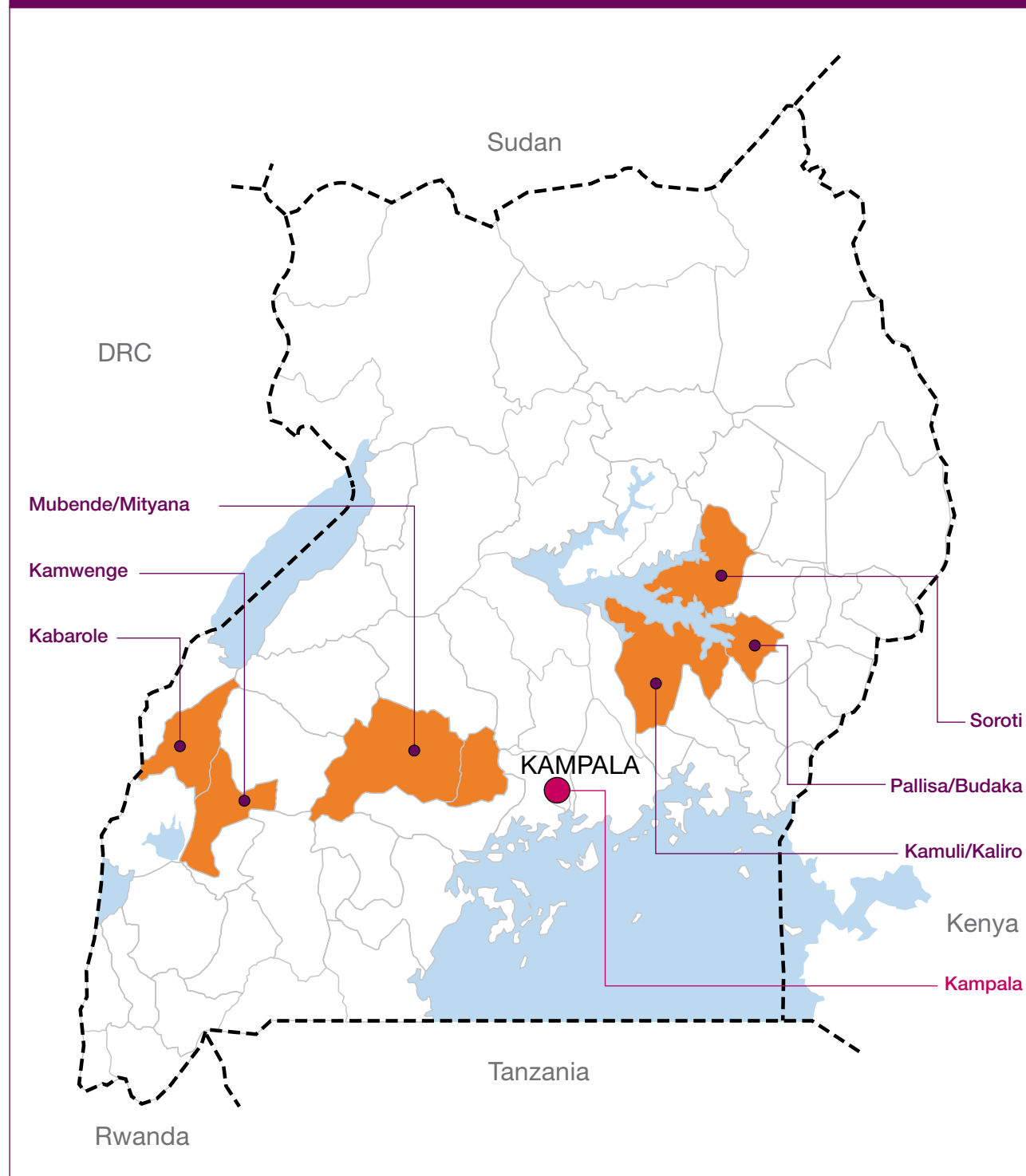
QUESTIONS FOR DISCUSSION

- What types, formulations and brands of antimalarial medicines are available for sale?
- What types of outlets sell (or distribute) these medicines?
- What are the relative costs of different antimalarial medicines?
- How affordable are various classes of antimalarials?
- Which ones are the best-sellers?
- What are the components of the final price?
- What factors impact the final price (including manufacturing, wholesale and retail components)?
- What guides outlets in the selection of which antimalarial medicines to stock and which to sell?
- What proportion of outlets per sector stock the recommended first-line treatments?
- Where do providers obtain their supplies of medicines?

The study also investigated the following additional issues relating to product mix, storage, dispensing behaviour, and legal limitations:

- What is the overall product mix of other commodities sold at the various types of outlet?
- Are antimalarial medicines on open display?
- Are expired antimalarial medicines available on the shelves?
- Are medicines stored appropriately?
- Do customers ask for antimalarial medicines by name or ask for a recommendation for something for fever and/or malaria?
- Which medicines do the outlets recommend for customers with fever/malaria? (antipyretics, anti-malarials or other medicines)
- How much would a "package" of treatment cost?
- Are incomplete courses of antimalarial medicines often sold? To what proportion of customers?
- Where do outlets obtain information about the antimalarial medicines stocked?
- What are the legal restrictions for commonly used malaria medicines?

Figure 1:   **Map of Uganda with the study districts and Kampala**

Sudan

DRC

Mubende/Mityana

Kamwenge

Kabarole

Soroti

Pallisa/Budaka

Kamuli/Kaliro

KAMPALA

Kampala

Kenya

Tanzania

Rwanda

Methodology

The Uganda antimalarial medicines market study can be divided into two parts:

- A study on the price, availability and affordability of antimalarials and selected essential medicines
- A price component study of antimalarials and selected essential medicines.

The methodology used in the study, as described below, was adapted from the WHO/HAI medicine prices methodology[19]. The adaptation was necessary because the study focused on a single therapeutic group; studied a much longer list of medicines; included a greater than normal number of sectors – including the informal sector; took a census approach in terms of studying all antimalarial medicines found; and surveyed all outlets that could be located within a defined geographic area. In addition, the location of the outlets was spatially mapped using GIS/GPS coordinates.

The study used a survey approach, based on a pre-tested questionnaire to assess the price, availability and affordability of medicines.[20] The price components section was based on semi-structured interviews with key informants. The list of informants was guided by the WHO/HAI methodology indicated above.

SURVEY DISTRICTS

The study was carried out in nine districts in Uganda[21]. In June 2007, the price survey was implemented in five Eastern districts/district groupings: Kamuli/Kaliro, Pallisa/Budaka and Soroti.

In September 2007, the study was implemented in four Western districts: Kabarole, Kamwenge and Mubende/Mityana.

Table 1: Study districts			
	Eastern Uganda	**Western Uganda**	**Other**
Medicine price, availability and affordability study	Kamuli/Kaliro	Kabarole	
	Pallisa/Budaka	Kamwenge	
	Soroti	Mubende/Mityana	
Price components study	Soroti	Kamwenge	Kampala

The price components aspect of the study was carried out in Kampala as the nucleus of the pharmaceutical supply chain in Uganda and two other study districts: Soroti and Kamwenge. Kamwenge, a distant rural district, was selected as it has a weak pharmaceutical supply chain infrastructure and few outlets. Soroti has a relatively stronger pharmaceutical supply chain infrastructure and more outlets, thus representing a 'mid-way' infrastructure example between Kamwenge and Kampala.

---

[19]   The methodology described at www.haiweb.org/medicineprices. In the Uganda survey, some aspects of the revised WHO/HAI methodology was used, which will be published in 2008

[20]   The questionnaire is available on the MMV website www.mmv.org/access

[21]   Selected by the Ministry of Health as intervention/control districts for the MoH-MMV intervention to provide a highly subsidized ACT through the private sector: 5 districts located in the east of Uganda and 4 districts in the west. The selection criteria were: different transmission settings (high and low/medium); no other major malaria pilot on-going; district borders within Uganda; not over-studied areas; homogeneous populations with similar dialects (for IEC materials); predominantly rural populations – for more information: http://www.mmv.org/article.php3?id_article=439

TYPES OF OUTLETS SURVEYED

The different outlets in the public, private and mission/NGO sectors were studied as described below. These were classified into 8 different types, attempting to capture the range of outlets to which people might turn, and to understand the comparative importance of different outlet types.

Table 2:	Classification of outlets selling antimalarial medicines		
Types of outlets	**Description**	**Public/ private sector**	**Formal/ informal sector**
1. Public facility	Public sector health facility managed by the Ministry of Health – ranging from clinics to hospitals	Provide "public /not-for-profit" services	Formal licensed outlets/ providers
2. Community Drug Distributor (CDD)	Community based distributor [22] implementing home-based management of fever (HBMF) for the Ministry of Health		
3. NGO/mission	Private, not-for-profit sector operating clinics and hospitals, collaborating with and supported by the Ministry of Health		
4. Retail pharmacy	Licensed by the National Drug Authority (NDA) within the last 3 years	Private for-profit	
5. Drug shop	Licensed by the National Drug Authority (NDA) within the last 3 years		
6. Private clinic	Licensed by the Medical and Dental Practitioners Council within the last 3 years		
7. Retail store	Fixed structure unlicensed retail outlets selling medicines		Informal (unlicensed) outlets [23]
8. Market/vendor	Temporary/mobile structures/individuals		

THE SAMPLING PROCESS

Sampling of parishes

The sampling of the geographic areas, where the outlets were mapped for the price and availability study, was carried out in conjunction with a demand-side household survey. These two studies were carried out within a few weeks of each other in order to provide an overview of both supply and demand influences on the antimalarials market in 9 districts in Uganda. A common element was included in the sampling in order to ensure coherence between the supply and demand studies.

---

[22]   To date that has involved the distribution of Homapak (pre-packaged chloroquine plus sulphadoxine-pyrimethamine)
[23]   In terms of the supply of medicines

Table 3:	MMV / MOH Antimalarials Market Survey in Uganda	
Demand Survey **(Treatment Seeking - Household)**	**Supply Survey** **(Price, Availability - Outlet)**
40 parishes selected (population proportional to size) Same approach used in all districts	**Sampling in eastern districts** 20 parishes randomly selected from the 40 demand survey parishes Additional 10-20 parishes (depending on the district) of the district capital purposively selected
	Sampling in western districts Adapted to clustered sampling: Parishes grouped into 1 or 2 clusters, after which all parishes in selected areas were surveyed

In the demand survey, 40 parishes were randomly selected for inclusion proportional to size. In the supply survey in each of the five eastern districts/district groupings, 20 parishes were randomly sampled from these 40. In addition, the parishes of the district capital(s) were purposively sampled resulting in an estimated total of 30-40 parishes from each district. It was found that the random sampling approach used in the eastern districts gave rise to many empty spaces on the maps between parishes.

In the western districts, clustered sampling was used in the supply study to better capture all the outlets a community could access. That is to say, in each western district, the 40 parishes included in the household survey were first clustered into district parts. To reduce the number of geographic gaps in the survey area, 1-2 of these parts were then selected for each district, and all the parishes in that area, including some not participating in the household survey, were included in the supply side study.

Sampling of outlets

In each sampled parish from the eastern and western axis of the study, a census approach was taken. *All* outlets selling antimalarials in the given geographic area were identified and approached for interview. If permission was not granted, the GPS coordinates of the outlet were captured, and the survey team moved on to the next outlet. Existing lists of licensed outlets (from the Ministry of Health) and interviews with key informants were used to identify all outlets and persons selling antimalarials.

Sampling of medicines

All antimalarial medicines found, whether or not registered, were included in the study. An additional 14 essential medicines were included to enable comparison of the price dynamics of antimalarials and other essential medicines. Their selection was based on the global core list of medicines used in the WHO/HAI Medicine Prices methodology [24]. In the western districts, data were also collected on 10 TB medicines selected to test whether the approach used for antimalarial medicines could be used for TB medicines [25].

Sampling for price components study: Selection of medicines

For the price components study, the medicines were selected by including the current and previous first-line treatments. In addition, those medicines were included which justified further study in terms of volume and/or interesting pricing dynamics from the study findings of the 5 districts in the east and the dataset collected for the national survey in Kampala. All outlet divisions were included in the study design.

[24] The list of 14 global medicines was drafted at the time of this study; subsequently fluconazole tab/cap 150mg was replaced by diazepam tab/cap 5mg
[25] The findings on essential medicines and TB medicines are not reported in this summary report

DATA COLLECTION

Data collection took place during June 2007 in the eastern districts, and in September 2007 for the western districts. The components study was carried out during August-September 2007.

Data collection for the price and availability survey

Relevant information on the national medicines and the malaria situation in Uganda was collated using forms adapted from the WHO/HAI Medicine Prices methodology [26]. For the pricing and availability study, data collectors attended a national training 21-25 May 2007, at which the questionnaires were also piloted. Data collectors worked in teams of two and were instructed to find all outlets providing antimalarials in the defined geographic area. Each district was coordinated by an area supervisor. A survey manager was responsible for overseeing the whole data collection, data cleaning and data entry process.

Data collectors visited each outlet/person selling or distributing antimalarials in the sampled parishes and mapped the location using GPS/GIS coordinates. They then recorded data on prices, availability and presence of any expired packs in the outlet. They also asked the owner or an employee a series of questions regarding sources of information on the medicines sold, wholesale sources, number of customers purchasing antimalarials, the potential influence of special "buying-terms" (e.g., credit) and decisions involving which medicines are sold to patients. In addition, data collectors recorded the types of other commodity items stocked, whether antimalarial medicines were on open display or hidden "under-the-counter", and finally the storage conditions of medicines.

Data collection for the price components study

For the price components case study, national procurement price data was collected centrally from the office of the procurement officer and central medical stores. A similar process was carried out for the NGO/mission sector. Additional data, such as manufacturer's price, cost of freight, import tariffs, taxes, mark-ups, distribution and any dispensing fees was collated through interviews with key informants across all outlet divisions. To understand the dynamics of different medicines and types of medicines, eight antimalarial medicines and five other essential medicines were tracked back from two to three outlets of each outlet type through wholesalers and/or importers, to the point at which the product entered the country, or to the factory gate for locally produced medicines. The price component study was carried out after preliminary analysis of the data from the pricing study which informed the approach used for the price components study.

DATA MANAGEMENT AND ANALYSIS

Data entry and analysis took place at central level using the WHO/HAI International Medicine Price Excel Workbook as well as a custom-made Excel Workbook. Results are reported here and findings were shared with Ugandan and international stakeholders at a stakeholder workshop in Kampala at the end of September 2007.[27]

Medicine prices in this report are stated in Ugandan Shillings.

Exchange rate used: 1 United States Dollar = 1680 Uganda Shillings (28 April 2007)

Affordability is expressed in terms of the equivalent number of days' income that households would have to relinquish to pay for a treatment course. Incomes used in these comparisons are the salary of the lowest-paid government worker and average rural and urban household incomes.

In addition, the cost of treatment courses are expressed as the equivalent number of days of food to feed a household[28] (at the time of the survey) and the equivalent number of months of schooling costs for a child at a government primary day school.

For quality control purposes, area supervisors ensured consistency in data collection through daily checks of the data collection forms and spot visits to 10 - 20% of the outlets in each district. At the data entry stage, double entry features of the WHO/HAI Medicine Prices Excel Workbooks were used as well as a "check-data" function to identify potential outliers. All Workbooks were also reviewed by the survey manager, survey coordinator and an independent additional data entry person.

---

[26] For a copy of the survey instruments, see the mmv website www.mmv.org/access

[27] http://www.mmv.org/article.php3?id_article=439

[28] A household is considered to consist of 2 adults, and 3 children aged 15, 7 and 2 years, based on Uganda Bureau of Statistics data

ETHICAL CONSIDERATIONS

Ethical clearance was not necessary - No issues of patient confidentiality arose - as there were no patient interactions with the data collectors. Moreover, patient information was not accessed as the data collectors obtained price and availability information of medicines available only at the facility. Approval of the study was obtained from the Ministry of Health and verbal informed consent obtained before the start of an interview at each outlet. Data has been stored and managed to ensure that neither the outlet nor the personnel could be identified in the research documents or reported to the authorities.

Business practices issues were raised relating to the prices charged for medicines in the outlets; some of the outlets were perhaps not legally licensed to sell medicines while others were selling medicines beyond the scope of their license. There was potentially very limited or no harm faced by data collectors or staff of the outlets visited, or to future patients to the outlets.

Findings

■ Overview of the market structure

SURVEY DISTRICTS

How many outlets and antimalarial medicines were found?
789 outlets where located across the 8 outlet types in the
9 study districts/district groupings; price and availability
information was collected from 752 outlets; 39 outlets that
were located could not be accessed to collect data as

they were either closed or the owner would not provide the
information. This was most common in the retail store outlet
type, which accounted for 17 of these 39 outlets.
5,662 pieces of price and availability data on antimalarial
medicines were collected.

Table 4:	Number of outlets located			
Study districts	**District names**	**Number of outlets located selling antimalarials**	**Outlets where price and availability data was collected**	
			Number	**Proportion of those located**
Eastern	Kamuli/Kaliro, Pallisa/Budaka, Soroti	432	412	95.4%
Western	Kabarole, Kamwenge, Mubende/Mityana	357	338	94.7%
Total		**789**	**750**	**95.1%**

OUTLET TYPES WHERE ANTIMALARIAL MEDICINES WERE SOLD OR DISTRIBUTED
Which outlet types were found to be selling or distributing antimalarials?

Figure 2:	Number of outlet types located selling antimalarial medicines, by district
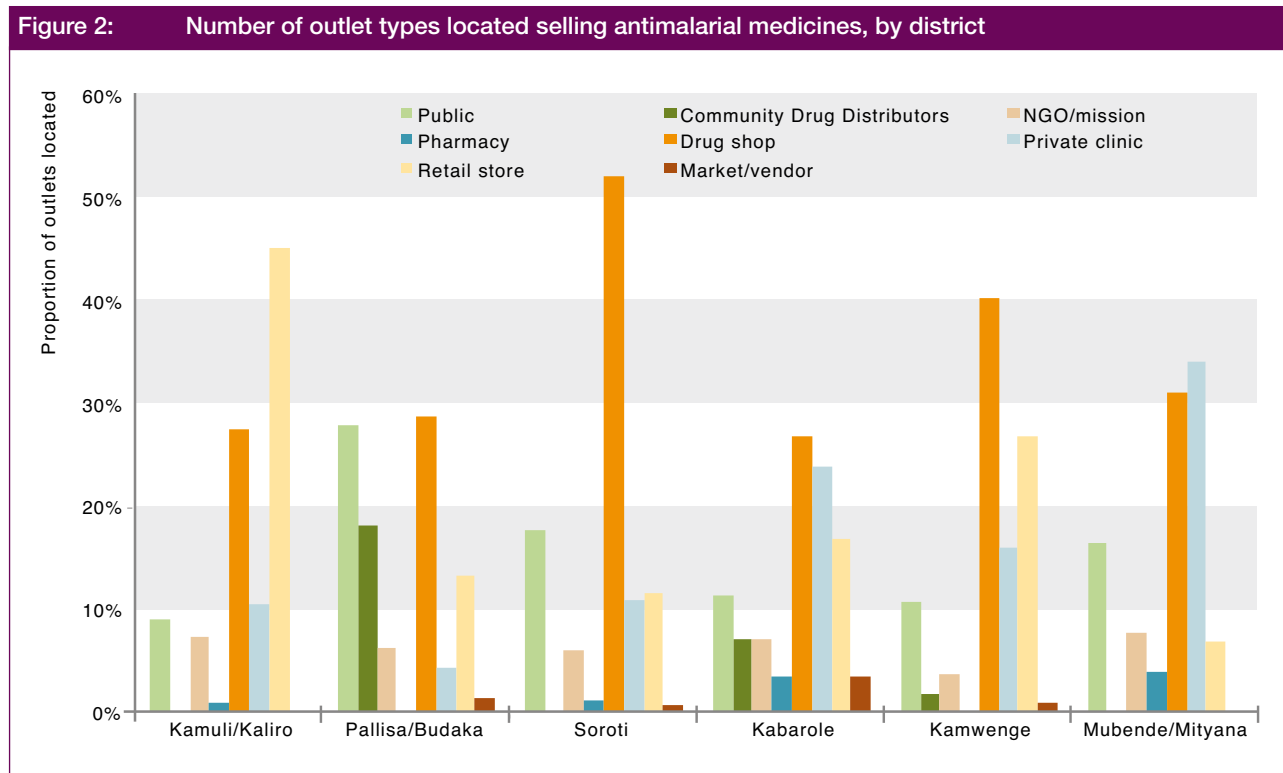
CLASSIFICATION AND RELATIVE IMPORTANCE OF DIFFERENT OUTLET TYPES

Roles and structures of different outlet types

- **"Public/not-for-profit"** outlets were defined in this study to include public sector facilities, NGO/mission sector facilities and community drug distributors (CDDs).
- Public/not-for-profit outlets accounted for 16-25% of outlets located in each district except for Pallisa/Budaka where they were 52%.
- Public/not-for-profit outlets are the main source of essential medicines for the majority of the population in Uganda, indicating that antimalarials have a slightly different distribution pattern.

- **"Private clinics"** incorporate dispensing clinics and private hospitals. Dispensing clinics require a qualified health person, but not necessarily a medical doctor.
- Clinics can provide a wide range of medicines and they are relatively loosely regulated compared to pharmacies and drug shops; they are licensed by the Medical and Dental Practitioners Council and the Nurses and Midwives Council.
- Many more private clinics were located off than on the official listings in Kamuli/Kaliro, Soroti Kamwenge and Mubende/Mityana. Private clinics accounted for 4-11% of outlets located in the 5 eastern districts of Kamuli/Kaliro; Pallisa/Budaka and Soroti. They accounted for a higher proportion in western districts: Kabarole (24%); Kamwenge (16%) and Mubende/Mityana (34%).

- **"Pharmacies"** must have a supervising pharmacist, who can supervise up to two pharmacies. This limits the total possible number of pharmacies in Uganda to a maximum of twice[29] the number of pharmacists (assuming all pharmacists are involved in the sector, which is not the case).
- There are 285 retail pharmacies in the country, the majority of which are found clustered in urban areas – with 80% found in the 3 major towns of Kampala, Jinja and Mbarara.
- Kabarole district has the most, with 8 registered pharmacies, while three of the study districts (Kamwenge & Pallisa/ Budaka) did not have a retail pharmacy at all. In terms of number of outlets, pharmacies account for just under 4% of the outlets found across the study districts.

- **"Drug shops"** are a lower level of pharmaceutical outlet than pharmacies. They are licensed by the National Drug Authority to sell a more limited range of medicines but, to operate, require a person with approved basic medical qualifications.
- Drug shops are found throughout Uganda and are the most common licensed pharmaceutical outlets located outside the major towns. Drug shops accounted for 25-30% of outlets found to be selling antimalarials across the study districts, except Kamwenge (at 40%) and Soroti (at 52%).

- **"Retail stores"** include unlicensed, permanent structure outlets found to be selling antimalarial medicines; they are categorised as informal as they are not permitted by law to sell medicines. Retail stores accounted for 7-16% of outlets except in Kamuli/Kaliro (45%) and Kamwenge (27%).

- **"Market/vendors"** include temporary unlicensed traders who were found to be selling antimalarial medicines.
- This outlet type was categorised as informal as it is not permitted by law to sell medicines.
- Detailed information was collected for all of the market sellers/temporary structures located. However, this outlet type is mobile and was difficult to locate – or disappeared when the data collectors were in the locality.
- Their proportion with respect to the total number of outlets found is likely to be under-represented – none were located in Kamuli/Kaliro or in Mubende/Mityana; in the other districts, they accounted for between 0.6% and 3.5% of outlets located (Table 5).

- Access to formal sector/licensed outlets was lower in Kamuli/Kaliro than in the other districts. However, it was found that many informal outlets in these two districts, notably retail shops, had at some point in the past held a licence from the NDA to sell antimalarials.
- The informal sector (retail stores and market/vendors) accounted for 7-15% of the total number of outlets located in Pallisa/Budaka; Soroti and Mubende/Mityana; and was more significant in Kabarole (20%), Kamwenge (28%) and Kamuli/Kaliro (45%).
- Kabarole has a higher number of formal sector/licensed outlets to population compared to the other districts (Table 6).

---

[29]   Each pharmacist in Uganda can run and supervise two pharmacies

Table 5:	Proportion of outlets – public vs private; formal vs informal (in %)			
District	Public [30]	Private [31]	Formal [32] (licensed [33])	Informal [34] (unlicensed)
Kamuli/Kaliro	16	84	55	45
Pallisa/Budaka	52	48	85	15
Soroti	24	76	88	12
Kabarole	25	75	80	20
Kamwenge	16	84	72	28
Mubende/Mityana	24	76	93	7

Table 6:	Number of outlets and population per outlet											
	Public and not-for-profit sector						Formal private sector					
	Public facilities		NGO/ mission facilities		Public + NGO/ mission		Pharmacies		Drug Shops		Clinics	
	#	Population per outlet	#	Population per outlet	#	Population per outlet	#	Population per outlet	#	Population per outlet	#	Population per outlet
Uganda	2,100	13,333	485	57,732	2,585	10,832	328	85,366	3,850	7,273	2,700	10,370
Kampala	39	51,282	39	51,282	78	25,641	168	11,905	638	3,135	1,640	1,220
Uganda – Kampala	2,061	12,615	446	58,296	2,507	10,371	160	162,500	3,212	8,095	1,060	24,528
Kamuli/ Kaliro	40	17,683	32	22,104	72	9,824	1	707,332	34	20,804	6	117,889
Pallisa/ Budaka	41	12,697	11	47,325	52	10,011		No pharmacy	42	12,395	11	47,325
Kabarole	25	14,277	14	25,494	39	9,152	8	44,614	70	5,099	75	4,759
Kamwenge	20	13,187	6	43,955	26	10,143		No pharmacy	29	9,094	10	26,373
Mubende/ Mityana	60	11,492	23	29,980	83	8,308	5	137,906	103	6,694	16	43,096
Soroti	32	11,556	10	36,979	42	8,805	2	184,895	69	5,359	18	20,544

Data sources: http://www.healthdata.go.ug/; http://www.nda.or.ug/

▊ Orange shaded = >50% higher than (Uganda – Kampala) average population per outlet (▊ pink shaded)

---

[30]   Public, community drug distributor, NGO/mission
[31]   Pharmacy, clinic, drug shop, retail store, market/vendor
[32]   Public, community drug distributor, NGO/mission, pharmacy, clinic, drug shop
[33]   Unlicensed in terms of selling medicines, vs. licensed as a business with local authorities; licensing to sell medicines is a competence of the National Drug Authority and health profession councils
[34]   Retail store, market/vendor

ESTIMATED MARKET SHARE OF DIFFERENT OUTLET TYPES

Antimalarial medicines were found in a wide range of outlet types as indicated in Figure 2. It is estimated that in terms of volumes, 40-60% antimalarials are sourced through "public/not-for-profit" channels. This is based on estimated volumes of products distributed (for example from health facility and other records), as compared to national malaria incidence rates. However, this number requires further validation, due to the difficulty in understanding the overall size of the antimalarials market, and the total treatment rates.

Three significant caveats should be indicated in this estimation of volumes sourced through the public/not-for-profit outlet types: first, health facilities suffer regular stock-outs, and treatment rates may therefore vary, not by incidence but by availability of stock. Second, it is difficult to gain an overall quantification of the total size (by volume) of the antimalarials market in Uganda, and thus understand the actual part of the "public/not-for-profit" outlet types in terms of volume. Third, treatment purchases in the private sector are often based on availability of funding, with only 50% of purchases comprising a complete treatment course. Thus, even with reasonable figures of the total market size, we would need to factor in an indication of total number of sales, which would not necessarily equate to total number of treatment courses.

MMV is currently working with the authorities in Uganda and elsewhere to further understand the size and structure (by drug class) of the antimalarials market. The current study has limitations in the ability to gather volumes data, and must therefore be complemented by additional approaches.

The findings for reported treatment purchase/supply transactions in the eastern districts are presented in Figure 3.

Figure 3:   Estimated market share of outlets visited (in terms of reported number of transactions)
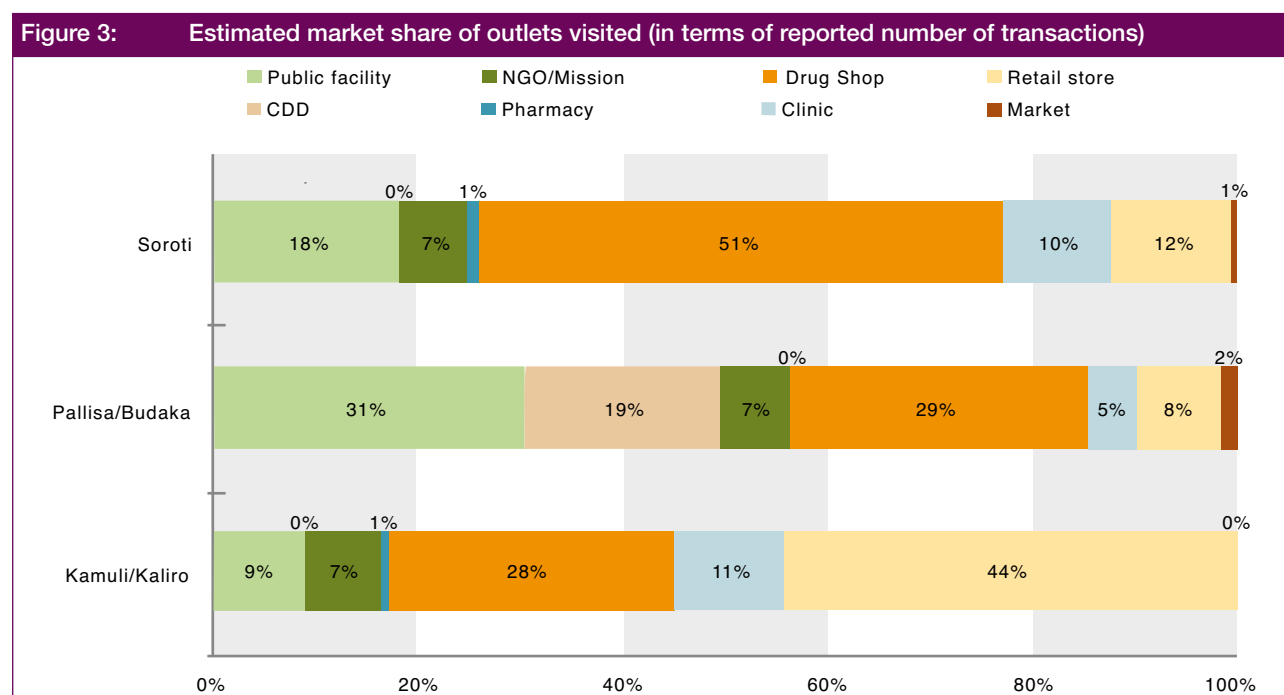
- Formal sector[35] transactions made up 56% of the estimated transactions in Kamuli/Kaliro, 91% in Pallisa/Budaka and 87% in Soroti.
- In Kamuli/Kaliro, 16% of the reported transactions occurred in the public and NGO/mission outlet types, while in Soroti the figure was 25%. In Pallisa/Budaka, 57% of the reported transactions occurred in the public, CDD and NGO/mission outlet types.

- These proportions of reported numbers of customers are similar to the proportions of outlets located (see Figure 3).

---

[35]   Public facilities, CDD, retail pharmacies, drug shops, private clinics and NGO/mission facilities (i.e. excluding retail stores and market stall/ vendors)

Figure 4:   Antimalarial medicines are available in the formal and informal sectors

GEOGRAPHIC ACCESS TO OUTLETS

**Where were the outlets located?**

Figures 5 and 6 illustrate the spatial mapping that was carried out in each district. Each outlet found was mapped and labelled according to the type to which it belonged. Figure 5 presents an overview of Pallisa and Budaka districts with a 2.5km radius drawn around each formal sector outlet [36] to illustrate those parts of the district outside a 2.5km radius of a formal health provider. Figure 6 zooms in on Pallisa county to show a more local spatial distribution of outlets.

Such mapping allows an easy assessment of the effect on local populations of geographic access to outlets providing or selling antimalarials. This also provides an indication to the national authorities of the impact – in terms of geographic access – of allowing or preventing a type of outlet to sell a particular type of antimalarial medicine. For further reference on which medicines outlets are allowed, please see the section describing the legal "scheduling of medicines", on page 33.

- Outlets were generally well dispersed across districts with clustering around trading centres
- In the formal sector, drug shops occur in the highest numbers across all districts and were generally the most often identified of all outlets selling antimalarial medicines across all the districts
- Access to formal (licensed) private sector outlets is much lower in some districts than others – e.g., lowest in Kamuli/Kaliro and Pallisa/Budaka
- The proportion of the different types of outlets located differs substantially between some districts including the public/private mix and the formal/informal split

---

[36]   Public facilities, community distributor, NGO/mission, pharmacy, drug shop, private clinic (excluding the retail store and market/vendor categories

Figure 5: Pallisa and Budaka with outlets selling antimalarial medicines mapped
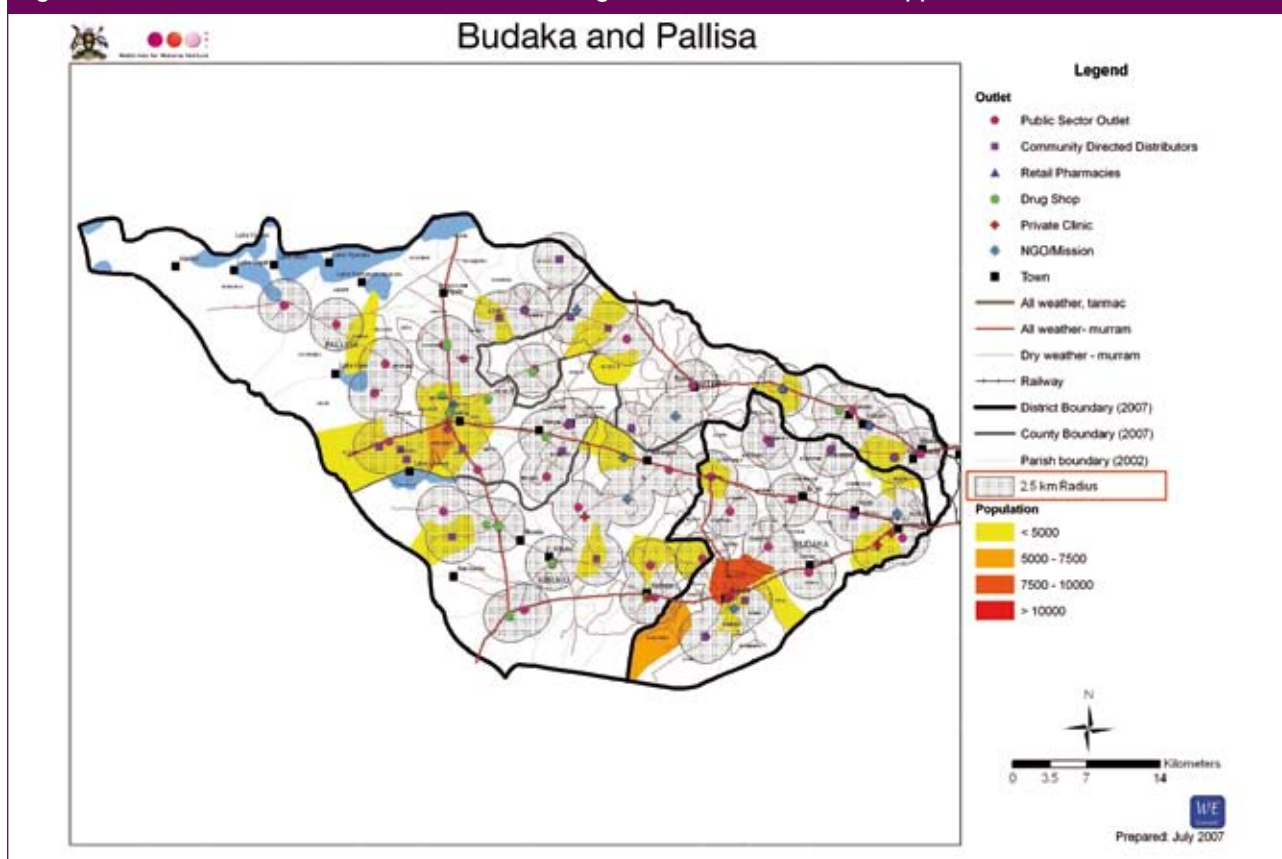
Shaded areas = surveyed parishes; shading refers to absolute population of that parish

Figure 6: Pallisa County with outlets selling antimalarial medicines mapped
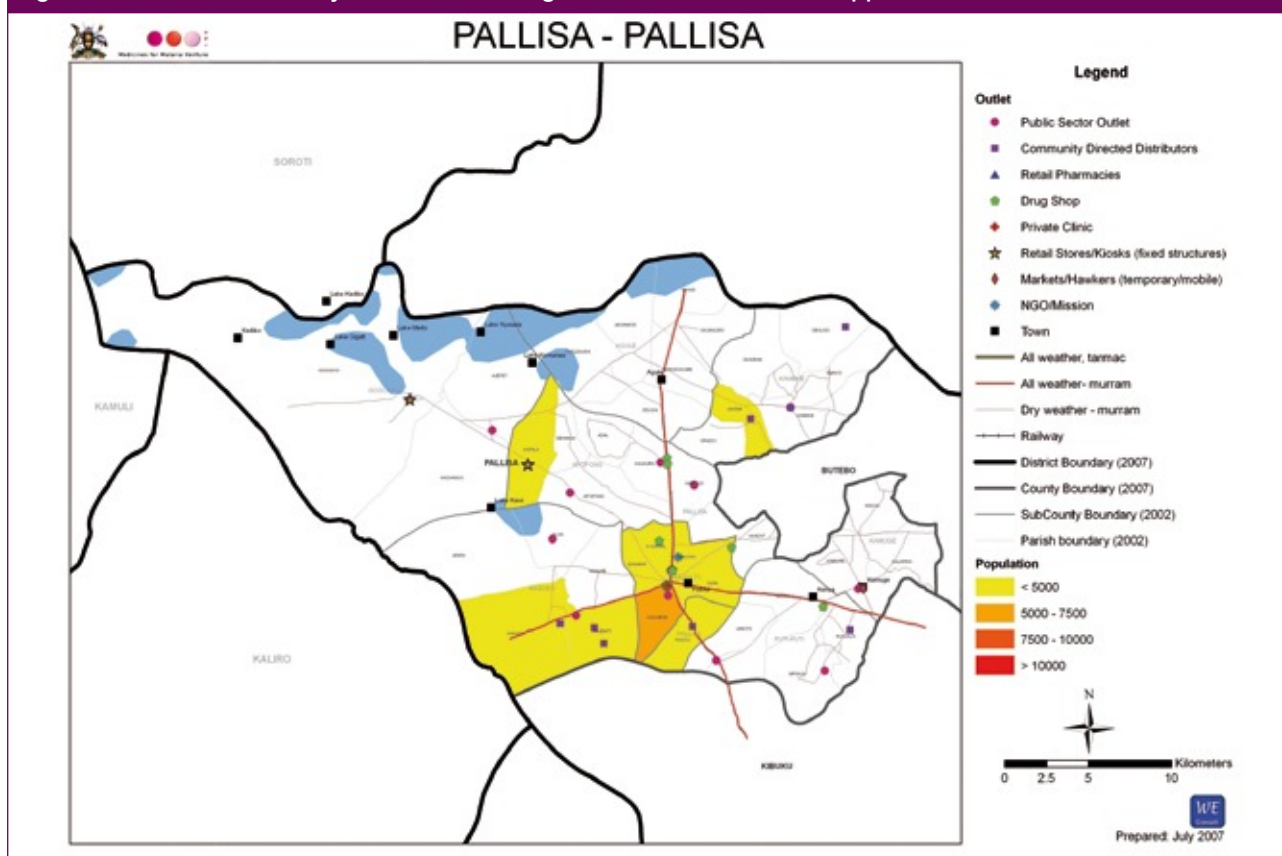
NUMBERS OF ANTIAMALARIALS STOCKED IN DIFFERENT OUTLET TYPES

How many antimalarial medicines do the outlets stock?

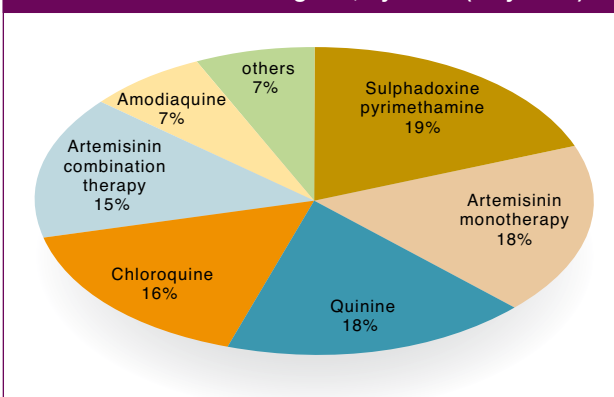Figure 7 presents how many different medicines were found in each outlet type across the 9 districts.

Figure 7: Average number of antimalarial medicines found per outlet type
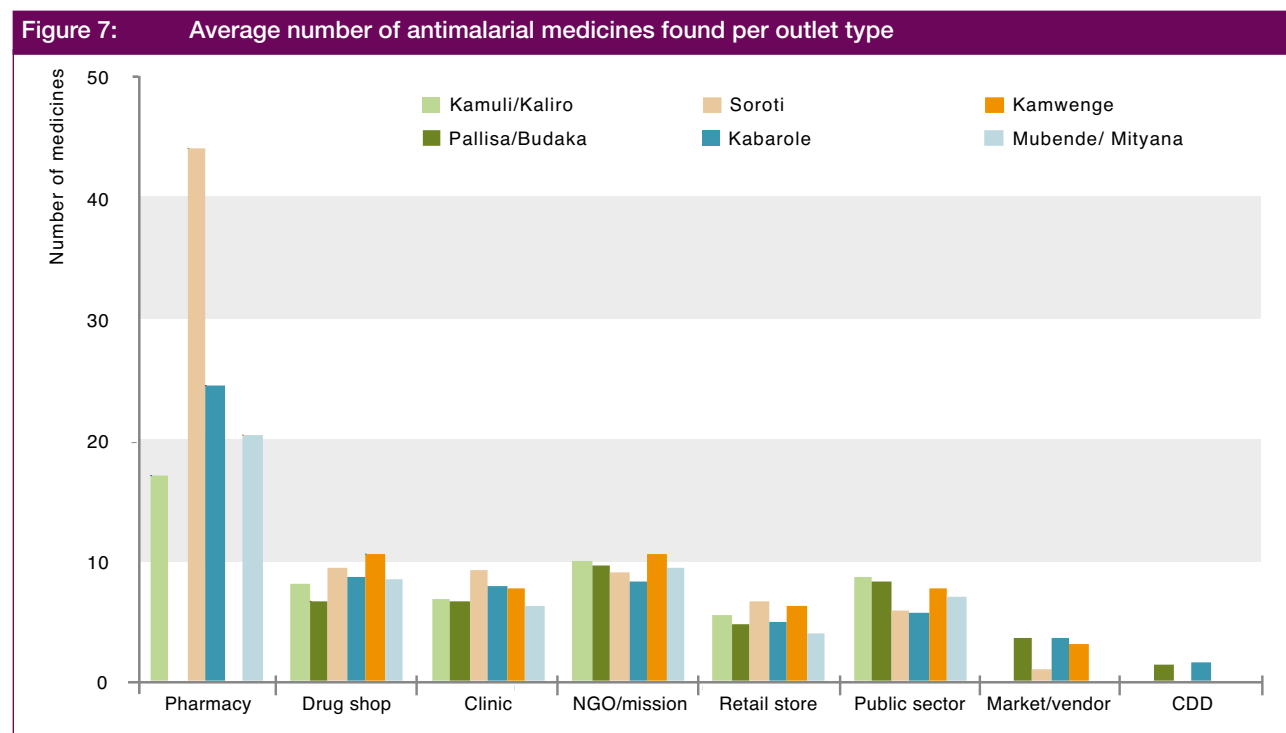
- The number of medicines[37] found in each outlet type was quite similar across the districts – except in the two retail pharmacy outlets in Soroti, which sold up to an average of 44 medicines

- Each formal sector outlet, except pharmacies, stocked on average 6-9 antimalarial medicines
- Public sector and mission facilities would be expected to stock 8 antimalarial medicines[38]

REGULATION OF MEDICINES

Medicines registered by the National Drug Authority (NDA)[39]

Uganda Government Statute No. 13 of 1993 established the National Drug Authority (NDA). The NDA is responsible, amongst other issues, for ensuring the quality and safe management of medicines. This includes the scheduling of medicines according to which outlets and/or professionals may supply them.

Figure 8: Proportion of antimalarial medicines on NDA register, by class (May 2007)

others 7%
Sulphadoxine pyrimethamine 19%
Amodiaquine 7%
Artemisinin combination therapy 15%
Artemisinin monotherapy 18%
Chloroquine 16%
Quinine 18%

---

[37] Each generic entity/dosage form/strength/brand/manufacturer permutation = 1 medicine

[38] Artemether-lumefantrine x 4 age packs(1st line); quinine tablets (1st trimester of pregnancy); sulphadoxine-pyrimethamine (IPT); quinine injection (severe/complicated); quinine syrup (children<5Kg)

[39] www.nda.or.ug

- 182 antimalarial medicines were listed on the May 2007 NDA register.
- 174 antimalarials were found on the market across the 9 district groupings.
- Artemisinin monotherapy, ACT, CQ, quinine, and SP each account for 15-20% of the number of registered entities.
- Local manufacturers are listed as producing 24 out of the 182 antimalarial medicines (13%) registered in Uganda; these are almost exclusively oral formulations (tablets and syrups) of amodiaquine, CQ, quinine and SP (and also the co-packaged CQ/SP combination therapy).

Across the nine districts/district groupings:
- 29 medicines on the register as of May 2007 were not found on the market. Of these
  - 12 were CQ formulations
  - 2 were locally produced CQ products.
- 20 medicines were found which were not on the May 2007 NDA register. Of these
  - 10 were registered ACTs (of a total of 27); 7 of the 10 being co-packaged AS+AQ
  - 6 were brands of registered SP (of a total of 35).

Medicines not found on the register could be available illegally on the market or could be medicines that have not had their registration renewed, but were selling out the last stocks on the market[40].

Medicines on the register but not found could simply be medicines not found in the districts and outlets surveyed. However the sample size across the districts was relatively large, meaning that even if such medicines are on the market in Uganda, their market share is low. Alternatively they may have been specifically imported for a programme or are not being marketed, but have not as yet been removed from the register.

Comparison with other studies indicates that the Ugandan Regulatory Authority has a relatively high control on the concurrence between the registration of products and what is found on the market, but that more could be done to improve data management of the register of medicines.

At which outlets can antimalarial medicines be legally sold?
Countries "schedule" medicines to restrict their distribution and sale. This is done to achieve a balance between the levels of control required to ensure access and availability of medicines, while at the same time protecting public health

and safety. 'Scheduling' medicines ensures that the person dispensing has sufficient knowledge of their use and impact.

In Uganda, all antimalarial medicines except oral chloroquine and SP are legally scheduled to be only supplied through the formal sector via public and NGO/mission health facilities, pharmacies, and clinics.

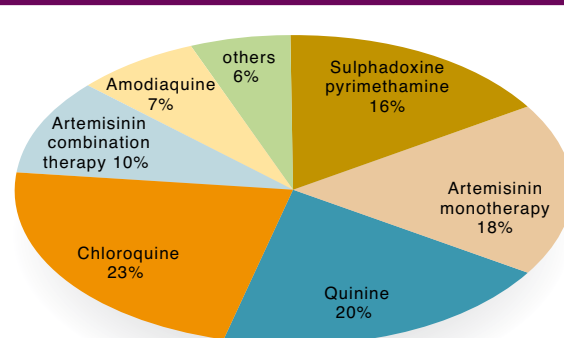Figure 9: Antimalarial medicines found in the 9 districts

Table 7:	Medicines permitted to be sold or supplied by different outlet types	
Sector		**Medicines permitted to be sold or supplied**
Formal sector	Public facility	All antimalarials
	Community Drug Distributor (CDD)	Co-packaged chloroquine + sulphadoxine-pyrimethamine
	NGO/mission	All antimalarials
	Retail pharmacy	All antimalarials
	Private clinics	All antimalarials
	Drug shop	Only oral chloroquine and oral sulphadoxine-pyrimethamine
Informal sector	Retail stores	No antimalarials
	Market/vendor	No antimalarials

40   A specific query has been made to the NDA to seek official confirmation on those medicines not found on the register.

# ■ Price, Availability and Affordability of Antimalarial Medicines

AVAILABILITY OF ANTIMALARIAL MEDICINES

Overall availability of antimalarial medicines

Figure 10 indicates that there was a high availability of CQ, SP and Quinine (all formulations) in most outlet types.

The availability of amodiaquine, artemisinin monotherapy and ACTs varied depending on outlet type.

Figure 10: Availability of key antimalarials, by outlet type
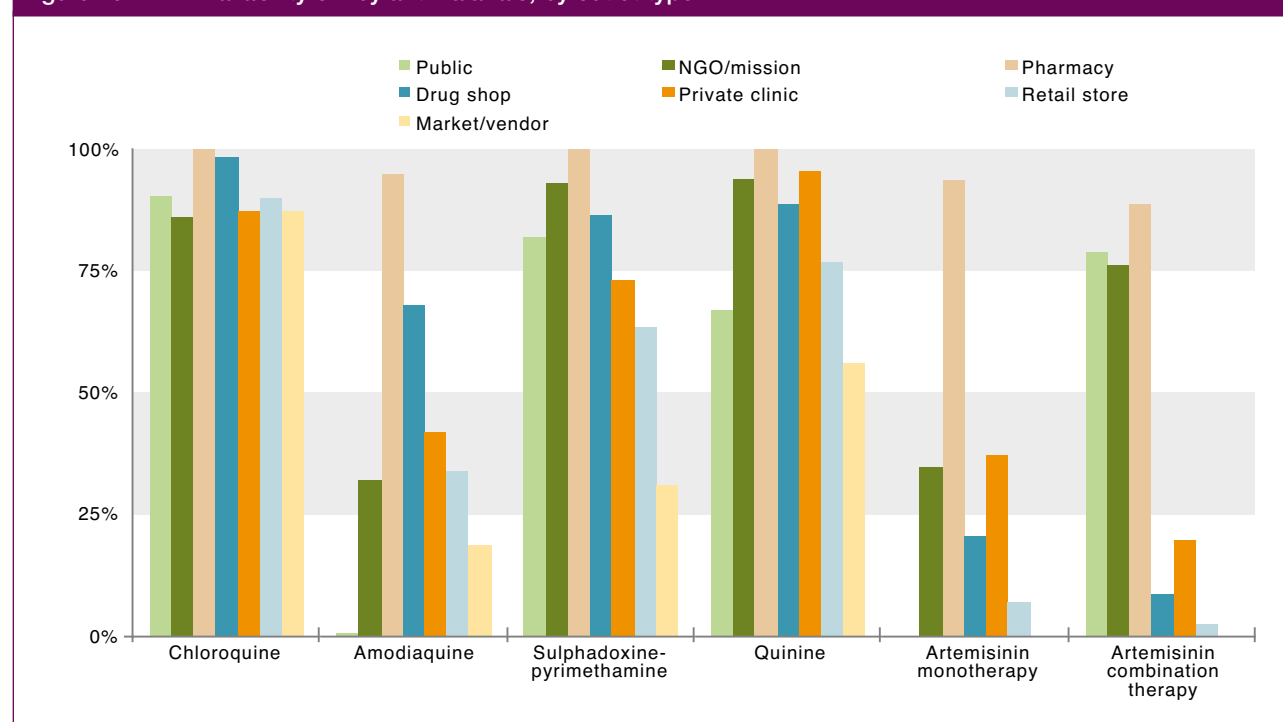
Which antimalarial medicines were available in the public/not-for-profit facilities?

The 2002 Uganda National Drug Policy had a stated goal: "to contribute to the attainment of a good standard of health by the population of Uganda, through ensuring the availability, accessibility and affordability at all times of essential drugs (medicines) of appropriate quality, safety and efficacy, and by promoting their rational use". In other words, all essential medicines should be available all the time. All malaria medicines in the national malaria drug policy are considered to be essential medicines. However, not all essential medicines are necessarily available at all levels of the health care system – e.g., some medicines may only be available at district hospitals or higher level institutions.

The full details of the 2006 Uganda Malaria Drug Policy is described within Table 8, with the addition of an alternative first-line ACT of artesunate plus amodiaquine (AS+AQ). The information below indicates the availability of key products – first and second-line antimalarial medicines – in the public/not-for-profit outlet types in the study areas at the time of the survey.

Artemether-lumefantrine (AL) is the first-line ACT being purchased by the government for use in the public and NGO/mission sector. Figure 11 presents the availability of the 4 age-specific pack sizes of artemether-lumefantrine[41] in all "public/not-for-profit" facilities surveyed.

---

[41]   http://www.who.int/malaria/cmc_upload/0/000/015/789/CoA_website5.pdf

Figure 11: Availability of artemether-lumefantrine (AL) tablets in public and mission/NGO facilities
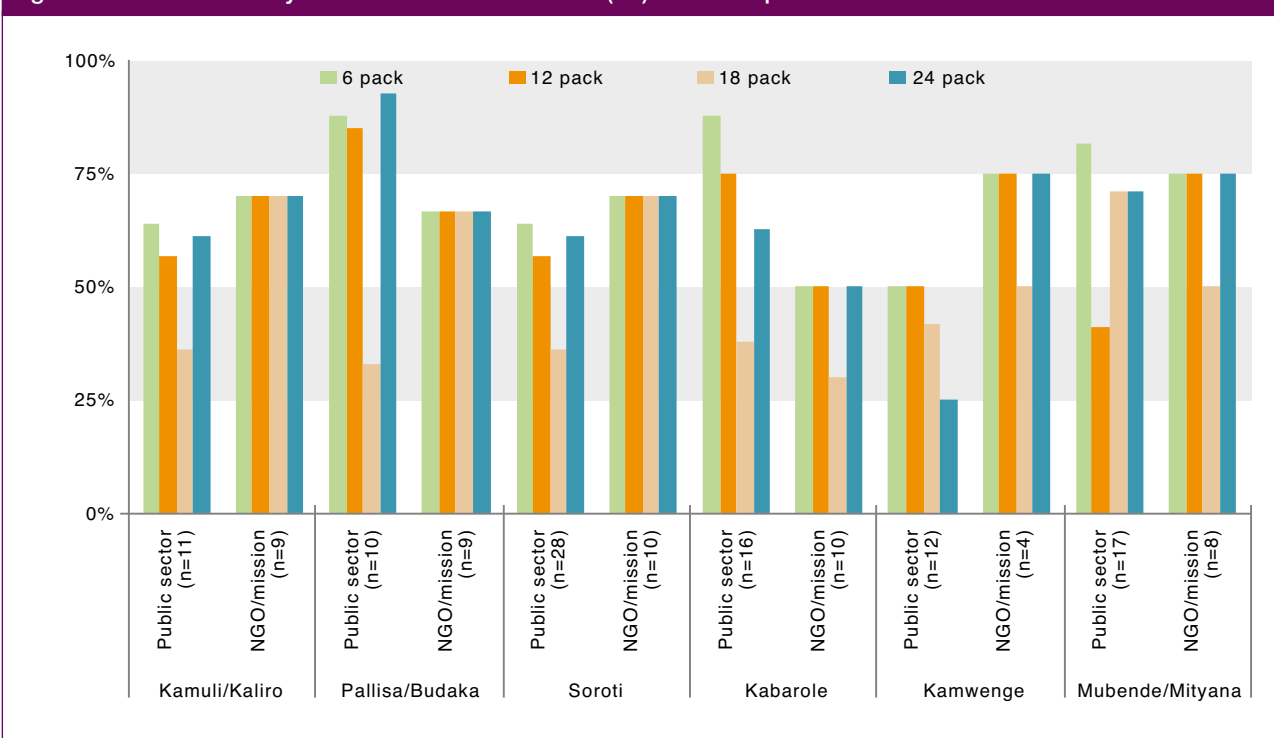
- At least 60% of facilities had AL in stock for all age bands other than the "18" pack (for children weighing 25-34Kg - 3 tablets twice a day for 3 days).
- In the public sector, the availability of AL was noticeably lower in Kamwenge than other districts.
- The issue of stock levels (as opposed to the availability of any product) was of significant concern and is further discussed below.

In addition to providing first-line treatment through health facilities, the Government of Uganda has also encouraged the use of community drug distributors (CDDs) to distribute certain essential medicines such as antimalarials. Good case management of malaria depends on prompt, effective antimalarial treatment of all fevers in children under 5 years. This was introduced in 2002 as a strategy for home-based management of fever (HBMF). A specific product, Homapak, comprising pre-packaged CQ plus SP, was introduced for free-of-charge distribution through CDDs to caretakers of febrile children.

CDDs were only identified in Pallisa and Budaka. The CDDs did have stocks of Homapak; stocks were found in the public facilities of all districts and also in NGO/mission facilities in Kamuli/Kaliro.

Table 8 presents the availability of all the antimalarial medicines recommended in the public and NGO/mission facilities; it should be noted that not all medicines are necessarily expected to be available at all levels of care in these facilities.

Table 8 :	Availability of medicines listed in national treatment guidelines at public and NGO/mission facilities																		
Malaria treatment guideline indication	Recommended medicine	Kamuli/Kaliro			Pallisa/ Budaka			Soroti			Kabarole			Kamwenge			Mubende/ Mityana		
		Public	NGO/ mission	CDD	Public	NGO/ mission	CDD	Public	NGO/ mission	CDD	Public	NGO/ mission	CDD	Public	NGO/ mission	CDD	Public	NGO/ mission	CDD
	n= number of facilities	11	9	0	40	9	25	28	10	0	16	10	10	12	4	2	17	8	0
First-line	Artemether-lumefantrine (all pack sizes)	73	78		95	89		75	80		93.8	60		50	42		88.2	75	
Severe malaria	Quinine injection	100	78		53	100		29	90		37.5	70		100	100		23.5	75	
2nd line; 1st trimester, <5Kg	Quinine tablets	64	44		55	67		18	60		12.5	70		16.7	100		35.3	75	
Intermittent preventative therapy (IPT)	Sulphadox-ine-pyrimeth -amine	73	100		100	76		75	90		75	80		0	25		76.5	87.5	
Home-based management	Homapak	Half	55	11		35	0	56	39	0		12.5	0	60	50	0	0	17.6	0
		Full	64	22		28	0	76	32	0		6.3	0	80	66.7	0	0	11.8	0

Data in percentage - ■ Pink cells = 50% or less availability

- Availability of AL, the first-line recommended treatment, varied considerably between districts; however, only in Kamwenge was availability a problem in more than 50% of facilities surveyed.
- Availability of quinine injection (for severe malaria) was more variable than that of first-line therapy (AL).
- Availability of quinine injection was particularly low in the public sector facilities in 4 districts: Kabarole, Mubende/Mityana and Soroti. However, in these districts, the situation was much better in the NGO/ mission facilities.

- Availability of quinine tablets (2nd-line treatment and for use in the first trimester of pregnancy) was critically low in the public sector facilities of Kabarole, Kamwenge, Mubende/Mityana and Soroti and very low in the NGO/mission sector in Kamuli/Kaliro.
- Availability of sulphadoxine-pyrimethamine recommended for intermittent presumptive therapy (IPT) was very low in Kamwenge.
- Overall, the amount of stock in the facilities is particularly vulnerable to stock-outs if the higher levels of the supply chain are not filled.

The availability presented above is for facilities on the day of the survey. Table 9 looks at the stock levels and estimated consumption rates for the antimalarial medicines in the public and NGO/mission sectors facilities so as to better understand the availability information presented in Table 8.

Table 9:			Stock levels of antimalarial medicines at public and NGO/mission facilities						
	Age group		Number of treatment courses						
			NMS [42]	Average per facility					
				Kamuli/Kaliro		Pallisa/Budaka		Soroti	
			31-May-07	May-07		May-07		May-07	
				Public	NGO/ mission	Public	NGO/ mission	Public	NGO/ mission
Arte-mether-lumefan-trine	6	child	2,223,000	301	234	461	127	392	257
	12	child	625,140	171	293	216	100	189	235
	18	child	75,510	75	142	115	66	120	162
	24	adult	237,330	321	369	357	140	485	314
	Total courses		3,160,980	868	1,038	1,149	433	1,186	968
Chloroquine tablets	adult		235,500	903	688	950	180	735	420
Sulphadoxine-pyrimethamine tablets	adult		68,666	452	682	2,067	1,030	848	556
Homapak	half	child	2,520,000	144	267	789		768	
	full	child	1,350,200	352	1,333	333		693	

	Kamuli/Kaliro		Pallisa/Budaka		Soroti	
	Public	NGO/ mission	Public	NGO/ mission	Public	NGO/ mission
Average number of patients estimated with malaria per week	140	75	220	85	70	42
Estimated number of weeks stock of AL	6.2	13.8	5.2	5.1	16.9	23.0

The implications of the findings above for AL in public sector facilities are as follows:

- Across the 5 eastern districts , an average of 868-1,186 courses of all four age-group packs of AL were found in each facility.
- Kamuli/Kaliro and Pallisa/Budaka had an average of 5-6 weeks stock – less than the delivery interval from National Medical Stores, the government supplier. There is also no safety stock in case of increased attendances or delayed delivery; this finding does not explore the variation in availability of the different age-packs – of which the "18" pack generally had the lowest availability and stock levels in the supply chain.
- The stock out of one pack size (e.g., the "18" pack) leads to longer-term problems of quantification and restocking if this is done based on historical consumption data. Such consumption data might be biased by facilities multiplying or cutting packs to achieve the pack size required.
- Soroti had more weeks of stock. However, this is largely because of the lower estimated number of patients – which may lead to an over-estimate in the stock levels.

As regards stock levels for AL in the NGO/mission facilities, we note that:

- Across the 5 eastern districts, an average of 433-1,038 courses of all four age-group packs of AL were found in each facility.
- The number of weeks stock ranged from 5 to 23 weeks across the 3 districts; the average number of patients treated was lower in the NGO/mission sector than the public sector; this finding does not explore the variation in availability of the different age-packs – of which the "18" pack generally had the lowest availability and stock levels in the supply chain.
- Stock levels in Pallisa/Budaka were low at 5.1 weeks – leaving little room for increased numbers of patients reporting or delays in obtaining stock.

[42]   NMS = National Medical Stores

Considering the stock levels of first-line treatment relative to other antimalarials in the public sector:

- Across the 5 districts[43], an average of 735-950 adult courses of chloroquine was stocked per facility (greater if the smaller numbers of tablets required for child doses are considered).
- Across the 5 districts, an average of 452-2,067 adult courses of SP was found in each facility.
- Across the 5 districts, an average of 496-1461 packs of Homapak was found in each facility.

A similar picture emerged in the NGO/mission facilities for other (non first-line) antimalarial medicines:

- Across the 5 districts, an average of 180-688 adult courses of chloroquine was stocked per facility (greater if the smaller numbers of tablets required for child doses are considered).
- Across the 5 districts, an average of 556-1,030 adult courses of SP was found in each facility.
- In Kamuli/Kaliro, an average of 1,600 packs of Homapak was found in each facility.

- The position of AL especially in the public sector is particularly vulnerable to stock-outs if the supply chain is not filled[44] or deliveries to facilities are delayed.
- Public sector facilities had very significant levels of CQ stock, almost similar to those of the first-line treatment. This has implications both for the efficient use of resources, as well as potential public health implications of treatment with a less-effective product, such as CQ.
- The presence of Homapak in the facilities indicates that further consideration is required to optimise the potential of CDDs, as they were found only in Kabarole and Pallisa/Budaka districts.

Which antimalarial medicines were available in the private sector?

■ Artemisinin combination therapy

Overall, the availability of ACTs in the private sector was very low. Table 10 and Figure 12 present the availability of artemisinin combination therapy (ACT) in the private sector across the 6 districts.
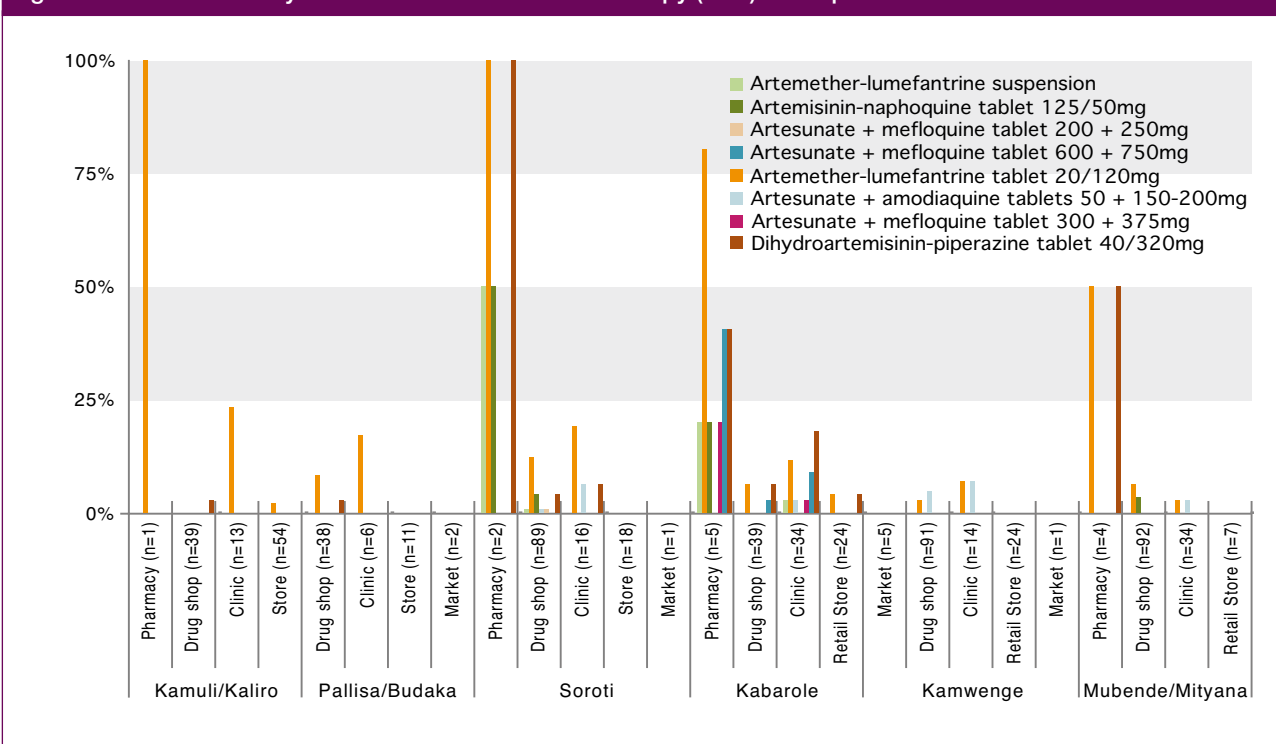
Table 10:	Number of private sector outlets selling ACTs			
		Total number of private outlets	Outlets with any ACT found	
			Number	% of total private outlets
Eastern districts	Kamuli/Kaliro	102	6	6%
	Pallisa/Budaka	57	4	7%
	Soroti	121	16	13%
Western districts	Kabarole	102	14	14%
	Kamwenge	80	3	4%
	Mubende/Mityana	77	7	9%
Total		539	50	9%

- ACTs were not widely found in any of the districts.
- ACTs were found in 50 out of 539 private sector outlets across the 9 districts (9%); 30 of these 50 outlets were concentrated in two districts: Kabarole and Soroti.

- Artemether-lumefantrine was the most commonly found ACT.
- Artesunate+amodiaquine (alternative first-line) was only found 1.3% (7 of 539) private sector outlets.

---

[43] Data for western districts not presented as corresponding (time) data not available at the National Medical Stores

[44] This is explored in more depth in the Malaria Consortium report "Documentation of the drug supply chain model for Uganda during the first year of implementation of the new malaria treatment policy", July 2007 – where few facilities had continuous availability and many did not have stock for significant periods.

Figure 12: Availability of artemisinin combination therapy (ACT) in the private sector

Legend:
- Artemether-lumefantrine suspension
- Artemisinin-naphoquine tablet 125/50mg
- Artesunate + mefloquine tablet 200 + 250mg
- Artesunate + mefloquine tablet 600 + 750mg
- Artemether-lumefantrine tablet 20/120mg
- Artesunate + amodiaquine tablets 50 + 150-200mg
- Artesunate + mefloquine tablet 300 + 375mg
- Dihydroartemisinin-piperazine tablet 40/320mg

Artemisinin monotherapy

The availability of artemisinin monotherapies was generally very low. It was more widely found in clinics and pharmacies.

Figures 13 and 14 present the availability of artemisinin monotherapy in the private sector across the 9 districts.
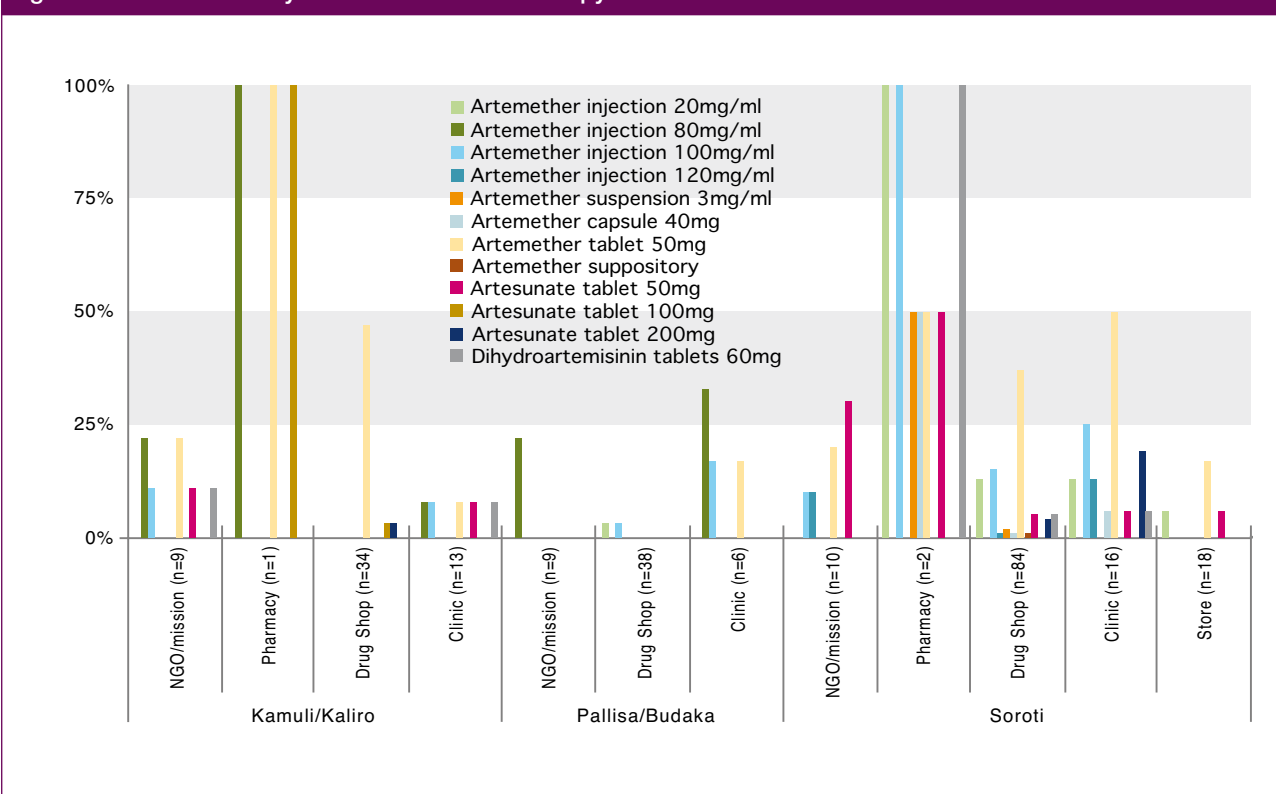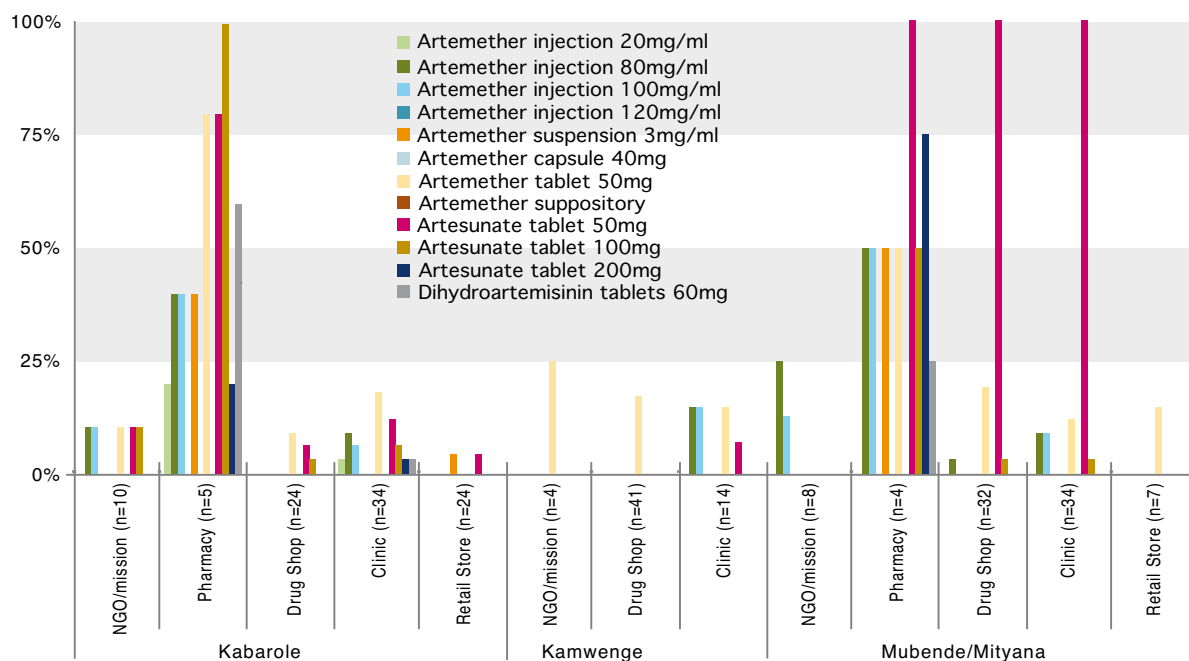

Figure 13: Availability of artemisinin monotherapy – 5 eastern districts

Legend:
- Artemether injection 20mg/ml
- Artemether injection 80mg/ml
- Artemether injection 100mg/ml
- Artemether injection 120mg/ml
- Artemether suspension 3mg/ml
- Artemether capsule 40mg
- Artemether tablet 50mg
- Artemether suppository
- Artesunate tablet 50mg
- Artesunate tablet 100mg
- Artesunate tablet 200mg
- Dihydroartemisinin tablets 60mg

Figure 14: Availability of artemisinin monotherapy – 4 western districts

Legend:
- Artemether injection 20mg/ml
- Artemether injection 80mg/ml
- Artemether injection 100mg/ml
- Artemether injection 120mg/ml
- Artemether suspension 3mg/ml
- Artemether capsule 40mg
- Artemether tablet 50mg
- Artemether suppository
- Artesunate tablet 50mg
- Artesunate tablet 100mg
- Artesunate tablet 200mg
- Dihydroartemisinin tablets 60mg

- Artemisinin monotherapies were not widely available but were obtainable in at least one outlet in each outlet type in all districts.
- Of those available, artemether tablet 50mg was the most common.

- A wide range of different products were found in very limited number; these included artesunate, artemether and dihydroartemisinin in a variety of different formulations.

■ Non-artemisinin therapies

Not surprisingly, non-artemisinin-based antimalarials were much more widely available across all districts and all sectors.

Figures 15-18 present the availability of these products in the private sector across the 9 districts.

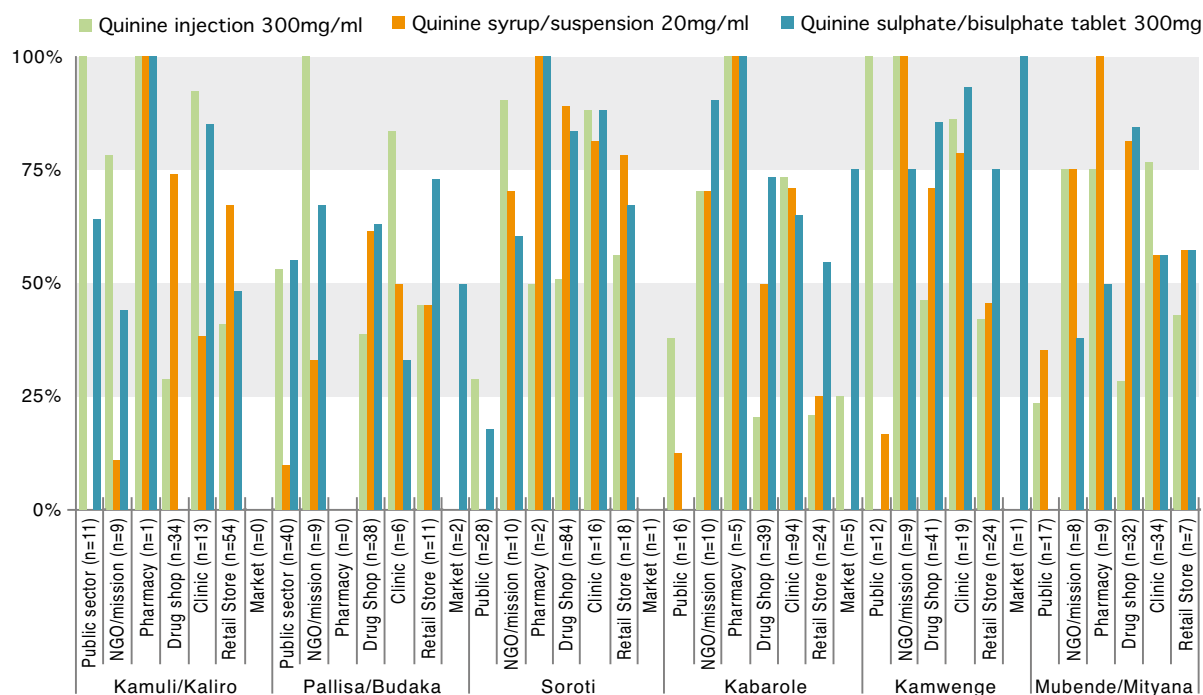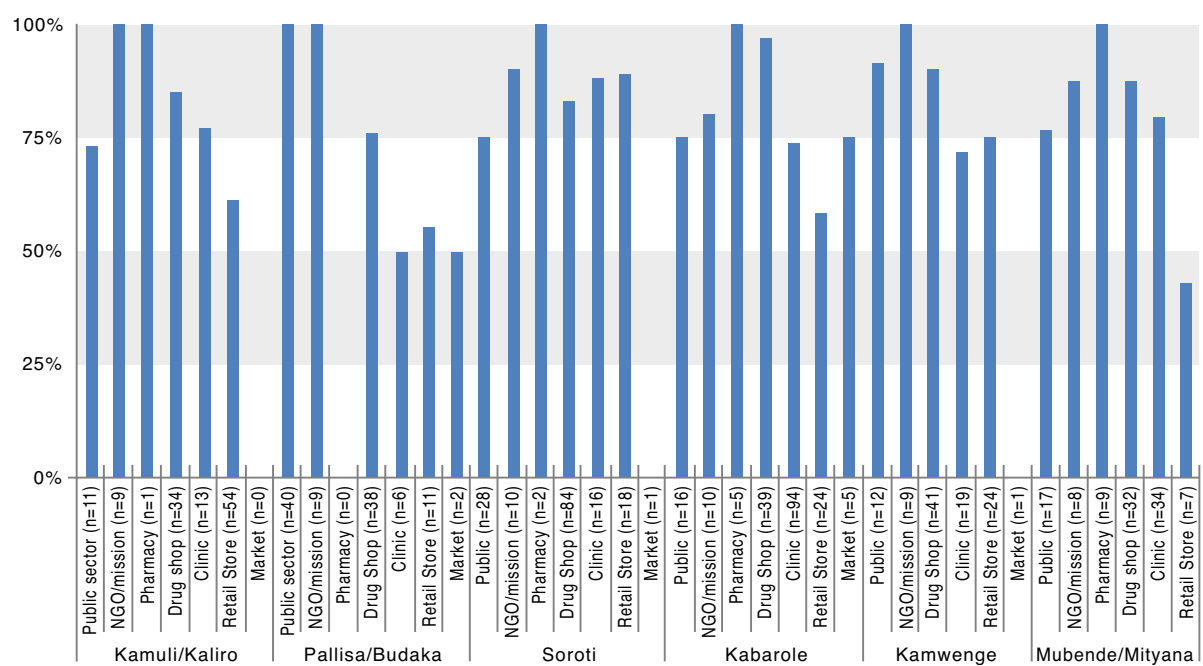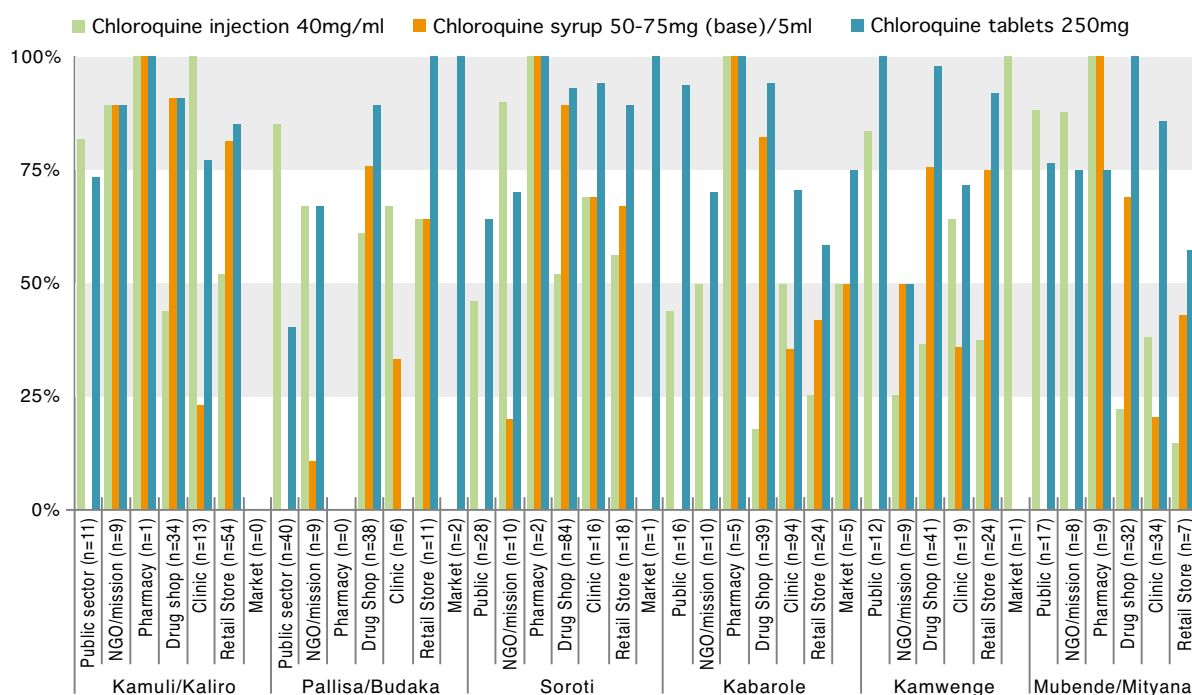**Figure 15: Availability of amodiaquine**

Legend:
- Amodiaquine suspension 50mg/5ml
- Amodiaquine tablet 200mg
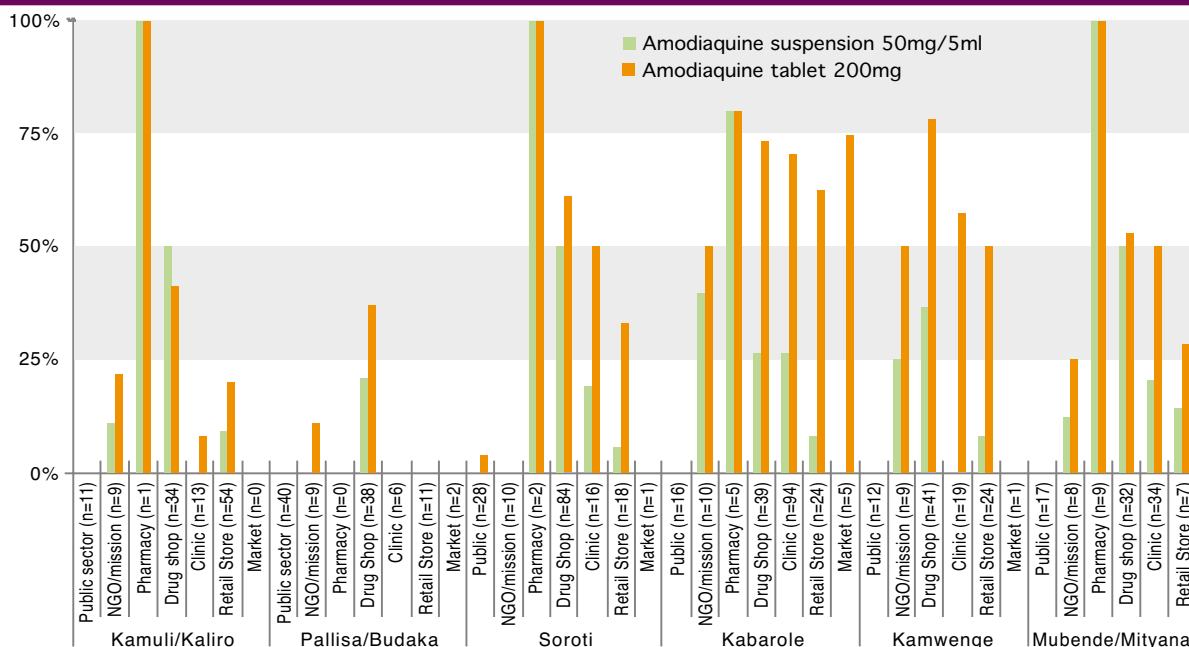
Figure 16: Availability of quinine

■ Quinine injection 300mg/ml   ■ Quinine syrup/suspension 20mg/ml   ■ Quinine sulphate/bisulphate tablet 300mg

Figure 17: Availability of sulphadoxine-pyrimethamine tablets

Figure 18:   Availability of chloroquine

- Based on drug efficacy studies, SP and CQ are no longer considered effective medicines for malaria in Uganda. However, they remain universally available in all sectors including the "public/not-for-profit" sectors. Among the reasons for this is the perception that they are still effective, their low price, and a lack of confidence in the public and NGO/mission facilities to furnish a regular supply of the first-line ACT, AL.
- Amodiaquine was less available than CQ, quinine and SP, but was still relatively widely available.

- Quinine was also widely available. It is often used as first choice for treatment, although it is recommended for second-line treatment or severe malaria depending upon dosage form.
- As seen in the geographic access discussion, the high rates of availability of CQ, SP and quinine in private sector outlets implies that many people would have easy geographic access to these products without having to turn to a public sector facility.

PRICE OF ANTIMALARIAL MEDICINES

Prices of antimalarials differed significantly between artemisinin-based and non-artemisinin based classes and between child and adult courses. Figures 19 and 20 present the price variations for the cost of a treatment of an adult and child respectively.

However, even lower prices of products could differ significantly between districts – relative to purchasing power. Purchasing patterns in the private sector indicate that even though older, traditional classes of drugs such as SP and CQ are cheap, they remain unaffordable to many people. Figure 21 presents the price variations for single ampoules of quinine, and similar information is available for CQ.

## Antimalarial medicines for adults

Figure 19: Illustrative price ranges of different classes of antimalarial medicines for adults
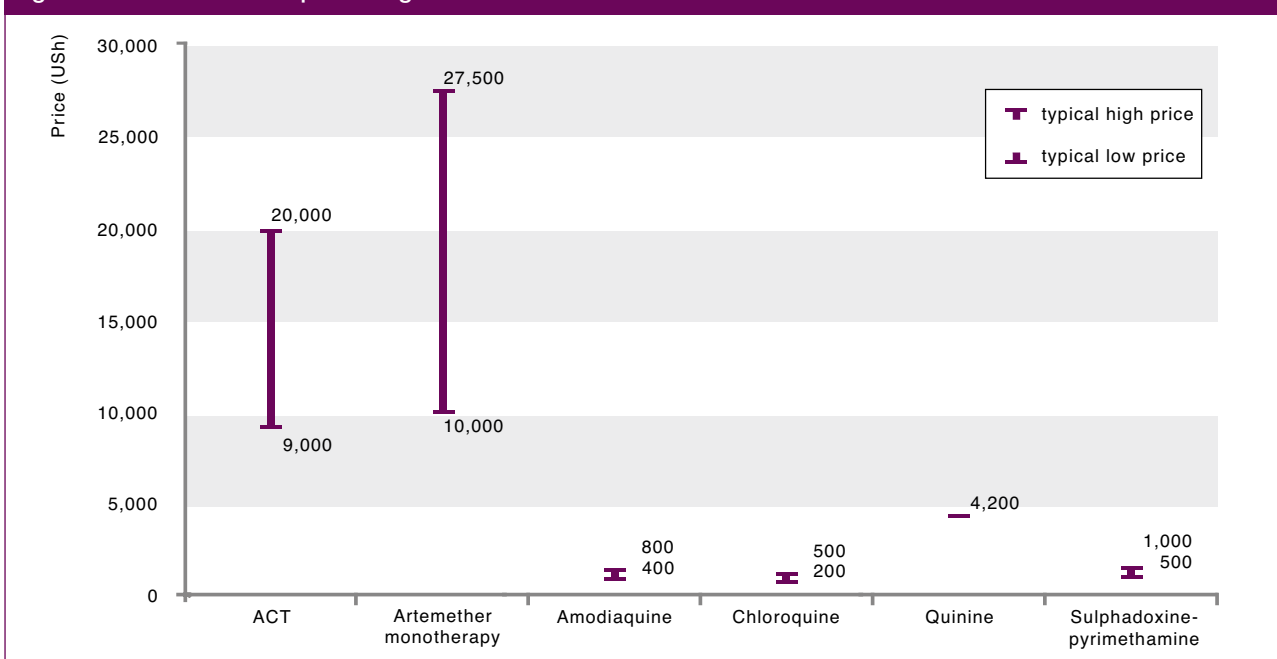
- A course of ACTs was around 30-60 times the price of ineffective non-artemisinin therapies.
- Non-recommended artemisinin monotherapies were often the most expensive products available.
- Typical prices of a course of oral treatment for adults were:
  - Amodiaquine, CQ and SP: USh 200 – 1000[45] (USD 0.12 – 0.60)

- Artemisinin combination therapy (ACT): USh 9,000 – 20,000 (USD 5.40 – 12.00)
- Artemisinin monotherapy: USh 10,000 – 27,500 (USD 6.00 – 16.50)
- Quinine: USh 4,200 (USD 2.50)
- Prices could vary by more than 50% between sectors and districts for the same medicine – especially ACTs and artemisinin monotherapies.

Antimalarial medicines for a child of 5 years

Figure 20: Illustrative price ranges of different classes of antimalarial medicines for children (5 year olds)
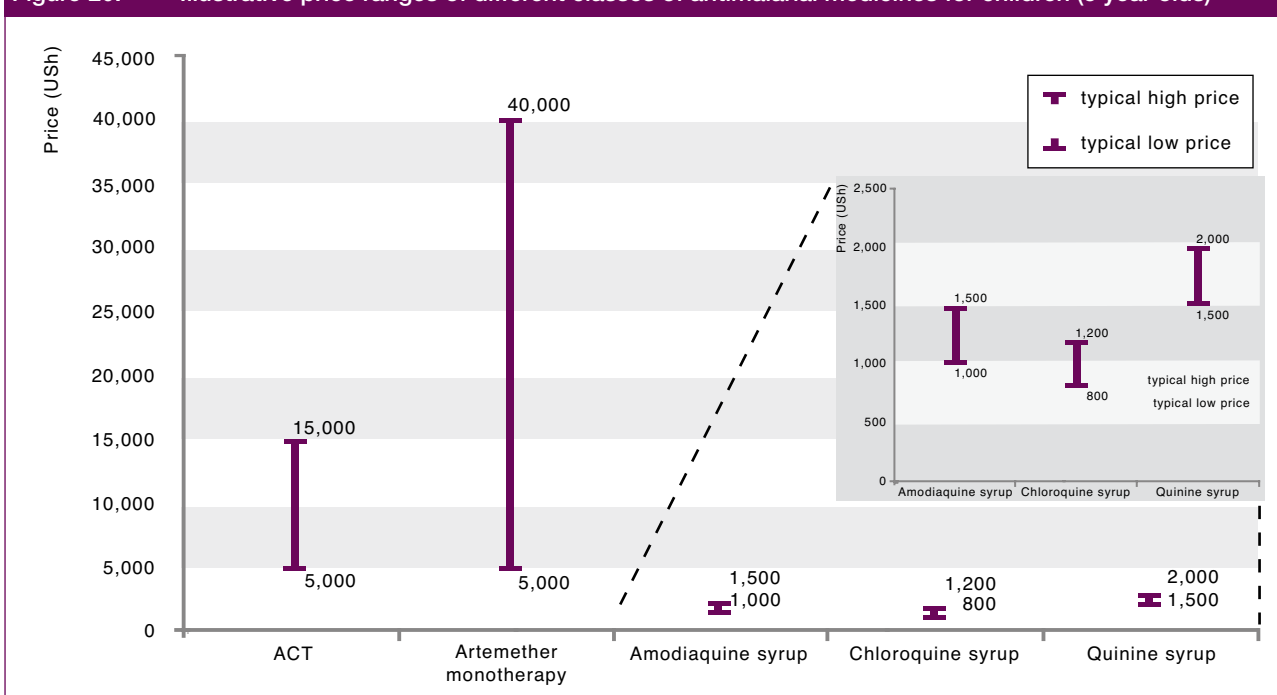
[45] Exchange rate : 1 United States dollar = 1680 Uganda Shillings (28 April 2007)

43

- A course of effective ACTs was around 5-10 times the price of ineffective non-artemisinin therapies; the non-recommended artemisinin monotherapies were often the most expensive antimalarials available, costing up to 20-40 times more.
- Typical prices of a course of treatment for children – depending on district, sector and locations:
  - Amodiaquine, CQ and quinine (syrups): USh 1,000 – 1,500 (USD 0.60 – 0.90)
  - SP (tablets): USh 300 – 600 (USD 0.18 – 0.36)

- ACT: USh 5,000 – 15,000 per course (USD 3.00 – 9.00)
- Artemisinin monotherapy: USh 5,000 – 40,000 per course (USD 3.00 – 24.00).
- For the non-artemisinin antimalarials, the cost of treatment for a child is greater than the cost of treatment for an adult if syrups are used – this is because syrups are sold in large-volume pack sizes that contain many treatment courses.

**Figure 21: Median price per ampoule: quinine injection (USh)**
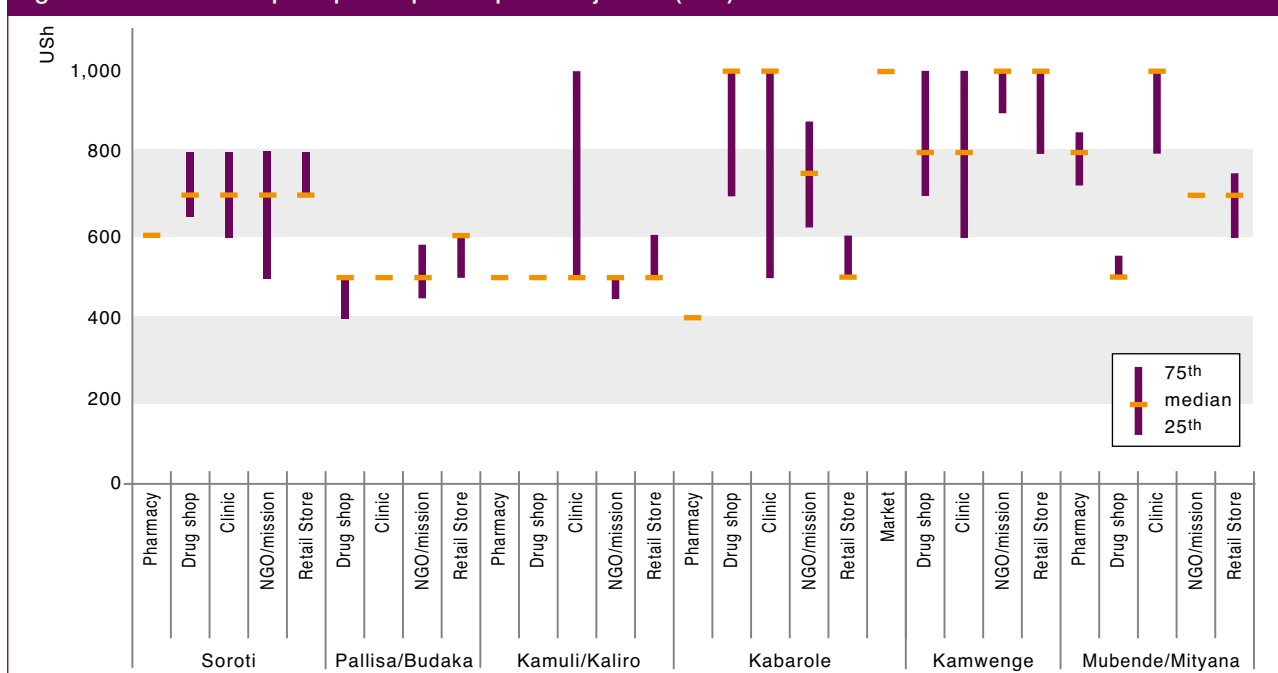
- The typical price of an ampoule of quinine is USh 450 – 800, with prices varying more between districts than between outlet types within districts.
- Although the price differential appears relatively low, it nonetheless takes on increased significance in poor rural populations.

- Similar findings are available for an ampoule of CQ, ranging from USh 300 – 500 (USD 0.18 – 0.30), with prices varying more between districts than between outlet types within districts.

VARIATION IN PRICE ACROSS DISTRICTS AND OUTLET TYPES

The main difference in price of antimalarial medicines depends on the class of drug. However, the cost of a treatment course varies widely for some medicines between and within districts, outlet types and location; and does not vary at all for other medicines. Medicines distributed through private clinics were normally more expensive – this corresponds to findings in other surveys of essential medicines carried out by HAI.

Figure 22 illustrates the variation in price for an adult course of AL from a median price of USh 8,000 in pharmacies in Mubende/Mityana to USh 18,000 in drug shops in Pallisa/Budaka, and clinics in Kamwenge and Mubende/Mityana. The price within drug shops in Kabarole varied, with 50% of the prices ranging from USh14,000-19,500.

Figure 22: Price of a treatment course for an adult using artemether-lumefantrine tablets (USh)
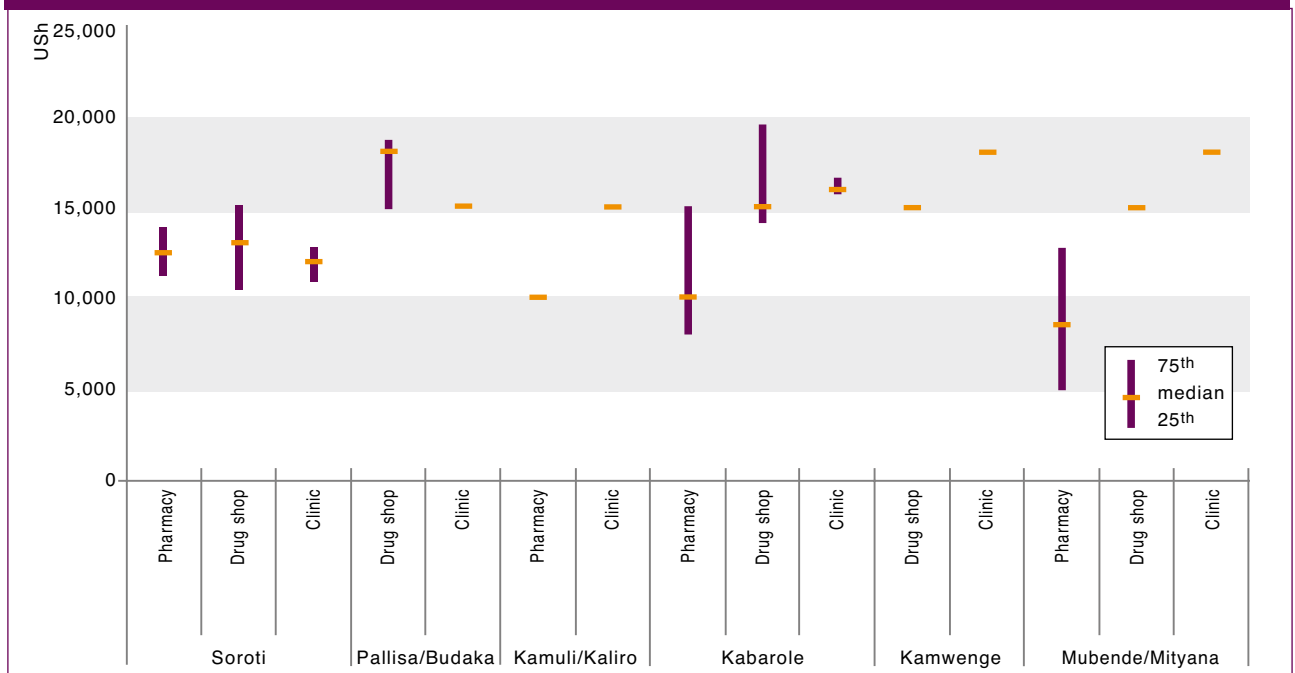
Similarly in Figure 23, the cost of a treatment course using artemisinin monotherapy in children varied from a median of USh 22,000 in the NGO/mission outlets in Soroti to USh 55,000 in a retail store in Soroti.

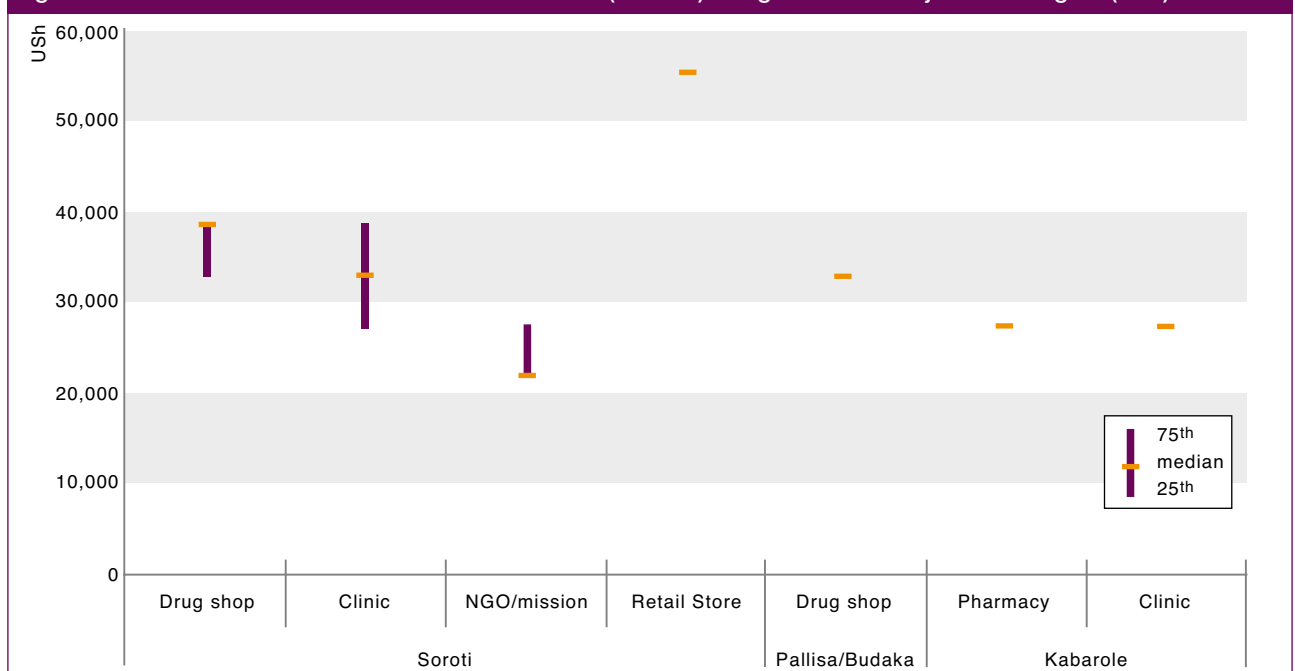**Figure 23:** Price of a treatment course for a child (under 5) using artemether injection 20mg/ml (USh)

Figure 24 demonstrates the variation of the price of a course of amodiaquine tablets which generally varies between USh 400 and USh 800 per treatment course – largely by location, with a course uniformly costing USh 800 in Kabarole, often USh 400 Kamuli/Kaliro and often USh 400, but up to USh 800 in Soroti and Kamwenge;

sometimes the differences were between locations and outlet types and sometimes within outlet types in the same districts. Similar variations were seen with sulphadoxine-pyrimethamine tablets (Figure 25) and for quinine syrup for children (Figure 26).

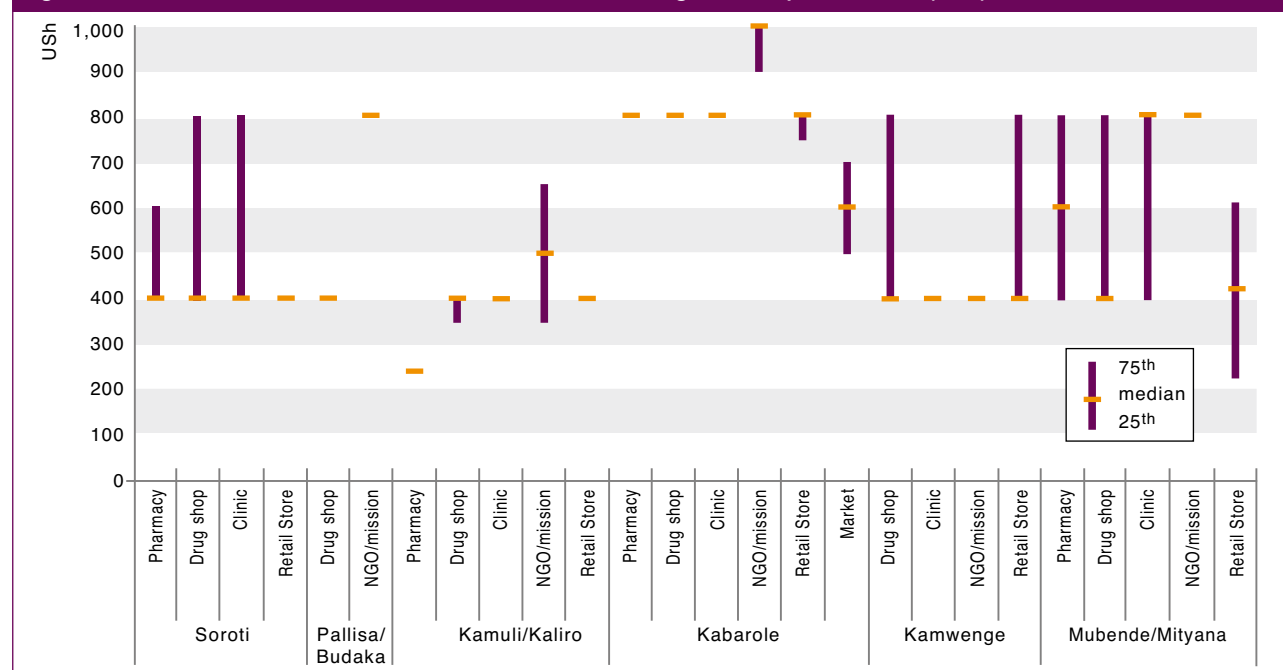**Figure 24:   Price of a treatment course for an adult using amodiaquine tablets (USh)**

Figure 25:   Price of a treatment course for an adult using sulphadoxine-pyrimethamine tablets (USh)
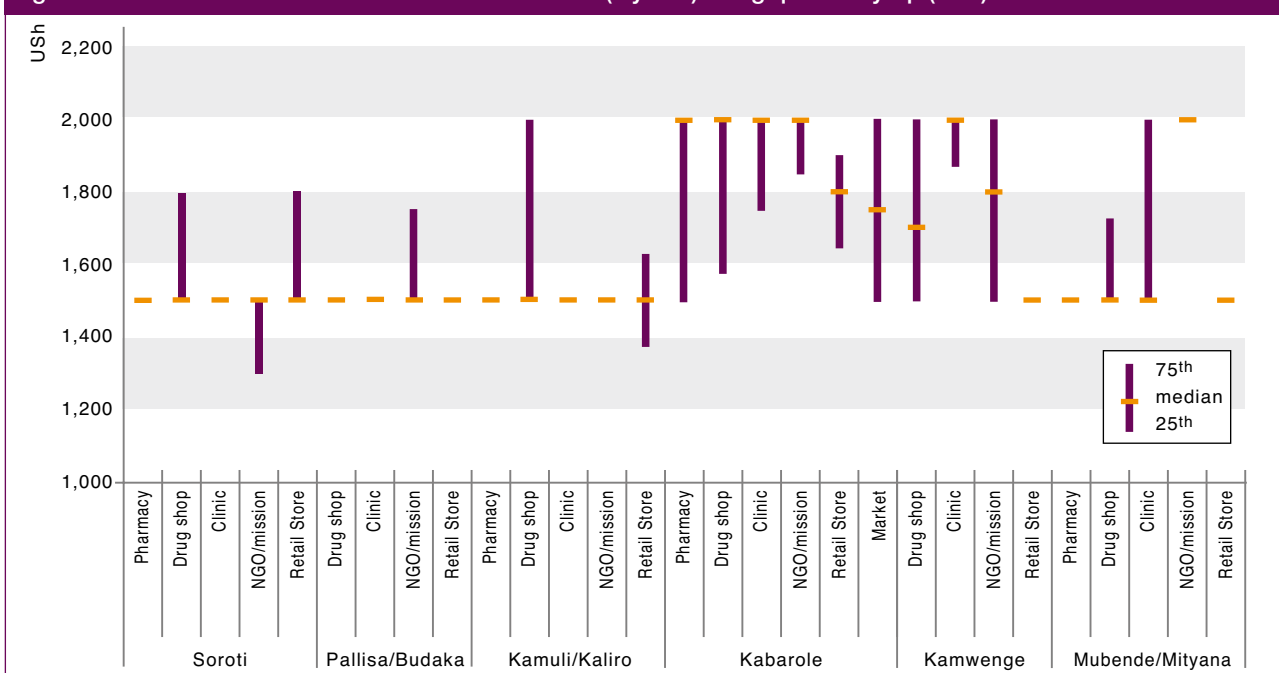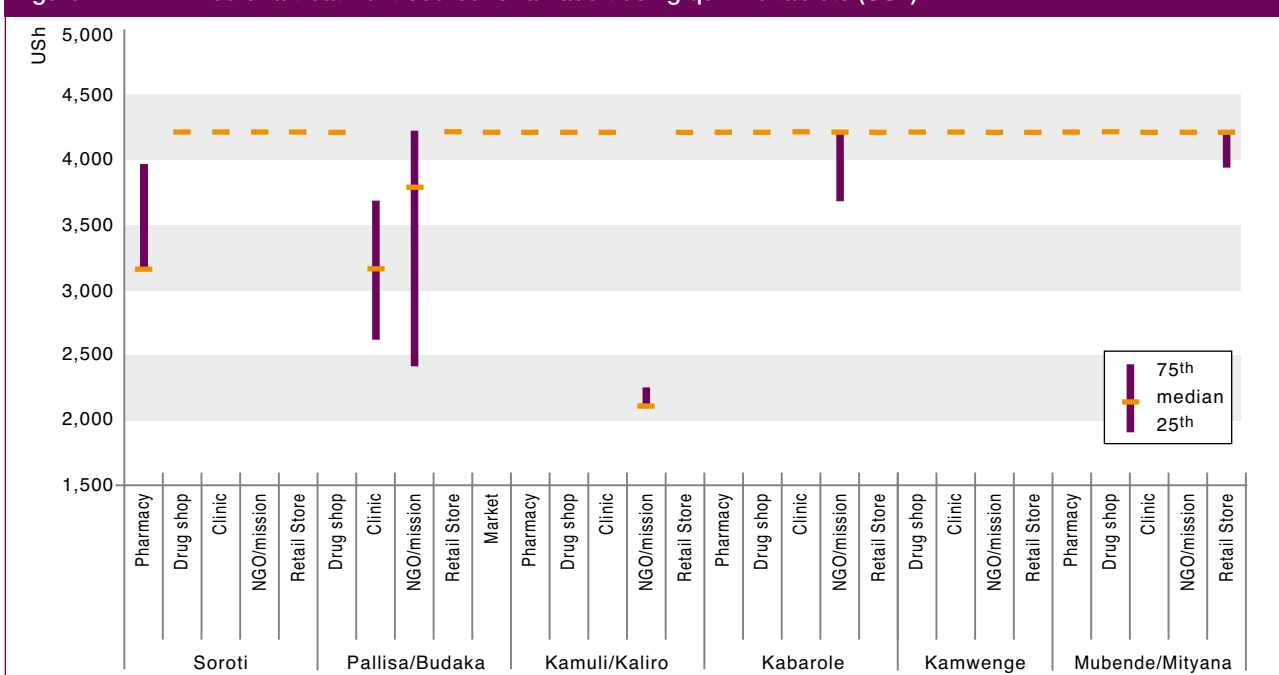
Figure 26: Price of a treatment course for a child (5 years) using quinine syrup (USh)

Figure 27: Price of a treatment course for an adult using quinine tablets (USh)

Figure 27 demonstrates the price variations for quinine tablets, which vary to a much lower extent, with effectively a "normal" price of USh 4,200 per course.

AFFORDABILITY OF ANTIMALARIAL MEDICINES

This section examines the financial impact of malaria on a household over the course of a year. Table 11 presents the annual price of various malaria treatments for a household of 5 people (2 adults and 3 children aged 15 years, 7 years and 2 years)[46]. Overall, the recommended antimalarial medicines remain unaffordable to the majority of the population.

Table 11: Annual cost of antimalarial medicines for a household				
Antimalarial medicine	Cost of antimalarial medicines to treat 1 episode and annually [47-48]			Annual cost for antimalarial medicines for household
	Child aged 2 years (assume 4 episodes per year)	Child aged 7 years (assume 3 episodes per year)	Child aged 15 years and two adults (assume 2 episodes per year per person)	
Chloroquine	(syrup) 60ml Cost for 1 episode: USh 1,000 Annual cost: USh 4,000	(tabs) 4 Cost for 1 episode: USh 80-200 Annual cost: USh 240-600	(tabs) 10 Cost for 1 episode: USh 200-500 Annual cost: USh 1,200-3,000	USh 5,440-7,600
Sulphadoxine-pyrimethamine	(tabs) 1 Cost for 1 episode: USh 167-333 Annual cost: USh 668-1,333	(tabs) 2 Cost for 1 episode: USh 333-667 Annual cost: USh 999-2,000	(tabs) 3 Cost for 1 episode: USh 500-1,000 Annual cost: USh 3,000-6,000	USh 4,667-9,333
Quinine	(syrup) 100ml Cost for 1 episode: USh 1,500-2,000 Annual cost: USh 6,000-8,000	(tabs) 21 Cost for 1 episode: USh 2,100 Annual cost: USh 6,300	(tabs) 42 Cost for 1 episode: USh 4,200 Annual cost: USh 25,200	USh 37,500-39,500
Amodiaquine	(syrup) 60ml Cost for 1 episode: USh 1,000-1,500 Annual cost: USh 4,000-6,000	(tabs) 5 Cost for 1 episode: USh 250-500 Annual cost: USh 750-1,500	(tabs) 8 Cost for 1 episode: USh 400-800 Annual cost: USh 2,400-4,800	USh 7,150-12,300
ACT (Artemether-lumefantrine tabs 20/120mg)	(tabs) 6 Cost for 1 episode: USh 2,500-4,375 Annual cost: USh 10,000-17,500	(tabs) 12 Cost for 1 episode: USh 5,000-8,750 Annual cost: Ush15,000-26,250	(tabs) 24 Cost for 1 episode: USh 10,000-17,500 Annual cost: USh 60,000-105,000	USh 85,000-148,750
Artemisinin monotherapy (injectables)	Artemether inj 20mg/ ml ampoule x 5 Cost for 1 episode: USh 20,000-30,000 Annual cost: USh80,000-120,000	Artemether inj 80mg/ ml ampoule x 5 Cost for 1 episode: USh10,000-17,500 Annual cost: USh30,000-52,500	Artemether inj 100mg/ ml ampoule x 7 Cost for 1 episode: USh 15,000-27,500 Annual cost: USh75,000 – 165,000	USh185,000-337,500

[46] The average household size in Uganda is 5.2 persons (Uganda National Household Survey 2005/2006: Report on the Socio-Economic Module. Uganda Bureau of Statistics. December 2006). The age distribution of the household used in these examples is based on that of the population in the surveyed districts (2002 census).

[47] The number of expected episodes of malaria per year based on Ministry of Health data.

[48] Prices included in this table are typical private sector prices (i.e. retail pharmacies, drug shops, private clinics) for antimalarial medicines found in Kamuli/ Kaliro at the time of the survey; related costs, such as doctor's or laboratory fees, are not included here. Household medication costs assume that full bottles of syrup are bought and not partial bottles. The episodes of fever for each age group are based in those estimated for the Uganda Application to Global Fund, Round 5.

- If an average family's antimalarial medicine needs were purchased out-of-pocket at typical median prices from the private sector, it would require between USh 4,667-9,333 for sulphadoxine-pyrimethamine and USh 185,000–337,500 for injectable artemisinin monotherapy (depending on district).
- Purchasing the first-line recommended ACT (AL) for the entire household over the course of a year would cost USh 85,000-148,750 (depending on district).
- Using chloroquine would cost USh 5,440-7,600 (depending on district); amodiaquine – USh 7,150-12,300; and oral quinine – Ush 37,500-39,500.

Table 12 presents the proportion of the population with income levels below various amounts. It should be noted that 68% of households depended on subsistence farming[49] for their livelihood and access to cash to purchase medicines vs. in-kind measures of income that are calculated in the household survey mean that financial access to medicines may be even more difficult than portrayed.

The following pages present various issues in relation to financial access and affordability to antimalarials:

➔ Table 10 presents the impact on various annual income scenarios of the total price of the various antimalarial medicines.

➔ Table 11 presents the impact in relation to food expenditure – the food needs are as described by the World Food Programme and UNICEF in terms of emergency food support programmes.

➔ Table 12 presents the impact in relation to the costs of sending a child to primary school; though Uganda has Universal Primary Education, some additional costs of schooling are required. These schooling costs include school and registration fees, uniform and sports clothes, books and supplies and other expenses.

In each case, the figures indicate the cost or equivalent cost for treatment of the whole family with a year's supply of antimalarial medicines, based on average incidence indicated in Table 11.

Table 12: Proportion of population below various income levels [50]		
Annual income below	Proportion	
	Eastern Uganda	Western Uganda
USh 600,000	45%	42.9%
USh 1,200,00	65%	65.7%
USh 1,800,000	75.2%	75.7%
USh 2,400,000	83.3%	81.8%

49   Uganda 2002 Census
50   Uganda National Household Survey 2005/2006: Report on the Socio-Economic Module. Uganda Bureau of Statistics. December 2006; district information not available

Table 13:	Annual proportion of cost of antimalarial medicines for a household vs. household income [51]					
	Antimalarial medicine	One wage income only	Total in cash and in-kind income of household			
		Scenario 1: Equivalent of one lowest government wage[52] and no other household income	Scenario 2: Household income of USh 600,000 a year [% population under USh 600,000: Eastern: 45%; Western: 42.9%]	Scenario 3: Average rural household income	Scenario 4: Average urban household income	Scenario 5: Average household income
Annual income		1,092,507		East: USh 1,729,392	East: USh 3,140,998	East: USh 1,866,120
				West:USh 1,730,928	West: USh 3,757,800	West: USH 1,909,824
Annual cost of antimalarial medicines for household as percentage of annual house-hold income	Chloroquine	0.5-0.7%	0.9-1.3%	0.3-0.4%	0.1-0.2%	0.3-0.4%
	Sulphadoxine-pyrimethamine	0.4-0.9%	0.8-1.6%	0.3-0.5%	0.1-0.2%	0.2-0.5%
	Quinine	3.4-3.6%	6.3-6.6%	2.2-2.3%	1.0-1.2%	2.0-2.1%
	Amodiaquine	0.7-1.1%	1.2-2.1%	0.4-0.7%	0.2-0.3%	0.4-0.6%
	ACT (Arte-mether-lume-fantrine tabs 20/120mg)	7.8-13.6%	14.2-24.8%	4.9-8.6%	2.3-4.0%	4.5-7.8%
	Artemisinin monotherapy (injectables)	17-31%	31-56%	11-19%	5-9%	10-18%
Number of days of household's income needed to pay for antimalarial medicines for household for one year [53]	Chloroquine	1.8-2.5	3.3-4.6	1.1-1.6	0.5-0.7	1.0-1.5
	Sulphadoxine-pyrimethamine	1.6-3.1	2.8-5.7	1.0-2.0	0.5-0.9	0.9-1.8
	Quinine	12.5-13.2	22.8-24.0	7.9-8.3	3.6-4.4	7.2-7.5
	Amodiaquine	2.4-4.1	4.3-7.5	1.5-2.6	0.7-1.2	1.42.4
	ACT (Arte-mether-lume-fantrine tabs 20/120mg)	28.4-49.7	51.7-90.5	17.9-31.4	8.3-14.4	16.2-28.4
	Artemisinin monotherapy (injectables)	61.8-112.8	112.5-205.3	39.0-71.2	18.0-32.8	35.4-64.5

- The lowest paid government worker would have to work 1.6-3 days to provide for his/her annual family needs for SP and 62-113 days (2-4 months) for injectable artemisinin monotherapy.
- Using the first-line recommended ACT (AL) would require 28-50 days work (1-1.6 months).
- It would require between 2.8-5.7 days income for SP and 112-205 days (up to more than half a year)

income for injectable artemisinin monotherapy for a household on an average income of USh 600,000 (more than 40% of households live on less than USh 600,000 per year).

- 14-25% of annual income for a household with an average income of USh 600,000 would be required to purchase the family's antimalarial medicine needs using AL.

[51] Uganda National Household Survey 2005/2006: Report on the Socio-Economic Module. Uganda Bureau of Statistics. December 2006. Note household income in scenarios 2-4 is defined as "the sum of income both in cash and in-kind that accrues from economic activities performed by household members on a regular basis" and thus is not solely wage income.

[52] Circular Standing Instruction No.1 of 2006: Salary Structure for 2006/2007 Financial Year. Ministry of Public Service, 3 July 2006. Note this household income is defined as the equivalent of one lowest paid government worker wage and no other household income.

[53] Note that other than scenario 1, the number of days of household income needed to pay for medicines in this table refers to the number of days of income from all sources needed to pay for medicines and is not the number of days only one person must work and is not necessarily referring to merely wages. Income lost because of being too sick to earn income is not included in this table.

Table 14:	Annual cost of antimalarial medicines for household compared to household food expenditure [54]
Annual expenditure on basic food basket [55]: USh 828,094-1,032,494 (depending on district)	
Antimalarial medicine	**Annual cost of antimalarial medicines for household expressed as equivalent number of days' food expenditure for household**
Chloroquine	2.1-2.8
Sulphadoxine-pyrimethamine	2.1-3.2
Quinine	13.6-24.2
Amodiaquine	3.2-4.4
ACT (Artemether-lumefantrine tabs 20/120mg)	42-61.8
Artemisinin monotherapy (injectables)	69.8-139.2

- The equivalent of 2-3 days of basic food needs for the household would be needed to purchase the household's antimalarial medicine needs using SP; using injectable artemisinin monotherapy would be the equivalent of 2-4 months of basic food needs; using the first-line recommended treatment (AL) would require 1.5-2 months basic food needs.
- The basic food basket costs considerably more than the average household income of USh 600,000 and more than 40% of the population in the districts live on less than USh 600,000.

- With food prices increasing globally in 2008 [56], families will have to spend more on food. Even based on food prices during the survey, around 40% population were earning one third less than the basic food needs alone, which would now would mean that this 40% of the population would only have enough income to purchase half their basic food needs. The increase in food prices imply that they would not have any money to purchase medicines without inflicting major food deficits on the household – even if they bought the lowest priced, ineffective antimalarial medicines.

Table 15:	Annual cost of antimalarial medicines for household compared to costs of schooling for one child attending government school
Median costs of schooling per child per year at government day primary school [57]: USh 18,600	
Antimalarial medicine	**Annual cost of antimalarial medicines for household expressed as equivalent number of <u>months</u> of schooling costs at government day primary school (depending on district)**
Chloroquine	3.5-5.1
Sulphadoxine-pyrimethamine	3.0-5.7
Quinine	24.2-25.3 (or 2 years)
Amodiaquine	4.6-7.8
ACT (Artemether-lumefantrine tabs 20/120mg)	68.5-90.5 (or 5.7- 7.5 years)
Artemisinin monotherapy (injectables)	163.9-184.2 (or 13.6- 15.4 years)

- The equivalent of 3-6 months primary schooling costs for each child would be needed to buy the household's antimalarial medicine needs using SP; the equivalent of 14-15 years of primary schooling costs using injectable artemisinin monotherapy; and 6-7 primary schooling costs using AL.

All antimalarials, let alone the expensive ACTs are unaffordable to a significant proportion or even the majority of the population, who have little or no disposable income left after purchase of food, or other essential expenditures

[54] Average food commodity prices from prices collected during data collection and minimum dietary requirement from World Food Programme & UNICEF
[55] Expenditures on basic food basket are based on the median price of 500g maize flour and 60g beans in Kamuli/Kaliro and 20g vegetable oil in Kampala, following the World Food Programme relief food basket of 2128 kcal/person/day, see http://www.wfp.org/eb/docs/2006/wfp092183~3.pdf. Note for the estimates made here, children and adults are counted as having the same food requirements of 2100kcal/day as, though children require fewer calories, they require more micronutrients, see http://www.unicef.org/videoaudio/PDFs/Childhood_Poverty_in_Mozambique_and_Budgetary_Allocations.pdf
[56] Information from news stories indicates that food prices have increased by around 30% from 3rd quarter 2007 to end April 2008
[57] Though Uganda has Universal Primary Education, some additional costs of schooling are required. These schooling costs include school and registration fees, uniform and sports clothes, books and supplies and other expenses. Uganda National Household Survey 2005/2006: Report on the Socio-Economic Module. Uganda Bureau of Statistics. December 2006.

■ ASPECTS OF SUPPLY CHAIN MANAGEMENT

DRIVERS OF PROVIDER SALES DECISIONS AND STORAGE CONDITIONS

- Only around 50% of clients reportedly purchased a full course of antimalarials, even when buying low-priced medicines; this was assumed to be related to liquidity issues.
- The private sector typically priced individual tablets rather than the full dose, which does not encourage the sale of full courses.
- Generally very limited amounts of leaked public sector AL were found in the private sector during the survey.

- Customer demand, price and recommendation by health professionals were the most frequent reasons given for deciding which medicine to stock & sell.
- Storage conditions are an issue in most retail stores and a minority of other outlets; poor storage conditions compromise product quality and integrity.
- Expired antimalarial medicines were relatively frequently found in some sectors and some districts.
.

THE SUPPLY CHAIN

Imported medicines arrive in Uganda either by air via Entebbe airport – or by road mainly from the Kenyan seaport of Mombassa. Each registered imported medicine has a Local Technical Agent (LTA) who is responsible for the product on the Ugandan market. Most of manufacturers will use a single LTA for all its products, but is not obliged to do so.

Locally produced medicines are either sold directly by the manufacturer (operating as a wholesaler) or sold to wholesale suppliers.

Medicines are imported effectively only by LTAs who then either wholesale the medicines themselves or sell them to other wholesalers (who may or may not be LTAs for other products). These wholesalers then sell on to the retail trade. Outside Kampala, some pharmacies and drug shops also conduct wholesale trade. Although pharmacies can be licensed to have a wholesale business, drug shops may not; hence, drug shops selling as wholesalers are doing so illegally.

National Medical Stores (NMS) and Joint Medical Stores (JMS) act as one of the main wholesale sources for the public and mission/not-for-profit facilities respectively. CDDs obtain their supplies from the local government health facility.

Medicine outlets obtain their medicines from wholesalers and then retail the medicines to the public. It has been observed that outside Kampala there is a significant amount of horizontal inter-wholesale trading – adding layers to the supply chain and potentially affecting price. Outside Kampala, some retail outlets also perform wholesale functions. In Kampala the supply chain appears to be simpler, with fewer layers, largely because of simpler logistics for the retail outlets to seek multiple wholesale sources in the capital city with relatively short distances between them.

Figure 28 and 29 diagrammatically present the supply chains in Kampala and outside Kampala respectively.

Figure 28: Diagrammatic representation of the supply chain in Kampala
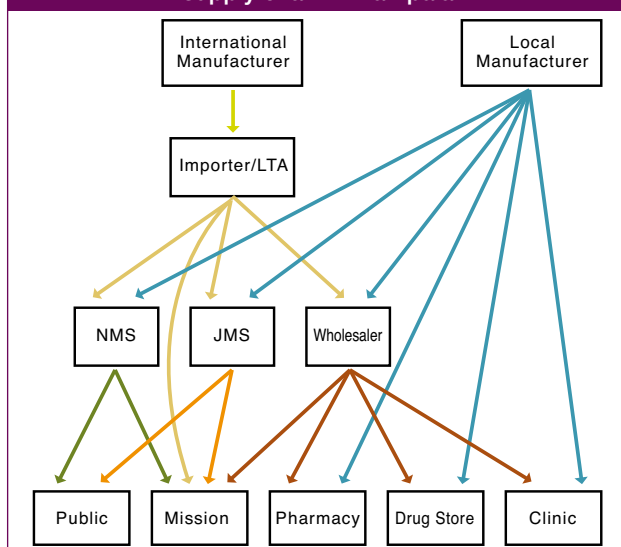
- The existing supply chain effectively delivers antimalarials to a wide range of outlets throughout Uganda – outlets obtained their supplies locally, regionally and in Kampala to differing degrees depending on the outlet division and its location

Figure 29: Diagrammatic representation of the supply chain outside Kampala
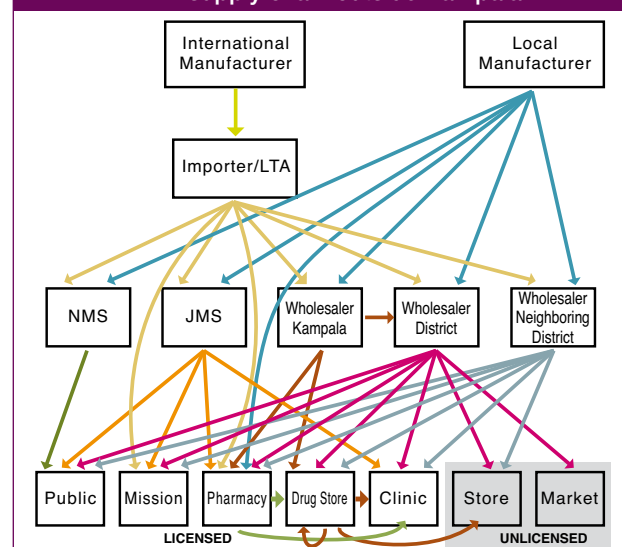
- The supply chain has more complexity outside Kampala with wholesale trading between districts and between retail outlets

COSTS RELATED TO IMPORTATION

The LTAs add upto 60% to the CIF (landed price [58]) to arrive at the Uganda selling price – however, this varies considerably, being highest for single source or originator products and perhaps as low as 20% for some common multisource (generic) products. As of June 2007, there were 30 LTAs (of imported goods) and local manufacturers importing or selling their locally manufactured antimalarial medicines; some of the local manufacturers are also LTAs for imported products from other overseas manufacturers. The following are the main direct charges related to importing medicines outside the operational costs of staffing, premises and vehicles.

Finance charges

- Letters of credit and foreign currency transaction fees; clearance charges – approximately 2%.
- The interest rate for borrowing money is around 25-30% (August 2007, including all charges).
- A "margin" to allow for foreign currency fluctuations (devaluation).

NDA verification fee: 2% of FOB[59] price (for verification process, inspection and Quality Control (QC) where necessary).

Shipping and insurance

These charges are sometimes included in the quoted price of the medicine. When they are calculated separately for imported medicines, shipping is calculated by size and weight, and means of transport.

- Freight costs by sea are around 6-7% FOB prices; by air up to 20%.
- Insurance is around 2% FOB price.

Clearance

The legislated ports of entry for imported medicines are: Nakawa Inland port; Entebbe International Airport; and Busia/Malaba in eastern Uganda on the border with Kenya. Clearance is performed by clearing agents with the Uganda Revenue Authority who work with the National Drug Authority. Clearance costs are estimated at around 1% FOB price.

- Importation typically adds 20-70% to the ex-factory price – generally lower amounts for multi-source products; and higher amounts for single, limited, or premium brand source products

---

[58] CIF = Cost of products + Insurance + Freight to a named port of destination – i.e. delivered to destination port with freight and insurance paid

[59] FOB =Free On Board: seller must load the goods on board the ship nominated by the buyer, cost and risk being divided once on board ship; the seller must clear the goods for export – delivered onto ship but does not include freight from port of loading or insurance

THE ROLE OF LOCAL MANUFACTURERS

Local manufacturers are listed as producing 24 of the 182 antimalarial medicines registered in Uganda (13%). All of these were found on the market. In addition, two other locally produced CQ products were found which were not on the NDA drugs register. Local manufacturers supply their products through wholesalers and perform wholesaling functions themselves. As indicated, some local manufacturers also operate as LTAs for foreign products.

- The locally produced antimalarials found on the market were chloroquine and SP.[60]

OVERVIEW OF WHOLESALING IN THE STUDY DISTRICTS

As described above, within Kampala, most private sector outlets obtain their supplies from wholesale sources. Outside Kampala there is a more complex supply chain where the smaller outlets/retailers are supplied by the larger outlets/retailers (who, either officially or not, act as wholesalers) as well as by wholesalers from the region or Kampala. There is also inter-wholesale trade.

The informal sector appears to be obtaining their wholesale supplies largely from Pharmacies and Drug Shops. Table 16 presents a breakdown of information on the types of business operated by the licensed pharmacy businesses in Uganda. In most districts, excluding the central region which includes Kampala, pharmacies are also operating wholesale businesses.

Table 16:	Types of business operated by the licensed pharmacy businesses in Uganda			
	Number of pharmacy businesses according to type (% total)			Total
	Retail only	Wholesale only	Retail & wholesale	
Northern	1 (8%)	5 (38%)	7 (54%)	13
Central (including Kampala)	108 (46%)	66 (28%)	60 (26%)	234
Eastern	1 (9%)	4 (36%)	6 (55%)	11
South Eastern	9 (39%)	4 (17%)	10 (44%)	23
South Western	3 (6%)	5 (11%)	39 (83%)	47
Total	**122 (37%)**	**84 (26%)**	**122 (37%)**	**328**

An analysis at the retail level across the outlets visited identified the following about the supply chain:
- Outlets obtained their supplies locally, in a neighbouring district, or in Kampala.
- Clinics, drug shops and retail stores are more likely to obtain their supplies from close by than from pharmacies; pharmacies used sources in Kampala more than locally.
- Wholesalers and retail pharmacies (also operating a small or significant wholesaling business) were the main or even only wholesale sources in all districts for all outlet divisions.

- A noteworthy proportion of outlets source their medicines from drug shops; however drug shops are not permitted by the NDA to operate a wholesale business.
- The informal market (retail stores and market/vendors) are more likely to obtain their antimalarial medicines close-by and largely obtain their supplies from licensed wholesalers, even though these wholesalers should only sell to licensed outlets.

.

---

[60]   Since the surveys, there have been moves in Uganda to produce ACTs locally.

The main costs and charges in the supply for a wholesaler, which should therefore comprise the bulk of his mark-up, are the costs of property, staff (including a pharmacist), transportation and other business transaction costs; write-offs for expiry could account for 2-3% inventory value.

Wholesale mark-ups are not set by the government and there is some variation. These are generally not high, at around 5-10% – however, some products have higher mark-ups. Sometimes the mark-ups at the wholesale level are higher for wholesalers outside Kampala; but these do not necessarily result in higher retail prices as the difference might be absorbed in a lower retail margin.

- Wholesalers and retail pharmacies (also operating a small or significant wholesaling business) were the main or even only wholesale sources in all districts for all sectors
- The wholesale market in Kampala is competitive – less so outside Kampala
- Retail pharmacies operating wholesale businesses were the most often stated source of supply
- The wholesaler/ retail pharmacy network does not cover all districts
- Wholesale mark-ups are not high, generally at around 5-10%
- For limited source products, mark-ups tend to be higher at the importer and wholesaler level
- Wholesale prices can fluctuate; however, as the retail margins are much higher, higher wholesale prices are absorbed into the retail price/mark-up
- Wholesale mark-ups increase when there is a shortage on the market
- Wholesalers stated that products with low demand, short expiry date and high price have a small mark-up

OVERVIEW OF RETAILING IN THE STUDY DISTRICTS

At retail level, the only costs and charges in the supply are the costs of property, staff, transportation and other business transaction costs; together these should comprise the retail mark-up. (Medically) licensed formal sector outlets[61] are required to have a responsible health professional, e.g., a pharmacist for a pharmacy, or a clinical officer or doctor for a clinic, which this results in the need for higher salary costs – which need to be paid even if, as was found, these personnel were not often present. However, as discussed elsewhere, the level of qualification of the personnel found in the informal, unlicensed sector was no lower than what was found in the formal, licensed outlets.

Medicines are sold or supplied to patients through a number of public, private, formal and informal outlets – the 8 outlet types of this study. Typical mark-ups at the retail level for each outlet type are described below:

- Public health facilities and community drug distributors (CDD) provide medicines free of charge to patients; running costs of clinics come from MOH budget.
- In the not-for-profit sector (NGO/mission health facilities), some medicines are provided free of charge, others have mark-ups similar to the private sector; some of the running costs of these facilities are subsidised by the Ministry of Health.
- Retail pharmacy mark-ups average 110% (from less than 110% to 500% depending on product).
- Private clinic mark-ups average 300% (from less than 300% to more 900% depending on product).
- Drug shop mark-ups average 100% (from less than 100% to 400% depending on product).
- Wholesale mark-ups are perhaps 7% higher and retail pharmacy mark-ups around 10% less outside Kampala; private clinic mark-ups are perhaps 5% higher outside Kampala.

---

[61]   Retail pharmacies, drug shops, private clinics

PRICE COMPONENTS

Manufacturers, importers, wholesalers and retailers all have legitimate business overheads in addition to the need to make a profit, since they are largely commercial enterprises. The main business overheads are property, equipment, staff, taxes & statutory responsibilities, and costs of investment in an inventory. However, earlier sections of this report, related to the huge variation in prices for the same medicine in the same district in the same outlet type, indicate that some providers are adding noticeably different mark-ups. They would be expected to have similar business costs, but very differing profits.

Cross subsidization is also a very common in practice in the pharmaceutical sector, where a product which is for a chronic disease is usually sold at lower retail mark-up as compared to a drug for a one-time need. The provider covers fixed costs more from latter items and variable costs from the others. This is because relationship building has to be factored in for customers with chronic disease.

In some settings, there are also those products which could be considered "store traffic drivers". These have a lower mark-up as they are intended to get the customer into the outlet and have them end up buying other products as well – with higher mark-ups, for example hygiene and personal care products.

Cross-subsidization and traffic drivers however do not really explain the price variation between the same outlet types in the same locality. The price variations illustrate that the sale of medicines is an imperfect market and that the customer/patient does not shop around, especially when turning to the private clinics where, after diagnosis, the patient feels compelled to purchase the medicine from the clinician whether the price is fair or not.

The figures below on price components illustrates the differences in mark-up between products and between different outlet types in different places. The findings have emerged from a case study where providers in the supply chain were interviewed, and are estimates of the effect on price of a medicine as it passes through the supply chain.

Figure 29 illustrates a typical imported product, with similar costs of insurance, freight and mark-ups at importation (given that generally one product is imported by a sole importer). At the wholesale level, mark-ups were different, being larger in Kamwenge than in Kampala or Soroti. Kamwenge is a rural district without a wholesaler network and outlets largely procure their wholesale supplies from retail pharmacies operating as wholesalers in Kabarole. However, in all districts the price is escalated at the retail level with private clinics having a much larger mark-up in all districts – the final patient price in Kampala and Soroti being almost 50% more than the price in the pharmacy, which is more than the price in the drug shop. The lower patient prices in Kamwenge, a poorer rural district, illustrate that the outlets are perhaps adjusting their prices towards affordability levels of the community.

Figures 31 to 34 represent the same information in terms of the contribution of the various components of the supply chain to the final patient price in various outlet types. The contribution of the mark-up at the retail level in private clinics was typically between 69-76% of the final patient price, while the cost of the medicine out of the factory accounted for around 14-17%.

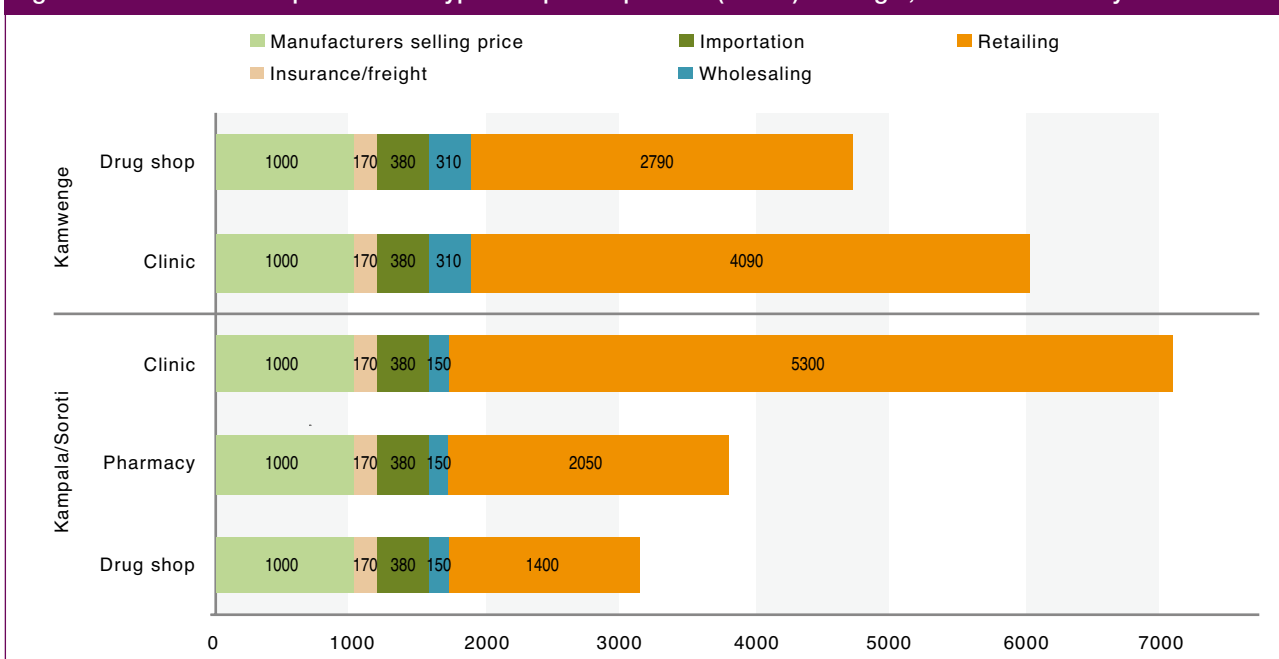**Figure 30:   Price composition of a typical imported product (in Ush) costing 1,000 Ush ex-factory**

Legend:
- Manufacturers selling price
- Insurance/freight
- Importation
- Wholesaling
- Retailing

Kamwenge
- Drug shop: 1000 | 170 | 380 | 310 | 2790
- Clinic: 1000 | 170 | 380 | 310 | 4090

Kampala/Soroti
- Clinic: 1000 | 170 | 380 | 150 | 5300
- Pharmacy: 1000 | 170 | 380 | 150 | 2050
- Drug shop: 1000 | 170 | 380 | 150 | 1400

(x-axis: 0, 1000, 2000, 3000, 4000, 5000, 6000, 7000)

Figure 31:   Proportion of final price (Pharmacy: Kampala/Soroti)

- Manufacturers selling price 27%
- Insurance/freight 5%
- Importation 10%
- Wholesaling 4%
- Retailing 54%
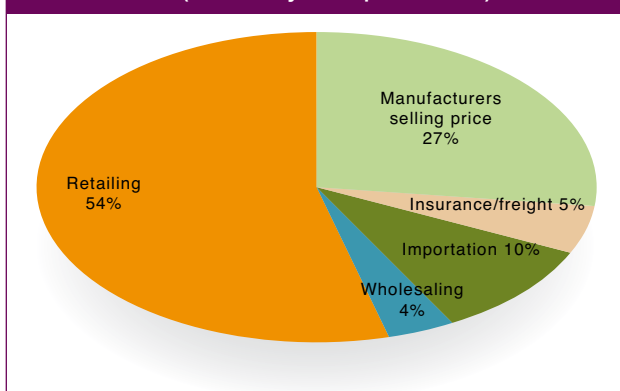
Figure 33:   Proportion of final price (Drug Shop: Kampala/Soroti)

- Manufacturers selling price 32%
- Insurance/freight 5%
- Importation 12%
- Wholesaling 5%
- Retailing 45%
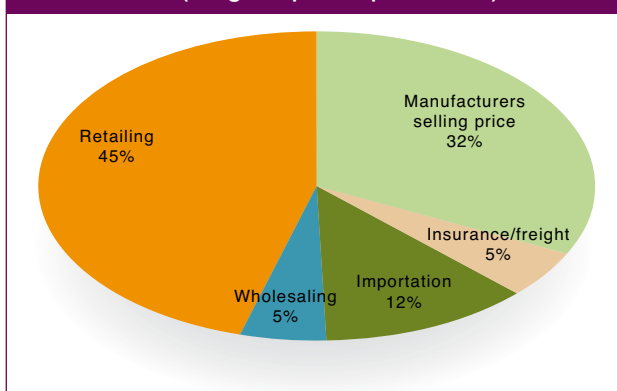
Figure 32:   Proportion of final price (Clinic: Kampala/Soroti)

- Manufacturers selling price 14%
- Insurance/freight 2%
- Importation 5%
- Wholesaling 2%
- Retailing 76%
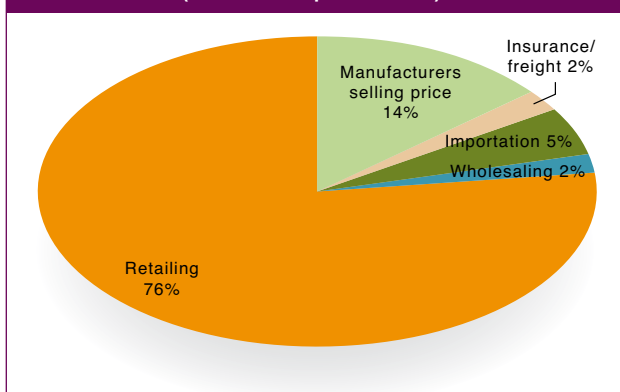
Figure 34:   Proportion of final price (Clinic: Kamwenge)

- Manufacturers selling price 17%
- Insurance/freight 3%
- Importation 6%
- Wholesaling 5%
- Retailing 69%
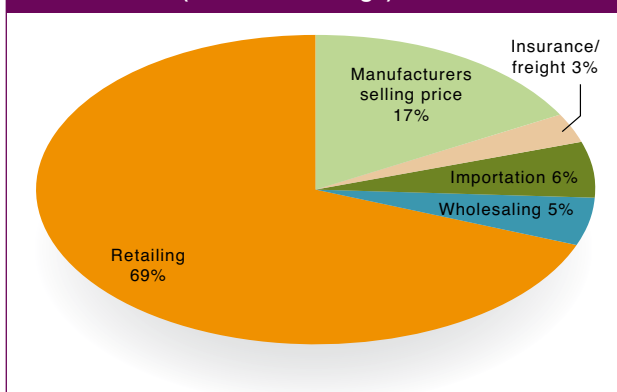
Antimalarial medicines

The same process used above was applied to specific antimalarial medicines to illustrate the difference in mark-ups for different types of products. Figures 35 and 36 present the observations for an imported originator brand ACT, Duocotexcin tablets [59] where it can be seen that the patient prices (end of bar) are similar in all the cases except a higher retail mark-up in the retail pharmacy in Kampala and an even higher retail mark-up in the private clinic in Kampala. The wholesale mark-ups paid by the outlets in Soroti are higher, particularly with the wholesaler from whom the pharmacy purchases supplies.

Figure 35: Price composition: Duocotexcin (Ush/tab)

As an example, in the clinic in Kampala where the prices were the highest, the retail mark-up accounts for 50% of the final patient price, the ex-factory price accounting for 28% of the final patient price.
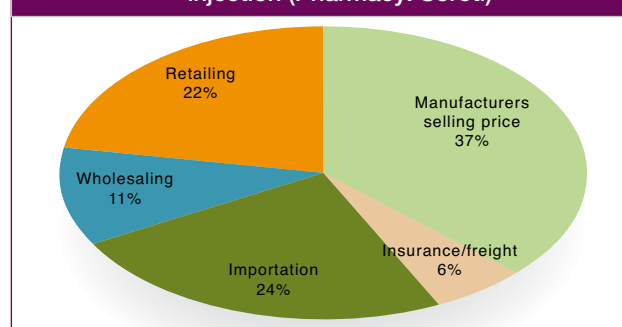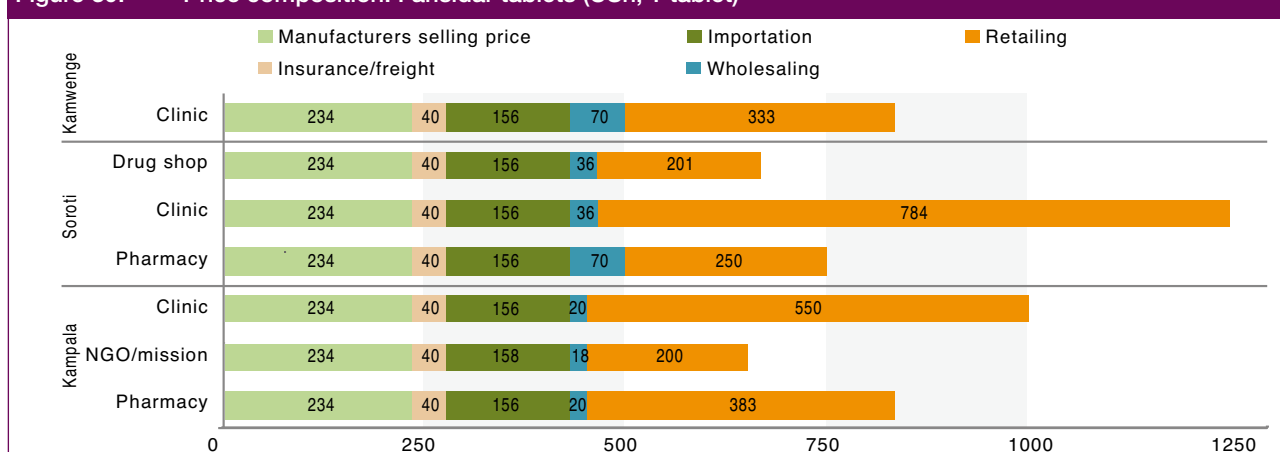

Figure 36: Proportion of final price for Duocotexcin tablets (Clinic: Kampala)

---
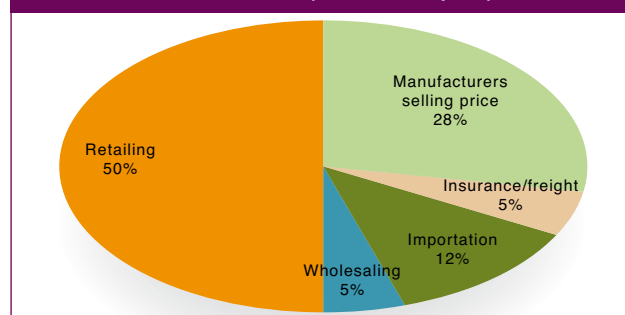
[59]   Dihydroartemisinin-piperaquine 40/320mg; Holley Pharmaceuticals, China

Figure 37:   Price composition: Artedinine (Ush/tab)

Legend: Manufacturers selling price | Importation | Retailing | Insurance/freight | Wholesaling

Location	Outlet	Manufacturers selling price	Insurance/freight	Importation	Wholesaling	Retailing
Soroti	Drug shop	215	36.5	248.5	166	334
Soroti	Pharmacy	215	36.5	141.5	63	127
Kampala	Drug shop	215	36.5	140.5	66	625
Kampala	Clinic	215	36.5	140.5	66	542
Kampala	Pharmacy	215	36.5	140.5	66	375

Figures 37 and 38 present the observations for an imported artemisinin monotherapy injection, Artemidine injection, [63] where it can be seen that the patient prices (end of bar, Figure 37) are similar in all the cases except for a lower retail mark-up in the retail pharmacy in Soroti. Clearly, wholesale and retail markups vary significantly, depending on the supply chain structure. However, a higher wholesale mark-up does not necessarily relate to the highest retail price.

Figure 38:   Proportion of final price for Artemidine injection (Pharmacy: Soroti)

Retailing 22%, Manufacturers selling price 37%, Wholesaling 11%, Importation 24%, Insurance/freight 6%

Figure 39:   Price composition: Fansidar tablets (USh, 1 tablet)

Legend: Manufacturers selling price | Importation | Retailing | Insurance/freight | Wholesaling

Location	Outlet	Manufacturers selling price	Insurance/freight	Importation	Wholesaling	Retailing
Kamwenge	Clinic	234	40	156	70	333
Soroti	Drug shop	234	40	156	36	201
Soroti	Clinic	234	40	156	36	784
Soroti	Pharmacy	234	40	156	70	250
Kampala	Clinic	234	40	156	20	550
Kampala	NGO/mission	234	40	158	18	200
Kampala	Pharmacy	234	40	156	20	383

Figures 39 and 40 present the observations for an imported originator brand sulphadoxine-pyrimethamine: Fansidar tablets, [64] where it can be seen that the patient prices (end of bar, Figure 39) vary largely due to differing retail mark-ups. The wholesalers providing supplies to the clinic in Kamwenge and the pharmacy in Soroti had a higher mark-up than the other wholesalers - more than double the rest. As an example in the clinic in Soroti where the prices were the highest, the retail mark-up accounts for 63% of the final patient price and the ex-factory price accounts for 19%.
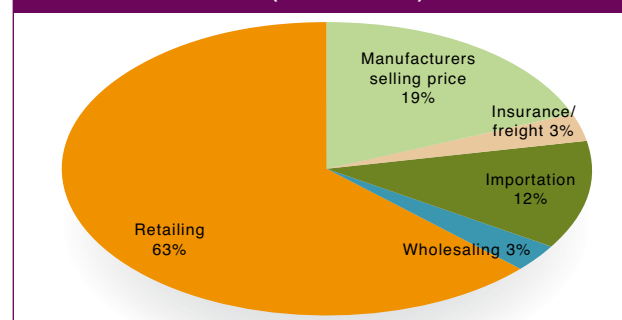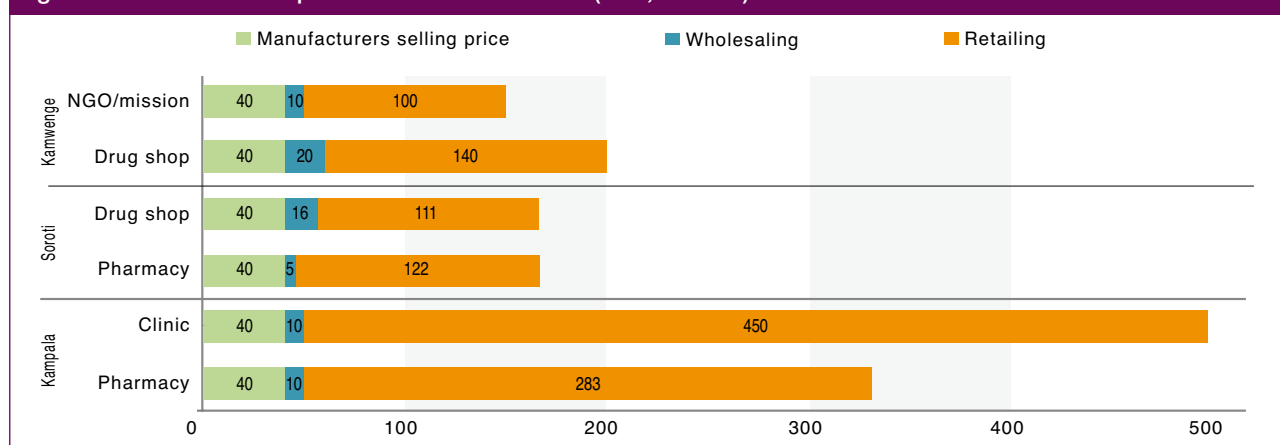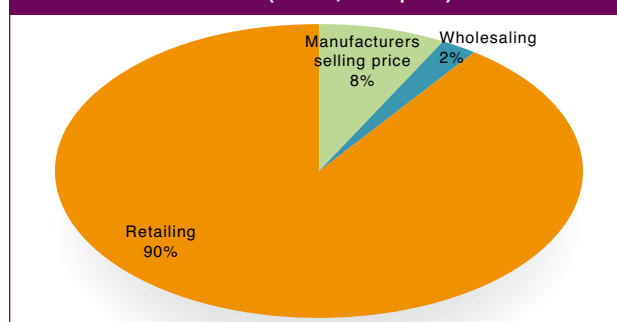
Figure 40:   Proportion of final price for Fansidar tablets (Clinic: Soroti)

Manufacturers selling price 19%, Insurance/freight 3%, Importation 12%, Wholesaling 3%, Retailing 63%

---

[63]   Artemether, 80mg/ml; Kunming Pharmaceutical Corporation, China | [64]   500/25mg; Roche, Switzerland

Figure 41:   Price composition: Kamsidar tablets (USh, 1 tablet)

Legend: Manufacturers selling price · Wholesaling · Retailing

Kamwenge
- NGO/mission: 40 | 10 | 100
- Drug shop: 40 | 20 | 140

Soroti
- Drug shop: 40 | 16 | 111
- Pharmacy: 40 | 5 | 122

Kampala
- Clinic: 40 | 10 | 450
- Pharmacy: 40 | 10 | 283

In contrast to this, figures 41 and 42 present the observations for locally produced sulphadoxine-pyrimethamine, Kamsidar tablets,[65] where it can be seen that the patient prices (end of bar) vary widely. Pharmacies and clinics in Kampala have the highest retail mark-ups accounting for 90% of the final patient price while the ex-factory price accounts for 8%.
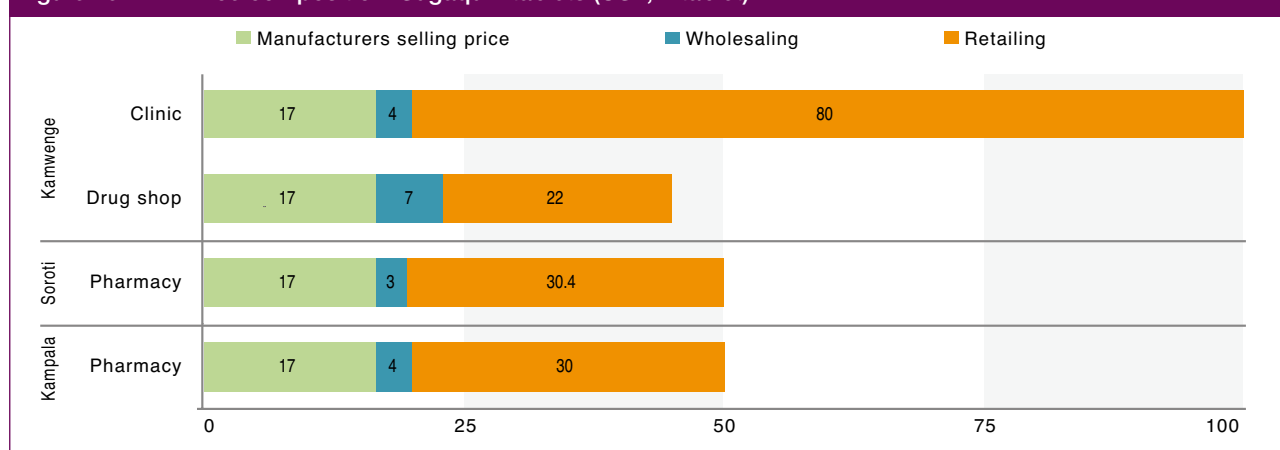
Figure 42:   Proportion of final price for Kamsidar tablets (Clinic, Kampala)

Manufacturers selling price 8%
Wholesaling 2%
Retailing 90%

Figure 43:   Price composition: Sugaquin tablets (USh, 1 tablet)

Legend: Manufacturers selling price · Wholesaling · Retailing

Kamwenge
- Clinic: 17 | 4 | 80
- Drug shop: 17 | 7 | 22

Soroti
- Pharmacy: 17 | 3 | 30.4

Kampala
- Pharmacy: 17 | 4 | 30

Figures 43 and 44 present the observations for locally-produced premium CQ tablet (sugar coated) Sugaquin[66] where it can be seen that the patient prices (end of bar) vary from USh 50-100 – all with high retail mark-ups, especially the clinic in Kamwenge where the retail mark-up accounts for 80% of the final patient price, and the ex-factory price for 17%.

Figure 44:   Proportion of final price for Sugaquin tablets (Clinic, Kamwenge)

Manufacturers selling price 17%
Wholesaling 4%
Retailing 80%

---
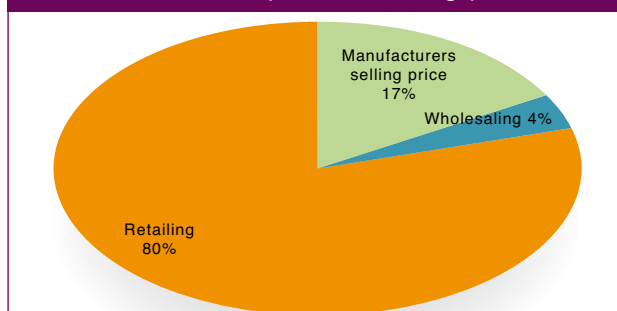
[65]   500/25mg; Kampala Pharmaceutical Industries, Uganda | [66]   Phosphate 250mg; Kampala Pharmaceuticals Industries, Uganda

To assess whether the situation is particular to the antimalarials medicines, similar assessments were made of the 14 essentials medicines included in the study. Figure 45 illustrates the mark-ups for an imported ciprofloxacin tablet, a non-antimalarial, essential medicine – specifically Ciprobid.[67] The patient price is similar to other generic versions of ciprofloxacin tablets, however, the ex-factory price is much lower. It can be seen that the insurance, freight, importation and wholesale costs and mark-ups are modest, but the retail mark-ups very high in that the price escalates by a factor of thirteen in the clinics of Kampala and Soroti.

Figure 45: Price composition: Ciprobid tablets (USh, 1 tablet)
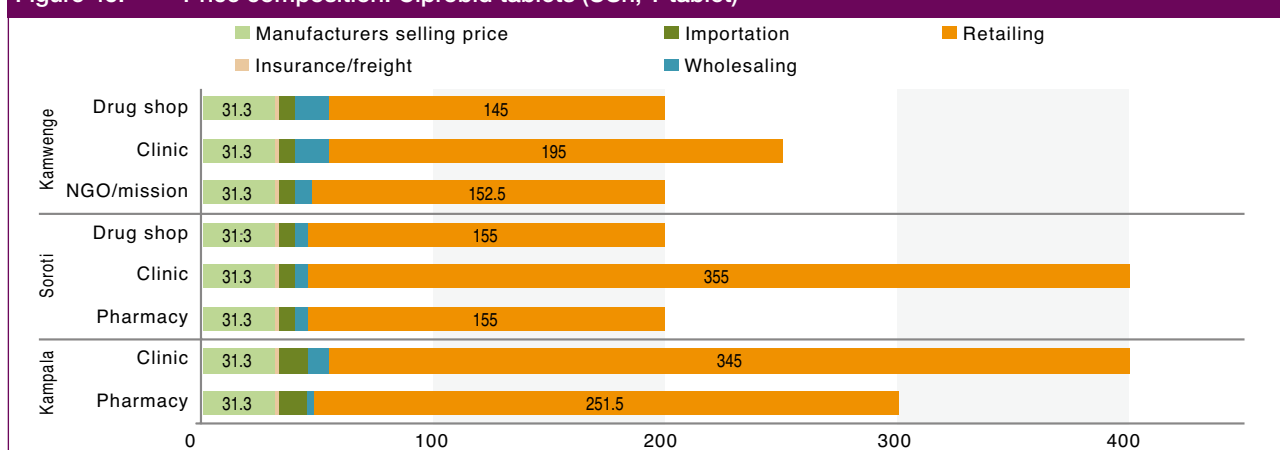
- Mark-ups at the retail level are high – varying by product and by sector
- Private clinics have much higher mark-ups than other retail sectors
- A low ex-factory price does not necessarily result in a low patient price
- Retail mark-ups can largely absorb all or most of the extra costs of distance – wholesale prices have been observed to be marginally higher outside Kampala; retail pharmacy mark-ups marginally lower; and private clinic mark-ups marginally higher

Additional information on the differences between products and sectors is available in a detailed report available on the MMV website www.mmv.org/access.

---

[67]   Ciprofloxacin 500mg; Zydus-Cadila, India

Suggested recommendations

Recommendations related to Availability

- Improve quantification, supply chain management and reduce leakage to address risks of public sector stock-out of key medicines.

- Recognise the potential of the existing supply chain and improve understanding of the incentives currently in place to deliver different product classes.

- Review the possibility of facilitating the upgrade of unlicensed drug shops to bring them into line with regulatory and quality requirements.

- Explore the possibility of differentiated messaging and training (by outlet type) to ensure appropriate distribution processes and maximise the potential of different levels of the existing supply chain.

- Increase efforts to communicate messages about the effectiveness of different classes of drugs, including the difference between ACT and chloroquine / SP.

Recommendations related to Affordability

- Pilot alternative approaches to encourage the private sector to move from supplying older, ineffective classes of drugs to ACT, while offering sufficient incentive to maintain supplies.

- Gather further information on the direct and indirect incentives in the supply chain to understand what drives outlets' decisions on which products to sell and how they are priced.

- Consider alternative ways of increasing public awareness on 'recommended' price levels for different pharmaceutical products, while respecting national price liberalisation policies.

General recommendations

- Improve national (public) awareness and dispenser training on medicines storage issues.

- Explore the potential for using wholesalers and pharmacies as increased information focal points.

Conclusions and further research

This study highlights the critical need for improved data on the size and structure of the antimalarials market in key malaria-endemic countries, if we are to make access to high quality ACTs a reality for those who need them.

The study confirms the perception that only 40-60% of all treatments are currently provided through the public/not-for-profit sectors, leaving a significant part of the population to turn to the private sector to access medicines. At the same time, the private sector market efficiently provides antimalarials – albeit older, less effective classes of medicine such as chloroquine and SP – down to the village level. Thus, there is a need to further understand how different incentives in the market can drive the replacement of older classes of drugs with high quality ACTs. This is an ambitious goal, particularly given difficulties of successfully influencing markets in the long term. However, unless this is achieved, millions of people in Africa will not benefit from the progress in drug development and the health impact this can bring.

This 'supply side' study is developed in parallel with a 'demand side' (household) survey, probing further into the drivers of treatment-seeking behaviour and household preferences for sector and drug type. By matching these two key aspects of the market – supply and demand – at the same time in the same populations, the studies provide a unique insight into drivers of choice in the delivery of antimalarial treatment.

Medicines for Malaria Venture will continue work with the authorities in Uganda to further understand the structure of the antimalarials market there, to gather data on the size and incentives driving this market, and to identify solutions for contributing to sustained accessibility of high quality ACTs.

Glossary

ACT	Artemisinin Combination Therapy
AL	Artemether-lumefantrine
AQ	Amodiaquine
AS+AQ	Artesunate plus amodiaquine
CDD	Community Drug Distributor
CIF	Landed price (Cost of product + Insurance + Freight)
CQ	Chloroquine
FOB	Free on Board
GIS	Geographical Information System
GPS	Global Positioning System
HBMF	Home Based Management of Fever
IPT	Intermittent Preventative Therapy (for infants and pregnant women)
LTA	Local Technical Agent
MOH	Ministry of Health
MSP	Manufacturer's Selling Price
NDA	National Drug Authority
NMS	National Medical Stores
NGO	Non Governmental Organisation
QC	Quality Control
SP	Sulphadoxine-pyrimethamine
USh	Ugandan Shillings
USD	United States Dollars

Medicines for Malaria Venture

International Centre Cointrin
Entrance G, 3rd floor
Route de Pré-Bois 20
PO Box 1826
1215 Geneva 15
Switzerland

Tel +41 22 799 4060
Fax +41 22 799 4061
access@mmv.org
www.mmv.org