ASSESSMENT OF MALARIA PHARMACEUTICAL MANAGEMENT SYSTEMS IN GHANA

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About SPS

The Strengthening Pharmaceutical Systems (SPS) Program strives to build capacity within developing countries to effectively manage all aspects of pharmaceutical systems and services. SPS focuses on improving governance in the pharmaceutical sector, strengthening pharmaceutical management systems and financing mechanisms, containing antimicrobial resistance, and enhancing access to and appropriate use of medicines.

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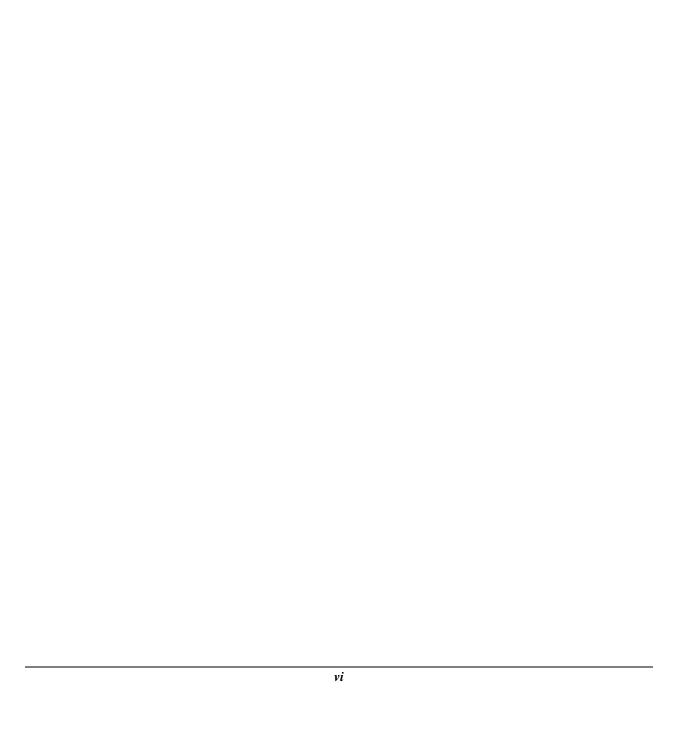|	
AS	artesunate
ACT	artemisinin-based combination therapy
AL	artemether lumefantrine
AQ	amodiaquine
ASH	Ashanti region
BA	Brong-Ahafo region
CMS	Central Medical Stores
CR	Central region
FEFO	first expiry, first out
GAR	Greater Accra region
GHC	Ghanaian cedis
ITNs	insecticide-treated nets
LCS	licensed chemical seller
MoH	Ministry of Health
NR	Northern region
PMI	U.S. President's Malaria Initiative
PMIS	pharmaceutical management information system
RMS	regional medical store
SP	sulfadoxine pyrimethamine
SPS	Strengthening Pharmaceutical Systems [Program]
UE	Upper East region
USAID	U.S. Agency for International Development
UW	Upper West region
VR	Volta region
WHO	World Health Organization

EXECUTIVE SUMMARY

The Strengthening Pharmaceutical Systems (SPS) Program conducted this rapid assessment of the malaria pharmaceutical supply management and information systems in Ghana between January and February 2009 to provide evidence for—

- Addressing challenges in prescribing, dispensing, quantifying, and reporting practices related to antimalarial management in the private and public sectors

- Identifying key needs in the private sector supply chain to support strategies to promote artemisinin-based combination therapy (ACT)

- Evaluating inventory management and warehouse requirements (including infrastructure) needed at medical stores and outlets at regional, district, and facility levels to improve practices and minimize stock-outs, wastage, and leakage of ACTs

Key assessment findings include the following areas.

Quality of Care Related to Antimalaria Medicines

Public and mission health facilities and private pharmaceutical outlets have challenges in prescribing and dispensing antimalarials appropriately for uncomplicated malaria. Prescribing habits among pharmacists and licensed chemical sellers demonstrated poor compliance with national guidelines; for example, when approached for medical advice by a simulated caregiver, only 32.6 percent of 43 attendants at private outlets inquired about patient symptoms, just 14 percent provided appropriate treatment (an ACT), and only 2.3 percent made appropriate referrals. Prescriptions of monotherapies and sulfadoxine-pyrimethamine for malaria treatment in chemical shops and other private sector outlets were relatively high compared to the public and mission sector providers; however, median prices for antimalarials in private pharmacies and chemical sellers were about half the median in public facilities—7.80 Ghanaian cedis (GHC) compared with GHC 4.41 in private pharmacies and GHC 3.10 in chemical shops. The higher prices in public health facilities were due to the fixed diagnosis group charges paid by the national health insurance scheme.

Private retail and mission sector facilities also do not have skilled pharmacy professionals on staff, which has the potential to limit quality of care in that sector. Unlike public sector facilities that were staffed mostly by pharmacists (91 percent), pharmacists were found in just 48 percent of mission facilities and only 22 percent of private facilities.

In spite of the potential contributions that the private sector makes to overall public health goals, the mechanisms for capturing existing information in malaria case management and tracking services and products prescribed and dispensed in the private sector are weak. These results validate the importance of the private sector as a significant target for future pharmaceutical management interventions.

Supply Chain Practices in Public and Private Medicine Outlets

Supply chain practices vary across public, mission, and private sector facilities, but overall, practices in the private sector are poorer compared to those in the public and mission facilities; for example, despite reported satisfactory physical conditions, about 90 percent of private facilities compared with 52 percent of public facilities and 40 percent of mission facilities stored medicines on the floor. Also, when calculating nine stock management indicators including defined minimum and maximum stock levels, renewal of stock on scheduled dates, traceability of batches, and existence of specific stock management tools, the private sector facilities average was only 28 percent compared to 51 percent and 40 in the public hospitals and mission facilities respectively.

Supply Chain Practices in Regional Medical Stores

In terms of availability, the three common brands of artesunate-amodiaquine (AS/AQ) combinations (AS/AQ 50 mg+153 mg [3×3]; AS/AQ 50 mg+153 mg [6×6]; AS/AQ 50 mg+153 mg [12×12]) were available in most stores on the day of the assessment visit; however, the average number of stock-out days in regional medical stores (RMS) for each of the three common brands of AS/AQ combinations ranged from 0 to as high as 198 days.

The data also show that almost all 10 RMS are constrained by limited storage space as a result of increases in the volume of stock over the years without commensurate expansion in physical infrastructure. In addition, lack of routine maintenance has resulted in poor physical conditions at most regional stores.

Problems notwithstanding, in terms of stock management and inventory control, most stores maintain proper ventilation and temperature control, arrange stock well, and have put in place good security measures to control theft.

On the basis of the assessment findings, the SPS makes the following recommendations—

- The MoH and partners need to build the knowledge and skills of pharmaceutical dispensers in private and public facilities on how to manage malaria cases appropriately, including improving their knowledge of Ghana's national malaria treatment guidelines.

- The MoH, Pharmaceutical Society of Ghana, Pharmacy Council, LCS, and other partners need to address the poor inventory and store management system in the private sector through training to build staff capacity to support good medicine management, safety, and rational use of antimalarials. Although the new malaria policy is not yet fully implemented, the National Malaria Control Programme (NMCP) needs to disseminate the new malaria standards and protocols widely, train health professionals in all health facilities, and monitor implementation to ensure compliance. Drug and therapeutic committees can contribute to this effort.

- Most RMS require physical refurbishment and revitalization to meet increased service needs and operations. MoH should explore cost-effective strategies to support appropriate storage and management of essential medicines at these facilities.

- The MoH, NMCP, and partners should support advocacy and social mobilization activities to educate the general public about appropriate medicines for malaria, their use, and the dangers of irrationally using ACTs.

- The MoH and NMCP need to explore effective mechanisms for private and mission sector facilities to capture malaria case management and product data to support the national malaria information system and also to promote effective decision making for the country.

- The Food and Drugs Board needs to explore practical and cost-effective strategies to deter the private sector from importing and selling malaria monotherapies, which are not recommended for use in the country.

- In the facilities surveyed, the prices of antimalarials varied from GHC 0.43 or about 0.30 U.S. dollars (USD) to 15 GHC (USD10), which negatively affect access. The MoH, Pharmacy Council, and NMCP should explore mechanisms to standardize the pricing of recommended antimalarials . Additionally, NMCP should work closely with the private sector to increase access to the Global Fund ACTs that are available in the public sector through CMS and RMS.

BACKGROUND

Ghana has committed to various initiatives that seek to achieve specific targets on malaria prevention and control including Roll-Back Malaria, the Abuja Declaration, and the Millennium Development Goals. To achieve its targets, Ghana is implementing a malaria control strategy that involves intersectoral partnerships working together on an agreed plan to reduce death and illness due to malaria. The strategic framework includes prevention through the use of insecticide treated nets (ITNs), early detection, and appropriate prompt treatment.

Ghana was selected in the third round of beneficiary countries by the U. S. Government President's Malaria Initiative (PMI), which seeks to *"dramatically reduce malaria as a major killer of children in sub-Saharan Africa."*[1] In early 2007, a PMI team consisting of the U. S. Agency for International Development (USAID), U.S. Centers for Disease Control and Prevention, World Health Organization (WHO), Management Sciences for Health's Rational Pharmaceutical Management Plus Program, and the Ghana Malaria Control Programme conducted a needs assessment to identify areas that PMI could support within the context of the national malaria policy and strategic plan and which would complement Roll Back Malaria partner interventions. As a follow-on to Rational Pharmaceutical Plus, USAID/Ghana asked the Strengthening Pharmaceutical Systems (SPS) Program to support the malaria pharmaceutical management system including developing a comprehensive management information system and strengthening supervision programs, forecasting, and warehousing at public and private sectors including mission facilities.

The SPS Program conducted a rapid assessment of the malaria pharmaceutical supply management and information systems between January and February 2009. The main areas the assessment addressed included—

- Prescribing, dispensing, quantifying, and reporting practices of antimalarials (private and public sectors)

- Identifying key needs of private sector supply chain to support strategies to promote ACTs.

- Evaluating inventory management and warehouse requirements (including infrastructure) needed at medical stores at regional, district, and facility levels to improve practices and minimize ACT stock-outs, wastage, and leakage.

Malaria Policy Changes and Implementation Bottlenecks

In Ghana, as in other malaria-endemic countries, malaria control programs are threatened by the development of drug resistance, necessitating treatment policy revisions. In 2002, Ghana initiated the process of switching recommended treatment to ACTs following WHO

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[1] http://www.whitehouse.gov/news/releases/2005/06/print/20050630-8.html

recommendations. Based on evidence of efficacy, compliance, side effects, cost effectiveness, impact on local industry, and key demographic variables, such as the appropriateness for treating malaria in children under five and in pregnancy, the government selected artesunate-amodiaquine as the first-line drug to treat uncomplicated malaria. The implementation of the new malaria policy, however, faced a number of challenges, such as tracking adverse drug reactions, lack of other treatment options, and safety concerns. Some anecdotal evidence from the NMCP suggested that these problems were due mainly to a lack of information about proper medicine usage.

In response, in June 2008, the Minister of Health commissioned a team led by the Ghana Malaria Control Programme to review existing policy guidelines and select additional ACT drugs and dosage forms to accommodate those who cannot tolerate AS/AQ. The team selected two additional ACTs, artemether-lumefantrine (AL) and dihydroartemisinin/piperaquine, while keeping AS/AQ as the preferred ACT for uncomplicated malaria.

The Private Pharmaceutical Sector in Ghana

In Ghana, about 55 percent of the health facilities are in the public sector, while the remaining facilities are private nonprofit (mission) and private sector medical and dental practitioners. There are over 1,300 pharmacies and 8,500 licensed chemical sellers (LCS), which sell over-the-counter medicines. More than 85 percent of the private clinics and pharmacies are located in only 3 of Ghana's 10 administrative regions (Greater Accra, Ashanti, and Western). Recent surveys by Management Sciences for Health and the Family Health International-Pfizer's Mobilize Against Malaria project confirmed that pharmacies and LCS are the first source of treatment for approximately 60 percent of Ghanaians.

The 7,500 malaria cases per day recorded in Ghana are in the public sector. Given the size and scope of the private sector's involvement in pharmaceuticals (formal and informal), the potential for the private sector to contribute to public health goals is great; however, no management information systems are in place to capture private sector malaria case management data, even though most private clinics, pharmacies, and chemical sellers have their own formal or informal systems to track services and products they prescribe and dispense.

Assessment Methodology and Data Collection

To align the study findings to those of other pharmaceutical sector supply chain studies in Ghana and with other international studies, the study design used standard core indicators from the WHO/Health Action International Level II/ facility methodology.

The survey was conducted with the permission of the Ministry of Health and approval from the Ghana Health Service ethical review committee. Local health managers were contacted for specific approval and cooperation.

Four teams of four to six data collectors had pharmacy, health science, or social science backgrounds. A supervisor assigned to each team checked data daily to eliminate errors and dealt with immediate logistic problems in the field. Teams received training in their specific roles and procedures from January 21–24, 2009. Data collection took place from February 1–13. Following a general field work debriefing on February 20, a follow up visit was carried out in Volta and Greater Accra regions from February 23–27.

Indicator measures on each survey form were calculated manually as part of data collection. After review of completed survey forms, data entry was carried out using Epi Data 3.1. The data analysis was done using SPSS and Microsoft Excel.

Selection of study areas and facilities

A multistage sampling procedure was applied to select the regions, districts, and individual facilities through a combination of select and random sampling. The study unit was the individual service-providing institution (e.g., RMS, health facility, or drug outlet). At private drug outlets, clients constituted another study unit. Researchers also reviewed outpatient treatment cards at facilities where drugs are prescribed.

The assessment included all ten RMS which include Ashanti (ASH), Brong-Ahafo (BR), Central (CR), Eastern (CR), Greater Accra (GAR), Northern (NR), Upper East (UE), Upper West (UW), Volta (VR), and Western (WR), plus facilities at five regions: GAR, CR, BR, UW, and VR. GAR was selected because it is the largest urban center in Ghana, while UW region was included to represent a low-income area; CR is the poorest region in the south of Ghana and there is need to determine access to medicines in the region; BR has its RMS outside the regional capital, which may affect drug procurement and distribution patterns.

In each survey area or region, the study targets were five public health facilities that catered to general outpatients with a pharmacy or drug-dispensing unit, including the regional hospital. Also, in each area, the study targeted 10 mission/nonprofit and private health facilities, depending upon the availability. Sixty-six health facilities were visited, which represented 88 percent of the expected number (table 1). The names of the facilities by type in each region are provided in Appendix A.

Table 1. Regional Distribution of Health Facilities Included in Assessment

Region	Type of facility				Total
	Public hospital	**Public clinic**	**Mission hospital/clinic**	**Private hospital/clinic**	
BA	5	0	4	5	14
CR	4	1	5	5	15
GAR	4	1	4	5	14
UW	4	2	6	0	12
VR	4	0	4	3	11
Total	**21**	**4**	**23**	**18**	**66**

The selected public health facilities served as the reference point in selecting private pharmacy outlets and warehouses. Ten private medicines outlets comprising five pharmacies and five LCS shops were randomly selected within 10 km of the selected public facilities. Also, five private warehouses, one from each geographic area, were also identified for study.
As a quality control measure, the study included facilities with record keeping known to be adequate in terms of data needed for the assessment; however, facilities were also identified to replace facilities that were found to have inadequate records.

Sampling of outpatient cards in a health facility

To collect data on drug prescription practices, researchers selected 30 outpatient cases—15 retrospective cases and 15 prospective cases—from each facility. To account for seasonal variations, the retrospective cases were selected in such a way that so that the prescriptions were spread over the one-year period for 2008. The prospective records involved cases of patients who sought medication on the day of the survey who were approached and interviewed after voluntary consent has been obtained.

Client exit interviews at a pharmacy or chemical sellers shop

Data collectors conducted interviews with clients exiting the health facilities, pharmacies, and LCS located within a 10 km radius of the public health facilities visited. The selection of clients leaving the pharmacy or the LCS shop was done according to convenience; the first five clients on a particular day were chosen, or, in busy institutions, the next available client was chosen after completing a previous interview. In all, data collectors interviewed a total of 156 clients.

Simulated client interviews

Data collection using a simulated client study was conducted in both private pharmacies and LCS. The exercise was designed to collect data on quality of care in the encounters where an appropriate antimalarial for uncomplicated (simple) malaria was sold. Data collectors visited medicine outlets posing as the caregiver of a four-year old girl who has fever on and off for a week. In one case, the simulated clients indicated that the sick child was able to take liquids and food while in the other simulation, the client indicated that the child was unable to keep foods and liquids down due to vomiting. They requested advice regarding which products to give the child. Altogether, the 83 client cases comprising 43 non-vomiting and 40 vomiting cases were simulated.

Data collection instruments

Using available literature and experience with previous studies, data collectors used different instruments at the selected drug outlets to study various aspects of the pharmaceutical management system including medicine storage, distribution, management information systems, pricing, and rational use (prescribing and dispensing). The various study tools and where they were applied are listed in table 2.

Table 2. Summary List of Survey Forms and Type of Information Collected

Assessment tool	Where administered
Storage and equipment questionnaire	RMS only
Supply chain health sector questionnaire	Public, mission, private facilities in five regions
Simulated purchase	Pharmacies and LCS shops in five regions
Stock-out data form	RMS; public, mission, private health facilities in five regions
Price comparison form A (patients and customers)	RMS; private wholesale, public, mission, private, pharmacies and LCS shops in five regions
Price comparison form B (private wholesalers and other organizations)	RMS; private wholesale, public, mission, private, pharmacies and LCS shops in five regions
Prescribing and dispensing analysis	Public, mission, private facilities in five regions
Quantification—monthly use	RMS; private wholesalers; public, mission, private health facilities in five regions
Client exit interview	Private pharmacies and LCS shops in five regions

Limitations of the data

The study was not intended to give a detailed analysis of Ghana's pharmaceutical sector, but to provide an overview of malaria-related pharmaceutical issues to help analyze policy and design appropriate interventions. Together, the regions and facilities provided a snapshot of the country situation with emphasis on the private sector. Data collection did not include households, and as a result, some key aspects of medicines use, such as herbal medicines, might have been missed. Nevertheless, the data provides information on household demand for services and facility supply of services.

The main difficulties noted during field work follow—

- Some facilities did not receive letters about the study on time, which made facility entry difficult in some cases. This was more frequent in private facilities where the owners were not present at the time of data collection. The problem was overcome by the study office contacting the heads of the affected facilities.

- Poor record keeping in some facilities, especially small private facilities, made data extraction tedious. Some private and small mission facilities also did not keep inventory cards or the information on the tally cards was combined instead of being disaggregated. Some prescriptions were written as abbreviations, and it took longer to decipher them. Furthermore, some facilities did not want to share procurement plans, and private facilities in particular were reluctant to make their invoices available. As a result, some data on purchase and procurement prices were not included in the analysis.

- Data collectors had a hard time collecting all the data within the time scheduled. Teams, therefore, had to work overtime and put in extra days to meet schedules, which put a lot

of pressure on them. The huge volume of data and the problems associated with the data collection also was reflected in the data management and the timely completion of the study report.

RESULTS OF SERVICE AND PRODUCT ASSESSMENT IN HEALTH FACILITIES

Quality of Care at Private Drug Outlets

The purpose of the simulated client study was to determine whether the dispenser would recommend the appropriate treatment based on the circumstances—either an ACT for the case of simple malaria or an ACT rectal suppository and referral to a health facility for the case with vomiting. Tables 3 and 4 present a summary of key findings for the two scenarios.

Table 3. Outcome of Simulated Client Encounters without Vomiting

		Pharmacy n=20	LCS n=23	Both N=43
Dispenser asked about the symptoms of the child	Yes %	30.0	34.8	32.6
	No %	70.0	65.2	67.4
Dispenser asked about medication history	Yes %	50.0	39.1	44.2
	No %	50.0	60.9	55.8
Dispenser provided information on how to take medication	Yes %	83.3	82.6	82.9
	No %	16.7	17.4	17.1

Table 4. Outcome of Simulated Client Encounters with Vomiting

		Pharmacy n=20	LCS n=20	Both N=40
Dispenser asked about the symptoms of the child	Yes %	35.0	35.0	35.5
	No %	65.0	65.0	65.0
Dispenser asked about medication history	Yes %	60.0	35.0	65.0
	No %	40.0	65.0	52.5
Dispenser provided information on how to take medication	Yes %	85.0	100.0	92.5
	No %	15.0	0.0	7.5

In both pharmacies and LCS shops, about two-thirds of dispensers did not ask about the symptoms of the child in either scenario. Also, 60 percent or more of LCS shop attendants did not ask about medication history before recommending and issuing medications in either scenario; the situation is better in the pharmacies, where at least half of the attendants asked about medication history.

On a positive note, over 80 percent of attendants in both types of outlets and in both sceneries provided information on how to take the medications recommended and sold; however, in over 80 percent of cases, the quality of the accompanying written information was poor and not totally correct. Also, a high proportion of the medications prescribed were monotherapeutic products. For example, in the non-vomiting scenario, only 6 pharmacies (30 percent) and none of the chemical sellers recommended a combination therapy. Similarly in the vomiting scenario, none

of the LCS shops and only 35 percent of the pharmacies recommended an ACT. The rest were all monotherapeutic products or products other than antimalarials (tables 5 and 6).

Table 5. Type of treatment given for Scenario without Vomiting (%)

Type of treatment	Pharmacy n=20	Chemical sellers n=23	Both N=43
ACT	30.0	0.0	14.0
Monotherapy or inappropriate antimalarial	55.0	91.3	74.4
No antimalarial	10.0	8.7	9.3
Advised to go to hospital	5.0	0.0	2.3

Table 6. Type of Treatment Given for Scenario with Vomiting (%)

Type of treatment	Pharmacy n=20	Chemical sellers n=20	Both N=40
ACT	35.0	0.0	17.5
Monotherapy or inappropriate antimalarial	60.0	80.0	70.0
No antimalarial	5.0	15.0	10.0
Advised to go to hospital	0.0	5.0	2.5

Client Care-seeking Practices

Data collectors conducted exit interviews with 156 clients of hospitals, health center pharmacies and dispensaries, and private pharmacies and LCS to examine care-seeking practices. The distribution of clients per facility is presented in figure 1.
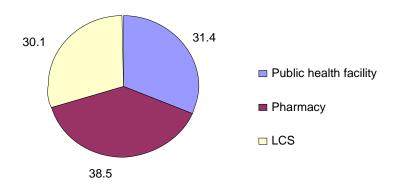

Figure 1. Percent Distribution of Facilities where Clients were Interviewed

The majority of clients interviewed walked up to five minutes (38.3 percent) or 6–10 minutes (24.6 percent) to reach the facility, suggesting that proximity is a key factor in where people seek medication. Clients indicated that they usually obtain their medicines from a pharmacy (44.6

percent) or LCS shops (32.4 percent). Only 20.9 percent indicated that they regularly access medicines at a public health facility. These data show the importance of the private sector in providing medication advice and influencing clients' decision making on health outcomes.

The majority of the clients had obtained the medication for themselves (60.7 percent) or for children under six years (15.3 percent) or another relative (12.0 percent). Clients were buying medication mainly for malaria, fever, headache, and body pains. Of the 156 clients interviewed, just over half (52.5 percent) obtained their medication based on a prescription from a health facility (47.4 percent) or health professional (5.1 percent). Close to a quarter (23.7 percent) had their medicines recommended by a drug outlet attendant. The remaining clients made their decision based on self-medication (12.2 percent) or advice from relatives (8.3 percent) and friends (3.2 percent) without receiving professional advice (figure 2). A high proportion (90 percent) of the clients obtained the medications they needed.

Figure 2. Who Recommended Medications to Clients

Malaria Treatment Practices in the Public and Private Sectors

The range of medicine obtained by clients were dominated by antimalarials comprising ACTs such as AS/AQ, AL 80/480 mg, Coartem® 20/120 mg, and Lonart® 20/120 mg, but also included AS, sulfadoxine-pyrimethamine (SP), chloroquine, and Halfan® (halofantrine hydrochloride) (tables 7 and 8). The use of ACTs was higher in health facilities, where nearly two out of three clients received them. The use of ACTs, however, tapers off at private pharmacies (43.3 percent) and chemical sellers' shops (21.3 percent), where attendants have not received education on the use of ACTs.

Of the ACTs prescribed, the proportion of use for both AQ combinations and AL combinations appear to be identical in health facilities, but the latter is very high compared to the former in pharmacies and health centers.

Table 7: Type of Antimalaria Treatment Dispensed (%)

Type of therapy	Health facility n=40	Pharmacy n=60	LCS n=47	All N=156
Combination	65.3	43.3	21.3	43.6
Monotherapy or inappropriate antimalarial	24.5	48.3	59.6	44.2
Nonantimalarial	10.2	8.3	19.1	12.2

Table 8: Combination Therapies Dispensed (%)

Combination therapies	Health facility n=33	Pharmacy n=38	LCS n=18	All N=89
AS/AQ	45.5	15.8	5.6	24.7
AL	45.5	47.4	44.4	46.1
SP	0	34.2	38.9	22.5
Chloroquine	6.1	2.6	11.1	5.6
AL + AS/AQ	3.0	0	0	1.1

Price of Medication

A significant difference in median prices was reported by clients exiting the various facilities. In general, the median price of medications obtained at the health facility (GHC 7.80) was double the price in the private pharmacies (GHC 4.41) and more than double the price in the LCS (GHC 3.10). The difference is likely due to clients from the health facilities not being able to separate the cost of medicines from other costs of treatment because they were usually combined.

Prescribing and Dispensing Analysis

A prescribing and dispensing analysis of prospective and retrospective facility records explored the quality of malaria care in health facilities. Overall, the analysis included prescribing and dispensing information for 1,931 patients; 35.5 percent were from public hospitals. All the patients' records surveyed were certified as malaria cases, of which 52.1 percent were confirmed, while others were presumptive based on symptoms of fever (16.7 percent) or persistent headache (12.3 percent). Other symptoms included general body weakness, cough, and dizziness.

The mean number of medicines prescribed per patient was 3.9 with 4.0 as the median. The mean number of medicines prescribed per patient differed by facility type: private facilities were more likely to prescribe more medicines per patient than the other facilities (table 9). Prescribing by generic name was quite high in all the facilities—81 percent of the medicines were prescribed by international nonproprietary name.

Table 9. Number of Medicines Prescribed per Patient by Facility Type

Facility type	Mean	Median
Public health center	3.37	3.00
Public hospital	3.85	4.00
Mission clinic	3.68	4.00
Mission hospital	3.84	4.00
Private clinic	4.33	4.00
Private hospital	4.20	4.00
Total	**3.93**	**4.00**

The range of antimalarials prescribed by type of facility indicates that public facilities are doing a better job of prescribing according to the existing malaria policy using combination therapy—prescribing ACTs 86.2 percent of the time (table 10). The situation in mission and private facilities (67.1 percent and 65.8 percent respectively) suggest the need for improvement. More than a quarter of prescriptions in mission and private facilities involved monotherapies.

Table 10. Type of Medicines Prescribed for Malaria by Facility

Type of facility	Nonantimalarial % n=100	Combination therapy % n=1,537	Monotherapy % n=434
Public	4.3	86.2	9.5
Mission	5.1	67.1	27.8
Private	5.2	65.8	29.0
Average	**4.8**	**74.2**	**21.0**

When dispensing combination therapies, facilities most often dispensed AS/AQ, although mission and private facilities prescribed it less often than public facilities (table 11). The use of the second-line combination of artemether- lumefantrine is also quite high. Another concern is that close to a quarter of antimalarial prescriptions observed in the private facilities included chloroquine, quinine, and other combinations such as sulfadoxine-pyrimethamine + chloroquine and artesunate + sulfadoxine-pyrimethamine.

Table 11. Combination Therapy Dispensed by Type of Facility

Antimalarial	Public % n=699	Mission % n=496	Private % n=402
AS/AQ	66.0	50.2	50.0
AL	33.3	42.9	24.6
Dihydroartemisinin piperaquine	0.1	0	2.5
Other combinations	0.6	6.9	22.9
Total	**43.8**	**31.1**	**25.2**

Availability of Antimalarials and Supplies in the Public and Private Sectors

Data collectors obtained information on availability of all regularly stocked antimalarials, including both generic and branded products, from public health centers and hospitals, mission, clinics and hospitals, private hospitals and clinics, and regional medical stores on one day. If any quantity of any dosage form of the antimalarial was in stock in the facility on the day of the visit, it was marked one (1). If the medicine was not available in stock, it was marked zero (0). The sum or total of each available antimalarial was added by type of outlet. The in-stock percentage was calculated by dividing the total number of outlets with stock by the total number of outlets and multiplying both by 100. Table 12 below provides the summary per type of facility.

The commonly used packages of AS/AQ (3×3, 6×6, 12×12) were available in all the regional medical stores, but availability was lower in public health facilities (75 percent for 12×12; 20.8 for 6×6; and 45 percent for 3×3) and mission facilities (47 percent for 12×12; 14.3 percent for 6 ×6 and 28.6 percent for 3×3) and lowest in private health facilities (no stock on hand for 12×12 and 6×6 and 7.7 percent of facilities with 3×3). Availability of AL 20/120, which is a second-line ACT, was also high at regional medical stores (77.8 percent) and available in the majority of public facilities (58.3 percent), but found in only two mission facilities and one private facility. Of significance, one RMS, one public facility, and one mission facility had chloroquine, although the existing treatment policy does not include chloroquine.

Table 12. Percentage of Facilities with Antimalarials Available

Drug name	RMS n = 9	Public hospital/ clinic n = 24	Mission hospital/ clinic n = 21	Private hospital/ clinic n = 9	Total N=67
AL 15/90 mg or 180/1080 mg (suspension)[a]	0.0	16.7	0.0	0.0	6.0
AL 160/50 mg-5 ml	44.4	20.8	23.8	0.0	20.9
AL 20/120 mg	77.8	58.3	9.5	7.7	35.8
AL 40/240 mg	55.6	29.2	28.6	23.1	31.3
AL 80/480 mg	33.3	20.8	28.6	15.4	23.9
AQ 200 mg	22.2	12.5	14.3	7.7	13.4
AQ 150 mg	0.0	0.0	9.5	7.7	4.5
AQ 50 mg/5 ml	33.3	37.5	33.3	30.8	34.3
AQ 50 mg+150 mg	0.0	8.3	0.0	0.0	3.0
Artemether 20 mg/ml	0.0	16.7	14.3	0.0	10.4
Artemether 40 mg/0.5 ml or 80 mg/ml	33.3	45.8	33.3	30.8	37.3
Artemos[a]	11.1	12.5	4.8	0.0	7.5
AS 200 mg	11.1	20.8	28.6	7.7	19.4
AS 50 mg	11.1	37.5	33.3	38.5	32.8
AS/mefloquine	0.0	0.0	4.8	0.0	1.5

Drug name	RMS n = 9	Public hospital/ clinic n = 24	Mission hospital/ clinic n = 21	Private hospital/ clinic n = 9	Total N=67
AS+SP 100 mg+500 mg/25 mg	0.0	0.0	0.0	0.0	0.0
AS/AQ 100 mg/270 mg	0.0	0.0	0.0	0.0	0.0
AS/AQ 100 mg/300 mg	0.0	0.0	0.0	7.7	1.5
AS/AQ 150 mg/50 mg-5 ml	0.0	4.2	0.0	0.0	1.5
AS/AQ 25 mg/75 mg	11.1	16.7	14.3	7.7	13.9
AS/AQ 50 mg/200 mg	0.0	0.0	9.2	7.7	4.5
AS/AQ 50 mg/153 mg, 3×3	100	45.8	28.6	7.7	40.3
AS/AQ 50 mg/153 mg, 6×6	100	20.8	14.3	0.0	25.4
AS/AQ 50 mg/150 mg	11.1	4.2	19.0	0.0	9.0
AS/AQ 50 mg/153 mg, 12×12	100	75.0	47.6	0.0	55.2
AS/AQ 200 mg/600 mg	0.0	0.0	0.0	0.0	0.0
Atovoquine/proguanil HCI 250 mg/105 mg	0.0	0.0	0.0	0.0	0.0
Atovoquine/proguanil HCI 62.5 mg/25 mg	0.0	0.0	0.0	7.7	1.5
B-artemether suspension[a]	0.0	12.5	4.8	7.7	7.5
Chloroquine 100 mg base (phosphate or sulfate	0.0	0.0	0.0	0.0	0.0
Chloroquine 150 mg base (phosphate or sulfate	11.1	4.2	0.0	0.0	3.0
Chloroquine 155 mg base (phosphate or sulfate	0.0	0.0	0.0	0.0	0.0
Chloroquine 40 mg/5 ml	0.0	0.0	4.8	0.0	1.5
Chloroquine syrup	0.0	0.0	0.0	0.0	0.0
Chlorproguanil/dapsone 80 mg/100 mg	0.0	0.0	0.0	0.0	0.0
Clindamycin	0.0	4.2	9.5	7.7	6.0
Dihydroartemisinin 20 mg or 40 mg (suspension)[a]	11.1	8.3	9.5	7.7	9.0
Dihydroartemisinin/piperaquine 40 mg/320 mg	0.0	8.3	4.8	0.0	4.5
Dihydroartemisinin/piperaquine/ trimethoprim	22.2	8.3	4.8	30.8	13.4
Doxycycline 100 mg	0.0	16.7	19.0	7.7	13.4
Mefloquine 250 mg	0.0	0.0	0.0	7.7	1.5
Primaquine 15 mg	0.0	0.0	0.0	0.0	0.0
Primaquine 7.5 mg	0.0	0.0	0.0	0.0	0.0
Proguanil 100 mg	0.0	0.0	0.0	0.0	0.0
Quinine 300 mg/ml or 600 mg/2 ml	88.9	70.8	57.1	23.1	59.7
Quinine/quinidine/cinchonine/cinchonidine tablet	88.9	58.3	52.4	38.5	56.7
Quinine/quinidine/cinchonine/cinchonidine syrup	77.8	45.8	28.6	15.4	38.8
SP 500 mg/25 mg	66.7	62.5	66.7	15.4	55.2

[a]These medicines were those that data collectors found and could not place with the original list.

RESULTS OF SUPPLY CHAIN ASSESSMENT IN HEALTH FACILITIES

The pharmaceutical supply chain assessment is based on data collected from 66 health facilities from 47 districts in the five survey regions. The assessment covered key logistics management issues such as the structure of the pharmacy/dispensary unit, staffing, product selection, product quantification, and forecasting. It also included procurement, ordering, storage capacity, stock management, and quality assurance systems. The rest covered logistics management information systems as well as monitoring and evaluation. Public health facilities represented 37.9 percent of the 66 facilities of which 6.1 percent were health centers. Mission facilities (Christian Health Association of Ghana) comprised 34.9 percent, and the remaining 27.3 percent were private outlets.

Structure of Pharmacy/Dispensary Units

All the facilities had pharmacy or dispensary units except for one small private health facility that stored and dispensed drugs in the consulting room. In addition to stock management, quantification of needs, product selection, and ordering, the facilities cited their core functions as—

- Dispensing medicines and other health products to outpatients and inpatients (100 percent)

- Providing counseling services to patients (96 percent)

- Supplying medicines and other health products to other health facilities (15.2 percent)

Other functions mentioned included producing small-scale drug formulations, providing drug information to health professionals and patients, and conducting in-service training for staff.

Cadres of staff represented in the facilities included pharmacists, dispensing technicians, dispensing assistants, and health aides; public hospitals had more skilled staff on hand, such as pharmacists. For example, 90.5 percent of public hospitals had at least one pharmacist on staff compared to 47.8 percent of mission facilities and 22.2 percent of private facilities. Table 13 below provides details.

Table 13. Category of Staff at the Pharmacy/Dispensary Units in Health Facilities

Category of staff	Type of facility (% availability)				Total n=66
	Public hospital n=21	Public clinic n=4	Mission hospital/ clinic n=23	Private hospital/ clinic n=18	
Pharmacist	90.5	25.0	47.8	22.2	53.0
Pharmacy technologist	9.5	0.0	21.7	5.6	12.1
Pharmacy technician	61.9	50.0	34.8	16.7	39.4
Dispensing assistant	57.1	25.0	43.5	55.6	50.0

Dispensing technician	19.0	0.0	26.1	5.6	16.7
Cashier	0.0	0.0	4.3	16.7	6.1
Medicine counter assistant	4.8	0.0	8.7	5.6	6.1
Pharmacy assistant	4.8	0.0	17.4	5.6	9.1
Health aide	57.1	50.0	52.2	16.7	43.9

Availability of Standard Treatment Guidelines, Antimalarial Drug Policy, and Essential Medicines List

Availability of the standard treatment guidelines was high—84.8 percent of facilities reported having copies. It was highest at public hospitals (95.2 percent) compared to the mission (82.6 percent) and private facilities (77.8 percent). Less than a third of all the facilities reported having copies of the antimalarial drug policy,[2] and only 12.3 percent of facilities had their own official policies on malaria. About 82 percent of all types of facilities reported that procurement of antimalarials at the pharmacy/dispensary units were in accordance with the antimalarial drug policy. A few others (18 percent) explained that they procured other antimalarials, such as AL, which are on the national health insurance system drug list. Some also continue to procure monotherapies such as artesunate. Some of the 12 facilities that reported procuring medicines out of accordance with policy cited their major concern as the essential medicines list not addressing local needs or demand. Others reported that some patients react negatively to some of the medicines in the standard treatment guidelines, such as artesunate and amodiaquine, or prescribers' and patients' preference for certain medications.

Average Retail Prices of ITNs and Rapid Diagnostic Tests

Information obtained from 45 facilities (68.2 percent) that carried ITNs showed a median price of GHC 2.0 and an average price of GHC 2.3; however, prices were also as high as GHC 6.5 and others were provided free of charge. Mission and private facilities quoted relative higher prices, although the difference was not significant**.** Major sources for the ITNs included the Central Medical Stores (CMS)/RMS, District Health Directorates, UNICEF, Malaria Control Programme, Plan Ghana, Agrimart, DAWA Ghana Ltd., Newmont, and Permanet. Information on the retail price for the rapid diagnostic tests was sparse because only nine facilities (14 percent) provided data. The prices ranged between GHC 0.75–GHC 5.0 with an average of GHC 2.12.

Quantification Practices

The pharmacist was most often in charge of quantifying needs for antimalarials and other essential medicines, while storekeeper/managers and supply officers were responsible for

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[2] In one private facility in the Greater Accra region, the respondent was not aware of the antimalarial drug policy.

quantifying medical supplies. The information used to quantify medicines and other medical supplies in the facilities generally did not vary much across facility types (table 14). The most often used data was dispensed-to-user (consumption) (93.9 percent), stock on hand (86.4 percent), expiry dates of stock on hand (84.8 percent), and stock-out duration (78.8 percent). Private facilities did not often use standard treatment guidelines as part of their quantification process.

Table 14. Information Facilities Used to Quantify Medicine and Supply Needs

	Facility type (% Yes)				
Information used to quantify needs	Public Hospital n=21	Public clinic n=4	Mission hospital/ clinic n=23	Private hospital/ clinic n=18	Total N=66
Dispensed-to-user data (consumption)	100.0	100.0	100.0	77.8	93.9
Stock on hand at all levels	85.7	100.0	78.3	94.4	86.4
Expiry dates of stock on hand	90.5	100.0	82.6	77.8	84.8
Stock out duration	71.4	100.0	91.3	66.7	78.8
Seasonal and regional variations in consumption	57.1	75.0	69.6	66.7	65.2
Available finances	61.9	50.0	69.6	50.0	60.6
Demographic data or disease prevalence/ morbidity	61.9	75.0	56.5	61.1	60.6
Standard treatment guidelines	57.1	75.0	69.6	38.9	57.6

In terms of tools, only a third (22) of the facilities used any electronic tool to quantify medicines and medical supplies, and facilities mentioned a number of different tools. A number of facilities had also developed their own Microsoft Excel programs for the purpose. Many of the facilities, however, carry out quantification manually because they lack computers, have broken computers, or lack funds to purchase the required software.

Almost half (46 percent) of all facilities do a quarterly quantification of needs for antimalarials and other medical supplies. A few facilities (13 percent) quantified on bimonthly basis, some on an as-needed basis, and others once a year. Generally, mission and private facilities did quantification of essential medicines, antimalarial medicines, and medical supplies more often than the public facilities. Table 15 below provides the distribution.

Table 15. Quantification period for antimalarial medicines and medical supplies

	Percentage ordering by time period			
Facility type	Weekly	Monthly	Quarterly	Other
Public hospital (n=20)	0.0	20.0	75.0	5.0
Public health clinic (n=4)	0.0	0.0	100.0	0.0
Mission hospital/clinic (n=23)	17.4	30.4	30.4	21.7
Private hospital/clinic (n=16)	25.0	43.8	18.8	12.5
All (N=63)	**12.7**	**28.6**	**46.0**	**12.7**

About 42 percent of all facilities reported having written procurement and supply plans on hand. Although public facilities were most likely to have written procurement and supply plans as shown in Figure 3.
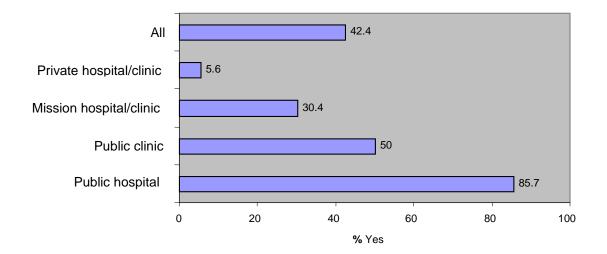

Figure 3. Percentage with Written Procurement and Supply Plan by Facility Type

Procurement Practices

The procurement processes assessment included the sources of medicinal products and the procedures facilities followed. The major sources of supply of medicines and supplies for private health facilities were private wholesalers (reported by all 16 facilities), international manufacturers (13), and private pharmacies (12). Only four private facilities reported ever having procured products (primarily antiretrovirals) through the national procurement systems (from CMS or the various RMS).

The staff members who were commonly responsible for procuring antimalarials and other essential medicines and medical supplies were pharmacists (39.4 percent), medical officers/directors (15.2 percent) and procurement officers (13.6 percent). Other staff mentioned included pharmacy technicians and dispensing assistants, administrators, supply officers, and storekeepers.

Preselection of Suppliers

Altogether, about 62 percent of the pharmacies reported having a preselection process in place for suppliers, but the practice was more commonly reported in public hospitals (76.2 percent) and private facilities (72.2 percent) than mission facilities (43.5 percent). Table 16 presents the factors that facilities reported as criteria for selecting suppliers, with product quality (50.0 percent), product prices (31.3 percent), and supplier registration (28.1 percent) reported most often.

Table 16. Criteria for Pre-selection of Suppliers

Criteria for pre-selection	% Yes (N=66)
Product quality	50.0
Prices of products	31.3
Supplier registered with relevant regulatory bodies	28.1
Past performance of supplier/capacity to perform	25.0
Product availability	18.8
Tax clearance certification	18.8
Payment terms	12.5
Supplier registered with health facility	12.5
Timeliness	9.4
Supplier's quotations	3.1

Criteria for Contract Award

The major considerations factored into awarding contracts for the supply of antimalarial medicines and other medical products included (allowing for multiple responses) the quality of the product in question (78.8 percent), the price of the product (77.3 percent) and the past performance of the suppliers (69.7 percent) (table 17). Facilities rated product quality as their primary consideration, followed by product price.

Table 17. Percentage Facilities Reporting Criteria for Contract Award

Criteria for contract award	Facility type				Total n=66
	Public hospital n=21	Public clinic n=4	Mission hospital/ clinic n=23	Private hospital/ clinic n=18	
Quality of product	100.0	50.0	60.9	83.3	78.8
Price	95.2	50.0	60.9	83.3	77.3
Performance of suppliers	90.5	50.0	56.5	66.7	69.7
Stated delivery time (lead time)	66.7	25.0	39.1	44.4	48.5
Supplier quotations	66.7	25.0	26.1	50.0	45.5
Supplier terms of payment (100% in advance, 100% after delivery)	47.6	25.0	34.8	38.9	39.9

Ordering from the Public Sector

The average distance to the CMS ranged between 30 km in the GAR region to 805 km in the UW. Facilities in the Volta region reported the longest average distance to both their respective RMS (124 km) and private wholesalers (107 km).

As figure 4 shows, most public health facilities order products monthly (42.9 percent) or quarterly (33.3 percent). A relatively high proportion of mission facilities (43.5 percent) and an overwhelming majority of private facilities (77.8 percent) order on an ad hoc basis.
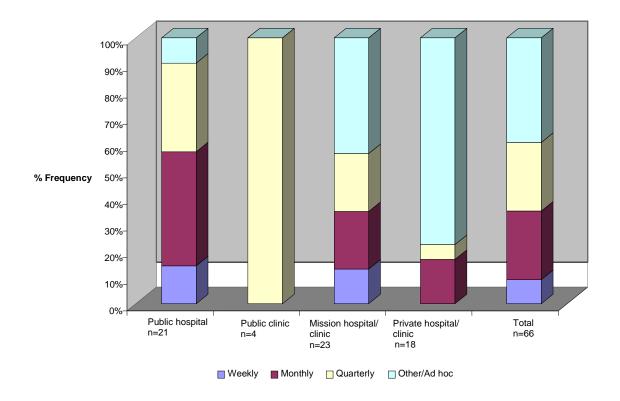

Figure 4. Frequency of Ordering by Outlets

Most of the orders (91.5 percent) from the CMS/RMS are distributed through self pick-up. Facilities reported problems in picking up ordered products from CMS/RMS because of lack of vehicles (55.3 percent), high cost of transportation (40.4 percent), and long distances to the supply source (38.3 percent). In relation to distribution, 68.1 percent of facilities indicated that they would prefer scheduled deliveries by CMS/RMS. Only nine (13.6 percent) of the facilities, however, reported having procurement systems that would allow them to adhere to CMS/RMS schedules.

Customer Complaints and Expectations about CMS/RMS

The main challenges facilities encountered in dealing with the public sector RMS were poor product availability (61.7 percent), long delays (31.9 percent), and high cost of products (27.7 percent). Other complaints included poor customer service (12.8 percent), poor product quality (10.6 percent), and long distance to the respective RMS (10.6 percent).

Facilities that do business with the public medical stores have high expectations in terms of service. Most facilities (76.6 percent) expect the medical stores to improve their product

availability to meet their needs, while nearly a third expects timely delivery of their orders. Product quality (27.7 percent) and customer service (21.3 percent) were important, but obtaining supplies on credit (6.7 percent) was less of an issue.

Ordering from Private Wholesalers/Manufacturers

With the exception of three public health facilities, nearly all facilities (95.5 percent) order supplies from private wholesalers/manufacturers, usually on a monthly or quarterly basis (figure 5). Unlike orders from the public medical stores, most of the facilities (90.2 percent) reported that they frequently receive their supplies from the private sector through direct deliveries. Overall, most facilities were satisfied with ordering supplies from private wholesalers/manufacturers.

Figure 5. Frequency of Ordering from Private Wholesalers and Manufacturers

Customers' Complaints and Expectations about Private Wholesalers/Manufacturers

Among the constraints facilities faced in dealing with private wholesalers and manufacturers were low product availability (22.7 percent), increased debt because of goods supplied on credit (19.7 percent), and abrupt increases in prices without notice, failure on the part of suppliers to deliver according to contract, and pressure to make cash payments for short credit terms for goods received.

The main service expectations customers included timely delivery of supplies (45.5 percent), product quality assurance (37.9 percent), product availability (31.8 percent), and credit or

flexible payment terms (24.2 percent). Customer service was only cited by a few (13.6 percent).

Storage

The storage conditions in the pharmacies were generally satisfactory. Most had temperature control measures, proper ventilation, protection from direct sunlight and moisture, and proper security measures. However, in 52.4 percent of public facilities and nearly 90 percent of private facility outlets, some of the products were directly stored on the floor; the situation was better for the mission facilities with about 40 percent of the facilities with having products directly on the floor. Only 26.2 percent (16) reported adequate storage capacity for forecasted quantities of medicines and medical supplies; 14 of these facilities were mission or private facilities. The detailed table is in Appendix B.

All public facilities and most mission (87 percent) and private facilities (83.3 percent) had a main storage area for all products. Most facilities also had areas for products requiring temperatures of less than 8°C. However, facilities lacked clearly defined and separated storage areas for specific stock management activities, such as quarantine and delivery (table 18).

Table 18. Availability of Clearly Defined and Separated Areas for Specified Activities

	Facility type (Yes %)				
Storage area	Public hospital (n=21)	Public clinic (n=4)	Mission hospital/ clinic (n=23)	Private hospital/ clinic (n=18)	All (N=66)
Reception of products	42.9	25.0	52.2	27.8	40.9
Quarantine of products	9.5	0.0	21.7	16.7	15.2
Storage of dangerous products	42.9	25.0	60.9	44.4	48.5
Product requiring cold chain <8°C	90.5	75.3	87.0	72.2	83.3
Main storage	100.0	100.0	87.0	83.3	90.9
Products returned from customers	23.8	25.0	26.1	0.0	18.2
Expired/damaged products	61.9	25.0	47.8	22.2	43.9
Delivery of products	9.5	0.0	26.1	22.2	18.2
Products from various partners	19.0	0.0	31.7	11.1	20.0

The cumulative results of the 12 indicators used to assess storage conditions showed that public hospitals scored higher, with an average of 77.0 percent compared to 66.7 percent in mission and 53.3 percent in private facilities, indicating that storage conditions in private facilities are generally poorer compared to their counterparts in the mission and public facilities.

Based on respondents, storage conditions in 45 (68.2 percent) of the facilities surveyed needed more capacity. In all, 88.0 percent (22) of the public facilities called for improvement compared to 52.2 percent (12) and 61.1 percent (11) of the mission and private facilities

suggesting that all the sectors require additional storage space to improve services. Apart from additional storage capacity, about half of the public and mission facilities also cited improvement needed in cold chain facilities

Stock Management

Assessment of the facilities' antimalarial stock management techniques based on nine indicators showed that the most commonly shared stock management technique was the use of first expired first out (FEFO) (used in 100 percent of public, 82.6 percent of mission, and 77.0 percent of private outlets respectively), followed by the use of stock cards (100 percent in public, 78.3 percent in mission, and 44.4 percent in private outlets respectively). When all nine indicators, including defined minimum and maximum stock levels, renewing of stock on scheduled dates, traceability of batches, and existence of "specific supports stock management tools," are cumulated, the private sector facilities average was as low as 28.3 percent and a respective proportion of 50.5 percent in public hospitals and 40.4 percent in mission facilities. The graphical representation is provided in figure 6 while the detailed distribution is in Appendix C.

Causes of Stock-outs and Expiries

The dominant causes of stock out (allowing for multiple responses) were delays in delivery of supplies (60.6 percent) and delivery of quantities which did not conform to what was ordered (60.6 percent). Only 4.8 percent of public facilities reported problems with stock control, and only a few mission and private facilities (17.4 percent and 16.7 percent respectively) noted problems with stock control. Problems associated with nonavailability of funds for orders were relatively more common in mission facilities (43.5 percent) than in public (33.3 percent) and private (22.2 percent) facilities. Transportation and insufficient staff as causes of stock-outs were more problematic in public outlets than in mission and private facilities. Other causes included changes in prescription patterns due to changes of prescribers and/or their preferences, the introduction of new prescription regimens, product unavailability, and high debt. Table 19 provides detailed results by type of outlet.

Table 19. Causes of stock-outs reported by facilities*

	Facility type				
Causes of stock-out	**Public hospital n=21**	**Public clinic n=4**	**Mission hospital/ clinic n=23**	**Private hospital/ clinic n=18**	**Total (n=66)**
Delay in delivery	66.7	75.0	60.9	50.0	60.6
Quantities delivered not in conformity with quantities ordered	81.0	100.0	65.2	22.2	60.6
Transportation not available	47.6	75.0	17.4	11.1	28.8
Funds not available for the order	33.3	0.0	43.5	22.2	31.8
Stock cards are not up to date	14.3	25.0	13.0	22.2	16.7
Minimum and maximum stock levels not regularly updated	28.6	50.0	26.1	22.2	27.3
Error in forecasts	33.3	75.0	39.1	11.1	31.8
No stock control	4.8	50.0	17.4	16.7	15.2
Insufficient staff	42.9	25.0	21.7	16.7	27.3
Unqualified staff	19.0	0.0	17.4	22.2	18.2
Other	19.0	0.0	13.0	11.1	13.6

*Multiple responses

Only 10 (15.2 percent) of the pharmacies recorded the expiration of any antimalarial products in 2007 and 2008. Mission facilities accounted for half of these facilities, while the remaining were public hospitals (3) and private facilities (2). The expired drugs included Alaxin suppository, AQ, AL, chloroquine, dapsone, halofantrine, SP, and Malafan. The main causes of expiry were cited as prescribers not complying with standard treatment guidelines (26 percent), errors in forecasts (20 percent), modifications in the standard treatment guidelines in the course of the year (16.7 percent), poor stock control (13.6 percent), and disregard of FEFO (10.6 percent).

Quality Assurance System

The facilities have adopted a number of mechanisms to ensure the quality of medicines—primarily by establishing that a product is registered by the Ghana Food and Drugs Board, which is the appropriate regulatory body. In addition, 95.2 percent of public hospitals, 83.3 percent of private facilities, and 43.5 percent of mission facilities assure that products are obtained from preselected suppliers. On average, about a third of all outlets use the WHO product prequalification mechanism. Only 18 percent of facilities, however, reported having received a visit from inspectors from the Pharmacy Council of Ghana within the last year.

Pharmaceutical Management Information Systems

About 71 percent (47) of the facilities reported having a pharmaceutical management information systems (PMIS), but the proportion was far less in private facilities (40 percent). All the responding facilities indicated that their PMIS include stock-keeping records (which include inventory control cards, bin cards, and stock registers), requisition and issue records, and stock on hand records. The facilities reported that the information system records are reconciled against physical inventory on a monthly basis (44.7 percent), quarterly (21.3 percent), or weekly (10.6 percent). The remaining 23.4 percent perform their reconciliation daily, yearly, or as needed. Thirty-five (74.5 percent) of the 47 facilities which reported having a PMIS indicated that they use the information generated to quantify medicine needs. About 91 percent (42) had information on dispenser-to-user records at the dispensing points, although the proportion was lower among public hospitals and private facilities.

The information that facilities regularly monitor includes quantities received (91.5 percent), average monthly consumption (76.6 percent), stock on hand (91.5 percent), and expiry dates (89.4). Only 22.7 percent (15) of facilities had fully automated information systems; these were mainly public hospitals and mission facilities. Another 18.2 percent had both automated and manual information systems. A little over a quarter of the facilities had software to quantify needs (27.3 percent), manage stock (28.8 percent), or manage financial information (21.2 percent). Only two facilities reported having any specific management information system specifically for antimalarial products financed by partners.

Monitoring and Evaluation

The use of performance indicators for monitoring and evaluation was very low in all types of outlets. The most commonly used M&E performance indicator was "number of stock-out days," but even that was only cited by 57.1 percent of public hospitals, 47.8 percent of mission facilities, and 16.7 percent of private facilities. Findings based on six performance indicators suggested that less than half of facilities used them (table 20). Some of the facilities, especially in the private sector, indicated that they were not required to monitor performance, while some explained that monitoring pharmaceutical indicators had become difficult due to the additional national health insurance products being stocked. Only one public hospital reported having specific monitoring indicators and tools related to antimalarial products and supported by partners.

Table 20. Monitoring and Evaluation of Performance Indicators by Facility Type

Performance indicator	Facility Type				All n=66
	Public hospital n=21	Public clinic n=4	Mission hospital/ clinic n=23	Private hospital/ clinic n=18	
Stock-out rate	42.9	75.0	39.1	11.1	34.8
Number of stock out days	57.1	25.0	47.8	16.7	40.9
% expiry	38.1	25.0	26.1	22.2	28.8
% late delivery	9.5	0.0	26.1	16.7	16.7
% products not in conformity	23.8	0.0	26.1	11.1	19.7
% incomplete delivery	4.8	0.0	26.1	11.1	13.6

RESULTS OF REGIONAL MEDICAL STORES ASSESSMENT

Data was collected from all 10 RMS in Ghana to access inventory management and warehouse requirements (including infrastructural requirements) needed to improve practices and minimize ACT stock-outs, wastages, and leakages.

Physical Condition of Stores

Many of the RMS had problems with their physical structures, most commonly roof leaks, and lack of air conditioning in the storage area. Some also complained about dirty and cracked walls, lack of loading docks, inadequate space, and poor ventilation. A detailed table is provided in Appendix D.

The stores that need upgrading made suggestions on what was needed to improve their physical condition. Many called for major refurbishment or even a new facility because of inadequate space. Four facilities also requested air conditioners. Other specific requests for regions are presented in table 21 below.

Table 21. Physical Upgrades Requested by RMS

RMS	Requests for Upgrades
ASH	• Expand the storage area/more storage space • Provide air conditioners
BA	• Provide new store—existing one was built to store colonial military wares
CR	• Expand the storage area/more storage space • Provide more shelves • Renovate the whole structure
ER	• Expand the storage area/more storage space
GAR	• Provide receiving and issuing bays • Repair roof leaks • Refurbish the whole store
NR	• Repair roof leaks • Provide air conditioners • Provide fire extinguishers
UE	• Expand the storage area/More storage space • Provide office space • Provide air conditioners
UW	• Expand the storage area/more storage space • Provide air conditioners • Expand cold chain store
VR	• Provide receiving and issuing bays • Provide a place for unserviceable items
WR	• Replace wooden doors with metal doors • Replace wooden floors with concrete

The dependability of public electricity supply to the RMS is unsatisfactory. Power outages occur frequently, with eight stores losing power about twice a month, and four regions (BA, UE, UW, WR) losing power more than once a week. Only two of the stores (UE and UW) reportedly have a back-up generator, although the one in UE is not able to power office air-conditioners and freezers. Seven of the RMS (exception of ASH, BA, UE) had access to a dependable water supply, while four (BA, CR, UE, WR) lack water holding tanks. Only four of the stores (ASH, CR, ER, and VR) had functional fire extinguishers at the time the study team visited.

Storage Space and Conditions

None of the facilities had space for additional storage or adequate storage capacity for forecasted quantities of medicines and medical supplies. The common types of storage equipment in use at the RMS included assembly trolleys, rolling step ladders, and shelves (table 22).

Table 22. Storage Equipment in Use at the RMS

Equipment	Regions with availability
Wood shelving	GAR, UE, UW
Metal shelving	ASH, BAR, CR, ER, NR, VR, WR
Metal Racks for pallets	ASH,UW
Pallet movers	ASH, NR, UE, UW
Forklift	None
Assembly trolleys	ASH, BAR, CR, ER, UE, UW, WR
Rolling step ladders	All except VR
Strapping machines	GAR
Plastic/shrink wrap machine	None

Of the equipment needed in the stores, five out of the ten stores identified a forklift as the priority piece of equipment needed. Other priority equipment identified were strapping machines, metal racks/shelves for pallets, wrapping machines, and modern security gadgets. Details by region are provided in Appendix E.

All the stores had separate storage areas for main storage and products requiring temperatures of less than 8°C. Five had clearly defined and separated areas to receive products, while another five stated that they have items packed directly from trucks or verandas in front of the stores. Only three stores (BA, UW, and WR) had clearly defined areas for quarantined products. A number of them also had areas for expired and damaged products as well as product delivery (table 23).

Table 23. Stores with Separate Areas for Selected Activities

Storage area	RMS availability
Reception of products	ASH, ER, UE, UW,WR
Quarantine of products	BA, UW, WR
Storage of dangerous products	ER, UW, WR
Product requiring cold chain <8°C	All, but insufficient in ASH, UE
Main storage	All
Products returned from customers	NR, WR, but in a poor state
Expired/damaged products	BA, CR, ER, GAR, NR, WR, but poor in NR
Delivery of products	ER, GAR, UE, UW, VR, WR
Products from various partners	ASH, CR, UW, VR, WR

The storage conditions in most stores were satisfactory. Most met standards based on study indicators. These included good security measures to control theft, proper ventilation, temperature control, as well as good product arrangement. Most stores, however, lacked adequate storage equipment and cold chain storage with temperature charts (table 24).

Table 24. Storage Conditions

Conditions of storage	RMS availability
Method in place to control temperature	All but BA, GAR
Windows can be opened or vents are available	All but BA, GAR, VR
No direct sunlight on products	All but CR, VR
Area free of moisture	All but GAR,WR
Products not stored directly on the floor	ASH, BA, NR, UE, UW
Storage equipment available	All but NR,VR
Storage equipment adequate	UW, WR
Cold chain storage with temperature chart	CR, NR, UE, UW
Products are stored systematically (e.g., alphabetically)	All but ER, NR, WR
No evidence of pests	All but GAR, UE
Doors have adequate locks with keys	All but WR
Security measures are in place to avoid burglary (i.e., guards)	All but WR

The storage conditions were scored "one" for availability and favorable conditions and zero for nonavailability. From a total score of 12 per region for all indicators, the average score was 8.8. UW was the only regional store that recorded the maximum score of 12 followed by ASH (11) and UE (10). On the basis of the indicators used, GAR and VR scored just half of the total.

Of specific storage conditions that needed improvement, 7 out of the 10 facilities rated air conditioners and improvement in ventilation their number one priority. This was followed by

the request for more space to store products and the need for more refrigerators to improve cold chain facilities.

Stock Management Techniques Used for Antimalarials

Data on antimalarial management techniques in the stores also indicated that RMS had stock cards and also released products on FEFO basis. The product batch traceability was assured in six stores. Although seven stores had defined minimum (threshold of concern), and six defined maximum stock levels, many did not specify the equivalent in months of stock. Table 25 provides the detailed distribution.

Table 25. Stock Management Techniques Used for Antimalarials in the Stores

Stock management techniques	RMS availability
Stock cards available	All
Specific stock management tools exist for products financed by partners	ER, UW
Release of products by FEFO	All
Traceability of batches assured	ASH, BA, ER, GAR, UW, VR
Minimum stock level (threshold of concern) is defined	All but BA, GAR, NR
Maximum stock levels are defined	ASH, ER, UE, UW, WR, VR
Stock replenishing done when minimum stock level is reached	All but BA, GAR, VR
Stock renewed on scheduled dates	ASH, BA, UE, NR, WR
Stock renewal based on another method	ASH, UE, UW, WR

Three RMS reported cases of expired antimalarial drugs during 2007–2008. The products involved were AQ tablets and suspension and chloroquine tablets, with quantities ranging between 26,000 and 261,000 tablets (table 26). The main causes of antimalarial product expiration were ignoring the FEFO rule, errors in forecasts, especially from the districts, poor stock control, and modification of the standard treatment guidelines.

Table 26. Expired Medicines in 2007–2008 by Region

Region	Antimalarial	Total quantity	# of packs expired	# of packs expired × cost per pack (GHC)
CR	AQ tablet	68,550	-	
UE	Chloroquine tablet 40mg	46,000	46	253
	AQ suspension	26,102	55	55
WR	AQ tablet	261,024	-	10,441

Availability of Tracer Drugs

Data obtained on availability of seven tracer drugs on the day of the visit revealed that most of the stores had in stock the common brands of AS/AQ (3×3, 6×6, 12×12) and AL 20/120 mg. The availability of AQ and dihydroartemisinin-piperaquine was, however, nonexistent

because only one or two stores had them in stock (table 27). Appendix F has details of stock-out days by RMS.

Table 27. Availability of Selected Tracer Drugs on the Day of Visit

Tracer products	RMS availability
AL 20/120 mg	All but BA, ER
AQ	CR, VR
AS/AQ 50 mg+153 mg (12x12)	All but CR
AS/AQ 50 mg+153 mg (3x3)	All but ASH, CR
AS/AQ 50 mg+153 mg (6x6)	All but ASH, CR
Dihydroartemisinin-piperaquine	CR
SP	All but UE, VR

Causes of Stock-outs

All seven tracer products were stocked out at RMS during 2008. The main causes cited included delays in the delivery by suppliers, errors in forecasts, and delivery of quantities which did not conform to what was ordered. In terms of importance, however, RMS ranked the nonconformity of products delivered to those ordered as number one, followed by delivery delays. A few stores also mentioned nonavailability of transport and lack of funds to place orders. The RMS in UE rated the high increase in demand for medicines because of the implementation of the national health insurance scheme as the major cause of stock-outs.

Information Technology

All the RMS had functional computers (1–6) but only two regions had computers with local area networks. Also, only three regions had Internet access in the stores, and the reliability of the landline services were described as poor or fair in five regions. All but two regions had official mobile telephone lines, which were described as reliable.

Quantification and Forecasting

Information obtained on sources used to quantify medicines and other medical supplies indicated that all the RMS rely on issue data for quantification. Other sources commonly used by most stores included stock on hand and stock-out duration (8 stores); the expiry dates of stock on hand and standard treatment guidelines (7 stores); available finances, demographic data or disease prevalence/morbidity, and seasonal and regional variations in treatment patterns (6 stores).

Preselection Criteria for Procurement

Seven of the RMS have pre-selection criteria for suppliers; however, the criteria varied across regions. Those shared by at least two regions were approval from Food and Drugs Board/Ghana Standards Board, following the national procurement law, following Pharmacy Council procedures, price of products, and quality of products. Other criteria cited once were business registration, social security, national insurance trust, or value-added tax certificates, tax payment clearance certificate, ability to deliver, and local supplier.

All the stores tended to use three main criteria in awarding contracts to suppliers: quality of the products, price of the products, and past performances of the suppliers. Other criteria used by most included stated delivery time (lead time), supplier terms of payment, and preference for local manufacturer.

Ordering and Distribution

Supplies from CMS

As expected, all the RMS order essential medicines and antimalarials from the CMS. Eight of the RMS reported ordering supplies from the CMS on quarterly basis, while the remaining stores order more frequently. Apart from the Northern region, all RMS indicated that they normally pick up their supplies from the CMS, although three other regions (ASH, UW, and VR) said that CMS occasionally delivered supplies to them. Seven of the RMS requested scheduled deliveries by the CMS.

RMS cited as lack of vehicles and cash flow (7 stores) as problems in picking up supplies from CMS. Other problems cited less frequently were long-distance travel (4), high cost of transportation (3), poor condition of vehicles (3), and lack of supply staff to do pick-ups (3).

Information obtained on RMS' expectations of service delivery from CMS reveals that almost all (9) expect the CMS to improve on product availability. Most also expect the CMS to improve timely delivery of supplies (7) and ensure supply of quality products (6). Interestingly, none of the stores expected to receive credit from the CMS.

Supplies from Private Wholesalers/Manufacturers

All RMS order supplies from private wholesalers/manufacturers in addition to the CMS; in most cases on quarterly basis (7), and in a few cases (3), on monthly basis or as necessary. The nearest private wholesalers patronized by RMS include Ernest Chemist (3 regions), Kinapharma, M&G Pharmaceuticals, Gokals, Eastern Chemist, Kama Pharmacy, and Cabmore Chemist. Detailed information on names and distance in kilometers to CMS and to the nearest private wholesaler per region is in Appendix G.

All ten RMS also reported that they receive supplies ordered from private wholesalers through direct deliveries by the suppliers, which is factored into the cost of the products. Only three RMS (CR, NR, and WR) reported scheduled deliveries from private wholesalers. Deliveries

were made on a quarterly basis or when the contract was awarded. The RMS expectations of private wholesalers and manufacturers were cited as timely delivery of supplies (7) and supply of quality products (4). None of the stores expected to receive drugs on credit.

RMS Deliveries to other Facilities

Five regional stores reportedly delivered to other facilities, but had no system to recoup the costs. The receiving facilities either paid for the cost of fuel or made no payments at all. Some problems encountered in the delivery service were lack of vehicles, long distance travel, and delays on the part of the facilities in submitting requisitions. Table 28 shows the status of delivery vehicles in the regions where the RMS delivered to other facilities. The condition of most of the vehicles was described as fair or functional.

Table 28. Description of Delivery Vehicles Owned by RMS

Region	Description	Age in years	Condition
	Toyota pick-up	6	Fair
ASH	Isuzu truck	8	Fair
BA	Isuzu truck	6	Fair
CR	Isuzu truck	4	Functional
ER	None available	—	—
GAR	Nissan truck (7 tons)	4	Good
NR	None available	—	—
UE	None available	—	—
UW	None available	—	—
VR	None available	—	—
	Mitsubishi truck (7 tons)	5	Functional
WR	Tata truck	2	Functional

RESULTS OF PROCUREMENT AND RETAIL PRICES OF ANTIMALARIAL MEDICINES AT HEALTH FACILITIES

To determine the public and private sector pricing policies and mark-ups, the head of the CMS and heads of wholesalers in the select regions were interviewed (table 29).

Table 29. Public and Private Sector Price Mark-ups for Medicines

Mark-ups in the public sector	International competitive bidding	National competitive bidding
CMS	20%	15%
RMS	15%	15%
Health facility	10%	10%
Total	**45%**	**40%**

Mark-ups in the private sector		
Importer		10%
Wholesaler		20%
Retailer		20–30%
Total		**50–60%**

Procurement and retail prices of antimalarials were assessed by collecting information on prices paid by wholesalers and medicine outlets or facilities visited using invoice prices (table 30). Retail prices were those charged to patients or facilities (table 31). As expected, the RMS obtained the lowest median prices for procurement and offered the lowest retail prices for most of the 14 antimalarials products. In cases where the private sector prices were the lowest, they usually involved cheaper generic brands.

Table 30. Median Procurement Prices per Pack in Cedis for 14 Antimalarials

Name of medicine	Type of Facility						
	RMS	Public hospital/ clinic	Mission hospital/ clinic	Private hospital/ clinic	Private pharmacy	LCS	Private wholesaler
AL 20/120 mg	3.20	2.98	3.40	3.30	3.30	2.80	3.75
AL 20/120 mg	3.36	4.00	3.40	3.20	3.50	3.25	—
AL 80/480 mg	3.20	3.75	3.50	3.45	3.25	3.00	4.00
Artemether 20 mg/ml	—-	0.75	0.80	0.63	0.59	1.35	—-
Artemether 300 mg/100ml	—-	2.27	1.60	1.85	1.93	2.00	3.50
Artemether 40 mg/0.5 mg or 80 mg/ml	0.88	0.90	0.90	0.90	0.90	0.85	1.30
Artesunate 50 mg	—-	2.16	2.00	2.40	2.50	2.60	1.90
AS/AQ 50 mg+153 mg (6x6)	0.50	0.84	0.37	1.70	—-	1.10	—-
AS/AQ 50 mg+153 mg (12x12)	1.50	1.90	1.98	2.70	2.18	2.00	—-

AS/AQ 50mg+153 mg (3x3)	0.90	0.39	0.31	5.48	0.90	1.54	0.60
Quinine injection	0.45	0.44	0.42	0.48	0.34	0.33	0.55
Quinine syrup [price per 100 ml]	2.32	1.70	1.57	1.23	1.50	1.00	1.90
Quinine tablet [Cost per treatment]	4.05	4.62	4.28	4.62	4.20	5.17	5.67
SP 500 mg/25 mg	0.18	0.24	0.24	0.26	0.20	0.18	0.25

Table 31. Median Retail Prices per Pack in Cedis for 14 Antimalarials per Outlet

Name of medicine	RMS	Public hospital/ clinic	Mission hospital/ clinic	Private hospital/ clinic	Private pharmacy	LCS	Private wholesaler
Artemether 20 mg/ml	0.98	2.25	1.00	2.10	0.95	1.00	—
Artemether 300 mg/100 ml	—	3.00	2.60	3.50	3.50	2.80	—
Artemether 40 mg/0.5 mg or 80 mg/ml	1.00	1.20	1.40	2.00	1.40	1.35	1.65
AL 20/120 mg	3.65	4.50	4.50	4.53	4.50	4.50	—
AL 40/240 mg	3.40	4.50	4.50	4.50	4.80	4.00	4.25
AL 80/480 mg	3.50	4.50	4.50	4.50	5.00	5.00	4.50
Artesunate 50 mg	4.05	3.66	3.12	3.50	3.50	3.25	3.35
AS/AQ 50 mg+153 mg (3x3)	1.80	0.78	1.56	3.60	3.42	0.60	1.80
AS/AQ 50 mg+153 mg (6x6)	0.59	1.20	1.08	2.00	3.00	3.50	—
AS/AQ 50 mg+153 mg (12x12)	1.68	3.00	3.40	3.50	3.60	3.00	2.00
Quinine tablet [Cost per treatment]	4.41	6.30	6.30	6.30	6.30	6.30	5.25
Quinine syrup [price per 100 ml]	2.35	2.50	2.45	1.21	2.45	2.05	2.60
Quinine injection	0.35	0.49	0.28	0.78	0.50	0.30	0.70
SP 500 mg/25 mg	0.45	0.66	0.90	1.10	1.20	1.20	0.90

Apart from the variations of AQ combinations, most of the antimalarials were distributed in branded forms. Table 32 provides the distribution of the common brands of the tracer antimalarial products that were observed on the market and the main suppliers of the branded products. The common suppliers were Tobinco, Ernest Chemist, and Kinapharma.

Table 32. Most Common Brands of 14 Tracer Antimalarial Products and Main Suppliers

Name of Drug	Most Common Brand Names	Main Supplier
Artemether 20 mg/ml	Gvither	Tobinco
Artemether 300 mg/100 ml	Gvither	Tobinco
Artemether 40 mg/0.5 mg or 80 mg/ml	Gvither	Tobinco
AL 20/120 mg	Lonart	Tobinco
AL 40/240 mg	Lonart Forte	Tobinco
AL 80/480 mg	Lonart-DS Lumether Adult	Tobinco Kinapharma
Artesunate 50 mg	Artenex Malasate-50	Kinapharma Ernest Chemist
AS/AQ 50 mg+153 mg (3x3)	Generic only	RMS
AS/AQ 50 mg+153 mg (6x6)	Generic only	RMS
AS/AQ 50 mg+153 mg (12x12)	Generic only	RMS
Quinine tablet	Quinoral Quilar	Ernest Chemist RMS
Quinine syrup	Antimal	Kama
Quinine injection	Quinineject	Ernest Chemist
SP 500 mg/25 mg	Palidar Fansidar Trafan	Phyto Riker Kinapharma Various

A summary of the median procurement and retail prices for the 14 tracer antimalarial products per outlet are presented in figures 6 to 12 below.
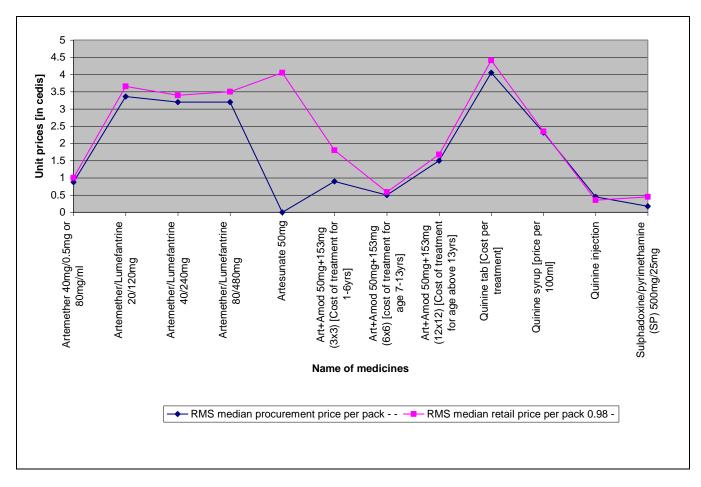
Figure 6. Median Procurement and Retail Prices for Antimalarials at RMS
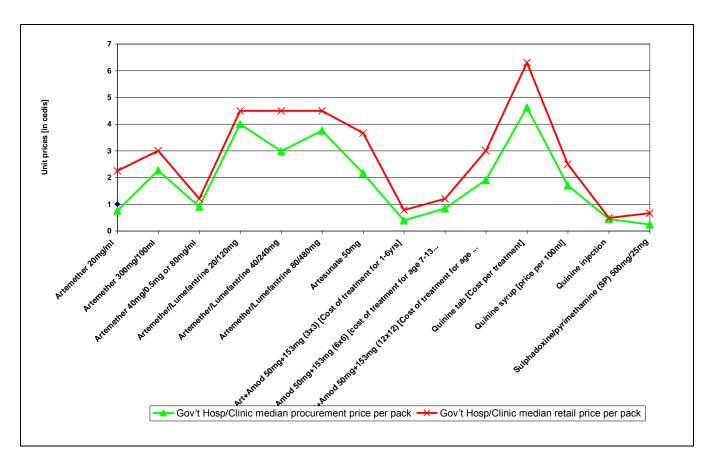
Figure 7. Median Procurement and Retail Prices of Antimalarials in Public Facilities
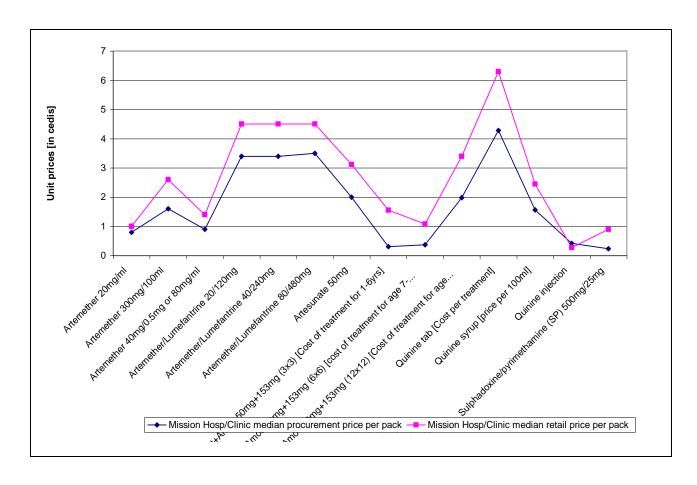
Figure 8. Median Procurement and Retail Prices for Antimalarials in Mission Facilities
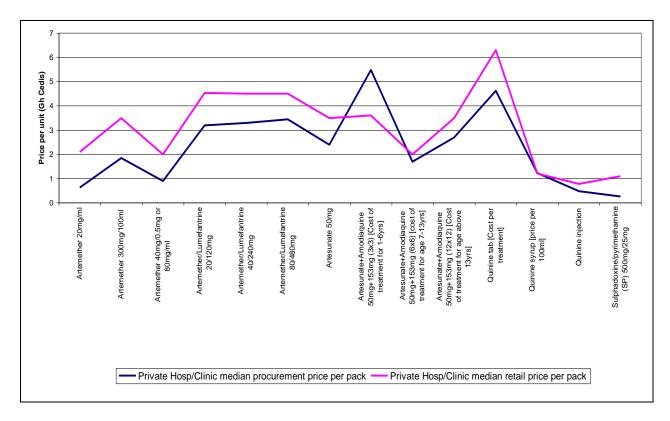
Figure 9. Median Procurement and Retail Prices for Antimalarials in Private Hospitals and Clinics
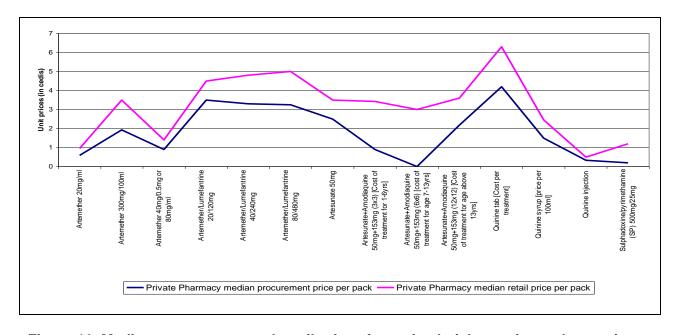

Figure 10. Median procurement and retail prices for antimalarials at private pharmacies
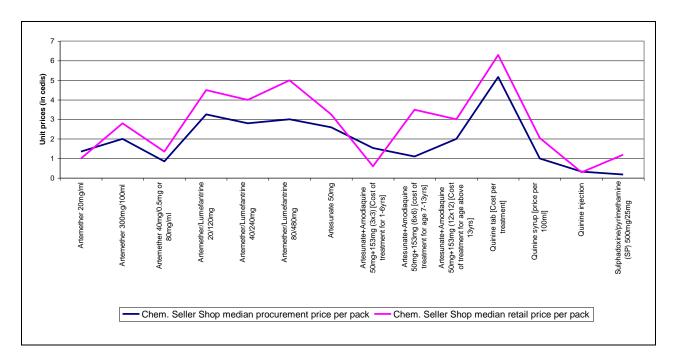
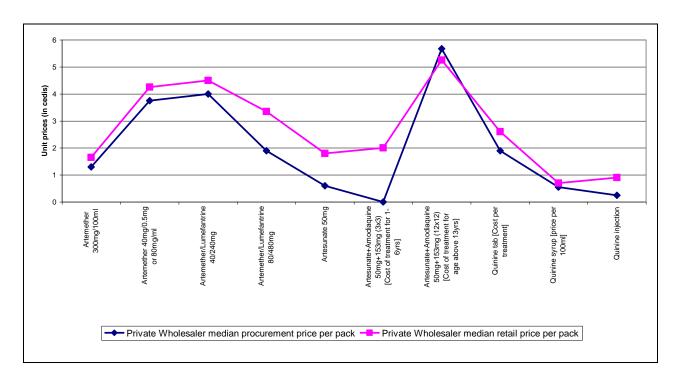**Figure 11. Median Procurement and Retail Prices for Antimalarials at LCS**

Figure 12. Median Procurement and Retail Prices for Antimalarials at Private Wholesalers

SUMMARY OF KEY FINDINGS

Access and Quality of Care of Antimalaria Medicines

The assessment findings indicate that public, mission, and private health facilities and pharmaceutical outlets have challenges in prescribing and dispensing antimalarials appropriately for uncomplicated malaria, although the quality of care is poorer in private pharmacies and LCS.

Simulated client interviews assessed prescribing procedures at pharmacies and LCS using a scenario of caregiver wanting advice regarding which medicine to give a child. Of the 43 facilities (20 pharmacies, 23 LCS) where simulated clients indicated that the child was able to take food and liquids—

- 30 percent of pharmacy dispensers and 35 percent of LCS dispensers asked clients about the child's symptoms.

- 50 percent of pharmacy dispensers and 39 percent of LCS dispensers asked clients about medication history.

- 30 percent of pharmacy dispensers and none of the LCS dispensers recommended ACT combination therapy, while 74 percent overall recommended malaria monotherapy.

- 83 percent overall provided information on how to take the medicine.

For the encounters (20 pharmacies, 20 LCS) where dispensers were told that the child could not keep food and liquids down due to vomiting—

- 35 percent of pharmacy dispensers and 35 percent of LCS dispensers asked clients about the child's symptoms.

- 50 percent of pharmacy dispensers and 39 percent of LCS dispensers asked clients about medication history.

- Only 17 percent recommended ACT combination therapy, while 70 percent recommended malaria monotherapy.

- None of the pharmacy dispensers and 5 percent of LCS dispensers advised that the patient go to the hospital.

Results show that these pharmacy outlets are not recommending appropriate treatment by following the national malaria treatment guidelines for Ghana.

Researchers conducted exit interviews to determine both access to medicines and rational prescribing and dispensing in public and private health facilities. Forty-five percent of clients got their medicines from pharmacies, 32 percent from LCS, and 21 percent from health facilities.

Over half (52 percent) of the clients interviewed obtained their medication based on a prescription from a health facility, 24 percent of the clients had their medicines recommended by a drug outlet worker, 12 percent self-medicated, and about 12 percent got advice from relatives and friends.

Findings also showed that more public health facilities (65 percent) prescribed combination therapy than pharmacies and LCS and that AS/AQ (46 percent) and AL (46 percent) were the most commonly prescribed antimalarials at health facilities. Pharmacies and LCS prescribed more AL (47 percent, 44 percent respectively) and less AS/AQ (16 percent and 6 percent respectively).The relatively high prescribing of inappropriate antimalarials by private sector facilities, such as SP sold in LCS requires intervention because the practice has negative implications on health in general.

The findings show that proximity of health facility and medicines outlets as well as people's knowledge and experience of medications are key determinants in health-seeking behavior and choice of medications they use when they have malaria. The informal supply sector is very important in people's decision making, and should receive attention to ensure rational use.

Supply Chain Practices in Public and Private Medicine Outlets

The study assessed 66 health facilities in 5 regions and 47 districts in the public, private, and mission sectors to investigate the differences in supply chain practices and to better understand how to plan interventions for these sectors.

Findings indicated that almost all facilities had a pharmacy/dispensary unit staffed by different cadres of health workers. Public sector facilities were staffed primarily by pharmacists (91 percent) compared to mission (48 percent) and private facilities (22 percent) that had pharmacists on staff.

The major supply sources for antimalarials at private facilities included private wholesalers, international manufacturers, and private pharmacies. The four most important criteria for pre-selection of suppliers reported by 65 percent of all 66 facilities included: product quality, product price, supplier registration with relevant regulatory bodies, and past performance. Quantification and order periods for all facilities varied from quarterly, monthly, to weekly.

The storage conditions at most of the facilities were satisfactory, although about 90 percent of private facilities stored medicines on the floor. Seventy-one percent of facilities reported having a pharmaceutical management information system, although the proportion of facilities was lower in the private sector (40 percent). Information regularly monitored by facilities included quantities received (92 percent), stock on hand (92 percent), expiry dates (90 percent), and average monthly consumption (77 percent).

Supply Chain Practices in Regional Medical Stores

Availability of Key ACTs

Although the three common brands of ACTs were available in most RMS, all antimalarials were stocked out at some point in the year. According to the stores themselves, the nonconformity of products shipped by suppliers versus what they ordered was the most common cause of out-of-stocks.

Physical Structure and Conditions

The data showed that almost all 10 regional medical stores are constrained by limited storage space as a result of increases in the volume of stock over the years without commensurate expansion in physical infrastructure. In addition, lack of routine maintenance has resulted in poor physical conditions at most RMS. Reported problems include roof and ceiling leaks, cracked walls, and poor ventilation. Stores lacked essential amenities such as air conditioning, ceiling fans, loading decks, and fire extinguishers.

Stock Management and Inventory Control

Despite the limited storage space and some challenging conditions, most stores were able to follow some reasonable storage and inventory control procedures. For example, all the stores separate storage of products requiring cold chain of less than 8°C from other products. Most stores maintain proper ventilation and temperature control, arrange stock well, and have put in place good security measures to control theft. Techniques to manage antimalarials in stores also appear satisfactory, with all stores using stock management cards and releasing products by FEFO; however, a third of all stores had no defined minimum and maximum stock levels. Of those that did, many did not specify the equivalent in months of stock.

Distribution

The findings here indicate that the main source of pharmaceutical supplies to the RMS is the CMS. In a few cases, the CMS distributes directly, but mostly the RMS do pick-ups, although the RMS are hampered by lack of vehicles and other transportation-related problems. All 10 RMS, however, receive ordered supplies from private wholesalers through direct deliveries. The private wholesalers build the cost of transporting the medicines into the cost of the drugs supplied or include the cost as part of service promotion.

Recommendations

The results of the rapid assessment suggest a need for strategies to improve the malaria pharmaceutical supply management and information systems in Ghana in the areas of inventory management and warehousing and antimalarial prescribing and dispensing practices, particularly in the private sector.

Although more data is needed to understand the causes and consequences of the assessment findings, the results provide a broad idea for future research and action. The following observations and recommendations are based on the results of the assessment—

- The MoH and partners need to build the knowledge and skills of pharmaceutical dispensers in private and public facilities on how to manage malaria cases appropriately, including improving their knowledge of Ghana's national malaria treatment guidelines.

- The MoH, Pharmaceutical Society of Ghana, Pharmacists' Council, LCS, and other partners need to address the poor inventory and store management system in the private sector through training to build staff capacity to support good medicine management, safety, and rational use of antimalarials. Although the new malaria policy is not yet fully implemented, the Malaria Control Programme needs to disseminate the new malaria standards and protocols widely, train health professionals in all health facilities, and monitor implementation to ensure compliance.

- Most RMS require physical refurbishment and revitalization to meet increased service needs and operations. MoH should explore cost-effective strategies to support appropriate storage and management of essential medicines at these facilities.

- The MoH, NMCP, and partners should support advocacy and social mobilization activities to educate the general public about appropriate medicines for malaria, their use, and the dangers of irrationally using ACTs.

- The MoH and Malaria Control Programme need to explore effective mechanisms for private and mission sector facilities to capture malaria case management and product data to support the national malaria information system and also to promote effective decision making for the country.

- The Food and Drugs Board needs to explore practical and cost-effective strategies to deter the private sector from importing and selling malaria monotherapies, which are not recommended for use in the country.

- In the facilities surveyed, the prices of antimalarials varied from GHC 0.43 or about 0.30 U.S. dollars (USD) to 15 GHC (USD10), which negatively affect access. The MoH, Pharmacy Council, and NMCP should explore mechanisms to standardize the pricing of recommended antimalarials . Additionally, NMCP should work closely with the private sector to increase access to the Global Fund ACTs that are available in the public sector through CMS and RMS.

APPENDIX A. LIST OF HEALTH FACILITIES VISITED BY REGION, DISTRICT, AND TYPE

Region	District	Facility	Type
Brong Ahafo	Asunafo North	Goaso Government Hospital	Public
Brong Ahafo	Asutifi South	St. Elizabeth's Hospital	Mission
Brong Ahafo	Berekum	Bre Nye Kwa Hospital	Private
Brong Ahafo	Berekum	Holy Family Hospital	Mission
Brong Ahafo	Kintampo North	Kintampo District Hospital	Public
Brong Ahafo	Sunyani Municipal	Rafchick Clinic	Private
Brong Ahafo	Sunyani Municipal	Healthlane Hospital	Private
Brong Ahafo	Sunyani Municipal	Regional hospital	Public
Brong Ahafo	Sunyani Municipal	Owusu Memorial Hospital	Private
Brong Ahafo	Tain	Tain District Hospital, Nsawkaw	Public
Brong Ahafo	Tano North	St. John of God Hospital	Mission
Brong Ahafo	Tano South	Bechem Govt Hospital	Public
Brong Ahafo	Techiman Municipal	Opoku Agyemang Hospital	Private
Brong Ahafo	Techiman Municipal	Holy Family Hospital	Mission
Central	AAK	Abura Dunkwa District Hospital	Public
Central	Agona	Ahmadiya Mission Hospital, Swedru	Mission
Central	Agona	Swedru Government Hospital	Public
Central	AOB	Our Lady of Grace Hospital	Mission
Central	Assin North	St Francis Xavier Catholic Hospital	Mission
Central	Awutu Efutu Senya	Otu Memorial Hospital	Private
Central	Awutu Efutu Senya	Justab Clinic	Private
Central	Cape Coast	Baiden Ghartey Memorial Hospital	Private
Central	Cape Coast	Central Regional Hospital, Cape Coast	Public
Central	Ewutu Efutu Senya	Klimovic Memorial Hospital	Private
Central	Gomoa West	Catholic Hospital, Apam	Mission
Central	KEEA	Elmina Urban Health Centre	Public
Central	Mfantsiman West	Prince Charles Clinic Ltd	Private
Central	THLD	Twifo Praso Govt District Hosp	Public
Central	THLD	Church of Pentecost Community Clinic	Mission
Greater Accra	Accra	Holy Trinity Medical Centre	Private
Greater Accra	Abokobi- Madina	Aipha Medical	Mission
Greater Accra	Accra	Iran Clinic	Mission

Region	District	Facility	Type
Greater Accra	Ashiaman Municipal	St Mina Clinic	Private
Greater Accra	Ayawaso	Maamobi Polyclinic	Public
Greater Accra	Dangme East	Dangme East District Hospital	Public
Greater Accra	Dangme West	Dodowa Health Centre	Public
Greater Accra	Ga South	SDA Hospital, Gbewe	Mission
Greater Accra	Lejekuku-Krowor	Manna Mission Hospital	Mission
Greater Accra	Okaikoi North	Lapaz Community Hospital	Mission
Greater Accra	Osu Klotey	Ridge Hospital	Public
Greater Accra	Osu Klotey	North Ridge Clinic	Private
Greater Accra	Tema Municipal	Port Medical Centre	Private
Greater Accra	Tema Municipal	Tema General Hospital	Public
Upper West	Jirapa-Lambusie	Hamile Health Centre	Public
Upper West	Jirapa-Lambusie	St. Joseph's Hospital	Mission
Upper West	Lawra	Lawra Hospital	Public
Upper West	Lawra	Nandom Hospital	Mission
Upper West	Nadowli	Nadowli Hospital	Public
Upper West	Sissala East	Tumu District Hospital	Public
Upper West	Sissala West	Gwollu Health Centre	Public
Upper West	Wa	Archbishop Dery Hospital	Mission
Upper West	Wa	Ahmadiyya Moslem Clinic	Mission
Upper West	Wa	Kaleo Ahmadiyya Hospital	Mission
Upper West	Wa	Islamic Hospital	Mission
Upper West	Wa	Regional Hospital	Public
Volta	Akatsi	Hoggar Clinic LTD	Private
Volta	Denu	Sape Agbo Memorial Hospital	Private
Volta	Ho Municipal	Volta Regional Hospital	Public
Volta	Hohoe	Hohoe Municipal Hospital	Public
Volta	Keta	Sacred Heart Hospital	Mission
Volta	Ketu North	St. Anthony Hospital	Mission
Volta	Ketu South	Ketu District Hospital	Public
Volta	Kpando	St Patrick Hospital Ltd	Private
Volta	Kpando	Margaret Maquart	Mission
Volta	North Tongu	Battor Catholic Hospital	Mission
Volta	South Tongu	Sogakope District Hospital	Public

APPENDIX B. PERCENTAGE OF FACILITIES WITH STORAGE CONDITIONS IN THE PHARMACY

Conditions of storage	Facility type				Total n=66
	Public hospital n=21	Public clinic n=4	Mission hospital/ clinic n=23	Private hospital/ clinic n=18	
There is a method in place to control Temperature	95.2	50.0	82.6	44.4	74.2
The windows can be opened or vents are available	76.2	75.0	87.0	72.2	78.8
No direct sunlight on products	90.5	100.0	73.9	77.8	81.8
Area is free from moisture	90.5	75.0	91.3	77.8	86.4
Products are not stored directly on the floor	47.6	75.0	60.9	11.1	43.9
Storage equipment is available	81.0	50.0	69.6	44.4	65.2
Adequate storage equipment	33.3	25.0	52.2	27.8	37.9
There is cold chain storage with temperature chart	57.1	75.0	43.5	16.7	42.4
Products are stored in a systematic way	76.2	75.0	69.6	50.0	66.7
There is no evidence of pest in the area	81.0	50.0	69.6	61.1	69.7
The doors to the store have adequate locks & keys	100.0	75.0	95.7	77.8	90.9
Security measures are in place to avoid burglary	95.2	75.0	91.3	77.8	87.9

APPENDIX C. PERCENTAGE OF FACILITIES USING STOCK MANAGEMENT TECHNIQUES USED FOR ANTIMALARIALS

Techniques of stock management	Facility type				All N=66
	Public hospital n=21	Public clinic n=4	Mission hospital/ clinic n=23	Private hospital/ clinic n=18	
Stock cards available	100.0	75.0	78.3	44.4	75.8
Specific supports stock management tools exists for products financed by the partners	19.0	25.0	13.0	5.6	13.6
Release of products is done by FEFO	100.0	100.0	82.6	77.8	87.9
Traceability of batches assured	23.8	0.0	34.8	16.7	24.2
Minimum stock level (threshold of alarm) defined	76.2	100.0	43.5	38.9	56.1
Maximum stock levels defined	81.0	100.0	47.8	16.7	53.0
The replenishing of stocks is done when the minimum stock level is reached	66.7	100.0	39.1	44.4	53.0
Stocks are renewed on scheduled dates	38.1	25.0	34.8	22.2	31.8
Renewal of stock is based on another method	0.0	0.0	30.4	16.7	15.2

APPENDIX D. PHYSICAL PROBLEMS WITH THE STORAGE FACILITIES

Storage problem	Number of facilities with problem	Facility locations and specific issue
Location	2	GAR; BA is located far from many of the districts in the region
Access road	3	Untarred in BA, UE, VR
Building condition	4	BA,GAR,VR,WR no renovation, no painting
Loading docks	4	BA,GAR,VR,WR do not have proper loading docks or forklifts
On site office space	3	ASH,CR, GAR inadequate, too small
Roof	5	No ceiling in BA; leakage in CR,GAR,NR, WR
Walls	4	Cracks in CR, GAR, NR; lack of painting in VR.
Floor	2	Dusty in GAR; wooden floor in WR
Ventilation	3	Inadequate windows in BA; very poor in GAR and VR.
Air conditioning for storage area	5	None in BA, CR, GAR, NR, VR.
Poor security	5	BA,WR, GAR no burglar proofing, wooden gates

APPENDIX E. EQUIPMENT NEEDED IN THE ORDER OF PRIORITY

Region	Priority 1	Priority 2	Priority 3	Priority 4
ASH	Trucks for distribution	Fridges/freezers	—	Forklift
BA	Plastic/Shrink wrap	Metal racks for pallets	Strapping machine	Weighing scale
CR	machine	More pallets	—	Ladders
ER	More shelves needed	Strapping machine	—	—
GAR	Forklift	Forklift	Stillage	—
NR	Stillage trolleys	Traps hand moving	trolleys/trolleys	—
UE	Forklift	Computers	—	—
UW	Forklift	—	More shelves	—
VR	Forklift	Stillage trolleys/trolleys	—	—
WR	Forklift	Modern security	Ladders	Strapping
	Metal racks for pallets	gadgets	Forklift	machine

APPENDIX F. NUMBER OF STOCK-OUT DAYS FOR SEVEN TRACER ANTIMALARIALS IN RMS

Tracer Products	ASH	BA	CR	ER	GAR	NR	UE	UW	VR	WR
Artesunate+Amodiaquine 50mg+153mg (3x3)	198	50	NS*	0	0	49	116	50	NS	NS
Artesunate+Amodiaquine 50mg+153mg (6x6)	168	93	NS	0	0	41	8	0	NS	NS
Artesunate+Amodiaquine 50mg+153mg (12x12)	0	68	NS	0	0	40	84	141	NS	NS
Artemether+lumefantrine 20/120mg	13	0	NS	NS	60	0	15	0	NS	NS
Artesunate+Amodiaquine	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Dhydroartemisin-piperaquine	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
SP	0	0	NS	0	0	0	0	24	NS	NS

*NS: Not stated

APPENDIX G. NAMES AND DISTANCE TO NEAREST WHOLESALERS

Region	Distance to CMS (Km)	Name of the nearest private wholesaler	Distance to the nearest private wholesaler (Km)
ASH	310	Kinapharma	1
BA	471	Ernest Chemist	178
CR	110	M&G (Takoradi)	90
ER	220	Eastern Chemist	1
GAR	30	Gokals	2
NR	Not stated	J.Y. Pharmacy	2
UE	Not stated	Kama Pharmacy	Not stated
UW	800	Ernest Chemist (Tamale)	Not stated
VR	160	Ernest Chemist	170
WR	260	Cabmore Chemist	1