President's Malaria Initiative/Ethiopia

Antimalarial Drug Management Program

Availability, Price, and Affordability of Artemisinin-Based Combination Therapies and Other Antimalarial Drugs in Oromia Regional State of Ethiopia: Implication on Universal Access to Malarial Treatments

June 2014

Oromia Regional Health Bureau

President's Malaria Initiative

SIAPS
Systems for Improved Access to Pharmaceuticals and Services

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The goal of the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program is to assure the availability of quality pharmaceutical products and effective pharmaceutical services to achieve desired health outcomes. Toward this end, the SIAPS result areas include improving governance, building capacity for pharmaceutical management and services, addressing information needed for decision making in the pharmaceutical sector, strengthening financing strategies and mechanisms to improve access to medicines, and increasing quality pharmaceutical services.

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ACRONYMS AND ABBREVIATIONS

ACTs	artemisinin-based combination therapies
AL	artemether-lumafentrine
AMDM	antimalarial drug management
AMDs	antimalarial drugs
AMFm	Affordable Medicines Facility-malaria
Cap	capsule
DRC	Democratic Republic of Congo
ETB	Ethiopian birr
FDRE MOH	Federal Democratic Republic of Ethiopia Ministry of Health
HAI	Health Action International
Inj	injection
IRPs	international reference prices
LPG	lowest-priced generic equivalent
MPR	median price ratio
MSH	Management Sciences for Health
NGO	nongovernmental organization
OB	originator brand
PFSA	Pharmaceuticals Fund and Supply Agency
PHEM	public health emergency management
PMI	President`s Malaria Initiative
SIAPS	Systems for Improved Access to Pharmaceuticals and Services
SNNPR	Southern Nations, Nationalities, and People's Region
Tab	tablet
USAID	United States Agency for International Development
USD	United States dollars
WHO	World Health Organization
WHO/HAI	World Health Organization/Health Action International

ETHICAL CLEARANCE

Because the survey dealt with the medicines in medicine outlets and their dispensers, no ethical issues existed related to clients' clinical confidentiality. The collected data were stored and managed to ensure that neither the medicine outlets nor the dispensers were identifiable in the research documents. Moreover, the data were not reported to or shared with any party. In addition, the respondents or dispensers had an option to decline participating in the survey. No conflict of interest existed, apart from the operational public health importance of the survey. Furthermore, an official endorsement letter was sought from the Oromia Regional Health Bureau, and written consent was acquired from the participants of the survey.

EXECUTIVE SUMMARY

Malaria is one of the major public health challenges in Ethiopia. Approximately 68% of the population (52 million people) is living in malaria-endemic areas. According to Ethiopian Public Health Emergency Management (PHEM) data, 18% of malaria cases reported in Ethiopia are in the Oromia Region. Only two other Ethiopian regions report more cases of malaria: the Southern Nations, Nationalities, and People's Region (SNNPR) (30%) and the Amhara Region (28%) (FDRE MOH 2013).

The availability, pricing, and affordability of antimalarial drugs (AMDs) are key indicators of access to malaria treatments. In Ethiopia, very few studies have been conducted about those indicators, particularly for antimalarial medicines.

Using methodology developed by the World Health Organization (WHO) and Health Action International (HAI) for measuring medicine prices, availability, and affordability, investigators collected and analyzed data from 67 medicine outlets (30 public, 30 private, and 7 nongovernmental organizations [NGOs]) in six geographical zones in the Oromia Region of Ethiopia. Data were also collected about government procurement prices for the surveyed medicines. Then prices of the medicines were compared to Management Sciences for Health (MSH) international reference prices (IRPs) to obtain median price ratios (MPRs). The salary of the lowest-paid unskilled government worker was used to evaluate the affordability of standard treatments for malaria.

Availability of AMDs

The chloroquine tablet (tab) was the most widely available antimalarial medicine, with more than 80% in all of the sectors. The availability of artemether-lumafentrine (AL), however, varied considerably, with 80%, 26.8%, and 6.7% availability at public, NGO, and private sector medicine outlets, respectively. Quinine tablet availability was 20% in public, 3.3% in private, and 57% in NGO sectors, while the availability of artesunate injections (inj) was 43% in public, 3.3% in private, and 0% in NGO sectors.

Cost of Treatment

All of the public health facilities surveyed provide AL tablets and artesunate injections free of charge to patients. Because the availability of AL and quinine tablets was remarkably low in the private sector, representative price data could not be obtained from the survey. Whereas a full course of the standard AMD treatment with the lowest-price generic drug chloroquine cost less than a day's wage for the lowest-paid unskilled government worker in the public and private sectors, quinine tablets cost nearly two days' wage in both sectors. Furthermore, when available, for a three-day course of treatment for *P. falciparum* malaria, patients have to pay about a week's wages for lowest-priced generics and two weeks' wages for originator brand AL.

Conclusion

The availability of AMDs in public health facilities is fairly good, although there is room for improvement. In the private sector, however, the availability of AL was particularly low and the price was significantly high, making the medicine unaffordable for the majority of malaria patients. In addition, many physicians who are faced with treating malaria patients are unaware of the appropriate AMD to prescribe for the various forms of malaria and for certain types of patients, such as pregnant women and children younger than 5 years old.

The Ethiopian Ministry of Health publishes *National Malaria Guidelines,* currently in its third edition (2012). Those guidelines address methods of prevention, as well as treatment options based on the type and severity of malaria. Increased distribution of the guidelines can significantly increase awareness and understanding of this disease—in particular, for health care professionals who dispense prophylactic or treatment medications. Getting the information out is the first step in arming Ethiopia to fight a winning battle against the formidable opponent, malaria.

INTRODUCTION

Malaria remains a very serious health challenge worldwide, especially in Africa. Countries in sub-Saharan Africa, including Ethiopia, bear most of the global malaria burden, with nearly 90% of global deaths. Although some encouraging efforts are taking place and consequently are reducing the malaria burden in many African countries, universal coverage and access to high-quality, effective antimalarial drugs (AMDs) and malaria treatment are far from an acceptable level. Access to malaria treatments, among other factors, is highly affected by the availability, price, and affordability of AMDs.

In Ethiopia, as part of improving access to malaria treatment and AMDs, artemisinin-based combination therapies (ACTs) are dispensed to patients free of charge at public health facilities. This effort has significantly and positively contributed to the malaria prevention and control strategies set by the country (WHO Global 2008).

Despite those encouraging progresses, evidence reveals frequent stock depletions and shortages of such drugs at the public health facilities (AMDM Ethiopia 2014). Consequently, patients often must visit the private sector for an alternative source of AMDs and malaria treatment. Studies conducted about the level of availability of those AMDs at public health facilities and prices of such medicines at private retail outlets are very limited. Furthermore, the information about providers' knowledge and their degree of adherence to the current national malaria treatment protocol and guidelines are reported to be low, particularly in the private sector.

OBJECTIVES

General Objective

The principal objective of the survey was (a) to assess the availability of ACTs and other antimalarial drugs recommended in the national malaria treatment guideline at randomly sampled Oromia zones and (b) to evaluate the affordability of such drugs to the low-income patients in those areas.

Specific Objectives

- Measure the availability of artemether-lumafentrine (AL) and other AMDs at different sector (public, private, and nongovernmental organization) outlets in Oromia Region.
- Investigate the prices of AL at private outlets in the Oromia Region.
- Determine the price of non-artemisinin-based AMDs at public and private outlets in the Oromia Region.
- Compare the prices of AMDs in different sectors of the Oromia Region with international reference prices, and discover if variations exist.
- Evaluate the affordability of AMDs for low-income people in the Oromia Region.
- Measure the level of providers` knowledge on the recommended malaria treatments at public, private, and NGO sector outlets in the Oromia Region.
- Assess the availability and use of current malaria diagnosis and treatment guidelines.

SURVEY SECTORS

Public Sector

Public Sector Procurement Prices

These are prices that the government pays to procure medicines and thus are collected centrally from the central medical stores, the Pharmaceuticals Fund and Supply Agency (PFSA).

Public Sector Patient Prices

Public sector patient prices include the cost of AMDs supplied by government health facilities—in other words, hospitals and health centers—where patients receive their AMDs. For AMDs provided to patients free of charge in the public sector, of course, only availability data were collected, although both price and availability data were collected for other medicines.

Private Sector Patient Prices

For this survey, the private sector included licensed retail pharmacies, drug stores, and rural drug vendors only. Private clinics, private hospitals, and faith-based health facilities were not included.

NGO or Other Sector Patient Prices

Data about the availability and price of medicines were collected from Ethiopian Red Cross pharmacies and Catholic Church mission clinics in the survey zones.

Survey Zones

The health facilities surveyed are from East Shoa, Bale, Jimma, West Shoa, Guji, and South West Shoa zones.

METHODOLOGY

Survey Design

The study involved a cross-sectional survey of the availability and price of ACTs and other AMDs at public, private, and NGO or "other" medicine outlets in six malaria endemic zones of the Oromia Region in Ethiopia. The survey was conducted on the basis of standardized methodology developed by the World Health Organization (WHO) and Health Action International (WHO/HAI 2008). Data about the availability and price of eight antimalarial medicines (recommended in the *National Malaria Guidelines* [Federal Democratic Republic of Ethiopia Ministry of Health (FDRE MOH) 2012]) were collected from 67 medicine outlets (30 public, 30 private, and 7 NGO) (Annex A). The median price of those medicines was compared with the Management Sciences for Health (MSH 2013) international reference prices (IRPs), which are expressed as median price ratios (MPRs). Affordability was measured as the number of days' wages required for the lowest-paid, unskilled government worker to purchase a full course of malaria treatment.

Data Sources

Data about drug availability and price on the day of the survey were collected from the medicine outlets at the public, private, and NGO medicine outlets using the medicine price collection form developed by WHO/HAI. In addition, a structured questionnaire was used to collect data about the availability of malaria treatment guidelines and providers' knowledge of current malaria treatment protocol at the sampled medicine outlets. Government AMDs' procurement prices were also collected from the PFSA.

Data Entry and Analysis

The WHO/HAI 2008 International Medicines Price Workbook was used to enter, edit, and analyze the quantitative data collected from the medicine outlets. The availability data of individual antimalarial medicines entered from the different sector medicine outlets were analyzed separately and reported as the percentage of medicine outlets in which the medicine was found on the day of data collection. Mean (average) availability is also reported for the overall group of AMDs surveyed. The availability data refers only to the day of data collection at each particular facility and may not reflect average monthly or yearly availability of medicines at individual facilities.

For the data to facilitate international comparisons, medicine prices found during the survey are expressed as ratios relative to a standard set of international reference prices, which are known as the MPR for four or more medicines (WHO/HAI 2008) that are identified for each antimalarial. Otherwise, the mean was calculated.

$$\text{MPR} = \frac{\text{median local unit price}}{\text{international reference unit price}}$$

The ratio is thus an expression of how much greater or less the local AMD price is than the IRP. The IRPs used were the 2012 reference prices taken from the *International Drug Price Indicator Guide* (MSH 2013). The exchange rate used to calculate MPRs was 1 USD (United States dollar) = 18.9571 ETB (Ethiopian birr), which was the commercial "buying" rate on the first day of data collection taken from the website of the Commercial Bank of Ethiopia (www.combanketh.et/More/CurrencyRate.aspx).

Price results are presented for individual medicines, as well as for the total antimalarial medicines surveyed. Summary results for the group of AMDs provide a reasonable representation of medicines recommended in the *National Malaria Guidelines* of Ethiopia and price conditions on the market. Because averages can be skewed by outlying values, median values have been used in the price analysis as a better representation of the midpoint value. The magnitude of price and availability variations is presented as the interquartile range between the 25th and 75th percentiles.

Finally, the affordability of malaria treatment was assessed by comparing the total cost of AMDs prescribed at a standard dose to the daily wage of the lowest paid unskilled government worker in Ethiopia at the time of the survey, which was ETB 420, or ETB 14 (approximately USD 0.74) per day. (www.wageindicator.org/main/salary/minimum-wage/ethiopia/ethiopia-minimum-wages). According to the WHO, a course of treatment that costs the equivalent of one day's salary of the lowest-paid government worker is generally considered affordable; treatments that cost more than that amount are classified as unaffordable (WHO 2011).

RESULTS

Availability of Antimalarial Medicines

For all medicines surveyed, the overall availability at all sectors was found to be extremely low. The availability at public sector outlets of the lowest priced generic (LPG) and the originator brand (OB) of AMDs was just under 22% and 16%, respectively. Similarly, the availability at private sector outlets of LPGs was less than 13%, and availability of OBs was less than 1%, while availability in the NGO (or other) sector was less than 4% for OB and less than 24% for LPGs (figure 1).

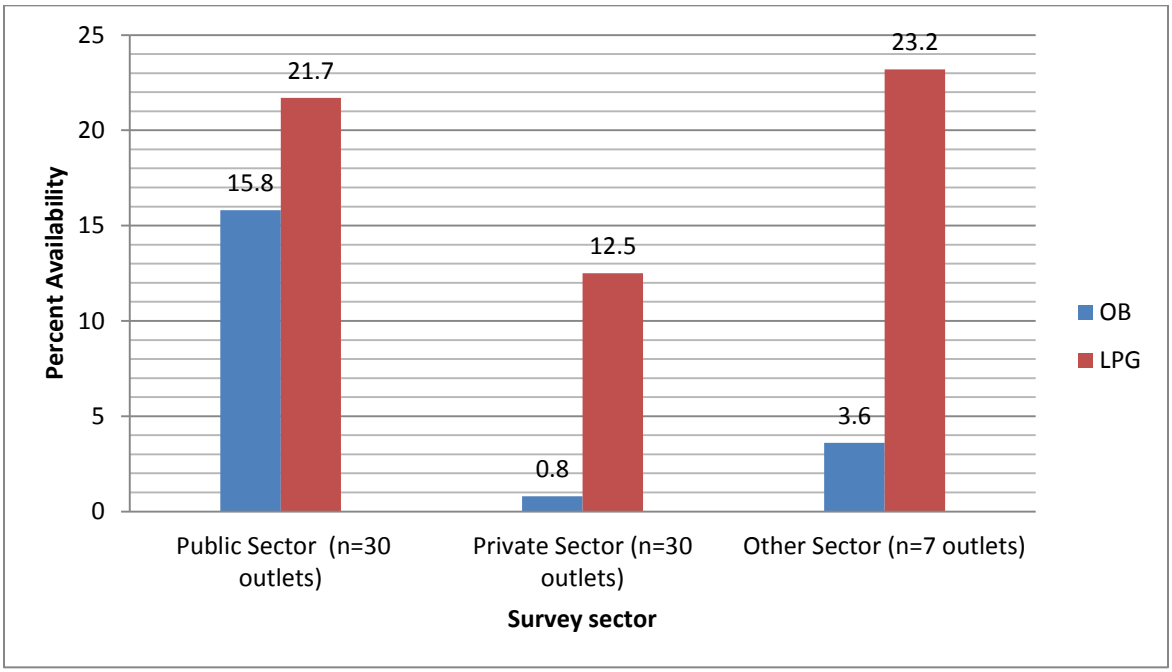

Figure 1. Mean availability of medicines on the day of data collection at public, private, and other sectors (expressed as a percentage of outlets having AMDs in stock)

When analysis is limited to AMDs only for treatment of malaria, not for prophylaxis, the mean availability increases to 21% and nearly 35% at the public sector outlets, to 1.3% and 20% at the private sector, and to 5.7% and 37% at the NGO sector for OB and LPG, respectively (figure 2).

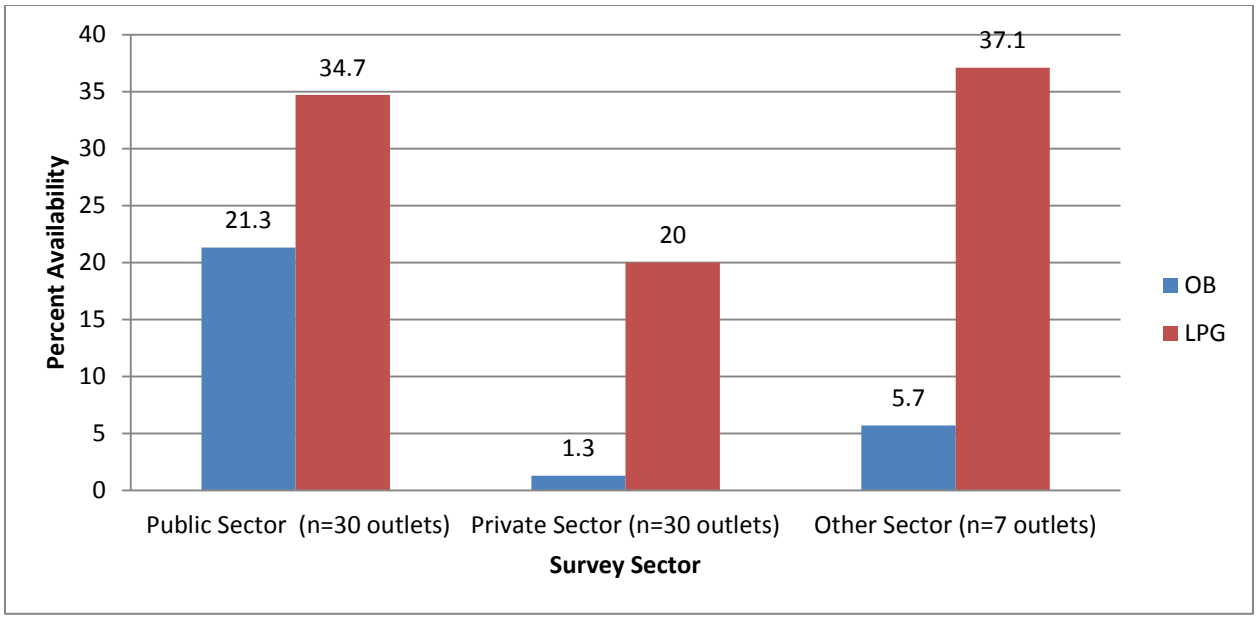

Figure 2. Mean availability of AMDs (excluding AMDs for preventive treatment) per survey sector

Across sectors, the public sector had the highest relative availability of AMDs, and generics were the predominant product type available in all sectors. Regarding the availability of individual AMDs, chloroquine was the most widely available, with mean availability of 80% and more in all sectors. The average availability of AL varied significantly, with 80% at the public sector, 26.8% at the NGO sector, and 6.7% (the least) at the private sector outlets. The quinine tablet was available only at 20%, 57%, and 3.3% levels at the public, NGO, and private sector outlets, respectively. The availability of artesunate injection was similarly so low that it was available at less than half (43%) of the public health, only 3.3% of the private sector, and none of the NGO medicine outlets. The overall availability of the quinine injection, a second line treatement option for treatment of severe malariam, is very low at all sectors—public (18%), at private (3%) and at other (43%). In addition, premaquine tablets, which are recommended for radical cure of *P. vivax* malaria after treatement with chloroquine, was available only at public sector (20%) but none at private and other sectors.

Medicines such as mefloquine and atovaquone-proguanil, which are recommended to be used as antimalarial chemoprophylaxes in Ethiopia (FDRE MOH 2012), were not available in all medicine outlets in the public, private, and NGO (or other) sectors or at the government procurement agency (figure 3).

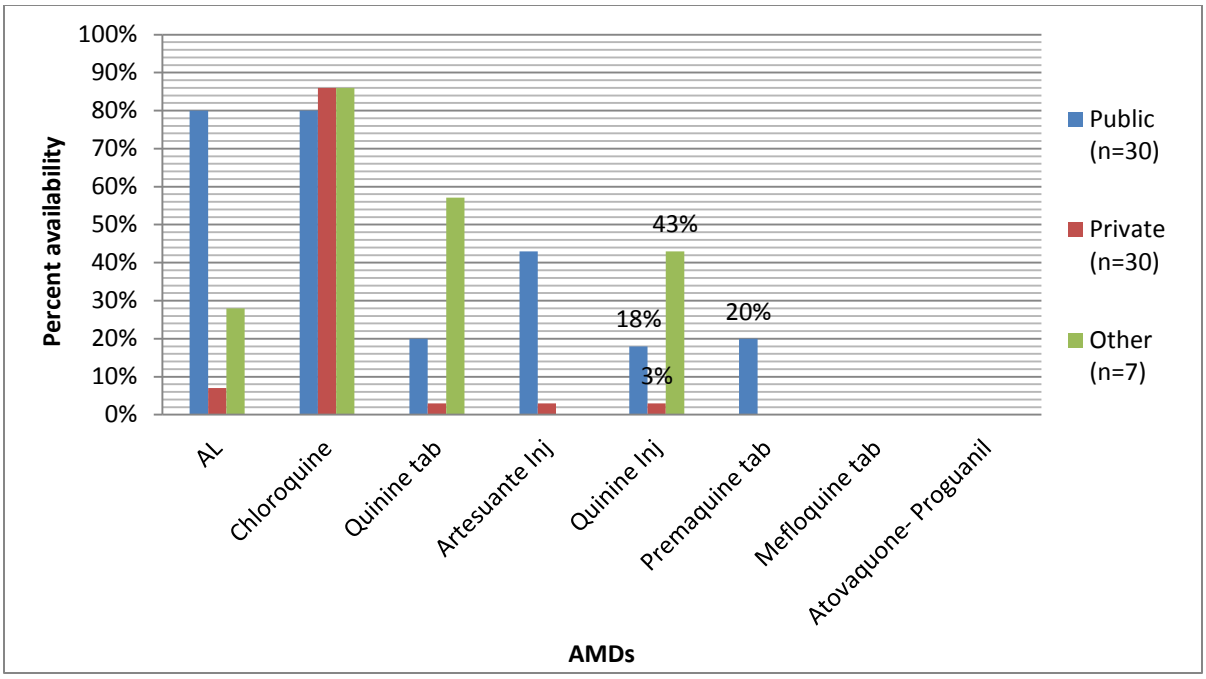

Figure 3. Overall percentage availability of individual AMDs on the day of survey at public, private, and other sectors

The general availability of OB products in all sectors was low with the exception of the AL Coartem (63%) and the artesunate injection Artesun (43%) (table 1). Even though this lack may not be a problem because high-quality generics are adequately available, it calls for strengthening registration and quality control activities of the generic products circulating in the market to ensure their quality and efficacy and, consequently, the safety of patients.

Table 1. Comparative Availability of Individual LPG and OB AMDs on the Day of Survey at Public, Private, and Other Sectors

	Public (n=30)		Private (n=30)		Other (n=7)	
	OB (%)	LPG (%)	OB (%)	LPG (%)	OB (%)	LPG (%)
AL	63.3	56.7	6.7	3.3	28.6	0.0
Chloroquine	0.0	80.0	0.0	86.7	0.0	85.7
Quinine sulfate	0.0	20.0	0.0	3.3	0.0	57.1
Quinine inj	0.0	16.7	0.0	3.3	0.0	42.9
Artesunate inj	43.3	0.0	0.0	3.3	0.0	0.0
Mefloquine	0.0	0.0	0.0	0.0	0.0	0.0
Atovaquone-Proguanil	0.0	0.0	0.0	0.0	0.0	0.0
Primaquine	20.0	0.0	0.0	0.0	0.0	0.0

Antimalarial Medicine Prices

Public Sector Prices

Public Sector Procurement Prices

Five (all generic) of the eight AMDs included in the survey were acquired by the national procurement agency, indicating that the public sector procurement agency is acquiring generic products exclusively. According to the MPRs, the public sector is procuring generics at nearly 1.2 times their international reference prices. Thus, the government procurement agency is purchasing fairly efficiently. However, the interquartile range (25th percentile MPR=1 and to 75th percentile MPR=2.04) shows substantial variation in MPRs across individual medicines; this finding calls for further investigation to identify the determinants of those variations in purchasing efficiency.

Table 2. Public Sector Procurement: MPR for All AMDs Found

Product Type	Median MPR	25th Percentile MPR	75th Percentile MPR
OB (n=0 medicines)	0	0	0
LPG (n=5 medicines)	1.18	1	2.04

Annex D contains procurement prices for individual medicines. Most of the generic medicines being purchased are at prices approximately equal to international prices, including chloroquine (MPR=1.01) and quinine sulfate (MPR=0.99). Conversely, medicines for which the government is paying more than the international reference price include quinine dihydrochloride (MPR=1.36) and AL (MPR=4.08).

Public Sector Patient Prices

Overall, most of the public health facilities surveyed provide AMDs free of charge to patients (figure 4). According to the responses of dispensers at the public health facilities, all of them provide free AL tablets and artesunate injections, while just over 50% dispense free chloroquine to treat *P. vivax* cases. Surprisingly enough, although less than 20% of the health facilities dispense free quinine tablets, the rest (80%) charge patients for quinine tablets, and all other facilities charge patients for quinine injections—when those injections are available.

The median price (median AMD unit price in local currency, ETB) for one chloroquine tablet is ETB 0.26, while a single quinine tablet and one ampoule of quinine injection cost ETB 2.01 and ETB 10.81, respectively.

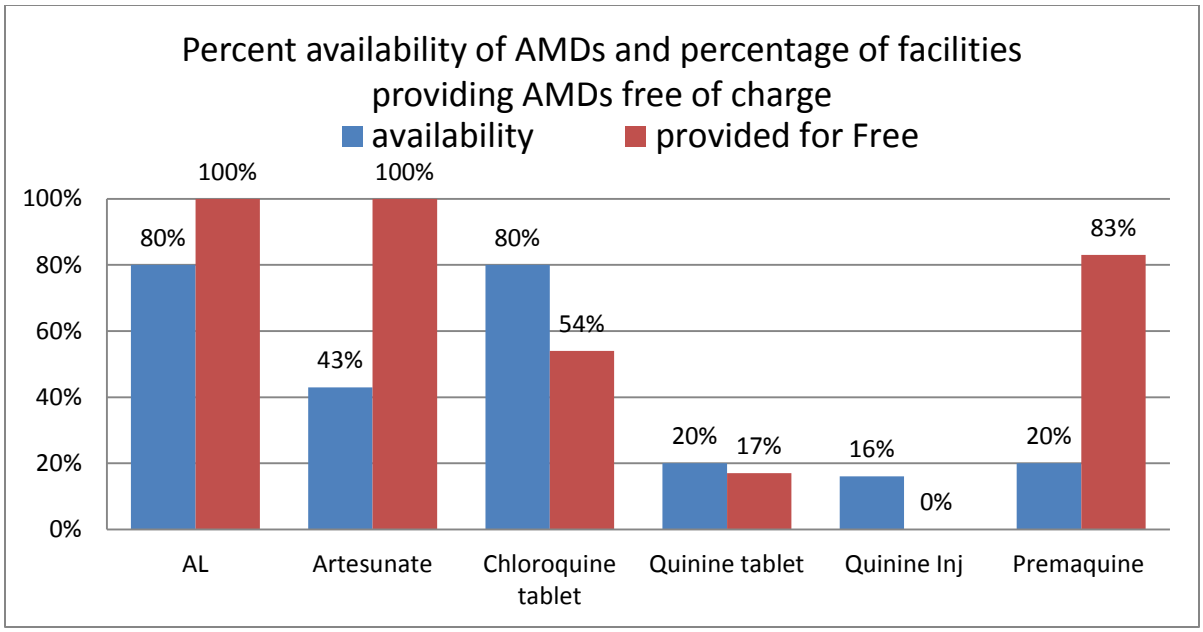

Figure 4. Percentages of AMD availability and public health facilities providing AMDs free of charge

Because both the originator brand and the lowest-price generic AL tablets and artesunate injections found in the public medicine outlets are given to patients free of charge, the price of those medicines paid by patients compared to the international reference prices need not be determined in this sector. However, LPG antimalarials that are provided at a price are generally sold at nearly two times their international reference prices. Half of the LPG antimalarial medicines were priced at 1.56 to 2.93 times their international reference price, indicating substantial variation in MPRs across individual generic medicines in the public sector (table 3).

The price ratios for LPG antimalarials showed considerable variability across the 30 public medicine outlets included in the survey, with substantial differences between the maximum MPR being more than twice that of the minimum MPR, which therefore shows that some of the outlets charge far higher prices than others. For example, the minimum MPR for chloroquine tablet is only 0.24, while the maximum is far higher with an MPR of 3.92. The MPR for chloroquine is 1.27, showing that the price patients pay to get chloroquine tablets in the Oromia Region is more than the international reference prices for the lowest-price generic equivalents. Similarly, the minimum MPR for quinine injection is 1.30, while its maximum MPR is more than three times higher at 4.46 and higher than the overall MPR of 1.84 (just under twice its international reference prices) (table 3).

Table 3. Public Sector Patient Prices: MPR for All AMDs Found

Product Type	Median MPR	25th Percentile	75th Percentile	Minimum MPR	Maximum MPR
Originator brand (n=3 medicines)	-	-	-	-	-
Lowest-price generic (n=3 medicines)	**1.84**	**1.56**	**2.93**	**1.27**	**4.02**

Private Sector Patient Prices

The only lowest-price generic antimalarial drug found in private sector outlets was chloroquine tablets. Similar to findings for the public sector, chloroquine tablets were generally sold at nearly two times their international reference price. Half of the lowest-priced generic chloroquine tablets were priced at 1.71 (25th percentile) to 1.96 (75th percentile) times their international reference price, showing some variation in MPRs across individual generic chloroquine tablets in this sector. However, the range (1.96) between the minimum (1.47) and the maximum (3.43) MPR is significant and is approximately twice the minimum MPR (1.47) (table 4), showing that some private medicine outlets charge higher prices than others.

Table 4. Private Sector Patient Prices: MPR for All AMDs Found

Product Type	Median MPR	25th Percentile	75th Percentile	Minimum MPR	Maximum MPR	Median Price
Originator brand (n=0 medicines)	-	-	-	-	-	-
Lowest-price generic (n=1 medicine, chloroquine)	1.96	1.71	1.96	1.47	3.43	0.4

The availability of other AMDs, such as AL and quinine tablets, in the private sector is so remarkably low that representative price data were not obtained from the survey. However, where available (at only 2 of the 30 private medicine outlets), the prices of AL were immensely high (ETB 88) for the lowest-priced generic and between ETB 96 and ETB 199 for the originator brand (Coartem) for a full adult dose.

Table 5. Comparison of the Prices of Originator Brands and Generically Equivalent Products: Median MPRs for Medicines Found as Both Product Types

Type (n=8 medicines)	Median MPR	25th Percentile	75th Percentile
Originator brand	-	-	-
Lowest-price generic	1.96	1.71	1.96

As shown in table 5, there was no antimalarial for which both the originator brand and a generically equivalent product were found to include in the analysis to allow for the comparison of prices between the two product types in all sectors. Hence, it is not known how much the originator brands cost compared to their generic equivalents in each of the sectors.

NGO or Other Sector Patient Prices

The lowest-price generic antimalarial found in more than four NGO medicine outlets used for summary of medicine-specific MPRs were chloroquine and quinine tablets. The overall price of those medicines compared to their international equivalents is higher by more than 50% (table 6).

Table 6. Summary Comparisons to Reference Prices and Percent Availability in NGO Outlets

Medicine Name	Medicine Type	MPR	25th Percentile	75th Percentile	Min.	Max.	% with Med.	Median Price
Chloroquine		1.40	1.37	1.52	1.22	2.45	85.7%	0.29
Quinine sulfate	LPG	1.87	1.56	1.92	0.72	1.95	57.1%	2.10

Chloroquine tablets were generally sold at nearly 1.5 times their international reference price table 7). The range between the minimum (1.22) and maximum (2.45) is more than 2, showing significant variation between the prices patients have to pay to get chloroquine at NGO sectors. Similar to data from the private and public sectors, quinine tablets were sold at nearly two times their international reference price at the Red Cross Pharmacies and Catholic Missionary Clinics surveyed.

Table 7. NGO Sector Patient Prices: MPR for All AMDs Found

Product Type	Median MPR	25th Percentile	75th Percentile	Minimum MPR	Maximum MPR
Originator brand (n = 2 medicines)	-	-	-	-	-
Lowest-price generic (n = 2 medicines, chloroquine)	1.63	1.51	1.75	1.4	1.87

Comparison of Patient Prices in Public and Private Sectors

Only those medicines (LPG chloroquine tablets) found in both public and private sector medicine outlets were included in the analysis to allow the comparison of prices between the sectors. The results, shown in table 8 and figure 5, show that final patient prices in the private sector are 53.8% higher than in the public sector for LPG chloroquine tablets. Given that, overall, 20% of the public health facilities sampled are out of stock of this medicine, it is reasonable to assume that patients are paying substantially higher prices to purchase these medicines from the private sector.

Table 8. Median MPRs for AMDs Found in Both Public and Private Sectors

Product Type	Public Sector Patient Prices	Private Sector Patient Prices	Percentage of Difference
Originator brand (n = 0 medicines)	-	-	-
Lowest-price generic (n = 1 medicine)	1.25	1.92	53.8%

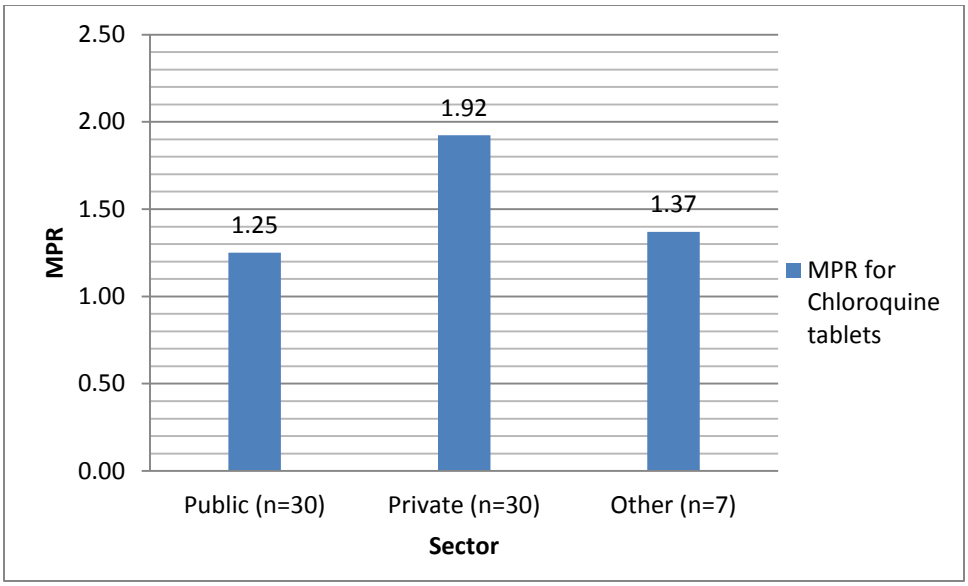

Figure 5. MPRs for LPG chloroquine tablets in the public, private, and other sectors

Affordability of Standard Treatment Regimens

The affordability of treatment of malaria was estimated as the number of days' wages that the lowest-paid, unskilled government worker needed to purchase antimalarial medicines prescribed at a standard dose in the *National Malaria Guidelines*, 3rd edition (FDRE MOH 2012). In Ethiopia, the daily wage of the lowest-paid, unskilled government worker used in the analysis was ETB 14 (USD 0.734), which is equivalent to ETB 420 (US 22) per month (en.wikipedia.org/wiki/List_of_minimum_wages_by_country).

In the public sector, AL tablets and artesunate injections were provided free to patients when prescribed. However, 20% of the surveyed facilities were out of stock of AL, and patients have to visit the private sector to buy the medicine. Conversely, the cost of LPG chloroquine used for treating uncomplicated *P. vivax* in the public sector was reasonable, with the full dose of the standard treatment costing less than a day's wage for the lowest-paid, unskilled government worker. However, AMDs costing more than a day's wage of the lowest-paid government worker in the public sector include quinine tablets (1.9 days' wage) and quinine injections (1.3 days' wage) (table 9 and figures 6 and 7).

Table 9. Number of Days' Wages of the Lowest-Paid Government Worker Needed to Purchase Standard Treatments

	Public Sector		Private Sector		NGO Sector	
	LPG	OB	LPG	OB	LPG	OB
AL, tab	Free	Free	6.2 (n=1/30)	6.85 to 13.7 (n=2/30)	Free	Free
Chloroquine, tab	0.2	NA	0.3	NA	0.2	NA
Quinine sulfate, tab	1.9		NA		1.9	
Quinine dihydrochloride, inj	1.3				NA	
Artesunate, inj	Free					

*NA, not available

In the private sector, the cost of lowest-price generic chloroquine tablets was also reasonable, such as at the public facilities for treatment of uncomplicated *P. vivax* malaria, with standard treatment costing less than a day's wage. Contrary to this, however, the availability of AL tablets (the first-line treatment for uncomplicated *P. falciparum*) was significantly limited at private medicine outlets, and prices were extremely high, making them unaffordable to patients even when available. The LPG and OB treatments cost more than 6 and up to 13 days' wages, respectively, for the lowest-paid, unskilled government worker in the limited outlets where they were found. This result also indicates that when originator brand medicines are prescribed and dispensed for *P. falciparum* in the private sector, malaria treatments cost more than twice that of the generic counterparts.

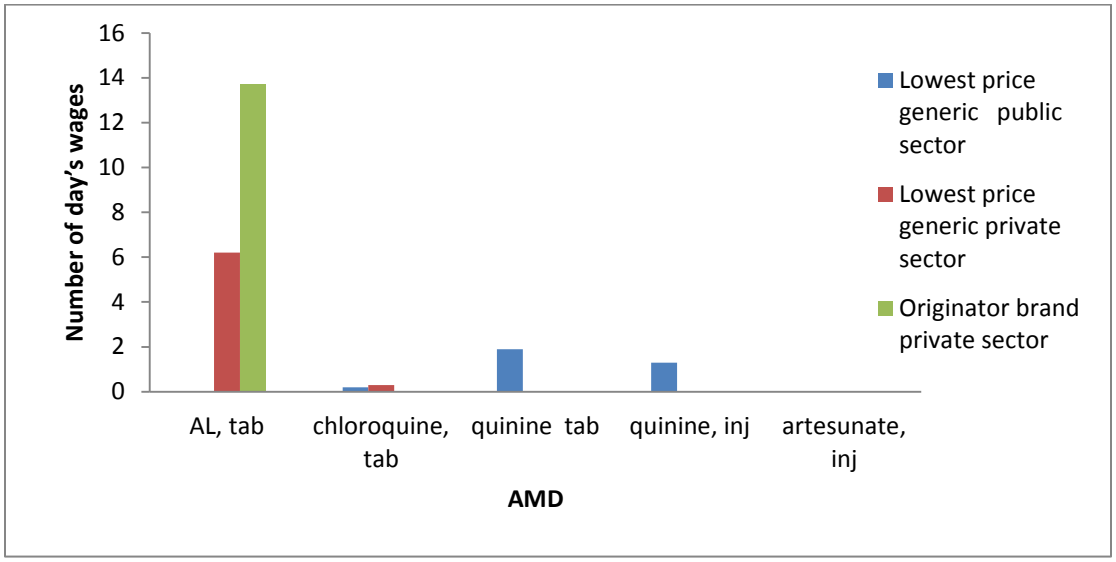

Figure 6. Number of days' wages of the lowest-paid government worker needed to purchase standard treatments

NB. Although available in only 2 of 30 medicine outlets, the originator brand Coartem, which is found in private medicine outlets, was similar to that of the public health facilities, indicating leakage from public facilities to the private sector.

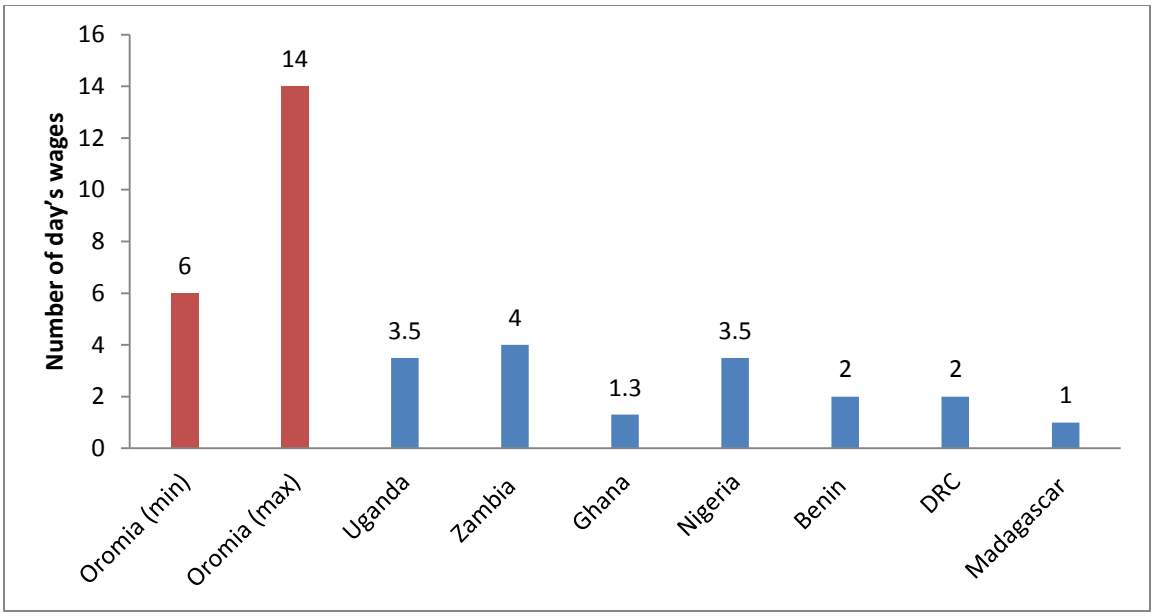

Figure 7. Comparative number of days' wages a patient needs to pay to get a standard treatment of malaria with AL in the private sector in Oromia Region and other African countries

Availability of the National Malaria Treatment Guidelines

Guidelines are systematically developed statements to help practitioners or prescribers make decisions about appropriate treatments for specific malaria conditions, and they are potentially powerful tools to ensure consistent and high-quality clinical care. Guidelines also support the obtaining of adequate financing during the selection, quantification, and procurement of antimalarial medicines at all levels. Therefore, if one is to ensure the rational use of AMDs and other essential medicines, it is vital to supply the health facilities and medicine outlets with adequate copies of the *National Malaria Guidelines* and to promote its adherence to support the prescribing and dispensing of the antimalarial medicines to patients.

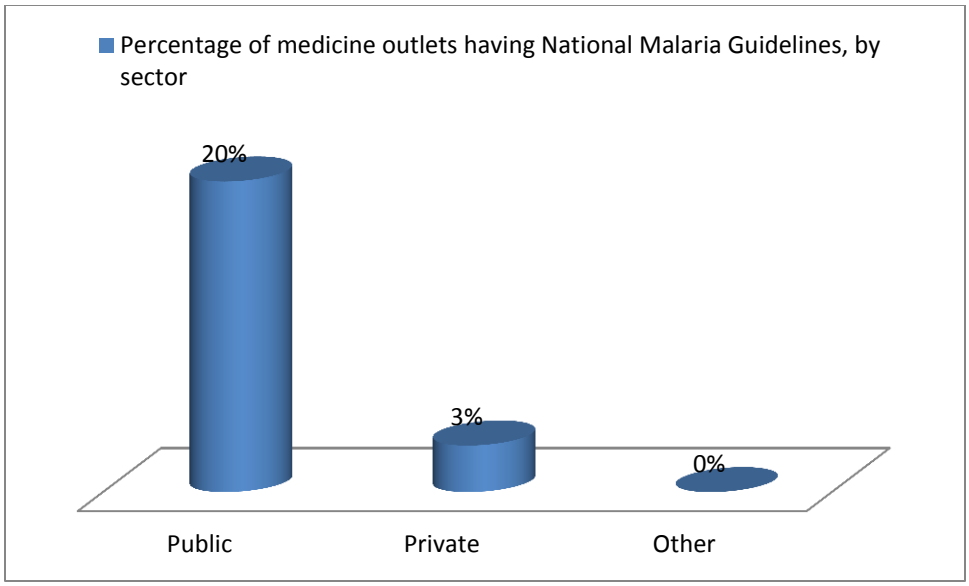

Figure 8. National malaria guidelines availability, by sector

According to the results of this survey, the percentage of medicine outlets having and using the current national malaria treatment guidelines in all sectors is shockingly low, with only 20% at public, 3% at private, and 0% at NGO (other) medicine outlets (figure 8). This finding clearly indicates the need for immediate distribution of the guidelines and promotion of their adherence in all sectors.

Providers' Knowledge of the Current Malaria Treatment Guidelines

Providers' knowledge of the first-line treatment was significantly higher in the public sector than in the private and NGO sectors: 64% of the medicine dispensers in the public sector could correctly state the first-line treatment, compared with 50% and 49% in the private and NGO sectors, respectively (Annex J) The overall percentage of knowledge is higher when the indicator for prophylaxis is excluded from the analysis (74% in public, 58% in private, and 57% in NGO sectors).

The percentage of medicine dispensers who were able to correctly state the recommended first-line treatment for treating severe malaria was significantly low in all sectors, ranging from 50% at public health facilities and approximately 15% in the NGO sector. Only 30% of dispensers at the private sector medicine outlets know that artesunate is the first-line treatment for the severe form of malaria according to the current national malaria treatment guidelines (figure 9).

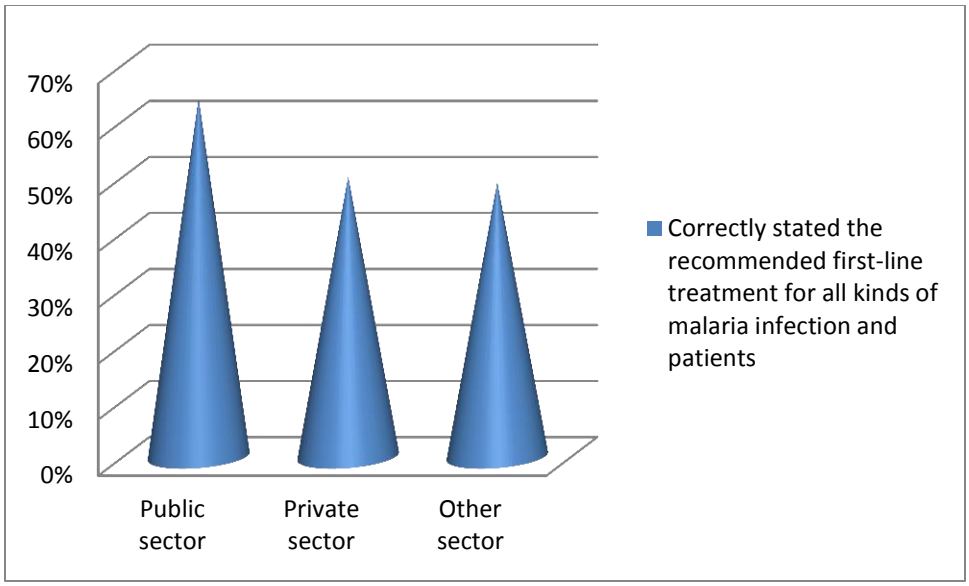

Figure 9. Overall providers' knowledge of the national malaria treatment guidelines, by sector

According to the current guidelines (FDRE MOH 2012), mefloquine and atovaquone-proguanil are the recommended chemoprophylactic antimalarial drugs in Ethiopia. Nevertheless, not only were those drugs not found in any of the medicine outlets in all sectors, but also a very limited number of dispensers (23% in public, 17% in private, and 3% in NGO sectors) have awareness of their indications and recommendations in the guidelines (table 10).

Table 10. Provider Knowledge of First-Line Treatment and Dosing Regimens, by Sector

Indicators (correctly stated the recommeded first-line treatment for)	Public Sector	Private Sector	NGO or Other Sector
Uncomplicated *P.vivax* malaria	86.70%	73.30%	57.10%
Uncomplicated *P. falciparum* malaria	90.00%	63.30%	71.40%
Uncomplicated *P. falciparum* malaria for pregnant women in their first trimester and children <5 kg	70.00%	66.70%	85.70%
Severe malaria	50.00%	30.00%	14.30%
Malaria prevention or prophylaxis	23.30%	16.60%	14.30%

DISCUSSION

The cross-sectional survey, which was carried out in 67 medicine outlets from public, private, and NGO sectors in six zones of Oromia Region, revealed various important information about the availability, pricing, and affordability of eight antimalarial medicines recommended in the national malaria treatment guidelines of Ethiopia.

In the public sector, the average availability of both the originator brand Coartem and the lowest-price generics AL and chloroquine were encouraging, with 80% for both. However, the mean availability across all the lowest-price generic antimalarials surveyed was just 21.7%. Medicines with particularly low availability (less than 50%) in the public sector included quinine tablets (20%), quinine dihydrochloride injections (16.7%), artesunate injections (43%), and premaquine tablets (20%).

In Ethiopia, pregnant women in their first trimester and children under 5 kg are treated with oral quinine tablets if infected by *P. falciparum* malaria (FDRE MOH 2012). The low availability of quinine tablets may force them to take other nonrecommended, ineffective, or less safe AMDs, or they would be exposed to a high risk of morbidity and mortality from the disease. Furthermore, given the overall low availability of those antimalarial medicines in the public sector, a significant proportion of malaria patients must purchase their antimalarial medicines from the private sector, where they may have to pay significantly higher prices than at the public facilities.

Medicines such as mefloquine and atovaquone-proguanil, which are recommended for antimalarial chemoprophylaxis in Ethiopia, were not available in all of the medicine outlets of public, private, and other sectors and at the government procurement agency, indicating a challenge for travelers or visitors to malaria-endemic areas.

In the private sector, LPG chloroquine tablets were the predominant antimalarial product found. Its mean availability in the private sector was just under 87%. Nevertheless, the availability of other antimalarial drugs to treat *P. falciparum* malaria was extremely low or unavailable. AMDs with particularly low availability in the private sector include AL (6.7% for OB and 3.3% for LPG), quinine tablets (3.3%), artesunate injections (3.3%), and quinine injections (3.3%). As indicated under the results of availability of those AMDs in the public sector—for example, ACTs—20% and 57% of the public sector facilities were out of stock of AL and artesunate injections at the time of data collection, implying that patients visiting those public facilities must get their medicines from other sources, including the private sector. Therefore, the low availability of such AMDs in both the public and private sectors would adversely affect universal access to AMDs and malaria treatments in Oromia Region and perhaps Ethiopia in general. This low availability may also open doors for lower-quality AMDs to penetrate the market, thereby threatening the safety of patients and losses of their limited resources.

Regarding the price of antimalarial medicines at the sample medicine outlets, AL (Coartem) tablets and artesunate injections in the public and other sectors were widely offered for free to patients. Other than those drugs, there is no uniformity among the public health facilities about providing AMDs for free or for a charge. For example, out of the public facilities stocking

chloroquine, 54% offer it to patients for free, while the rest dispense it for a fee. Similarly, only 17% of the public facilities stocking quinine tablets dispense it for free, while the rest (83%) charge patients for this drug. It is distressing to see pregnant women and children—for whom quinine is recommended to treat *P. falciparum*—not only have to pay for this medicine but also not be able to get it because of its significantly low availability in all sectors. This disparity in the exemption of fee for antimalarials requires attention and a solution to serve patients on a uniform basis.

Among the AMDs sold at public health facilities, the final patient prices for lowest-price generic chloroquine tablets, quinine tablets, and quinine injections were high compared to their international reference prices. Overall, lowest-price generic antimalarial medicines were priced at just under twice (MPR=1.84) their international reference price in the public sector. The disparities between the LPG prices and their international counterparts suggest a substantial variation in procurement efficiency or price markups between medicines in both the public and private sectors.

Compared with prices in the public sector, private sector patient prices were, on average, 54% higher for one generic equivalent (LPG chloroquine) taken for comparison. Similar to prices at the public facilities, the lowest-price generic medicines were priced at nearly two times (MPR=1.96) their international reference price in the private sector. The price of lowest-price generic AL tablets in the private sector (found in only 1 of the 30 outlets) is ETB 88, or just under USD 5. In another outlet, the price of originator brand Coartem was as high as ETB 199, or more than USD 10, showing that patients are paying a substantially higher price to purchase Coartem compared to LPG AL or the same free medicine at public facilities.

The interquartile range for the MPRs of individual medicines shows small variability in the medicine price across medicine outlets. However, in the public sector, results show a relatively higher amount of variation in price for chloroquine across outlets, while the other sector has more range of variation for quinine tablets in comparison with the public and private sectors. In the private sector, the degree of variation for chloroquine tablets found in the majority of the outlets is just 0.25 for interquartile range for the MPRs. However, the range (1.96) between the minimum (1.47) and maximum (3.43) MPR is significant—approximately twice the minimum MPR (1.47)—showing that some of the private medicine outlets charge higher prices than others (table 4).

The overall affordability of each AMD in the three sectors generally shows the presence of disparities. For example, in both the public and private sectors, the cost of LPG chloroquine tablets was reasonable, with standard treatment costing less than a day's wage (0.2 and 0.3 day's wage, respectively). Conversely, quinine tablets in public and other sectors are not affordable, with standard treatment costing nearly two days' wage for the lowest-paid government worker.

On top of its considerably low availability in the private sector, AL was found to cost, extraordinarily, several days' wages of the lowest-paid government worker even when lowest-price generics are used. The cost of the treatment of uncomplicated *P. falciparum* malaria in the private sector when AL is available is more than 6 days' wages for lowest-price generics and up to 14 days' wages for the premium originator brand (Coartem), clearly indicating huge unaffordability even when generic equivalents are used. Additionally, treatment costs refer to

medicines only and do not include the additional costs of consultation and diagnostic tests. Furthermore, many people in Ethiopia earn less than the lowest government wage, so even treatments that seem affordable could be too costly for the poorest segments of the population. Finally, even where individual treatments seem affordable, individuals or families who need multiple medications may obviously face exorbitant drug costs.

In the private sector, the low availability and high price of AL is undoubtedly a big obstacle to accessing effective treatment of malaria for the significant proportion of patients who use this sector as their primary or alternative source of AMDs. With extremely limited stocking of ACTs by private facilities, expanding the involvement of the private sector toward the availing and rational use of ACTs will be beneficial to the entire population.

For example, many malarious Sub-Saharan African countries, in collaboration with development organizations and partners such as Global Fund through Affordable Medicines Facility-Malaria (AMFm), have initiated innovative strategies to provide subsidized ACTs through the retail sector to improve access through improved availability and reduced cost of those drugs. The results obtained after the beginning of this initiative are encouraging. For example, a randomized controlled trial in Kenya demonstrated a dramatic improvement in the percentage of children under age 5 who received AL for their fever after deployment of subsidized AL in the retail sector (Kangwana et al. 2011). In addition, a pilot evaluation of subsidized ACTs provided to wholesalers in three districts in Tanzania also showed remarkable improvement in the number of patients who purchased ACTs (Sabot et al. 2009).

To strengthen and promote the rational use of antimalarial medicines, health facilities and medicine outlets must have adequate copies of the national malaria treatment guidelines and must promote its adherence to support prescribing and dispensing of the antimalarial medicines to patients.

According to the results of this survey, the percentage of medicine outlets having and using the current national malaria treatment guidelines in all sectors is shockingly low, with only 20% in public, 3.3% in private, and 0% in NGO medicine outlets. This finding clearly indicates the need for immediate distribution of the guidelines and promotion of adherence at all sectors. Conversely, the providers' knowledge of the first-line treatment was significantly higher in the public sector than in the private and NGO sectors: 64% of the medicine dispensers in the public sector could correctly state the first-line treatment, compared with 50% and 49% in the private and NGO sectors, respectively. The overall percentage of knowledge rises when the indicator for prophylaxis is excluded from the analysis (74% in public, 58% in private, and 57% in NGO sectors).

The percentage of medicine dispensers who were able to correctly state the recommended first-line treatment for treating severe malaria was significantly low in all sectors: 50% at public health facilities and approximately 15% in NGO and 30% in private sectors, respectively. In other words, the knowledge of the national malaria treatment guidelines was especially low in the private and NGO sectors, although the gaps at the public health facilities are also significant. Given the number of patients they serve, the percentage of dispensers who are not up-to-date according to the current national malaria treatment guidelines raises concern regarding the drugs and information they provide to their patients.

CONCLUSION

The results reported here describing access to antimalarials recommended in the current national malaria treatment guidelines showed good availability of AL (in the public sector) and chloroquine (in all sectors) but low overall availability of AMDs in all sectors. In addition, on top of very low availability of ACTs in the private sector, their prices were found to be extremely high when the drugs were available, and they were hardly affordable to lower-income patients.

The results of this survey provide important insights into current factors related to the price, availability, and affordability as good indicators to universal access to key medicines for the treatment of malaria. The results also highlight priority areas for action to Oromia Region Health Bureau, in particular; the Federal Ministry of Health, in general; and other partners in improving access to affordable antimalarial medicines. Broader debate and dialogue are now needed to identify how best different players can contribute to the prospect of enhancing accessibility and affordability to antimalarial medicines in the region and the country as a whole.

Recommendations

The findings of this survey about access to antimalarial drugs suggest the need for various interventions, policies, and initiatives to ensure universal access to antimalarial medicines and malaria treatments in all sectors. Although ensuring the availability and affordability of essential medicines, including antimalarials, could be argued to be primarily the responsibility of the government, this effort can be supported and improved by involving the private sector through strong public-private partnerships.

Generally, the low availability of AMDs in the public sector can be addressed through an improved supply chain management system, including procurement and distribution efficiency, stock transfer and redistribution between facilities, and strong recording and reporting practices.

It is advisable also to adopt the innovative strategies being implemented by other malarious Sub-Saharan African countries, such as Kenya, Tanzania, Burundi, and Uganda, in collaboration with development organizations and partners such as Global Fund through Affordable Medicines Facility-Malaria (AMFm), to provide subsidized ACTs through the retail sector to improve access through improved availability and reduced cost of these drugs.

The high prices of such vital medicines can also be reduced by promoting and strengthening the use of quality-assured generic medicines and by regulating the markups that could contribute add-on costs in the supply chain in all sectors.

Creating uniform pricing practices at public health facilities, considering price markup regulation, expanding social insurance schemes, and periodically monitoring availability and prices of AMDs are worthwhile efforts to improve universal access to antimalarial drugs and malaria treatments.

Finally, one of the strategies to ensure the implementation of the national malaria treatment policy and guidelines is to improve the availability of the guidelines and to promote adherence at all levels through regular follow-up and monitoring. In addition, training and in-service supportive supervision can help to fill the knowledge gap in all sectors.

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ANNEX A. LIST OF ANTIMALARIAL MEDICINES INCLUDED IN THE SURVEY

Med. No.	Medicine Name	Medicine Strength	Dosage Form	Target Pack Size
1	AL	20 mg + 120 mg	tab	24 tabs per blister pack
2	Chloroquine	250 mg	tab	1,000 tabs per tin OR 10 tabs per blister pack
3	Artesunate	60 mg/vial	Injection in 1-ml ampoule	5 ampoule/pack
4	Quinine	300 mg	Tab	100 tabs per tin
5	Quinine hydrochloride	300 mg/ml	Injection	100 ampoule/pack
6	Mefloquine hydrochloride	250 mg tablets	Tablet	100 tabs per pack
7	Primaquine phosphate	7.5 mg	Tablet	12 tabs per pack
8	Atovaquone-proguanil hydrochloride	250 mg atovaquone and 100 mg proguanil hydrochloride	Tablet	1,000 tabs per pack

ANNEX B. MEDICINE DATA COLLECTION FORM

Medicine Price Data Collection Form

Use a separate form for each medicine outlet

Date: _____ Survey area number: _____

Name of town/village/district: _____

Name of medicine outlet (optional): _____

Medicine outlet unique survey ID (mandatory): _____

Distance in km from nearest town (population >50,000): _____

Type of medicine outlet :

Public sector facility (specify level of care below):

Private sector medicine outlet

Other sector medicine outlet (please specify): _____

Type of price :

Procurement price:_____ Price the patient pays:_____

Name of manager of the medicine outlet:

Names of data collectors: _____

Verification: To be completed by the area supervisor at the end of the day, once data have been verified

Signed:_____ Date:_____

Medicine Price Data Collection Form

Lowest-priced generic equivalent product: determined at facility

A	B	C	D	E	F	G	H	I	J
Generic Name, Dosage Form, Strength	**Medicine Type**	**Brand or Product Name(S)**	**Manufacturer**	**Available Yes/No**	**Pack Size Recommended**	**Pack Size Found**	**Price of Pack Found**	**Unit Price (4 decimal places)**	**Comments**
Artemether-Lumefantrine 20+120 mg tab	Originator brand	Coartem	Novartis		24			per tab	
	Lowest-priced generic				24			per tab	
Chloroquine 250 mg tab	Originator brand	Aralen	Sanofi-Aventis		1,000			per tab	
	Lowest-priced generic				1,000			per tab	
Quinine Sulfate 300 mg tab	Originator brand	QUALAQUIN	MUTUAL PHARM		100			per tab	
	Lowest-priced generic				100			per tab	
Quinine Dihydrochloride 300 mg/ml Inj	Originator brand		Renaudin Laboratoire		100			per Inj	
	Lowest-priced generic				100			per Inj	
Artesunate Artesunate 60 mg/Vial Powder for Inj	Originator brand	ARTESUN	Guilin Pharmaceutical Co. Ltd.		5			per powder for Inj	
	Lowest-priced generic				5			per powder for Inj	
Mefloquine Hydrochloride 250 mg tab	Originator brand	Lariam	Roche		100			per tab	
	Lowest-priced generic				100			per tab	
Atovaquone-Proguanil Hydrochloride 250 +100 mg tab	Originator brand	Malarone	GlaxoSmithKline		12			per tab	
	Lowest-priced generic				12			per tab	
Primaquine Phosphate 7.5 mg tab	Originator brand	Primaquine	Remedica		1,000			per tab	
	Lowest-priced generic				1,000			per tab	

ANNEX C. AVAILABILITY OF INDIVIDUAL MEDICINES, PUBLIC, PRIVATE, AND OTHER SECTORS

	Public Sector (n=30 outlets)		Private Sector (n=30 outlets)		Other Sector (n=7 outlets)	
	All Medicines (n=8 medicines)		All Medicines (n=8 medicines)		All Medicines (n=8 medicines)	
	OB	**LPG**	**OB**	**LPG**	**OB**	**LPG**
Mean Availability (standard deviation)	15.8% (24.7%)	21.7% 30.6%	0.8% 2.4%	12.55 30.5%	3.6% 10.1%	23.2% 34.1%

ANNEX D. GOVERNMENT PROCUREMENT PRICES FOR INDIVIDUAL ANTIMALARIAL MEDICINES

Medicine Name	Medicine Type	MPR	25th Percentile	75th Percentile	Median Price
AL	Brand	-	-	-	-
	Lowest price	4.08	4.08	4.08	0.94
Chloroquine	Brand	-	-	-	-
	Lowest price	1.01	1.01	1.01	0.21
Quinine Sulfate	Brand	-	-	-	-
	Lowest price	0.99	0.99	0.99	1.11
Quinine dihydrochloride	Brand	-	-	-	-
	Lowest price	1.36	1.36	1.36	3.65
Artesunate	Brand	-	-	-	-
	Lowest price	-	-	-	17.99

*-, not available

ANNEX E. MEDIAN PRICE RATIOS, PUBLIC SECTOR PATIENT PRICES (SUMMARY COMPARISONS TO REFERENCE PRICES, AND PERCENTAGE OF AVAILABILITY IN PUBLIC OUTLETS)

Medicine Name	Medicine Type	MPR	25th Percentile	75th Percentile	Min.	Max.	% with Med.	Median Price
AL	Brand	-	-	-	-	-	63.30	-
	Lowest price	-	-	-	-	-	56.70	-
Chloroquine	Brand	-	-	-	-	-	0.00	-
	Lowest price	1.27	1.02	1.47	0.24	3.92	80.00	0.26
Quinine sulfate	Brand	-	-	-	-	-	0.00	-
	Lowest price	1.84	1.84	1.87	1.79	1.97	20.00	2.06
Quinine dihydrochloride	Brand	-	-	-	-	-	0.00	-
	Lowest price	4.02	4.02	4.09	1.3	4.46	16.70	10.81
Artesunate	Brand	-	-	-	-	-	43.30	-
	Lowest price	-	-	-	-	-	0.00	-
Mefloquine hydrochloride	Brand	-	-	-	-	-	0.00	-
	Lowest price	-	-	-	-	-	0.00	-
Atovaquone-proguanil hydrochloride	Brand	-	-	-	-	-	0.00	-
	Lowest price	-	-	-	-	-	0.00	-
Primaquine phosphate	Brand	-	-	-	-	-	20.00	-
	Lowest price	-	-	-	-	-	0.00	-

ANNEX F. MEDIAN PRICE RATIOS, PRIVATE SECTOR PATIENT PRICES

Medicine Name	Medicine Type	MPR	25th Percentile	75th Percentile	Min.	Max.
AL	Brand	-	-	-	-	-
	Lowest price	-	-	-	-	-
Chloroquine	Brand	-	-	-	-	-
	Lowest price	1.96	1.71	1.96	1.47	3.43
Quinine sulfate	Brand	-	-	-	-	-
	Lowest price	-	-	-	-	-
Quinine dihydrochloride	Brand	-	-	-	-	-
	Lowest price	-	-	-	-	-
Artesunate	Brand	-	-	-	-	-
	Lowest price	-	-	-	-	-
Mefloquine hydrochloride	Brand	-	-	-	-	-
	Lowest price	-	-	-	-	-
Atovaquone-proguanil hydrochloride	Brand	-	-	-	-	-
	Lowest price	-	-	-	-	-
Primaquine phosphate	Brand	-	-	-	-	-
	Lowest price	-	-	-	-	-

ANNEX G. AVAILABILITY OF MEDICINES IN THE PUBLIC, PRIVATE, AND OTHER SECTORS

Medicine Availability (%)	Public Sector	Private Sector	Other Sector
Medicines not found in any outlets	- Atovaquone-Proguanil Hydrochloride tablets - Mefloquine Hydrochloride tablets	- Atovaquone-Proguanil Hydrochloride tablets - Mefloquine Hydrochloride tablets - Primaquine Phosphate tablets	- Proguanil Hydrochloride tablets - Mefloquine Hydrochloride tablets - Primaquine Phosphate tablets - Artesunate injection
Medicines found in less than 25% of outlets	- Quinine Sulfate tablets - Quinine dihydrochloride injections - Atovaquone-Proguanil Hydrochloride tablets - Mefloquine Hydrochloride tablets - Primaquine Phosphate tablets	- AL tablets - Quinine Sulfate tablets - Quinine dihydrochloride injections - Atovaquone-Proguanil Hydrochloride tablets - Mefloquine Hydrochloride tablets - Primaquine Phosphate tablets	- Proguanil Hydrochloride tablets - Mefloquine Hydrochloride tablets - Primaquine Phosphate tablets
Medicines found in 25% to 50% of outlets	- Artesunate injections	- none	- AL tablets - Quinine dihydrochloride injections
Medicines found in 50% to 75% of outlets	- AL tablets	- none	- Quinine Sulfate tablets
Medicines found in more than 75% of outlets	- Chloroquine tablets	- Chloroquine tablets	- Chloroquine tablets

ANNEX H. NUMBER OF DAYS' WAGES OF THE LOWEST-PAID GOVERNMENT WORKER NEEDED TO PURCHASE STANDARD TREATMENTS FOR MALARIA

<table>
<tr><th colspan="2">Disease Condition and Standard Treatment</th><th colspan="5">Days' Wages to Pay for Treatment</th></tr>
<tr><th>Drug Name, Strength, Dosage Form</th><th>Treatment Schedule</th><th>Lowest-Price Generic—Public Sector</th><th>Lowest-Price Generic—Private Sector</th><th>Originator Brand—Private Sector</th><th>Lowest-Price Generic—Other Sector</th><th>Originator Brand—Other Sector</th></tr>
<tr><td rowspan="2">Artemether-Lumefantrine, 20 +120 mg, tab</td><td rowspan="2">4 tab x 2 x 3 days = 24</td><td rowspan="2">free</td><td>6.2</td><td>6.85 to 13.7</td><td rowspan="2"></td><td rowspan="2">free</td></tr>
<tr><td>(n=1)</td><td>(n=2)</td></tr>
<tr><td>Chloroquine, 250 mg, tab</td><td>(4 tab x 1 x 2 days) + (2 tab x 1 x 1 day) = 10</td><td>0.2</td><td>0.3</td><td></td><td>0.2</td><td></td></tr>
<tr><td>Quinine Sulfate, 300 mg, tab</td><td>1 cap/tab x 30 days = 30</td><td>1.9</td><td rowspan="6">Not available</td><td></td><td>1.9</td><td></td></tr>
<tr><td>Quinine Dihydrochloride, 300 mg/ml, inj</td><td>2 tab x 3 x 7 days = 42</td><td>1.3</td><td></td><td colspan="2" rowspan="3">Not available</td></tr>
<tr><td>Artesunate, 60 mg/ Vial, powder for Inj</td><td></td><td>free</td><td></td></tr>
<tr><td>Mefloquine Hydrochloride, 250mg, tab</td><td>1 tab x 1 x 5 days = 5</td><td rowspan="2">Not available</td><td></td></tr>
<tr><td>Atovaquone-Proguanil Hydrochloride, 250 + 100 mg, tab</td><td>1 tab x 1 x 10 days = 10</td><td></td><td></td><td></td></tr>
<tr><td>Primaquine Phosphate, 7.5, Tab</td><td>1 tab x 2 x 14 days = 28</td><td>-</td><td></td><td></td><td></td></tr>
</table>

ANNEX I. COMPARISONS OF MEDIAN MPRS FOR MEDICINES WITH PRICES IN BOTH SECTORS INCLUDES ALL MEDICINES (N=4 ON LIST)

Procurement vs Public Sector

	Procurement (n=1 orders)	Public Sector (n=30 outlets)	# of Meds. in Both Sectors	% Difference Public to Procurement
Brand			0	
Lowest Price	1.01	1.84	3	82.60%

Procurement vs. Other Sector

	Procurement (n=1 orders)	Other Sector (n=7 outlets)	# of Meds. in Both Sectors	% Difference Other to Procurement
Brand			0	
Lowest Price	1	1.63	2	63.60%

Procurement vs. Private sector

	Procurement (n=1 orders)	Private Sector (n=30 outlets)	# of Meds. in Both Sectors	% Difference Private to Procurement
Brand			0	
Lowest Price	1.01	1.96	1	94.20%

ANNEX J. PROVIDERS' KNOWLEDGE RESULT, BY AMD INDICATION AND BY SECTOR

No.	Questions	Sector	Artemether-Lumafentrine	Chloroquine	Quinine	Sulphadoxine-Pyrimethamine (Fansider)	Artesunate Injections	Combination of AL and Chloroquine	Mefloquine	Atovaquone-Proguanil	Artemether Injection	Don't Know	Doxycycline
1	What is the drug of choice for treating *P. vivax* malaria?	Public n=30	13.30%	86.70%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
		Private n=30	23.30%	73.30%	0.00%	3.30%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
		Other n=7	42.90%	57.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2	What is the drug of choice for treatment of uncomplicated cases of *P. falciparum* malaria?	Public n=30	90.00%	3.30%	3.30%	3.30%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
		Private n=30	63.30%	16.70%	10.00%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
		Other n=7	71.40%	0.00%	28.60%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
3	What is the drug of choice for treatment of uncomplicated cases of *P. falciparum* in pregnant women in their first trimester and child <5 kg?	Public n=30	16.70%	6.70%	70.00%	6.70%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
		Private n=30	16.70%	6.70%	66.70%	3.30%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
		Other n=7	0.00%	14.30%	85.70%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

No.	Questions	Sector	Artemether-Lumafentrine	Chloroquine	Quinine	Sulphadoxine-Pyrimethamine (Fansider)	Artesunate Injections	Combination of AL and Chloroquine	Mefloquine	Atovaquone-Proguanil	Artemether Injection	Don't Know	Doxycycline
4	What is the first-line drug for treating severe malaria according to the current (3rd) national treatment guidelines?	Public n=30	16.70%	0.00%	33.30%	0.00%	50.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
		Private n=30	26.70%	3.30%	36.70%	0.00%	30.00%	0.00%	0.00%	0.00%	3.30%	0.00%	0.00%
		Other n=7	14.30%	0.00%	71.40%	0.00%	14.30%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
5	What are the drug(s) recommended for malaria prevention or prophylaxis in Ethiopia?	Public n=30	3.30%	46.70%	0.00%	0.00%	0.00%	0.00%	20.00%	3.30%	0.00%	26.70%	0.00%
		Private n=30	3.30%	76.70%	0.00%	0.00%	0.00%	0.00%	13.30%	3.30%	0.00%	3.30%	0.00%
		Other n=7	28.60%	42.90%	0.00%	0.00%	0.00%	0.00%	14.30%	0.00%	0.00%	0.00%	14.30%

ANNEX K. QUESTIONNAIRE FOR NATIONAL MALARIA TREATMENT GUIDELINES ADHERENCE AND PROVIDER KNOWLEDGE ASSESSMENT

This is to be completed by the interviewer

Business Code No.: _____ Date (dd/mm/yy): _____

Zone: _____ District: _____

Type of the Business: Public_____ Private_____ Other_____

Interviewer's Name: _____ Time Interview Started: _____

SCREENING QUESTIONS

1. Are there any antimalarial medicines in your stock today? Yes _____ No_____
2. If yes to Q-1, what is your source of Antimalarial drugs?

   PFSA ___ Private wholesaler ____ Private pharmacies/drug stores/RDVs _____

   Others, please specify: _____

3. If no to Q-1, have you stocked any antimalarials in the past 3 months?

   Yes_____ No_____

4. If no to Q-3, why?

   _____

   _____

5. What is the average number of days of stock outs of antimalarial drugs in your premises during the past three months?

AMDs	Fewer than 15 Days	15–30 Days	More than 30 Days	3 Months	More than 3 Months
Artemether-Lumafentrine					
Chloroquine					
Quinine					
Artesunate inj.					

Providers Knowledge Assessment

Questions 6–10 are to be answered according to the current National Malaria treatment Guidelines **(**3rd ed.**)**

6. Is there a National Malaria treatment guidelines in your health facility?
   Yes_____ No_____

7. If yes, do you use it as a reference for counseling and dispensing antimalarial medicines?
   Yes_____ No_____

8. What is the drug of choice for treating *P. vivax* malaria?

Artemether-Lumafentrine _____Chloroquine _____ Quinine _____

Sulphadoxine-Pyrimethamine (Fansidar) _____

Others, please specify: _____

9. What is the drug of choice for treatment of *P. falciparum* malaria?

Artemether-Lumafentrine (Coartem) _____ Sulphadoxine-Pyrimethamine (Fansidar) _____

Chloroquine _____ Quinine _____

Others, please specify: _____

10. What is the drug of choice for treatment of *P. falciparum* in pregnant women in their first trimester and child <5 Kg?
    Artemether-Lumafentrine (Coartem) _____ Sulphadoxine-Pyrimethamine (Fansidar) _____

    Chloroquine _____ Quinine _____ Others, please specify: _____

11. What is the first-line drug for treating severe malaria according to the current (3rd) national treatment guidelines?

Artemether-Lumafentrine ____Chloroquine _____Quinine ____ Artesunate injections ___

12. What are the drug(s) recommended for malaria prevention or prophylaxis in Ethiopia?
Artemether-Lumafentrine____ Mefloquine _____Atovaquone-Proguanil_____

Any other comments:

_____

_____

_____

_____

Thank you very much for your participation.

ANNEX L. LETTER REQUESTING PARTICIPATION IN SURVEY

Date: _____

Dear Participant:

For the improvement of universal access to antimalarial drugs and malaria treatment in Oromia Region, it has become essential to investigate the availability, price, and affordability of antimalarial drugs at public, private, and other medicine outlets.

Your response to this survey is crucial in providing the necessary information to design and develop additional initiatives and policies that will speed up the current efforts at regional and national levels.

The purpose of this survey is to determine (a) the extent of availability of antimalarial medicines, especially ACTs, and (b) what prices patients pay to get those medicines from the outlets.

We would like to determine the percentage of health facilities stocking antimalarial medicines and to evaluate the affordability of such medicines to low-income patients in your area.

The interviewer will ask you a few questions about the availability and prices of antimalarials in your stock. In addition, he will add some questions regarding your knowledge of the current malaria treatment guidelines.

Your responses are voluntary and will be confidential. Responses will not be identified by individual person or individual premises. All responses will be compiled and analyzed as a group, and no individual response will be shared.

The questionnaire takes about ---------- minutes to complete.

Your response and time are greatly appreciated.

Thank you!

Sincerely,