

Assessment of the Supply Systems for Malaria in Thailand, July 2008: Final Report

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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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ACRONYMS

ACT	artemisinin-based combination therapy
AS	artesunate
BAAM	Borderless Action Against Microbes Program
BVBD	Bureau of Vector-Borne Diseases
CQ	chloroquine
DDC	Department of Disease Control
DHO	District Health Office
DX	doxycycline
FEFO	first-expiry/first-out
FIFO	first-in/first-out
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
GPO	Government Pharmaceutical Organization
HC	Health Center
KIAsia	Kenan Institute of Asia
MC	malaria clinic
MOPH	Ministry of Public Health
MP	malaria post
MPW	malaria post worker
MQ	mefloquine
MSH	Management Sciences for Health
ODPC	Office of Disease Prevention and Control
PHO	Provincial Health Office
PQ	primaquine
QN	quinine
RDT	rapid diagnostic test
SOP	standard operating procedure
SPS	Strengthening Pharmaceutical Systems Program
USD	U.S. dollar
VBDC	Vector-Borne Disease Center
VBDU	Vector-Borne Disease Unit
WHO	World Health Organization

INTRODUCTION

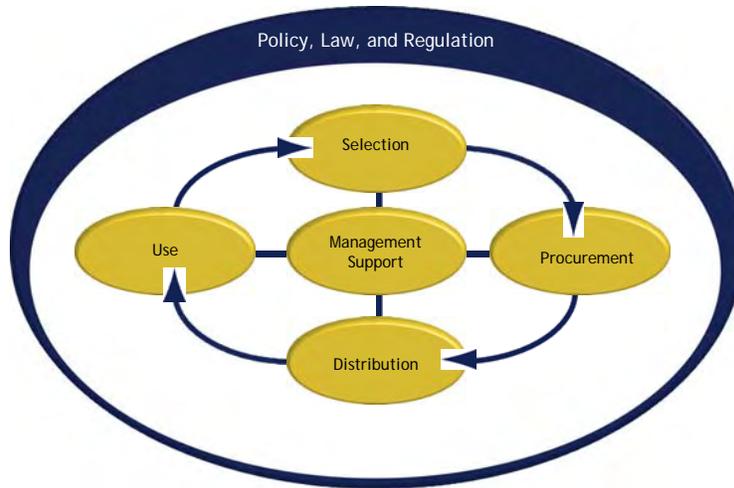
Early diagnosis and prompt treatment of malaria are cornerstones of Thailand's national malaria control program. Most diagnostic and treatment services are delivered at the primary-care level at either malaria clinics (MCs), which are part of the routine malaria service program, or malaria posts (MPs), which were created under the malaria grant from the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM). Ensuring the availability of diagnostic supplies and medicines at both types of facilities is essential in effectively controlling malaria in the country.

Management Sciences for Health's Strengthening Pharmaceutical Systems Program (MSH/SPS)—the follow-on to the Rational Pharmaceutical Management Plus Program—was asked to conduct an assessment of the supply systems for antimalarials and rapid diagnostic tests (RDTs), and to provide recommendations for improvement and scale-up in response to general concerns about the potential for disruption of the supply of these essential products to MCs and MPs during the decentralization and integration of specialized malaria services into the overall health system and the implementation of the GFATM Round 7 malaria grant, respectively.

Objectives of the assessment were as follows—

- Describe the pharmaceutical management practices, including procurement, quantification, storage and distribution, and information systems, used to supply the GFATM-supported MPs with antimalarial medicines and RDTs in selected provinces.
- Identify key functions and issues at each level.
- Describe the pharmaceutical management practices currently used to supply the national malaria program's routine-service MCs in selected provinces.
- Identify potential challenges in maintaining access to first-line antimalarials during the integration of MCs into the general public health system.
- Provide recommendations for addressing aspects of management of antimalarial medicines and RDTs during the scale-up of MPs from 9 to 43 provinces, planned under GFATM Round 7.

The pharmaceutical management cycle (figure 1) was used as a framework for organizing the data collection and the report on findings and recommendations. The cycle illustrates the four basic functions of managing pharmaceuticals—selection, procurement, distribution, and use—which logically build on each other, one function to the next. Management support systems, including the pharmaceutical management information system, human resources management, and monitoring and evaluation, hold the cycle together. The cycle is framed by policies, laws, and regulations.



Source: Management Sciences for Health

Figure 1. Pharmaceutical Management Cycle

Key issues considered in this report include—

- Policies and guidelines: the availability of standard operating procedures (SOPs) and standardized forms, specifically for storage, distribution, and inventory management
- Procurement: procedures for forecasting needs and procuring malaria medicines at the central and regional levels
- Distribution: procedures for receiving and storing malaria medicines and RDTs; quantifying needs and requisitioning at the local level; and issuing malaria medicines, including record keeping and inventory control methods
- Pharmaceutical management information system
- Program management: monitoring and supervision, and human resources

The needs of the malaria program dictated the assessment’s primary focus on procurement and distribution, including storage and inventory management. Thus, selection and use were outside the scope of the present assessment. Furthermore, because of the impending scale-up of the MP program under the GFATM Round 7 malaria grant, which began in July 2008 at the time of the assessment, and the conditions precedent to the second disbursement of the Round 7 grant funds, greater emphasis was placed on the supply system for the GFATM-supported MPs than on the supply system for the national malaria program’s MCs.

BACKGROUND

Malaria Situation

The burden of malaria in Thailand has decreased significantly in recent years, with the number of confirmed cases dropping from 149,586 in 2000 to 63,354 in 2007.¹ The Annual Parasite Index has reportedly dropped to 0.57 per 1,000.² Despite remarkable improvements in the situation on a national level, however, the malaria burden remains high in border areas, particularly along the Thai-Burmese and Thai-Malaysian borders, and disproportionately among the migrant population. In addition, evidence increasingly shows multidrug resistance of *P. falciparum* to artemisinin-based combination therapy (ACT) on the Thai-Cambodian border.

The majority of malaria cases in Thailand are reported from the provinces on the Thai-Burmese border. Over half of these cases are in the non-Thai migrant population, which crosses the border from Burma to flee political unrest or seek better job opportunities and living conditions. This population, made up of registered and unregistered migrants, is particularly at risk of contracting malaria and has typically had limited access to care because of a combination of real and perceived barriers. Of the provinces along the Thai-Burmese border, Tak and Mae Hong Son report the highest number of cases—the second- and fourth-most cases, respectively, in the country as a whole.

The malaria burden also remains high, with signs of increasing, in three provinces along the Thai-Malaysian border, where the ongoing civil conflict has severely compromised the public health system's ability to provide essential services. One of the provinces, Yala, reported the highest number of cases (7,824) and the highest incidence (17.2 cases per 1,000 population) in the country in 2007. Another, Songkla, reported the third-most cases in the country.

Although fewer cases of malaria are reported on Thailand's border with Cambodia than on its borders with Burma or Malaysia, the area is of particular concern—locally, regionally, and globally—because of the emergence of multidrug resistance. In addition to parasite resistance to chloroquine (CQ), sulfadoxine-pyrimethamine, and mefloquine (MQ), surveillance sites on the Thai-Cambodian border have recently detected treatment failures with ACTs that are suggestive of resistance. In 2007, Trat province reported a treatment failure rate of 10 percent to two-day treatment with artesunate (AS) and MQ.

National Treatment Policy

In 1998, Thailand changed its national treatment policy and adopted an ACT as the first-line treatment for *P. falciparum* malaria. The two-day treatment regimen consisted of AS and MQ on day 1 and AS and primaquine (PQ) on day 2. In January 2008, following a World Health

¹ Dr. Wichai Satimai, Bureau of Vector-Borne Diseases, Department of Disease Control, Ministry of Public Health, Thailand. 2008. "Malaria Situation in Thailand 2007–2008." Presentation at the ACT Malaria Executive Board and Partners Meeting, Siem Riep, Cambodia, March 17–19.

² Ibid.

Organization (WHO) technical consultation organized in the region and in response to increasing evidence of treatment failures at sentinel sites, Thailand changed to a three-day treatment regimen, as recommended by WHO, of AS and MQ on days 1 and 2, and AS and PQ on day 3 (see table 1). The second-line treatment for *P. falciparum* malaria is a seven-day course of oral quinine (QN) and doxycycline (DX).

Table 1. First-Line Treatment for *P. falciparum*

Age (Weight)	Day 1		Day 2		Day 3		Total		
	AS (tab)	MQ (tab)	AS (tab)	MQ (tab)	AS (tab)	PQ (mg)	AS (tab)	MQ (tab)	PQ (mg)
>14 years (50+ kg)	4	3	4	2	4	30	12	5	30
8–13 years (25–50 kg)	3	2	3	1½	2	15	8	3½	15
3–years (15–24 kg)	2	1½	2	1	2	10	6	2½	10
1–2 years (11–14 kg)	1	¾	1	½	1	5	3	1¼	5
6–11 months (6–10 kg)	1	½	1	1/3	n.a.	n.a.	2	5/6	0
<6 months and pregnant women	<i>Refer to hospital</i>								

Note: AS = 50 mg/tablet, MQ = 250 mg/tablet; kg= kilogram; mg = milligram; tab = tablet; n.a. = not applicable.

The first-line treatment for *P. vivax* and *P. ovale* malaria cases is 3 days of CQ and 14 days of PQ, in accordance with WHO recommendations. Relapse cases are treated with a higher daily dose of PQ.

Treatment for malaria is provided only for cases that have been biologically diagnosed; treatment is not permitted at any level of the system on the basis of a clinical diagnosis. Microscopy is used to diagnose all malaria cases at hospitals and MCs. Rapid diagnostic tests are used in place of microscopy for diagnosis at MPs because of the malaria post workers' (MPWs') limited training and the lack of necessary infrastructure. Two types of RDTs have been used to date: one that detects only *P. falciparum* (Paracheck) and another that detects *P. falciparum* as well as other species (OptiMAL). All malaria cases diagnosed by RDT at MPs should be confirmed by microscopy at MCs.

National Malaria Control Program

The Ministry of Public Health (MOPH) in Thailand has a long-standing vertical malaria program, which has been effective in reducing the malaria burden through activities in the following areas—

- Early diagnosis and prompt treatment

- Vector control
- Information, education, and communication

The vertical malaria program is managed at the central level by the Malaria Cluster of the Bureau for Vector-Borne Diseases (BVBD)—one of nine bureaus within the MOPH's Department of Disease Control (DDC). Management of the program also extends to the Malaria Sections of 12 Offices of Disease Prevention and Control at the regional level, 39 Vector-Borne Disease Centers (VBDCs) at the provincial level, and 302 Vector-Borne Disease Units (VBDUs) at the district level. At the subdistrict level, the program delivers diagnostic and treatment services through 650 MCs, including mobile malaria clinics and community malaria clinics.

The national malaria program is facing two significant challenges that affect the provision of diagnosis and treatment for malaria. In part because of the success of the program and the significantly lower burden of malaria the country now faces, the domestic budget for malaria has been dramatically reduced over the last several years, from 23 million U.S. dollars (USD) in 2002 to USD 12 million in 2006. In addition, and with greater implications, specialized malaria services are being progressively integrated into the general public health system at the provincial and local levels over the next five years, in accordance with a recent change in national health policy that calls for the decentralization of health care services.

GFATM Malaria Grants, Rounds 2 and 7

The MOPH received funding for malaria activities from the GFATM in March 2004 under Round 2. With a goal of reducing morbidity and mortality by 50 percent, one of the four main objectives was to increase access to early detection and prompt, effective antimalarial treatment in the nine provinces selected for inclusion in the proposal. To this end, a portion of the GFATM grant was used to set up 200 MPs at the village-level. Building on the success and experience of the MP model, the MOPH applied for and was awarded another GFATM malaria grant in Round 7, under which MPs will be scaled up from 200 in 9 provinces to 460 in 43 provinces.

The MPs set up under the GFATM grant are part of a management structure distinct from the national malaria program. The BVBD and the other institutions in the vertical national malaria program provide technical support; however, Provincial Health Offices (PHOs), District Health Offices (DHOs), and in some cases, Health Centers (HCs) are responsible for all other management responsibilities at their respective levels, including administration, data collection, supervision, and most aspects of pharmaceutical management. The structure was designed to include partners that are involved in the delivery of general health services in the public health system as part of the effort to integrate malaria services.

METHODOLOGY

The assessment team consisted of an SPS consultant, a member of the Malaria Association of Thailand hired as a consultant for Kenan Institute of Asia (KIAAsia)/Borderless Action Against Microbes (BAAM), and a rotating representative of the BVBD.

Data for the assessment were collected on site visits conducted June 26 to July 17, 2008. See Annex 1.

Methods

The assessment team used a combination of the following methods to assess the supply systems for malaria commodities at MCs and MPs.

Document review: Documents were collected and reviewed to provide background for the assessment and shape the development of the assessment tools. Documents included the national treatment policy, the treatment guidelines for MCs and MPs, the GFATM proposals for Rounds 2 and 7, and the Procurement and Supply Management Plan for Round 7.

In-depth interviews: The assessment team conducted in-depth interviews with key personnel at total of 39 malaria offices and facilities June 26–July 22, 2008. Data were collected from institutions at the central, regional, provincial, district, and subdistrict levels of the system.

Record review: At each of the sites, relevant records were reviewed to gather information about the record-keeping system, check the quality of record keeping, collect specific data, and verify the information provided during the interviews. The assessment team specifically requested stock records, request/issue forms, and patient records.

Direct observation: Information on storage conditions and inventory management practices was collected through direct observation, guided by preestablished checklists. Dispensing practices could not be observed because of a lack of positive cases detected at any of the MCs or MPs at the time of the site visits.

After a preliminary analysis of the data, the findings were presented and validated at a workshop with participants from the central, regional, and provincial levels of the two systems. The participants were given the opportunity to share their experiences, ask questions, prioritize the issues based on the situation in their particular area, and consider the feasibility of the recommendations provided by the assessment team. Their input has been integrated into the results and recommendations presented in this report.

Sampling

As agreed with the BVBD and KIAAsia/BAAM, the assessment team—led by MSH/SPS—conducted assessment visits and collected data in three of the nine provinces with existing MPs: Tak, Mae Hong Son, and Kanchanaburi. These provinces, all of which are located on the Thai-Burmese border, were selected because—

- They account for the largest proportion of malaria cases in Thailand.
- Under GFATM Round 7, they will experience the largest increase in number of MPs.

For each of the three provinces, data were collected from the Office of Disease Prevention and Control (ODPC), the PHO, the VBDC, and a sample of DHOs, VBDUs, MCs, and MPs. The number of DHOs, VBDUs, MCs, and MPs visited in each province was determined in large part by practical considerations, namely time. The specific DHOs, VBDUs, MCs, and MPs visited for the assessment were selected on the basis of their malaria burden and geographic accessibility.

Originally, the team intended to visit the province of Songkhla for one day to collect information from the provincial-level offices about the status of pharmaceutical management practices in the area affected by the civil unrest near the Thai-Malaysian border. However, because of security concerns, the team was not permitted to travel there and thus the assessment does not include any information on the supply system and the particular challenges faced in that region. In place of Songkhla, the assessment team visited the province of Surat Thani, which does not border another country and has a relatively low incidence of malaria. Information was collected at the provincial level only from the PHO and VBDC.

Instruments

The primary data collection instrument used in the assessment was an interview guide developed by SPS for each level of the supply system, which was further adapted in the field, as necessary, based on the local context. See Annex 2.

Checklists were also used to assess availability, storage conditions, inventory management, and record keeping. See Annex 3.

Data Collection

Data were collected from the following offices and facilities—

Table 2. Offices and Facilities Visited

System Level	Supply System for MCs	Supply System for MPs
Central	BVBD – Malaria Cluster	BVBD – Malaria Cluster DDC – GFATM Principal Recipient Office
Regional	ODPC Region 4 ODPC Region 9 ODPC Region 10	
Provincial	VBDC Tak (North) VBDC Mae Hong Son VBDC Kanchanaburi VBDC Surat Thani	PHO Tak PHO Mae Hong Son PHO Kanchanaburi PHO Surat Thani
District	VBDU Mae Sot VBDU Tha Song Yang VBDU Mae Ramat VBDU Mae Hong Son VBDU Khun Yuam VBDU Mae Sarieng VBDU Sai Yok	DHO Mae Sot DHO Tha Song Yang DHO Mae Ramat DHO Khun Yuam DHO Mae Sarieng DHO Sai Yok
Facility	MC Mae Sot MC Tha Song Yang MC Mae Ramat MC Mae Hong Son MC Khun Yuam MC Mae Sarieng MC Sai Yok	MP Doi Hin Kin MP Wangtakian MP Tha Song Yang MP Muang MP Khun Yuam MP Mae Salab MP Sai Yok
Total number	22	19

Data Processing and Analysis

All of the data and information collected on site visits were systematically compiled, reviewed, and grouped. They were analyzed by system (GFATM or routine malaria services), level, and office or facility type. Because of the small sample sizes used in the analysis, most of the findings are not presented as percentages.

After a preliminary analysis of the data, the results were presented at a validation workshop attended by representatives from the BVBC, the GFATM Principal Recipient office, 10 ODPCs, 14 VBDCs, and 16 PHOs. The participants were given the opportunity to confirm, prioritize, and dispute the findings based on their knowledge of the situation in their area.

Limitations

Because of the sample used in this assessment, the primary limitation of the findings is the extent to which they are representative of the supply system in other geographical areas of the country. The assessment focused on an area of the country with the highest incidence and some of the most extensive malaria services. Therefore, the results cannot necessarily be generalized to

provinces with lower incidence and less extensive malaria services, which manage smaller quantities of medicines at fewer offices and facilities, or to the provinces affected by the civil unrest near the Thai-Malaysian border, which face unique challenges arising from the conflict.

Another limitation of the study that affects the extent to which it represents the actual situation is the facility sample that was used. The MPs and MCs visited for the assessment were selected largely because of their accessibility. Notably, all of the MCs were attached to a VBDU office. MPs and MCs located in less accessible areas, far from the offices that manage them and supply their medicines, are more likely to experience stock-outs and to receive less supervision because of transportation problems, especially during the rainy season.

Informant bias, which is inherent in the use of key informants as a source of information, as well as the use of a translator for the interviews, may also limit the accuracy of the findings.

RESULTS

Structure and Design of the Supply Systems

First-line malaria medicines are supplied to MCs and MPs by two different systems, as illustrated in figure 2.

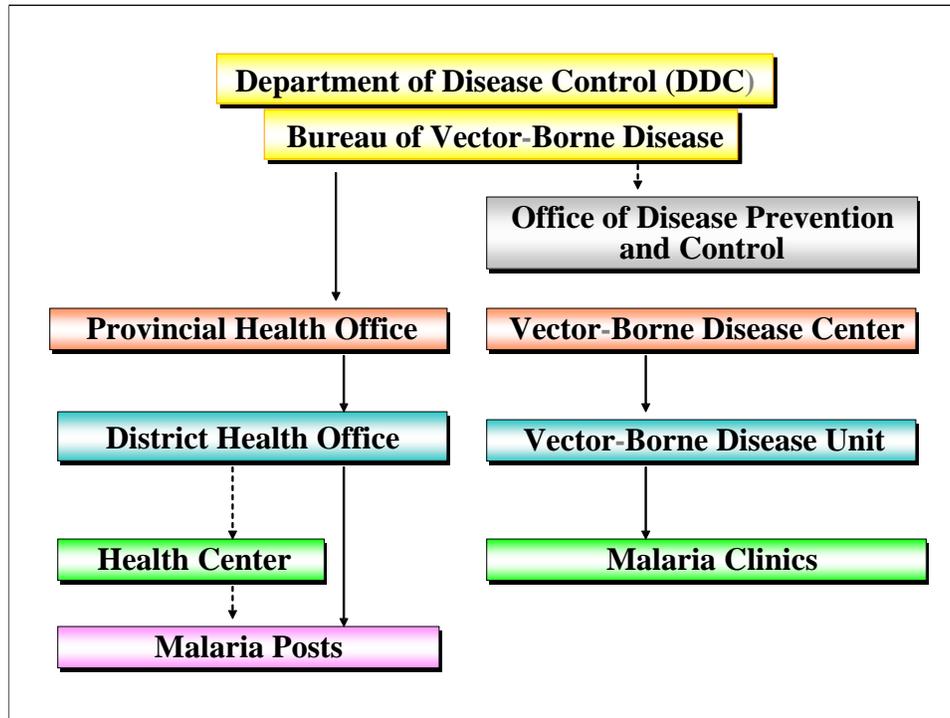


Figure 2. Structure of public sector malaria services in Thailand

The current supply system for MCs originates at the regional level with the ODPCs, which in 2007 assumed responsibility from the BVBD for the procurement, storage, and distribution of the antimalarials used in the national malaria program's routine treatment services at the MCs. Prior to 2007, the BVBD procured the medicines and then sent them to the ODPCs to store and distribute. From the ODPCs, the antimalarials are distributed to the VBDCs in the provinces, where they are stored and then distributed to the VBDUs. The VBDUs supply them directly to the MCs in their district.

The structure of this supply system, including the specific duties assigned to each level of the system, is outlined in a booklet devoted exclusively to pharmaceutical management issues.³ Based on the findings of the assessment, the basic structure of the supply system is intact, and the medicines are passing through the designated institutions in all of the provinces examined.

³ Bureau for Vector-Borne Diseases. 2006. *Drug Management Guidelines for Malaria and Filariasis Treatment* Bangkok, Thailand: Bureau for Vector-Borne Diseases.

The supply system for MPs originates with the BVBD, which procures malaria medicines and RDTs at the central level and then distributes them to the PHOs, which are responsible for storing the commodities and distributing them to the DHOs that have MPs in their district. In some cases, the DHOs give the antimalarials to the HCs to distribute to the MPs under their supervision; in other cases, the DHOs supply the medicines directly to the MPs.

The design of the supply system for MPs outlined was described by an informant at the BVBD before the field visits and observed in most of the provinces and districts during the visits. However, it was not officially documented, including in the Procurement and Supply Management Plan for Round 2 or the preliminary draft of the Procurement and Supply Management Plan for Round 7, which identified only the BVBD as being responsible for procurement and the PHOs for distribution. The roles of the DHOs and the HCs in the supply system were not mentioned in these documents.

The MPs have a different supply system from the MCs, largely because the GFATM wanted the MP program to promote greater collaboration between the vertical malaria program and the other areas of the public health system, which are to assume responsibility for malaria services as part of the plan for integration. The distribution of supplies was seen as one of the ways for the malaria grant to incorporate these other actors. Nevertheless, the supply system for MPs incorporated elements of the supply system for MCs in one province and in one district in another province, which used the local VBDC and VBDU, respectively, to store and distribute the medicines for MPs. In both cases, the decision was made by local authorities based on their perception of the most effective option given local conditions.

Key Findings: Structure and Design of the Supply Systems

Supply system for malaria clinics

- The structure and design of the system is in place, well-established, and documented.

Supply system for malaria posts

- The structure and design of the system is not well defined or documented.
- Some variation in the structure of the system exists among provinces and districts, with some overlap with the supply system for malaria clinics.

Availability

The availability of first-line antimalarials for *P. falciparum* malaria (AS+MQ+PQ) and *P. vivax* malaria (CQ+PQ) throughout the supply system was used as an indicator of each system's overall performance. The availability of second-line antimalarials for *P. falciparum* malaria (QN+DX) was also assessed, but only in the supply system for MCs, because MPs do not offer second-line treatment. Similarly, the availability of RDTs was assessed in the supply system for MPs but not for MCs, because MCs use only microscopy for diagnosis.

In the supply system for MCs, 69 percent of the offices and facilities visited during the assessment had the seven essential antimalarials—five first-line plus two second-line—available

at the time of the site visit. This level of availability of essential antimalarials throughout the system suggests the system is not functioning optimally; it means five of the sites had a stock-out of at least one antimalarial. The most common medicine out of stock was PQ (5 and 15 mg). Although only one of the five sites with a stock-out was an MC, where treatment services are delivered and access to treatment is most critical, three of the sites were VBDUs (of six VBDUs total), which are responsible for supplying the MCs. One VBDU was out of four of the five first-line medicines.

Availability in the GFATM supply system for MPs is lower than in the national malaria program's supply system for MCs, with only 53 percent of the offices and facilities visited having all five first-line antimalarials available at the time of the assessment. The sites and facilities that had stock-outs of at least one first-line antimalarial included three of the four PHOs, four of the seven DHOs, and one of the seven MPs. Three of these sites had stock-outs of two or more medicines. One of the PHOs had a stock-out of all five of the first-line medicines because of a provincial-level decision to distribute the entire supply of medicines to the DHOs at one time, rather than store a portion on hand for periodic distribution. Although only one MP had a stock-out of medicine at the time of the assessment, an additional three MPs had low stock levels—defined as less than a full adult treatment—of at least one first-line antimalarial. One of these MPs also had a stock-out of RDTs; it was the only site or facility in the supply system with a stock-out of RDTs at the time of the assessment. The most common product out of stock in the supply system for MPs was CQ, followed by PQ (15 mg).

The degree to which the levels of availability observed in each of the supply systems can be used as an indicator of the official systems' functioning may be confounded by the unofficial, and largely undocumented, practice of borrowing and lending medicines—within each system, as well as across the two systems—to address low or depleted stock levels. Ten informants at the provincial, district and facility levels, representing both supply systems, reported borrowing from or lending to sites outside of their system. In nearly all of these cases, sites and facilities in the supply system for MPs borrowed medicines from their counterparts in the supply system for MCs to fill gaps in their pipeline and ensure availability. In the absence of borrowing, the levels of availability observed in the supply system for MPs in the assessment may have been lower.

The factors that are contributing to the availability gaps in the pipelines for MCs and MPs—namely in procurement, storage, distribution, inventory management, record-keeping and supervision—are discussed in the sections below.

Key Findings: Availability

Supply system for malaria clinics

- Of the offices and facilities, 69 percent had all the essential malaria medicines available at the time of the assessment.
- Availability was lowest at the district-level VBDUs.

Supply system for malaria posts

- Of the offices and facilities, 53 percent had all the essential malaria medicines plus RDTs available at the time of the assessment.
- Availability was low at the provincial and districts levels, where over half the offices had stock-outs of at least one medicine.

Both systems

- The practice of borrowing and lending medicines between the two systems was common; in most cases, the supply system for malaria posts borrowed from the supply system for malaria clinics to fill gaps in the pipeline and ensure availability.

Procurement

The antimalarials supplied to MCs and MPs are procured separately: the ODPC in each region procures for the MCs, whereas the BVBD at central level procures for the MPs.

The ODPCs assumed responsibility from the BVBD for the procurement of antimalarials for the MCs in 2007, as part of a larger and ongoing effort to decentralize malaria services. This recent shift in responsibility has presented significant challenges to the ODPCs, according to informants at all three of the ODPCs included in the assessment.

One of the procurement challenges reported and observed was quantification. The three ODPCs included in the assessment used a combination of quantification methods, based primarily on morbidity but with some consideration of consumption. Neither the method, nor the process, nor the tools for quantification were standardized across the different ODPCs. An informant at one of the ODPCs reported feeling uncomfortable with the validity of his calculations and with the pressure to predict the amount of medicines that would be needed with limited information. At another ODPC, the assessment team noted a significant calculation error in the quantification worksheet: three tablets of MQ per adult treatment, rather than five, were being used to calculate the quantity needed.

Another challenge reported by informants at the ODPCs was compliance with procurement policies. One informant stated that because they were new to the process, they did not know or fully understand all the policies they needed to follow. This lack of understanding, combined with the practical repercussions of the policies themselves—notably on competitive bidding and priority for purchasing from the Government Pharmaceutical Organization (GPO), a state enterprise and the primary manufacturer and supplier of pharmaceuticals for Thailand's public health system—had led to unexpected procurement delays, according to two informants.

The most significant procurement challenge reported and observed in the assessment of the supply system for MCs was the high price the ODPCs had to pay for malaria medicines. Two of the three ODPCs mentioned they had to pay higher prices for malaria medicines than the BVBD paid when it did a central procurement. In one region, for example, the ODPC paid 32 percent more per tablet of AS and 25 percent more per tablet for MQ than the BVBD paid for those same medicines. Because the budget given to the ODPCs by the MOPH for the purchase of antimalarials was based on the prices the BVBD paid in the past—and the ODPCs have not been able to secure that same price—the ODPCs’ budgets have been insufficient for procuring the total estimated requirements. Informants at both the ODPCs and the BVBD conjecture that the ODPCs have been charged higher prices than the BVBD for the same medicines from the same suppliers because they purchase smaller quantities: the ODPCs procure medicines only for the MCs in their region, as opposed to the BVBD, which used to procure medicines for all MCs countrywide.

In the Procurement and Supply Management Plan for the GFATM Round 2 malaria grant, the BVBD was assigned responsibility for the central procurement of all malaria medicines and RDTs used at MPs. However, the BVBD did not purchase the medicines for the MPs with GFATM money but rather with government money from the national budget. The decision to use government funds to procure the medicines was made prior to the start of Round 2 in an effort to avoid some of the GFATM’s procurement policies, which would have resulted in a more expensive and less sustainable medicine supply. In particular, an informant at the BVBD noted that GFATM policies would have prevented the BVBD from using national manufacturers and suppliers, including the GPO, for certain antimalarials. RDTs, in contrast, were purchased entirely with funds from the GFATM grant.

One of the procurement challenges faced by the BVBD, according to one informant, has been the availability of first-line antimalarials from national manufacturers and suppliers. The GPO does not produce or consistently offer AS and MQ. Therefore, the BVBD has had to procure these medicines from alternative sources: AS from a Chinese pharmaceutical company (then packaged in blisters by a Thai company) and MQ from a private Thai pharmaceutical company. In addition, the GPO produces PQ only on a limited basis and in limited quantities, so it is not always available when the BVBD needs to procure it. The GPO’s limited production of PQ had also affected the ODPCs’ ability to procure it as needed for MCs, according to two informants.

Key Findings: Procurement

Supply system for malaria clinics

- ODPCs pay higher prices for malaria medicines than the BVBD pays.
- ODPCs do not have sufficient budgets to purchase their total annual requirements.
- ODPCs report procurement delays resulting from challenges perceived in procurement policies.

Supply system for malaria posts

- BVBD uses government funds to purchase malaria medicines for the malaria posts, instead of GFATM grant money, because of the latter’s strict procurement policies.

Both systems

- Malaria medicines are not consistently available from the GPO.

Distribution

The assessment did not note any fundamental problems with the similar structure and design of the two distribution systems, which allow for frequent resupplying and have the potential to be responsive to local conditions as well as unexpected changes. However, evidence of uneven distribution—stock-outs, overstocks, and stock levels inconsistent with combination treatment ratios—was observed in both systems and suggests they are not functioning optimally.

- Nearly a third of sites and facilities in the supply system for MCs and nearly half in the supply system for MPs had stock-outs of at least one medicine at the time of the assessment, even though there was no evidence of system-wide shortages or stock-outs of any malaria medicines (see “Availability” above).
- Numerous sites in both systems had potential or suspected overstocks of one or more antimalarials, including AS and MQ, presumably because of overestimation of need and lack of definition of maximum stock levels. However, these reasons could not be confirmed because calculating maximum stock levels was outside the scope of the assessment.
- Four sites in the supply system for MCs had obvious overstocks of CQ, QN, or AS because of distribution practices characterized as “drug dumping”—(re-)distributing medicines to lower levels in excessive quantities without consideration of actual need in an effort to unload overstock or stock nearing expiry.
- Stock level data observed and collected from both systems and at all levels showed that malaria medicines were not regularly distributed in the correct proportions to one another based on the combination therapy treatment regimens. With the exception of two MPs, which received and managed their medicines as complete treatments rather than individually, none of the other offices or facilities in either supply system that were visited during the assessment had stock levels of MQ and AS that reflected the 5:12 ratio of MQ tablets to AS tablets in an adult treatment regimen for *P. falciparum* malaria. Based on the size of their respective packaging, all offices and facilities should have had on hand one bottle of 100 MQ tablets per box of 20 × 12 AS blisters, or an equivalent fraction thereof. Similar problems were observed with CQ and PQ, which are used in a 10:14 ratio of CQ tablets to PQ tablets (5 mg) for the treatment of *P. vivax* malaria.

The most significant and consequential gap observed in both distribution systems, which likely contributed to the preceding distribution problems, was the lack of documented and well-defined distribution plans. None of the informants at the regional-, provincial-, or district-level offices that distribute malaria medicines (and RDTs, in the case of the supply system for MPs) reported having a distribution plan.

Guidelines for distribution in the supply system for MCs were documented in the pharmaceutical management booklet. The ODPCs normally distributed medicines to the VBDCs twice a year, while distribution from the VBDCs to the VBDUs and from the VBDUs to the MCs occurred on a monthly basis at regularly scheduled meetings where the medicines were picked up. Some

exceptions were noted, most often caused by low stock levels, which necessitated additional pick-ups in between scheduled distributions.

The system appeared to be primarily a “pull” system, with lower levels typically submitting a request for the quantities of medicines they needed; however, it also had elements of a “push” system, in that the requests were reviewed and subject to modification by the higher levels, which sometimes pushed unrequested quantities on the lower levels on the basis of their perception of need. One VBDC, two VBDUs, and two MCs reported sometimes receiving quantities that differed significantly from the quantities they requested. The ODPCs, VBDCs, and VBDUs in the supply system for MCs did not appear to have a set formula for calculating the amount to request or to distribute to each level, based on defined minimum and maximum stock levels. However, the majority reported basing their decision on the reported number of positive cases in the previous month(s) in the catchment area as well as the existing stock levels, plus an additional amount for safety stock.

Documented guidelines for distribution, similar to those developed for the supply system for MCs, did not exist for the supply system for MPs; however, the two systems functioned similarly. The BVBD normally distributed medicines to the PHOs twice a year, depending on availability at the central level, while distribution from the PHOs to the DHOs and the DHOs to the MPs—in some cases, via the HCs—occurred, on average, once a month at regularly scheduled supervision meetings where medicines were picked up. In one province, however, the frequency of distribution had to be cut back from once a month to once a quarter toward the end of the Round 2 grant because of the insufficiency of funds to continue supporting the monthly meetings. HCs were used to distribute medicines if the MPs required additional stock between the quarterly distribution.

Distribution in the supply system for MPs appeared to be an ad hoc combination of “push” and “pull,” based on informants’ reports of how distribution quantities were determined. It varied between provinces, as well as within provinces, presumably because of the lack of defined procedures, which allowed for individual adaptations of the system. The PHOs, DHOs, and MPs did not have a standard method for determining request or distribution quantities and often did not consider all relevant information when they made their determination. Over half the informants at the PHOs and DHOs reported using only the number of cases in the previous month(s) to decide how much medicine to distribute or request. They did not mention existing stock levels—stock on hand—as a factor in their calculation. Safety stock was factored into the request and distribution quantities by less than half.

An additional distribution issue observed in the supply system for MPs was the distribution of loose tablets outside their original packaging, particularly without all of the required information about the medicines. Based on the reports of various PHOs and DHOs, as well as observations made during the assessment, bottles of loose tablets were sometimes divided and transferred to other containers—generic or recycled medicine bottles, or plastic bags—so that less than the full amount contained in the original bottle could be distributed to the DHOs and MPs. At times this was done because stock levels at the point of distribution did not allow for the distribution of full containers to all recipients; more often it was done to accommodate the smaller quantities needed in certain districts and at MPs. Of the 12 nonoriginal containers used to distribute loose tablets to

DHOs and MPs that were observed during the assessment, none had been labeled with all of the necessary information—name of the medicine, quantity enclosed, the date issued, the lot number, and the expiry date. The most common omissions were date issued and lot number, followed by expiry date. One plastic bag was not labeled with any information.

Key Findings: Distribution

Both systems

- Evidence exists of uneven distribution: stock-outs, shortages, overstocks, and stock levels inconsistent with combination therapy ratios
- No distribution plans exist.
- No standard formulas exist for calculating request/distribution quantities.

Supply system for malaria clinics

- Distribution system and responsibilities are outlined in a pharmaceutical management booklet developed specifically for the offices in the system.
- Evidence exists of drug dumping of excess stock.

Supply system for malaria posts

- An ad hoc combination of “push” and “pull” distribution systems exists within and between provinces.
- Distribution of medicines and RDTs to malaria posts happens less frequently in some provinces and districts because of budgetary constraints.
- PHOs and DHOs distribute medicines in plastic bags and generic medicine bottles without all of the required drug information.

Storage Conditions

According to the structure of both supply systems, malaria medicines (and RDTs, in the case of the supply system for MPs) are stored at all levels of the system—theoretically in decreasing quantities and for decreasing periods of time as they move down the system. The assessment found that a majority of these sites and facilities that store malaria medicines in the supply systems for MCs and MPs had substandard storage conditions, based on one or more of the assessment team’s criteria: basic infrastructure (exterior and interior), space, climate control, cleanliness, and security.

Storage conditions at the ODPCs, which store the largest volume of malaria medicines in the supply system for MCs, varied widely among the three sites visited on the assessment. At one ODPC, space in the storeroom was severely limited: boxes of medicines that could not be accommodated on the shelves were stacked up to the ceiling as well as in the walkways. In addition, the temperature inside the storeroom noticeably exceeded the acceptable range, despite a report from the pharmacist in charge of the facility that the storeroom had automatic climate control. At another ODPC, where the procurement, storage, and distribution responsibilities for malaria medicines were assumed by the office’s Pharmaceutical Department, rather than the Malaria Cluster, the storage conditions met all minimum standards: the medicines were well organized on shelves in a clean, climate-controlled, secure storeroom with adequate space.

At the VBDCs, VBDUs, and MCs, the main storage condition not met was climate control. In all cases, the malaria medicines were stored out of direct sunlight in a consistently shaded area with ventilation, but most of the storage areas did not have air conditioning to ensure that medicines remained at an acceptable temperature when the ambient temperature exceeded the maximum storage temperatures—reportedly a problem during certain times of the year. At the one VBDC where malaria medicines were stored in an air-conditioned area, the medicines were kept in an office rather than in the storeroom. In general, the storage areas at the VBDCs, VBDUs, and MCs were spacious and clean without any visible signs of pests or damage to the medicines or packaging resulting from poor storage conditions.

All of the sites and facilities in the supply system for MCs, including the MCs themselves, had some degree of security in place to limit the accessibility of the medicines to unauthorized persons and to prevent theft. Additionally, none of the ODPCs, VBDUs, VBDCs, or MCs reported any theft or significant leakage.

The storage conditions of the sites and facilities in the supply system for MPs varied significantly, but overall were inadequate at all levels of the system, particularly given the added challenges of storing RDTs—a commodity managed in the supply system for MPs but not in the supply system for MCs, which requires a lot of space because of the quantities used and the size of the packaging, as well as temperature stability because of the sensitivity of the product's quality to high temperatures and humidity.

The BVBD, which is responsible for storing all antimalarials for MPs after they have been procured and before they are distributed to the PHOs, does not have a permanent central warehouse. To fill this gap, the agency rents a temporary facility located off site, which an informant acknowledged does not have the conditions—namely, climate control—for storing pharmaceuticals appropriately. The antimalarials for MPs were stored in this temporary storage facility, while the RDTs were stored in the Principal Recipient's office—a large room located in the same building as the BVBD offices. The lack of a permanent warehouse with the infrastructure, climate control, space, and security required to meet minimum standards was identified by multiple informants at the central level as one of the major pharmaceutical management challenges the agency faces. Plans to integrate malaria services, including the procurement, storage, and distribution of malaria commodities, into the general public health system over the next five years has made justifying the additional funding from the MOPH to establish an adequate central warehouse during the transition difficult for the BVBD.

PHOs also struggle to meet the necessary storage conditions for the malaria medicines and RDTs they receive from the BVBD to supply to MPs. Space and climate control were identified as storage challenges at all four of the PHOs in the assessment, especially because of the RDTs, which require more space and lower temperatures than the PHOs could provide with existing infrastructure. One PHO was unable to overcome the storage challenges it faced and thus decided not to store any medicines or RDTs in its office but rather to distribute all of them to the DHOs immediately upon receiving them from the BVBD. Another PHO that lacked the capacity to store the medicines and RDTs appropriately gave them to the VBDC to store.

The storage conditions at the DHOs varied widely. Four of the DHOs stored all the malaria medicines and RDTs on shelves in a clean, locked cabinet in an air-conditioned area of the office, which was considered adequate for the district level. Three of the DHOs, however, were not providing these same storage conditions. One DHO gave its medicines—though not its RDTs—to the VBDU to store.

Although HCs were involved in the supply system for MPs in some districts—acting as a distribution mechanism between the DHOs and the MPs—reportedly none of the HCs stored medicines or RDTs for more than a few days or in sizable quantities.

Storage conditions at the seven MPs visited for the assessment were poor. The most concerning issue was the lack of temperature control or ventilation in all of the areas, which are known to have excessive heat and humidity. Of particular concern was the effect prolonged exposure to such conditions would have on the quality of the medicines and RDTs at four of the MPs, which had quantities of stock on hand that far exceeded expected use or were older than one year. Although two of the MPs stored their medicines in cabinets with shelves and a lock issued to them by the DHO to protect the medicines and RDTs from damage and potential leakage, the remaining MPs stored their medicines in less secure areas—such as boxes and desk drawers—that left the products more vulnerable to damage and more accessible to unauthorized persons.

Key Findings: Storage Conditions

Both systems

- Lack of temperature stability/control at the majority of offices and all facilities
- Overall poor storage conditions at all levels

Supply system for malaria clinics

- ODPCs are not prepared to store the large quantities of medicines they now manage as part of their procurement responsibilities.

Supply system for malaria posts

- BVBD is using a temporary site with poor conditions as a central warehouse.
- Inadequacies of storage conditions at all levels are magnified by the added storage requirements of RDTs in terms of space and temperature stability.

Inventory Management

Deficiencies in inventory management at all levels of the two supply systems appear to have contributed to the stock-outs, overstocks, and generally unbalanced stock levels observed at numerous sites throughout both systems, as well as to unnecessary loss of stock because of expiry.

Effective inventory management was hindered in both supply systems by the lack of set minimum and maximum stock levels to help sites monitor and maintain appropriate levels of stock and to prompt timely requests for stock replenishment. As a result, many sites defined their own minimum stock levels, or reordering levels, based on their perceptions of “low” stock. Ten

informants, representing both supply systems at the district and facility levels, said they request more medicine when they run out of it entirely. The concept of a maximum stock level was not widely acknowledged at the sites and facilities that had, or were suspected of having, overstocks.

Another inventory management concern observed in both systems and at all levels was poor adherence to the first-expiry/first-out (FEFO), or first-in/first-out (FIFO), order for storing and moving (distributing and dispensing) stock. The assessment found that approximately half the sites and facilities in each of the systems were not complying with the FEFO method in their storage, distribution, or dispensing of medicines. Expired medicines were found among the usable stock at seven sites—three in the supply system for MCs and four in the supply system for MPs. CQ was the most common expired medicine.

Additional expired medicines may have been present at MPs; however, they could not be distinguished from unexpired medicines because of the practice noted at four of the seven MPs of combining tablets received from the DHO at different times in the same container, without verifying that they were from the same lot with the same expiry date. Because the tablets were combined, neither the MPWs nor their supervisors nor the assessment team could monitor the expiry dates of those medicines. In addition, the four MPs had not labeled or updated the containers with any of the new drug information, nor was the drug information transcribed into the stock records.

Key Findings: Inventory Management

Both systems

- Minimum and maximum stock levels are not defined or used to maintain appropriate stock levels.
- Medicines on shelves were not arranged according to FEFO.
- Expired medicines were discovered on the shelf at several sites in both systems.

Supply system for malaria posts

- Some malaria posts combine tablets of the same medicine, but received at different times, in the same container without consideration of their different lot numbers and expiry dates, making expiry of medicines impossible to monitor at those malaria posts.

Information System and Record Keeping

The assessment found considerable variability in the extent and quality of reporting and record keeping, including in the forms themselves, not only between the two supply systems but also within each system. It was not feasible within the scope of the present assessment to collect and review all the different forms systematically to determine the type of information captured and the frequency of reporting. Therefore, the findings presented are based on general observations made of each system during the field visits, with an emphasis on basic stock records.

Neither of the systems had a uniform set of forms for requesting, issuing, and monitoring stock. As a result, most of the sites and facilities had developed their own forms, which did not necessarily capture all information needed to effectively manage the malaria commodities throughout the supply system.

All offices and facilities in the supply system for MCs had a stock book or ledger to monitor stock levels based on the medicines received and issued. The formats varied significantly, with some capturing more complete data on stock than others. In three-quarters of the sites, the stock records were up-to-date and accurately reflected the stock on hand. Although consumption data could have been readily collected, compiled, and reported within the system, it was not systematically calculated or reported.

The quality of record keeping in the supply system for MPs was generally low. Four sites—one DHO and three MPs—did not maintain any kind of stock record. Half the stock records observed at the other sites had not been updated in one month or longer or did not match the physical count of stock on hand. Many of the forms reviewed during the assessment did not have information on drug expiry. The PHOs and DHOs appeared to have numerous forms to collect comprehensive data on stock levels at different levels of the system, including consumption at MPs; however, they did not appear to have an effective system for compiling, organizing, and using the data.

Key Findings: Record Keeping

Both systems

- Variability exists in the extent and quality of reporting and record keeping in both systems and at all levels.
- Forms and reporting procedures are not standardized within each system.

Supply system for malaria clinics

- Consumption data are not systematically recorded or reported.

Supply system for malaria posts

- Four sites did not maintain any kind of stock record.
- Stock records at half the offices and facilities had not been updated in over one month.
- Data are available but not effectively managed and used.

Supervision and Monitoring

Both malaria service programs have supervision and monitoring built in, particularly for the district and facility levels, to address programmatic and service delivery issues. Although pharmaceutical management is one of the areas to be supervised and monitored, it did not appear to be covered adequately. Some of the issues observed in the assessment—such as the presence of expired stock at facilities and poorly maintained stock records—could have been addressed through more effective supervision and monitoring.

The routine malaria services program, led by the BVBD and comprising VBDCs, VBDUs, and MCs, relies primarily on regular meetings to provide supervision and monitoring. The VBDUs have monthly meetings at the VBDC, and the MCs have monthly meetings at VBDUs, at which stock levels are supposed to be reported, expired medicines returned, and new medicines distributed. Because they were all located within the same building as their supervising VBDU, the MCs included in the assessment received considerable on-site supervision, but this practice was not the norm. MCs located farther away did not receive the same level of supervision. Reportedly, supervisory visits to the individual offices and sites were irregular and uncommon. A supervision tool did not exist for such visits.

The MP program has extensive and frequent supervision and monitoring for MPs, with some variation between provinces and districts, based on information collected from informants during the assessment. The assessment found that most MPs attended monthly meetings at the DHOs, in addition to receiving regular, often monthly, on-site supervisory visits from HCs and VBDUs. In one province, however, the frequency of supervision was reduced from once a month to once a quarter because of budget constraints. In addition to regular meetings and supervisory visits, MPs also underwent semiannual monitoring by a team of malaria professionals.

The supervisors in the MP program did not have the necessary expertise or tools to address effectively problems related to pharmaceutical management, based on reports from informants, as well as the assessment team's own observations. None of the supervisors had received any specific training in pharmaceutical management. In addition, they did not have appropriate tools to use during the supervisory visits, such as a checklist of pharmaceutical management issues to check, to guide the supervision. This lack of training, as well as the absence of tools, may have been a consequence of the program managers and coordinators at the regional and provincial levels not possessing a sound knowledge of pharmaceutical management themselves—a deficiency that was observed in discussions during the assessment.

One indicator was being used to monitor the performance of the supply system—and that one, only for MPs: percentage of health facilities reporting no disruption of stock of antimalarial drugs and RDTs for greater than two weeks. The assessment team considered the criterion of “greater than two weeks” for reportable stock-outs to be inappropriate, given the importance of prompt treatment for malaria and the level of functioning expected from an effective supply system. The supply system for MCs did not appear to have any indicators by which to monitor its performance.

Key Findings: Supervision and Monitoring

Both systems

- Supervision and monitoring are built into the programs but are not effectively addressing pharmaceutical management issues based on some of the types of problems identified in the assessment.
- No checklists or other tools are available to guide the supervision and monitoring of pharmaceutical management issues.

Supply system for malaria clinics

- Supervision and monitoring are provided at regular monthly meetings; on-site supervision at facilities is reportedly uncommon.
- No indicators exist for monitoring the performance of the system.

Supply system for malaria posts

- Regular and frequent on-site supervision and monitoring is done at malaria posts.
- Program managers and supervisors do not have adequate knowledge and capacity in pharmaceutical management.
- Stock-out indicator for GFATM malaria grant is poorly defined.

RECOMMENDATIONS

The following recommendations are intended to address the specific deficiencies in pharmaceutical management that were identified in the assessment. They were validated by participants from the regional and provincial levels of the two supply systems at the validation workshop immediately following the assessment and deemed to be high priorities.

Because many of the deficiencies are interrelated, an effort has been made to propose actions and strategies that will strengthen the overall systems and that will be both feasible and appropriate, given the larger context in which they are to be introduced and implemented. In the case of the supply system for MCs, the emphasis is on strengthening and refining the system already in place so that it can function optimally while malaria services are integrated into the general public health system. In the case of the supply system for MPs, the emphasis is on developing and standardizing a more effective system for the scale-up of MPs under the GFATM Round 7 grant.

The recommendations are organized under the same headings used in the “Results” section of the report to indicate the aspect(s) of the system they address, as well as several additional headings that reflect cross-cutting areas relevant to the systems’ overall functioning.

Structure and Design of the Supply Systems

1. Design a Standard Supply System for MPs in Round 7

Designing and documenting a standard supply system for MPs is an essential first step in ensuring its effectiveness, particularly as the MP program is scaled up in Round 7 and new posts are created in provinces that were not involved in the program in Round 2. The design should—

- Define the roles and responsibilities of the different actors at all levels of the system
- Take into account the perspectives, experiences, and concerns of stakeholders—the BVBD, the GFATM Principal Recipient office, and a selection of PHOs and DHOs
- Incorporate effective strategies and lessons learned from the implementation of the supply system in Round 2
- Give PHOs and DHOs a degree of freedom to adapt the standard supply system to the local context

After a standard system has been defined, it should be documented—in the Procurement and Supply Management Plan for Round 7, as well as in a more user-friendly version for the PHOs and DHOs, similar to the pharmaceutical management booklet developed for the routine malaria services’ supply system—and communicated to all stakeholders, especially those who are new to the MP program in Round 7.

2. Distribute the Pharmaceutical Management Booklet for the Routine Malaria Services' Supply System for MCs

The pharmaceutical management booklet developed for the routine malaria services' supply system for MCs is a useful reference for the offices involved in the system. However, it does not appear to have been distributed to all of them, based on conversations with informants at some of the ODPCs, VBDCs, and VBDUs, who reported not knowing about it. Ensuring that the booklet is distributed to all of the offices and remains on site as a reference will increase the likelihood that the offices understand and apply the roles and responsibilities it outlines.

3. Define the Policies and Procedures for Lending and Borrowing Medicines between the Two Supply Systems

Although the routine malaria services' supply system for MCs and the GFATM's supply system for MPs are two distinct systems, intended to function independently of each other, the reality on the ground is that they are sharing medicines and, in some cases, storage and distribution responsibilities. The BVBD must decide the following—

- What is the official policy on borrowing and lending medicines between the two systems?
 - Is borrowing/lending permitted?
 - If so, under what circumstances is it permitted?
- What are the standard procedures offices and facilities must follow when they borrow or lend medicines?
 - Can individual offices and facilities manage the process of borrowing and lending medicines themselves, or will the process be managed only by certain offices or levels (e.g., the regional, provincial, or central level)?
 - How will the exchange be recorded in the stock records and reported?
- If offices and facilities assume storage or distribution responsibilities for the other supply system, do they need to manage the two stocks of medicine separately?

The practices of borrowing and lending medicines between the two systems and combining the stock have the potential to distort the estimation of annual requirements (quantification) for the procurements in each of the systems, if it is not adequately tracked, reported, and accounted for.

The BVBD may also want to define the policy and procedures for borrowing and lending malaria supplies with the other Round 7 subrecipients—American Refugee Council and Shoklo Malaria Research Unit—that will be managing malaria medicines and RDTs purchased by the BVBD with GFATM money.

Procurement

1. Centralize Procurement

A number of the procurement problems identified in the assessment could be overcome if the BVBD assumed responsibility for central procurement of all malaria medicines for both systems from 2009 through the end of the GFATM Round 7 malaria grant in 2012. By centralizing procurement for the two supply systems, the BVBD will be able to—

- Obtain lower prices from the suppliers than the individual ODPCs because of the larger volume of medicines the BVBD will be purchasing
- Set up a regular procurement schedule with the GPO, so that the GPO can count on the annual procurement and plan accordingly to ensure the availability of the requested medicines

Recognizing that the transfer of responsibility for procurement from the BVBD to the ODPCs in the supply system for MCs was done as part of a broader strategy to decentralize malaria services and integrate them into the general public health system, the ODPCs can resume procuring malaria medicines after the end of the Round 7 grant. In advance of that shift, arrangements can be made to train the ODPCs more thoroughly in procurement, including the country's procurement policies, and to lower prices for them, either through negotiations with suppliers or through a pooled procurement strategy.

2. Address Quantification

A systematic review of quantification at the BVBD and each of the ODPCs was outside the scope of the present assessment; however, the findings of the assessment in other, related areas suggest quantification could be improved in the following ways—

- Collect and report more complete consumption data from the facility level.
- Provide the ODPCs with a standardized spreadsheet that is already programmed with all the necessary formulas and requires them only to insert their region's specific data and assumptions.
- Make the appropriate adjustments for—
 - Potential increase in consumption as a result of improved accessibility of malaria services, particularly among migrants
 - Potential decrease in cases as a result of the pattern of declining malaria incidence over the past three to five years

Distribution

1. Standardize the Calculation of Request/Distribution Quantities

In the absence of sufficient guidance on how to determine the amount of medicine to request (where there is a pull system) or to distribute (where there is a push system), the offices and facilities have established their own methods, which do not necessarily take into account all relevant or necessary stock information and therefore often result in either inadequate or excessive quantities of stock on hand. The BVBD can correct this error by developing a standard formula for calculating the quantity to request and distribute. The formula should be based on—

- Minimum and maximum stock levels (to be defined according to the estimated consumption and the local malaria situation; see below)
- Number of cases expected during the period between distributions
- Existing stock levels (stock on hand)
- Correct proportions of medicines according to the combination treatment regimen (e.g., 5:12:2 for MQ+AS+PQ)

Standardizing the request and issue form, the information required on the form, or both, would also help ensure a more accurate determination of the distribution quantities.

2. Maintain and Prioritize Monthly Meetings for Distribution, Especially with MPs

The monthly meetings that occur in most provinces and districts, at which the district-level offices and facilities are resupplied with medicines (and RDTs in the case of the DHOs and MPs), are a cost-effective method of distribution, which should be maintained and prioritized even in the face of budget constraints. Monthly distributions help keep the amount of stock required in the field—where capacity to store and manage supplies appropriately is limited—to a minimum and allow for frequent monitoring of stock levels. In the supply system for MPs, the meetings will also help prevent, or eliminate, the need for HCs to act as an intermediary, and largely unmonitored, distribution point between DHOs and MPs. The multiple additional purposes served by the monthly meetings—in terms of reporting, supervision, and problem solving—add to their cost-effectiveness. As such, sufficient funds should be allocated to ensure their continuation, particularly in the Round 7 malaria grant.

3. Prevent “Drug Dumping”

Improvements in quantification and the calculation of distribution quantities, such as those recommended above, will help prevent excess stock in the supply systems as a whole and at any given point in the systems. Nevertheless, BVBD should—

- Establish procedures for handling overstocks at offices and facilities if and when they occur; this may mean returning excess supplies to a designated point in the system or redistributing them to other offices and facilities in the system that need them.
- Give offices and facilities at all levels of the system the authority to refuse medicines, or quantities of medicines, they did not request and they know they do not need.

The BVBD may want to centralize the reporting of overstock and the redistribution process, because it is in the best position to assess where additional supplies are needed in the country, if at all.

Storage

1. Establish an Appropriate Storage Facility for Malaria Commodities at the Central Level

Establishing an appropriate storage facility at the central level is essential. The facility should have, at minimum—

- A fixed site
- Sufficient space (accounting for growth as the MP system is scaled up under GFATM Round 7)
- Temperature stability/control
- Security
- Shelving and/or pallets

The BVBD can either lobby for the necessary funds to create a new facility, based on the expectation that it will retain at least some of its storage responsibilities in the long term, or it can identify a preexisting facility with the appropriate conditions to meet its needs in the short term. Possibly, the BVBD can negotiate a deal with the GPO, particularly given its status as a state enterprise and the supplier of many malaria medicines, to store the medicines at its warehouse until the BVBD is ready to distribute them.

2. Systematically Assess Deficiencies in Storage Facility Infrastructure in All Offices and Facilities at Regional, Provincial, and District Levels to Identify Major Gaps

It is widely recognized throughout both supply systems that the majority of storage facilities at the regional, provincial, district, and community levels do not have the necessary infrastructure to ensure appropriate storage conditions for malaria medicines and RDTs. To address these deficiencies in infrastructure, the BVBD must first assess them systematically, using realistic “minimum standards” for each level, and then identify the major gaps. When the extent of the

gaps is known, the BVBD can either identify funds to improve storage infrastructure—throughout the system or at strategic points—or provide guidance to the regional, provincial, and district-level offices on how to assess the adequacy of alternative, preexisting storage facilities in their area, such as hospitals or other offices.

Storage, Distribution, Inventory Management, and Record Keeping

1. Develop SOPs or Guidelines for Storage and Distribution in the Supply System for MPs

Developing and documenting standard operating procedures for storage and distribution—including inventory management and record keeping—is essential in ensuring the effectiveness of the supply system for MPs. The process will give the BVBD an opportunity to think systematically and strategically about those aspects of the supply system, while the product will give the offices and facilities in the system a reference guide for their specific roles, responsibilities, and duties. Ideally, the PHOs and DHOs would also be involved in the development process to ensure the feasibility and appropriateness of the procedures, given the conditions at their offices.

At minimum, the SOPs should define—

- Specific responsibilities of the storage facilities at all levels of the supply system in terms of—
 - Storage
 - Distribution
 - Inventory management
 - Record keeping
 - Monitoring and supervision
- Distribution procedures, including—
 - Guidelines for developing a distribution plan (schedule, distribution mechanism, etc.)
 - Formula for calculating quantities to distribute
 - Information to be provided with distributed medicines
- Minimum and maximum stock levels, or the method for determining them
- Good storage practices, including—
 - Realistic standards, or minimum standards, for storage conditions at each level
 - FEFO/FIFO
- Record-keeping procedures (including sample forms) for—
 - Stock records (ledger, stock cards)
 - Request form
 - Monthly/quarterly/annual reporting forms

Information System

1. Standardize Stock Records and Forms

The inconsistency of information collected and reported by the offices and facilities in the two supply system is a major obstacle to an effective information system. Standardizing the stock records and reporting forms for each of the systems will ensure that the offices and facilities in the same supply system are collecting and reporting the same, relevant information. Although the forms used in the two systems are likely to differ, based on the different reporting requirements of the two programs, certain basic information should be collected and reported the same in both systems so that it can be compared and possibly combined to present an overall picture of the supply situation for malaria.

Supervision and Monitoring

1. Maintain Regular and Frequent Supervision and Monitoring for MPs

The regularity and frequency of on-site supervision and monitoring of MPs by the PHOs, DHOs, VBDUs, and HCs is one of the greatest strengths of the MP program. Among other things, the on-site visits provide the opportunity to observe the MPs' stock levels, inventory management, record-keeping practices, and prescribing/dispensing practices on an ongoing basis, so that mistakes can be identified and addressed effectively and in a timely manner. The provinces may want to budget more time and money for the supervision and monitoring of new MPs, particularly in their first few months of operations while they are still learning and getting accustomed to their duties.

2. Develop a Standard Checklist for Supervision

The regular supervision and monitoring of pharmaceutical management practices at MPs will be more effective if the supervisors and monitors have a tool, or checklist, to guide their activities. The checklist should guide the supervisors and monitors to—

- Observe the stock levels to determine whether the MP needs to request more supplies, or return excess stock
- Review the stock records since the last visit and check that the records have been reconciled with the stock on hand
- Observe the MPWs' receiving procedures (if the supervisor is present when the MP receives new stock)
- Verify the adequacy of the storage conditions (at the start, as well as if conditions change)

It may not be necessary to perform all of these supervisory activities on every visit, particularly as an MP becomes more established and the MPWs' competency increases. As such, an appropriate schedule should be set up specifying how often each activity should be performed.

3. Establish Indicators to Measure Performance of the System

Indicators are essential in monitoring and evaluation of a supply system. At present, no indicators are used to measure the performance of the supply system for MCs and only one inappropriately defined indicator is used to measure the performance of the supply system for MPs. To ensure that problems in the system can be detected and addressed and that progress can be reliably demonstrated, the BVBD must—

- Establish a set of indicators to measure the performance of the supply systems on an ongoing basis
- Ensure that the information needed to calculate the indicators is collected and reported in the forms submitted by offices and facilities as well as in the supervision and monitoring tool
- Redefine the stock-out indicator for the GFATM malaria grant so that shorter stock-out periods are reported (e.g., one, three, or five days instead of two weeks), reflecting a higher standard for the supply system for MPs

Capacity Building

1. Pharmaceutical Management for Malaria Course for Regional and Provincial Offices

Training key personnel at the ODPCs and PHOs in pharmaceutical management, specifically for malaria, is the first step toward building capacity throughout the two supply systems. With a more thorough understanding of the concepts and their importance to the overall functioning of the supply system, the ODPCs and PHOs will be better prepared to perform their duties, train and supervise the offices and facilities in their region or province, and ultimately, manage the medicines in their areas more effectively.

2. Storage and Distribution SOPs for PHOs and DHOs

When the SOPs for storage and distribution have been developed, as previously recommended, they will need to be effectively communicated to the PHOs and DHOs. Distributing the document alone will not ensure that the contents and specific duties are understood. Thus, an interactive training that covers all the material and gives the participants the opportunity to ask questions is recommended. If feasible, the PHOs should train the DHOs.

3. Training for Supervisors and Monitors

The supervisors and monitors for MPs will need to be trained to use the checklist for supervising stock-related issues. This training should cover not only *what* they need to look for but also *why* they need to look for those things, so they understand the importance.

4. MPW Training

The assessment team was not able to obtain a copy of the training materials for MPWs to ensure that all relevant aspects of pharmaceutical management were covered. The training should include information on—

- How to receive medicines
- Good storage practices
- Inventory management
- Stock record keeping

Additional Considerations for Scale-up of MPs under GFATM Round 7

1. Account for Increase in Annual Procurement

As the number of MPs increases, so will the number of cases detected and the quantities of medicines needed in the system to treat them. The BVBD will need to account for that increase in need in its quantification, also taking into consideration the timeline for rolling out the new MPs, which will likely span at least two procurements.

2. Estimate Redistribution of Cases in Areas with New MPs

In areas where new MPs are established, the number of cases detected at other facilities—namely, nearby MPs and MCs—is likely to drop because of the redistribution of patients among more facilities. To the extent possible, PHOs and DHOs should estimate the redistribution of cases in the area given the presence of a new facility and adjust distribution quantities accordingly.

Private Sector

1. Conduct Assessment of Availability of Malaria Medicines in Private Pharmacies and Dispensaries in Border Areas Where New MPs Are Targeting Migrants

Although the private sector was not within the scope of the assessment, anecdotal information gathered from informants, as well as the results of a small study conducted in one of the provinces, suggests that malaria medicines are available in private pharmacies and dispensaries in the border areas and that migrants may be accessing them because of fears of the public health system or a lack of awareness of the services available to them. The BVBD may want to consider

conducting an assessment of the availability of malaria medicines in the private sector and migrants' use of the private sector for malaria treatment, particularly in areas where new MPs are targeting migrants, to understand the scope of the problem more fully and develop effective messages for changing migrants' treatment-seeking behavior.

ANNEX 1. ASSESSMENT ITINERARY

Supply System Assessment
Data Collection Itinerary
29 June–16 July, 2008

29 June	Travel from BKK to Phitsanuloke
30 June	08:30 a.m. Visit ODPC 9, Phitsanuloke 11:00 a.m. Travel to Tak Province 01:30 p.m. Visit PHO Tak
1 July	08:00 a.m. Travel to Maesot District 09:00 a.m. Visit VBDC, VBDU and Malaria Clinic Maesot 01:00 p.m. Visit DHO Maesot 03:00 p.m. Visit Malaria Post (x2)
2 July	08:00 a.m. Travel from Maesot to Tha Song Yang 09:30 a.m. Visit DHO Tha Song Yang 01:00 p.m. Visit VBDU and Malaria Clinic Tha Song Yang 03:00 p.m. Visit Malaria Post
3 July	08:00 a.m. Travel Mae Ra Mat District 09:00 a.m. Visit DHO, VBDU and Malaria Clinic (all in same building) 01:00 p.m. Travel to Phitsanuloke
4 July	08:00 a.m. Travel to Chiang Mai 01:30 p.m. Visit ODPC 10 Chiang Mai 03:00 p.m. Visit Kenan Institute Asia office
6 July	10:00 a.m. Travel by car to Mae Hong Son Province
7 July	09:00 a.m. Visit PHO Mae Hong Son, meet PCMO 11:00 a.m. Visit VBDC Mae Hong Son 01:00 p.m. Visit VBDU and Malaria Clinic 02:30 p.m. Visit Malaria Post
8 July	08:00 a.m. Travel to Pangma Pha District 09:30 a.m. Visit VBDU and Malaria Clinic 11:00 a.m. Visit DHO Pangma Pha 01:00 p.m. Visit Malaria Post
9 July	08:00 a.m. Travel to Khun Yuam District 09:30 a.m. Visit DHO Khun Yuam 11:00 a.m. Visit VBDU and Malaria Clinic

- 01:00 p.m. Visit Malaria Post
03:30 p.m. Travel to Mae Sarieng District
- 10 July 08:00 a.m. Visit DHO Mae Sarieng
10:30 a.m. Visit VBDU and Malaria Clinic
01:00 p.m. Visit Malaria Post (x2)
- 11 July 08:00 a.m. Travel to Chiang Mai and Bangkok
- 13 July 02:00 p.m. Travel from Bangkok to Ratchaburi
- 14 July 09:00 a.m. Visit ODPC 4 Ratchaburi
01:00 p.m. Travel to Kanchanaburi Province
02:00 p.m. Visit PHO Kanchanaburi
03:30 p.m. Visit VBDC Kanchanaburi
- 15 July 08:00 a.m. Travel to Sai Yok District
09:00 a.m. Visit VBDU and Malaria Clinic
11:00 a.m. Visit DHO Sai Yok
01:30 p.m. Visit Malaria Post
03:30 p.m. Travel to Bangkok
- 16 July 09:35 a.m. Travel from Bangkok to Surat Thani
01:00 p.m. Visit PHO Surat Thani, meet Assistant PCMO
03:00 p.m. Visit VBDC Surat Thani
07:00 p.m. Travel from Surat Thani to Bangkok

ANNEX 2. INTERVIEW GUIDE

SUPPLY SYSTEM ASSESSMENT THAILAND, JUNE–JULY 2008

GENERAL

1. What are your office's/facility's responsibilities—technical, managerial and administrative—with respect to the malaria program, specifically the GF malaria grant?
 - What are the specific supply chain responsibilities (storage, distribution, inventory management, reporting, etc.)?
2. What malaria commodities (medicines, diagnostic supplies, etc.) does your office/facility receive?

PROCUREMENT/QUANTIFICATION (BVBD and ODPCs only)

3. What malaria products does your office procure?
4. What is the source of funding for the procurement of malaria supplies?
5. When and how often does your office procure malaria supplies?
6. What does the procurement process entail (step by step)?
 - How long does the procurement process typically take (from calculating requirements, i.e. quantification, to receiving the order)?
7. What are the procurement policies your office must follow?
 - Competitive bidding?
 - WHO prequalified products/manufacturers?
 - Etc.
8. What have been the greatest challenges in the procurement of malaria medicines and RDTs?

ORDERING/RECEIVING

9. Does your site request malaria drugs and supplies or does another office decide when to send them to your office/facility (i.e., is it a push or pull system)?

10. How often does your site order/receive malaria commodities? (Number of times per year; recall last calendar year for reference.)
- Do they all come in a single shipment, or in 2 or more shipments during the year?
 - Does your office/facility request or receive medicines on a regular schedule or just when more medicines are needed?
 - If the former, what is the schedule?
 - If the latter, how does one determine that more medicines are needed (e.g. when they run out, when the inventory reaches the minimum stock level, when the quantity on-hand seems low)?
11. Does the office that sends your site supplies alert you before the delivery is sent? (i.e., Does your office/facility know when to expect the shipment?)
12. Does your site have records of all the shipments of antimalarials and RDTs that have been received (minimum: in the past year)? Ask to see the records.
- What information is captured in the records/forms?
 - Does your office/facility send any records/forms back to confirm receipt of the shipment?
13. Who determines the quantity of antimalarials and RDTs that your site receives?
- If your office/facility determines/calculates the quantity, what information is used to determine the quantity? What is the process? Who is involved?
 - Request spreadsheets or other quantification/requisition documents
14. Do you usually receive the amount of medicines and RDTs that you request?
- If not, do you tend to receive more or less?
 - If less, do you receive the balance/remainder at another time?
15. What are the procedures for receiving malaria medicines and RDTs at your site?
- Who receives them? Who has the authority to receive them?
 - Where are they received?
 - What forms are sent with the delivery?
 - What forms are sent back?
 - Are the products counted upon arrival?
 - Are the products visibly checked for quality?
 - Under what circumstances are supplies sent back?
16. Has your site had a stock-out of any malaria medicines (1st and 2nd line) or RDTs in the last year?
- If so, please explain the circumstances, the response and the resolution.
 - What does your site do if stock levels are depleted (i.e. there is a stock out) or almost depleted?
 - Are there “emergency” procedures for ordering more stock? If so, what are they?

STORAGE

17. Where are the malaria medicines and RDTs stored?
18. Who is responsible for managing the storage area and inventory?

See “Observation checklist.”

INVENTORY MANAGEMENT/RECORD-KEEPING

19. What forms/records are used to record the movement of the stock (i.e., for inventory management)?
 - How often are these forms/records updated?
 - Does someone do a physical count of the stock on-hand at any time to verify the quantity in the records? If so, how often?

See “Observation checklist.”

DISTRIBUTION (Not applicable for facilities)

20. Where does your site send/distribute malaria medicines and RDTs?
21. How often does your site send/distribute malaria medicines and RDTs?
22. What triggers the distribution?
 - Is there a set distribution schedule?
 - Do the offices/facilities request the supplies?
 - Does your office or a higher level office decide?
 - Is the distribution triggered by a minimum stock level?
23. How are the quantities to distribute to each site in each delivery determined? Who determines them?
24. Are the supplies delivered to the offices/facilities or picked up by someone from the site?
 - If the former, what mode of transportation is used to transport the antimalarials and RDTs?
 - Is the transportation run by the government or contracted out?
25. What forms are issued with the deliveries? Is there a form that the offices/facilities return to confirm receipt?
 - How does the office/facility notify your site that they received the delivery, the condition of the delivery, etc?

26. What are the recipients expected to do when they receive the products?
- Inspect the delivery?
 - Record information on specific forms?
 - Communicate receipt of the delivery?
 - To your knowledge, do they usually comply with these procedures?

REPORTING

27. What information does your site collect from other offices/facilities? (Not applicable for facilities)
- Stock levels?
 - Consumption?
 - How often is it collected?
 - How complete is it? (i.e., What are the reporting rates)?
 - Who is responsible for collecting the information?
 - What system is used to enter, compile, organize, and analyze the data/information?
28. What information does your office report about malaria?
- To whom do you report the information?
 - Are stock levels and shipment quantities reported?
 - Consumption?
 - How often is the information reported?

MONITORING AND SUPERVISION

29. Does your site receive any supervision?
- Who, or what office, supervises your site?
 - Is the supervision on site?
 - If so, how often does the supervisor visit?
 - Does the supervisor check supplies? If so, what aspects of the supplies (e.g., storage conditions, stock levels, stock records, etc.)
 - Do you attend meetings at the supervising office?
30. Does your site supervise lower level offices/facilities? (Not applicable for facilities)
- Which offices/facilities?
 - How many?
 - On site or at meetings?
 - How often?
 - Do you check supplies? If so, what aspects?
 - Are there any supervision tools/forms to guide the process?

ANNEX 3. OBSERVATION CHECKLIST

SUPPLY SYSTEM ASSESSMENT THAILAND, JUNE–JULY 2008

Observe and record information on the following conditions of the storage area/inventory:

<p>1. SPACE – Does the designated storage area have sufficient space for the quantities of antimalarials and RDTs being stored by the office/facility (currently and in general, based on reported maximum stock levels/quantities)</p> <ul style="list-style-type: none"> • Can the shelves accommodate all of the supplies? • Can all of the supplies be stored in the same place? 	Y	N
<p>2. TEMPERATURE CONTROL – Are there adequate temperature control mechanisms in place?</p> <ul style="list-style-type: none"> • Is there a functioning air conditioner? • Does the room or cabinet have a thermostat? • Is the daily temperature (at peak) recorded? • Are there any other sources of climate control? • Are the supplies out of direct sunlight? 	Y	N
<p>3. SECURITY – Is the area (room and/or cabinet) secured?</p> <ul style="list-style-type: none"> • Is there a lock on the door to the room? • Are the medicines in a locked/lockable cabinet? • Is entry restricted to authorized employees? 	Y	N
<p>4. ORGANIZATION – Are the supplies well organized?</p> <ul style="list-style-type: none"> • Are the medicines/RDTs arranged neatly on shelves? • Are they arranged by product (i.e., all packages of the same product together) • Are the labels, including the expiry date information, visible? • Are medicines with the earliest expiry dates arranged in front of medicines with later expiry dates so that they can be issued first (i.e., FEFO)? 	Y	N
<p>5. EXPIRED MEDICINES – Are there any expired medicines or RDTs on the shelf with the useable stock?</p>	Y	N
<p>Notes:</p>		

Observe and record information on the availability of the following supplies:

Medicines:	>= 1 full adult treatment available and unexpired?		Any expired medicines on shelf with useable stock?		Does the physical count match the record count?	
	Y	N	Y	N	Y	N
Artesunate 50 mg	Y	N	Y	N	Y	N
Mefloquine 250 mg	Y	N	Y	N	Y	N
Primaquine 5 mg	Y	N	Y	N	Y	N
Primaquine 15 mg	Y	N	Y	N	Y	N
Chloroquine	Y	N	Y	N	Y	N
Quinine (MC only)	Y	N	Y	N	Y	N
Doxycycline (MC only)	Y	N	Y	N	Y	N
RDT	Y	N	Y	N	Y	N
Notes:						

Request all stock records to answer the following questions:

Does the office/facility have stock records?	Y	N
Is all necessary information (minimum: medicine name, dose, lot number, expiry date, receipts, issues, balance, dates) included in the record?	Y	N
When were the stock records updated last?		
Notes:		