



## A RAPID ASSESSMENT OF SEVERE MALARIA CASE MANAGEMENT IN LIBERIA





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## A rapid assessment of severe malaria case management in Liberia

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# Final Report

Developed by



NMCP

National Malaria Control Program



MINISTRY OF HEALTH  
Republic of Liberia

With Technical Support from:



Medicines for Malaria Venture



DEVELOPMENT DATA

OCTOBER 16, 2019

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## Acknowledgements

The assessment was conducted by the National Malaria Control Programme (NMCP) with technical support from Development Data. It was designed to provide timely information to guide policy direction on severe malaria case management. Medicines for Malaria Venture (MMV) provided funding and technical support and shares research findings with the global malaria community. Findings from the assessment are published on the Severe Malaria Observatory ([www.severemalaria.org](http://www.severemalaria.org)). Key personnel for this assignment were drawn from NMCP and Development Data. NMCP provided a principal investigator (PI), four malaria case management experts, and four senior staff members from the monitoring and evaluation unit. Development Data provided two technical experts: a co-principal investigator and a malaria treatment expert.

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# Acronyms

ACT	Artemisinin-based combination therapy
AsAq	Artesunate-amodiaquine
AL	Artemether-lumefantrine
CDC	Centers for Diseases Control
CHA	Community health assistant
CHO	County Health Officer
CHRS	County Health Research Specialists
CHDD	County Health Disease Diagnosis
DHIS	Demographic and Health Information System
EPHS	Essential Package of Health Services
HC	Health Centre
HMIS	Health Management Information System
GCHV	Government community health volunteer
FGD	Focus Group Discussion
iCCM	integrated Community Case Management
IM	Intra-muscular
Inj AS	Injectable artesunate
IV	Intra-venous
LGH	Liberia General Hospital
IRB	Institutional review board
MMV	Medicines for Malaria Venture
MoH	Ministry of Health
mRDT	Malaria Rapid Diagnostic Test
M&E	Monitoring and Evaluation
NMCP	National Malaria Control Programme
PMI	President's Malaria Initiative
PI	Principal investigator
RAS	Rectal artesunate
TOT	Training of Trainers
TWG	Technical Working Group
WHO	World Health Organisation

## Foreword

It gives me great pleasure to present this report which summarises the results of a rapid assessment of severe malaria case management in Liberia. Malaria continues to be the leading cause of out-patients attendance at health facilities, and the number one cause of death. While we continue to focus our efforts, investments and other resources to preventing and treating cases of malaria, we also continue to receive cases where uncomplicated malaria deteriorates into the severe form of the disease. We, therefore, have to invest in a better understanding of why this is the case and be proactive in how we manage each case of malaria so that it does not become severe.

In the past, our health delivery system has been affected by epidemics such as Ebola, but concerted efforts and support from our partners has seen us prevail. As the system is recovering, we are happy that the fight against malaria is also gaining momentum. Malaria can be prevented, can be treated, and should be eradicated. The Ministry of Health, through the National Malaria Control Program (NMCP) is driving the policy and strategic plan for malaria control and prevention, with an updated strategic plan in place to guide interventions up to 2020. This plan aims to reduce morbidity and mortality caused by malaria by 50%, and we are focusing on the general population with emphasis on the most at-risk populations (children under-fives and pregnant women) including communities that stay far away from health facilities.

NMCP is increasing its capacity to lead the national malaria program, and we are increasingly pressured to ensure that our partners are supported with adequate evidence-based policy guidance. We have therefore, conducted this assessment to provide the much-needed evidence to inform our policy on case management of severe malaria; and to provide evidence on how well we are managing cases, especially in children and pregnant women. We have been objective in documenting the status as it stands, in the hope that such transparency will assist in adequately pointing out gaps and areas needing urgent action.

Thank You

*Mr. Oliver James Pratt*  
*Program Manager*  
*National Malaria Control Program*  
*Ministry of Health*

## Executive Summary

This report summarises the findings of a rapid assessment of severe malaria case management in Liberia. The assessment was conducted between April and June 2019 by the National Malaria Control Programme (NMCP) with technical support from Medicines for Malaria Venture (MMV), the U.S. President Malaria Initiative (PMI) Liberia, and Development Data. This assessment was commissioned by NMCP with a purpose to provide evidence on severe malaria case management for children and pregnant women, comparing policy with practice. The specific objectives of the assessment were to identify gaps, assess the quality and use of training by health workers, report on accuracy of data management and generate evidence for supporting adjustments to severe malaria case management strategies.

The rapid assessment was conducted as a scan of case management and treatment of severe malaria at community level and throughout the health care delivery system. At the community level, discussions were held with community members that included pregnant women and parents of children who have recently been treated with severe malaria. Health workers were met at all 18 health facilities visited (10 in Bomi; 3 in Montserrado; and 5 in Nimba).

The assessment found that only 4% of health workers had received training in severe malaria management. Most staff in hospitals and health centres had not been trained. However, 10 out of 12 clinics had at least one staff member trained in severe malaria case management. Training had been conducted recently (within the last three months) in half of the cases. Most training focussed on public facilities, with private ones mostly benefitting from in-service training. In private facilities, there was a more critical shortage of technical, case management and malaria in pregnancy guidelines.

Data on malaria cases tested was collected for all assessed facilities for the months of May, June and July 2018. Findings from the assessment show that 87% of patients under-five years of age and 84% of those above five years were tested with mRDT and or microscopy. All cases presented at hospitals were tested using microscopy.

All the health facilities, including all the 12 clinics, were managing severe malaria cases. Recordings in treatment registers indicate that clinics were directly managing severe malaria cases: referring cases only when there was stockout of injectable medicines; when the patients could not afford to procure prescription medication on their own; or for complications that required advanced treatment (such as coma, blood transfusion). This finding is not in line with the national policies which indicate that clinics should refer severe malaria cases upwards. Current national malaria guidelines also contradict policies as they allow clinicians to manage what they can and refer what they cannot.

Severe malaria case management guidelines and protocols were not being followed strictly. Severe malaria cases were managed based on the types of injectable drug on hand, and in private hospitals especially, mostly based on the ability of the patient to pay. This has resulted in most patients opting for quinine which is cheaper than artesunate or artemether. In summary, the assessment noted that health care workers were not strictly following treatment guidelines due to lack of training on the updated treatment protocols, stock outs of required medicines, stock outs of lab test kits, or due to staff preferences.

There were significant gaps in availability of severe malaria drugs in the facilities visited. Injectable artesunate (Inj AS), the recommended first line treatment option, was largely unavailable in most

clinics. InjAS was available at 5 out of the 18 centers including two private hospitals, at two health centres, and one private clinic. However, Inj artemether was available at 16 of the 18 health facilities visited, including clinics where it is also used for pre-referral intervention. WHO recommends use of antibiotics as well. The National Malaria Case Management Guideline provide for correct hypovolemia with appropriate plasma expander (screened fresh blood, plasma or dextran); taking blood culture and starting patients on broad-spectrum antibiotics immediately. Based on blood test results, clinicians should provide the appropriate plasma antibiotic. The assessment observed that these recommendations were being followed at all the three hospitals visited and one clinic where there were no antibiotic drug shortages.

There was limited availability of the other drugs used to manage conditions such as pain and fever. Paracetamol was available at 8 facilities only, while IV diazepam was available at only 8 facilities as well. IV Dextrose (50%) was available in just seven health facilities. Two facilities indicated that they had run out of gloves. Two clinics and a health centre did not have fluid giving sets.

Malaria drugs for under 5s were not available in all of the communities visited, including those with a community health assistants (CHA). The CHAs mentioned that malaria drugs were out of stock since early 2018 (by the time of the assessment they had not received any drugs for more than 12 months). Once clinics run out of antimalarial supplies, it affects the CHAs as well. Implementers of the CHA programme mentioned that unavailability of essential drugs for CHAs was a main reason for reduced effectiveness of the programme.

There were serious shortcomings in the way data is managed. Errors were associated with poor recording of drug names on treatment registers, where ACTs and injectable versions were not being differentiated; inaccurate counting of uncomplicated and severe malaria cases when recording onto HMIS; use of injectable drugs for uncomplicated cases; inaccuracies in how diagnosis and treatment information is recorded onto registers and HMIS forms; and inadequate time allocation for data management due to work overload. Other problems included lack of stationery, including Ministry of Health approved diagnosis and treatment registers at facility level, especially in private health facilities; lack of interest in some private health facilities to collate and report onto HMIS forms; and limited training on data collection and analysis at all levels.

Most patients cannot afford the cost of motorcycle transport (the most or only viable option) and often go back to the community even if referred. The absence of a functional referral system often results in death; in some cases, patients refuse to be referred. Drug stock outs raise concerns around supply chain, and potential proliferation of sub-standard medicines into the country because people are being forced to buy their own drugs.

When clinics and hospitals run out of malaria medicines, they often provide prescriptions and ask patients to buy from pharmacies. This is contributing to two kinds of problems: drugs destined for public facilities can find their way onto the street because of the resultant demand; and poorer patients find it harder to effectively treat malaria early. Data collected on relative cost of severe malaria drugs used in private facilities showed that quinine-based regimens were almost five times cheaper than InjAS (US\$3 vs US\$14); and even cheaper on the street. In private facilities the cost goes up to US\$30, including consultation fees. This is problematic for communities where the nearest facility is private.

## **Conclusions**

The assessment has identified a number of important gaps in severe malaria case management from communities to clinics, and throughout the referral system. The assessment concludes that there is

“continuum of care” thinking within the health delivery system by design, but several challenges exist. There are clear gaps in treatment, supply chain and information management. There are, therefore, many opportunities for improvement. Health workers demonstrate knowledge of severe malaria, and most are managing cases regularly. Although malaria case management guidelines provide for management of cases at clinic level, health policies do not currently support this. Nevertheless, nurses are managing severe malaria cases in clinics.

There is limited use of case management guidelines; and training has not reached health workers in hospitals. Relevant training and support have also not been rolled out to doctors. Job aids, flow charts and guidelines are not readily available where patients are treated. While the main sources of information for referring are guidelines, most health workers feel that job aids and flowcharts are more user friendly.

Drug stockouts are common and highlight problems with supply chain and information management. At the community level, the CHA programme is not adequately supported with required drugs, although it has demonstrated value in cutting the number of severe cases that reach health facilities. This is limiting the effectiveness of their work. It is possible that some counties are not requesting adequate supplies because they are forecasting needs for lower level health facilities using flawed data. Private facilities, however, seem to be well resourced, and are managing cases at a premium.

The quality of reporting in the HMIS forms and database is affected by errors in the interpretation of treatments in patient treatment charts and registers. Errors identified during the assessment span all types of facilities. These errors are not checked, and therefore get recorded onto HMIS forms and uploaded onto the DHIS2 platform. The case management unit within NMCP is still to roll out training on monitoring and evaluation.

Researchers were not able to visit all counties, although six were represented at the national stakeholders meeting. The research could not, therefore, confirm with certainty that the counties with favourable treatment outcome figures (as recorded on HMIS) were indeed performing better. It could be the result of flaws in recordings in the other counties. Nevertheless, the research did show that there are serious problems with data recording and this problem should be rectified before planners can rely on what is shared through the HMIS.

## **Recommendations**

1. NMCP and its partners, including those involved in funding and supply chain, should urgently review the national malaria treatment guidelines in the context of prevailing situations on the ground. They should provide guidance to counties and districts on suitable regimens for managing severe malaria at clinic level, taking into consideration existing situations and their causes.
2. Given the large number of severe malaria cases being managed at clinic level, NMCP needs to encourage government to revisit its policy with regards to referrals.
3. Training for health workers (including for CHAs) needs urgent attention. NMCP and its partners should review coverage of health worker training programmes and ensure that all relevant facilities and within these cadres, are reached with suitable training. NMCP and its partners should develop job aids and flow charts for use by health workers to ensure that management of severe malaria is enhanced.
4. NMCP’s monitoring and evaluation unit should urgently design a training programme for data clerks in all health facilities and roll it out to improve data quality collected at health

facilities. Such training should be cascaded and include guidance on how to record different drug regimens onto registers and HMIS forms.

5. NMCP should strengthen its collaboration with partners implementing the CHA programme, and explore ways for improving information sharing, and for introducing RAS at community level.
6. NMCP and programme partners should continue to discuss placement of pre-referral intervention options for communities at lower level facilities. They should discuss and agree placement for rectal artesunate and inInjAS and ensure that any decisions reached are possible to implement, and supported with adequate training and other capacity building, especially for referral.
7. NMCP should strengthen collaboration with supply chain actors (eg by including them in malaria training) at national and county level, so that joint monitoring of stock levels can assist in addressing artificial and real stockouts. NMCP should advocate for more capacity development for quantification; and training at the point of care so that stock levels are reported better. At county level, planning should include NMCP so that there is wider sharing of quantification information.
8. Medical stores should review their system for pushing drugs to health facilities and revise their forecasting approaches to ensure that existing stock outs are eradicated.
9. The Ministry of health should provide clear guidance on the working relationship with private sector facilities and ensure that agreements reached on collection and sharing of data are implemented.

# 1. Background to the Assessment

## 1.1. About this report

This report summarises the findings of a rapid assessment of severe malaria case management in Liberia. The assessment was conducted between April and June 2019 by the National Malaria Control Programme (NMCP) with technical support from Medicines for Malaria Venture (MMV); President Malaria Initiative (PMI), and Development Data. In December 2018, NMCP expressed an interest to conduct such a rapid assessment in key vulnerable groups, including pregnant women and children under 5; and to guide policy direction and improve service delivery.

Ensuing discussions between NMCP, PMI-Liberia and MMV culminated in a proposal to conduct a rapid assessment to inform national level dialogue on the critical gaps and opportunities for improving severe malaria case management and treatment at all levels of the health delivery system. MMV committed to provide technical and limited financial support for the assessment, and to link NMCP with Development Data who recently conducted similar assessments in Uganda and Zambia.

## 1.2. Malaria in Liberia

The World Health Organisation (WHO)'s World Malaria Report (2016)<sup>1</sup> estimates that in 2015, there were 212 million new malaria cases and 429 000 deaths related to the disease. In 2017, an estimated 435,000 people died from malaria globally, 61% of whom were children under 5 years old.<sup>2</sup>

Data from the Liberian Health Management Information System (HMIS) is routinely collected and stored in a DHIS2 database; and shows that in 2018, there were about 1.3 million malaria cases among the 4.3million population (about 31%); and as many as 209,545 severe malaria cases (16.3% of malaria cases). This is much higher than the rates of 5-7% of malaria cases that are reported elsewhere in the region as being severe;<sup>3</sup>either pointing to a high disease burden or indicating challenges with how severe malaria is defined and/or reported.

TABLE 1: SEVERE MALARIA STATISTICS IN LIBERIA (2018)

County	Population (2018)	Malaria cases (2018)	Severe malaria cases	% of malaria cases which are severe
<b>Bomi</b>	103550	50028	7849	16%
<b>Bong</b>	410514	111546	6012	5%
<b>Gbarpolu</b>	102650	25287	2353	9%
<b>Grand Bassa</b>	272904	70422	12411	18%
<b>Grand Cape Mount</b>	156430	41419	3759	9%

<sup>1</sup> World Health Organisation (2016). World malaria report

<sup>2</sup>World Health Organisation (2018). World Malaria Report

<sup>3</sup>World Malaria Report, 2015

<b>Grand Gedeh</b>	154191	39711	3346	8%
<b>Grand Kru</b>	71291	33075	1255	4%
<b>Lofa</b>	340818	114458	5487	5%
<b>Margibi</b>	258414	70247	13823	20%
<b>Maryland</b>	167340	62767	9029	14%
<b>Montserrado</b>	1376554	385688	114812	30%
<b>Nimba</b>	568754	181865	21505	12%
<b>River Cess</b>	88027	32108	1924	6%
<b>River Gee</b>	82217	26798	980	4%
<b>Sinoe</b>	126043	42072	5000	12%
<b>Total</b>	<b>4279697</b>	<b>1287491</b>	<b>209545</b>	<b>16%</b>

Source: Ministry of Health, Liberia. DHIS2 Database

Malaria management in Liberia is guided by the 2016-2020 National Malaria Strategic Plan which seeks to, by 2020, reduce illnesses and deaths caused by malaria by 50%. Among the objectives of the Strategic Plan are to increase access to prompt diagnosis and effective treatment targeting 85% of population by 2020 (objective 2); strengthen the supply chain system for effective quantification and prompt distribution of commodities under a universal system by 2020 (objective 5); and improve routine data monitoring and program evaluation to ensure quality data management at all levels by 2020 (objective 6).

According to the 2013 Health Facility Survey, malaria accounts for over 42% outpatient department attendance and 39% of inpatient deaths in Liberia. Severe malaria, characterised by organ dysfunction, is typically linked to delayed treatment of uncomplicated malaria, often due to late treatment seeking or poor-quality case management. Over the years, however, significant investment has gone into enhancing severe malaria case management.

### 1.3. Challenges with severe malaria case management

Severe malaria case management in Liberia is guided by WHO guidelines for malaria management. Since 2012, the WHO essential medicines list has expanded to include injectable artesunate (Inj AS) as first line treatment for severe malaria; and rectal artesunate (RAS) for pre-referral interventions. WHO recommends that severe malaria be treated with Inj AS for at least 24 hours, until patients can tolerate a 3-day course of oral Artemisinin-based Combination Therapy (ACTs). If artesunate is not available, artemether should be used in preference to quinine. WHO guidance recommends the use of antibiotics as well; and the National Malaria Case Management Guideline makes this specific:

- Ensure correct hypovolemia with appropriate plasma expander (screened fresh blood, plasma or dextran);
- taking blood culture and starting patients on broad-spectrum antibiotics immediately;
- based on blood test results, provide the appropriate plasma antibiotic.

RAS are recommended as pre-referral intervention or children under the age of six. However, there are barriers to wide use of artesunate (injectable or rectal); including lack of health worker training

and entrenched treatment beliefs. Additional changes to case management for pregnant women have been proposed from April 2019 onwards, and artesunate will be used in all trimesters of pregnancy. These advances require changes in health policy and service delivery protocols, including medicines supply chain, procurement and staff training for the new regimens.

NMCP has been promoting early diagnosis and treatment of all malaria cases. NMCP and its partners emphasise that patients have early access to quality malaria treatment and supportive care, especially in cases of severe malaria where most deaths occur within 24 hours of symptom onset. Yet anecdotal evidence suggests that severe malaria case management is facing challenges. Guidelines for case management of severe malaria are in place, but some known shortcomings with regards to implementation exist. For example, the latest WHO guidelines for treatment of children and for pregnant women are not yet fully implemented; and training has not been conducted adequately for all health workers. It is not clear whether health workers apply case management guidelines as recommended.

Artesunate is not widely used as first line treatment at all levels of the health delivery system as recommended, nor for pre-referral intervention. Artesunate is currently distributed to hospitals and health centres, but not to clinics which are the first level health facility. Clinics are provided artemether for use in pre-referral intervention. In pregnancy, quinine is still widely used in the first trimester. RAS which is recommended as the drug of choice for pre-referral intervention of children under the age of six years has been included in treatment guidelines but is not yet procured or distributed.

NMCP conducted this rapid assessment to better understand the problems with case management of severe malaria highlighted above, and to review related information management systems so that the programme can be improved. The results of the assessment, used in conjunction with data available from other programs, will help to unpack the extent of challenges faced, and practical steps to addressing them.

## **1.4. Goal and Objectives of the assignment**

This assessment was commissioned by NMCP with a purpose to provide evidence to inform its policy on case management of severe malaria for children and pregnant women, comparing policy with practice. The review tracks case management of severe malaria from the community up the health delivery system; showing how the continuum of care is working or not; and identifying gaps and opportunities for improvement. The specific objectives of the assessment were to:

- Identify gaps in distribution and use of severe malaria drugs and other commodities (including Inj AS, RAS), and provide insights for future quantification of these drugs.
- Assess the quality and use of training by health workers (including for CHAs), and report on use of case management guidelines.
- Provide insights on how the referral system is working and how it links from the community up the health system, and between private and public facilities.
- Assess how severe malaria is reported (what indicators, measurement methodology and reporting), including at community level; and provide recommendations on improved and more accurate methods.
- Provide evidence on adoption and use of WHO severe malaria treatment guidelines, including for pregnant women.

- Generate evidence for supporting adjustments to severe malaria case management strategies in the new strategy in 2020.

## 2. Methodology

### 2.1. Scope of the rapid assessment

The rapid assessment was implemented as a scan of case management and treatment of severe malaria at community level and throughout the health care delivery system. It interrogated treatment options and practices in carefully selected health facilities. At the community level; discussions were held with community members that included pregnant women and parents of children who have recently been treated with severe malaria. The aim was to shed light on and increase understanding of the reasons why appropriate malaria treatment is not sought on time. The assessment also reviewed treatment options from the perspectives of community members, including availability of malaria drugs at community level. At each health facility visited, the assessment team contrasted available staffing, equipment and drugs, against Ministry of Health policy and guidelines. Discussions with health officials provided insights on challenges faced, and innovations that were adopted.

### 2.2. Study sites

The evaluation was guided by a protocol that was developed and submitted to University of Liberia Institutional review board (IRB) for ethical approval. Selection of health facilities for the study was determined by the research team in conjunction with NMCP senior personnel. Eighteen health facilities were selected, including three referral hospitals, three health centres and 12 clinics. These were carefully selected to capture the structure of the health delivery system.<sup>4</sup>

A multistage approach was used to select the facilities that were visited. The interest was to ensure representation of the health delivery system in settings such as rural and urban; private and public; and facility type. In the first stage, a decision was made to visit a county where the severe malaria case management efforts were likely to face the most serious challenges. Criteria was set and used to determine this. It included highest disease burden (malaria cases per capita); highest severe malaria disease burden (severe malariated capita); highest severe malaria risk (highest likelihood that malaria results in severe malaria); and lowest availability of supportive infrastructure (lowest number of health facilities per capita). Using HMIS statistics and population projection data, a

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<sup>4</sup>Liberian health delivery system has three tiers of facilities- clinic, health centres and hospitals.

statistical ranking of the four criteria above was computed, with each criterion assuming equal weight.

Using the ranking method described above, Bomi was selected as the county where severe malaria case management was likely to face the most challenges. An additional criterion was to include private health facilities. It was necessary to visit private facilities in both urban and rural settings. As such, two counties-Montserrado with the highest number of private health facilities and Nimba with a number of rural private facilities- were included for assessments. The final list included a total of 18 facilities: 10 in Bomi; 3 in Montserrado; and 5 in Nimba. The distribution is given in Table 2.

**TABLE 2: NUMBER AND DISTRIBUTION OF FACILITIES INCLUDED IN THE STUDY**

	Hospitals	Health centres	Clinics
Bomi	1	0 (none exist)	9
Montserrado	1	1	1
Nimba	1	2	2
Total	3	3	12

Within the chosen counties, sites were selected to include those with serious accessibility problems during the rainy season and those with and without a community health assistant<sup>5</sup> (CHA) program.

### 2.3. Data collection methods

The assessment was conducted by a team of 8 researchers led by a Principal Investigator from NMCP; an international co-principal investigator; two other technical experts, and 4 research assistants. The distribution of types of respondents and information collected is presented in Table 3. Data was collected using:

- a desk review of severe malaria literature,
- key informant interviews with relevant partners and health workers at all levels of the health delivery system,
- a review of patient records<sup>6</sup>, and
- stock check of diagnostic and treatment supplies.

**TABLE 3: DISTRIBUTION OF RESPONDENTS FOR THE ASSESSMENT**

Information source	Location or type	Information collected
Communities	Seven communities surrounding primary health care facilities where severe malaria cases are first reported	<ul style="list-style-type: none"> <li>• Care-seeking habits of patients with severe malaria; knowledge, attitudes and practices relating to malaria; and effectiveness of the referral system.</li> <li>• Volunteers' experiences in management of severe malaria cases</li> </ul>

<sup>5</sup> In 2016, Liberia launched the country's first national community health worker initiative, called the National Community Health Assistant (CHA) program. This program will deploy over 4,000 health workers over 5 years across Liberia to serve the 1.2 million Liberians who live more than 5km from the nearest health centre.

<sup>6</sup> Patient record reviews were useful for gathering information on the management and referral process of malaria and severe malaria patients. This included observations on how well data was recorded onto treatment registers and HMIS forms.

Clinics	12 primary health care facilities (clinics) where most malaria cases are first reported.	<ul style="list-style-type: none"> <li>Severe malaria equipment, drugs and treatment practices.</li> <li>HMIS data on severe malaria indicators</li> </ul>
Health centres and Hospitals	Three hospitals and three health centres	<ul style="list-style-type: none"> <li>Severe malaria equipment, drugs and treatment practices.</li> <li>HMIS data on severe malaria indicators</li> </ul>
County Health Teams	County medical officers, officials in charge of health facilities	<ul style="list-style-type: none"> <li>discussions on county plans, experiences and opportunities for improving case management.</li> </ul>
National stakeholders' workshop	Technical working group (TWG) and senior malaria stakeholders	<ul style="list-style-type: none"> <li>Dissemination, triangulation and further discussion</li> </ul>

## 2.4. Assessed coverage

The research team conducted all planned 18 health facility assessments and visited seven communities where focus group discussions were conducted. The list of health facilities reached is given in Table 4. In each community, focus groups were conducted with participants split according to gender. The women groups included pregnant women and mothers of children who were treated for severe malaria in the recent past. Three CHAs were interviewed in the three communities that had a CHA program, while general community health volunteers (gCHVs) were interviewed in the other four.

At clinics and health centres, interviews were conducted with a total of 43 staff relevant to the management of severe malaria, including from the paediatric ward, from the obstetrics and gynaecology ward and those dealing with malaria referrals not specific to children or pregnant women. Interviewers asked questions on knowledge of current severe malaria treatment guidelines and the appropriate treatment process, as well as on how severe malaria was defined in their context.

Three hospitals were visited, and 12 members of staff involved in the management of severe malaria interviewed. Interviews focused on the pathway of patients accessing care, including at what stage patients first accessed services, what challenges existed; and referral options.

Patient record reviews were conducted in all 18 facilities visited. These focussed on case management practices for severe malaria, including what proportion of patients received diagnostic tests, what severe malaria classification was based on, what proportion received appropriate treatment and how well the referral pathway worked.

**TABLE 4: DISTRIBUTION OF FACILITIES VISITED**

	County	Facility	Ownership
<b>Hospitals</b>			
1.	Bomi	Liberia Government Hospital	Public
2.	Montserrado	ELWA Hospital	Private
3.	Nimba	Ganta Methodist Hospital	Private
<b>Health centres</b>			
1.	Nimba	Bahn Health Center	Public
2.	Nimba	Karnplay Health Centre	Public
3.	Montserrado	Barbara Ann Health Center	Private
<b>Clinics</b>			
1.	Bomi	Ahmadiyya Clinic	Private

2.	Bomi	Beh Town Clinic	Public
3.	Bomi	Fefeh Town Clinic	Public
4.	Bomi	Gogeh Clinic	Public
5.	Bomi	Malema Clinic	Public
6.	Bomi	Mulbah Clinic	Public
7.	Bomi	Sami Diaby Clinic	Private
8.	Bomi	Sasstown Clinic	Public
9.	Bomi	Weawolo Clinic	Public
10.	Montserrado	Bromley Clinic	Public
11.	Nimba	Vayenglay Clinic	Public
12.	Nimba	Zoe-Geh Clinic	Private

## 3. Findings

This section presents findings from the assessment.

### 3.1. Staffing levels

The coordination and supervision of severe malaria case management is organized at different levels of the health system. The health system has four recognisable referral levels, including hospital (highest level), health centre, clinic and community (lowest level). Each county has a referral hospital that receives malaria cases from the lower level facilities. In public facilities, severe malaria cases should be referred from the community to clinics then to the health centres and if necessary, to hospitals where most complications should be managed. The total number of staff in the eighteen facilities visited was 707 professionals. Nurses accounted for 42% followed by nurse aids 31%. Doctors accounted for 5%.

According to Liberia's Essential Package of Health Services (EPHS), a clinic should have two or more professional staff, including a laboratory assistant, depending on workload. Clinics should be headed by professional staff members, that is, at least a qualified nurse. The health policy indicates that clinics should refer severe malaria cases to higher level facilities. However, malaria treatment guidelines provide for professional staff at clinics to manage what they can.

A health centre should have a medical doctor, although this level does not perform surgical procedures. The staffing requirement for a county hospital should be a minimum of 327 and maximum of 442 professional and support staff.

#### 3.1.1. Hospitals

Two out of the three hospitals visited did not meet the national staffing requirements but had adequate staff to manage severe malaria cases.<sup>7</sup> ELWA hospital which is a church-owned private facility in Monrovia met all the EPHS requirements. Most staff in the three hospitals had not received any recent training in severe malaria management. In fact, only 2 out of over 500 professional staff in the three hospitals had ever been trained, and these were found in one of the private hospitals (see table below).

TABLE 5: AVAILABILITY OF STAFF WHO MANAGE SEVERE MALARIA CASES

Facility	ELWA Hospital	Ganta Methodist Hospital	Liberia Government Hospital
Doctors	21	6	5
Nurses	127	60	50
Physician Assistants	12	0	0
Nurse Assistant	100	36	29
Midwife	12	8	15
Lab Tech/Aid	20	15	10
<b>Total number of staff</b>	<b>292</b>	<b>125</b>	<b>109</b>
<b>Staff formally trained in severe malaria management</b>	<b>0</b>	<b>2</b>	<b>0</b>

<sup>7</sup> Two hospitals did not have dentists, radiologists, psychologists, nutritionists, and physician assistants.

The publicly owned Liberia General Hospital (LGH) in Bomi was understaffed without specialized staff at consultant level, nor paediatric nurses. Service delivery was affected by staff attrition. Reported gaps in overall staffing reduced effective delivery of health services, especially for patients with conditions that required specialized care. LGH expressed concerns at the limited formal training of its entire hospital staff in severe malaria case management. There had not been training on administration of Inj AS and administration of RAS. Severe malaria cases at the hospital were managed based on experience and education obtained during pre-service training. Key personnel expressed being overwhelmed. The facility is the only referral hospital in the entire county; yet only one ambulance is available. This has made the referral system ineffective.

In all three hospitals, severe malaria case management guidelines and protocols were not strictly followed. Malaria cases were managed based on the types of injectable drug on hand, and in private hospitals especially, mostly based on the ability of the patient to pay. This resulted in most patients opting for quinine-based regimens which are cheapest. The assessment also noted that records on management of severe malaria were not being recorded onto HMIS forms in ELWA. In this hospital, senior staff did not seem to be aware that this was happening.

In the two private hospitals, there were several good practices adopted. ELWA hospital, for example, had a functional regular in-service training for staff in all clinical areas including malaria (but not severe malaria). In this case, all staff interviewed demonstrated knowledge and experience in administration of Inj AS even though they had not had the formal training. A total of 16 out of the hospital's 20 laboratory staff had received in-service training in malaria Rapid Diagnostic Test (mRDT) and microscopic diagnosis.

Ganta Methodist Hospital ensures that all its departments are headed by a doctor; and all severe malaria essential health workers (senior consultant, medical doctor, intern doctors, paediatric nurse and general nurses) had experience in severe malaria case management and administration of Inj AS. This hospital sent two of its eight midwives for training in severe malaria case management and Inj AS; and these were tasked to train others in house.

### **3.1.2. *Health centres***

Three health centres were visited, including two public and one private. The two public health centres- Karnplay and Bahn- did not meet stipulated staffing requirements. Both had assistant physicians only, and neither had a paediatric nurse as required. Barbra Ann, which is a private facility, had a covering doctor and did surgical procedures on demand. Clinical staff in one of the public health centres had received training in severe malaria case management in January 2019. The training had covered administration of suppositories for severe malaria and administration of IV artesunate and IM artesunate. The NMCP and CHTs confirmed that, for the other two facilities, the last training was conducted in 2017. In the three health centres, only two out of 58 key staff had formal training on severe malaria case management and administration of Inj AS.

Despite the limited exposure to in-service training, knowledge of diagnosis and treatment was high, and aligned to treatment guidelines. Deviations from guidelines were observed on how cases were managed after-diagnosis. This is discussed under the treatment section later in the report.

TABLE 6: DISTRIBUTION OF PROFESSIONAL STAFF AT HEALTH CENTRES VISITED

Facility	Bahn Health Centre (public)	Karnplay Centre (public)	Health Barbara Ann Health Centre (private)
Doctors	0	0	2
Nurses	7	5	8
Physician Assistants	2	2	2
Nurse Assistant	4	1	8
Midwife	2	3	0
Lab Tech/Aid	4	4	4
<b>Total Staff</b>	19	15	24
<b>Trained in severe malaria</b>	0	2	0

### 3.1.3. Clinics

There were differences in staffing capacities between private and public clinics visited. In general, private clinics were better resourced in terms of drugs, personnel and equipment. All three private clinics had a doctor, while none of the nine public ones did. Only one, Bromley, had a physician assistant. All the severe malaria cases presented at private clinics were therefore attended to by a doctor. Patients paid consultation fees in these cases.

Per EPHS requirements, 11 of the 12 clinics assessed met staffing needs, while one (Mulbah Town clinic) did not have a laboratory assistant. This gap added additional load to the professional staff (especially screeners who would then also need to run RDTs). Ten (10) out of 12 clinics had at least one staff member trained in severe malaria case management, and in 5 clinics, this had been conducted within the three months of the assessment. Staff reported that training had been well received and helped them improve management of severe malaria cases. Trainings targeted professional staff, that is, officer in charge, screeners and midwives.

TABLE 7: DISTRIBUTION OF PROFESSIONAL STAFF AT CLINICS VISITED

Facility	Doctors	Nurses	Physician Assistants	Nurse Assistant	Midwife	Lab Tech/Aid	Trained in severe malaria
<b>Public</b>							
Bromeley clinic	0	9	1	7	3	1	1
Vayenglay Clinic	0	3	0	2	0	1	3
Beh Town Clinic	0	2	0	1	1	1	1
Fefeh Town Clinic	0	3	0	2	1	1	3
Gogeh Clinic	0	3	0	1	1	1	3
Malema Clinic	0	3	0	1	0	1	1
Mulbah Clinic	0	1	0	1	1	0	2
Sasstown Clinic	0	0	0	2	1	1	0
Weawolo Clinic	0	3	0	2	0	1	1
<b>Average</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>2</b>
<b>Private</b>							

Ahmadiyya Clinic	1	1	0	4	0	2	2
Zeo-Geh Clinic	1	5	6	10	1	1	0
Sami Diaby Clinic	2	8	0	11	3	4	5
<b>Average</b>	<b>1</b>	<b>5</b>	<b>2</b>	<b>8</b>	<b>1</b>	<b>2</b>	<b>2</b>

### 3.1.4. *Community level*

According to the National Community Health policy, communities beyond 5 kilometres of a health facility should have a CHA for every 40-60 households; while communities within 5 kilometres should have a general community health volunteer (gCHV). CHA programmes were at different levels of roll-out in the rural counties visited (Bomi, Nimba). The main challenges in referring patients from communities were bad road conditions, high cost of transport, long distances, ambulance delay and ambulance breakdown due to poor service and maintenance.

Montserrado county which is predominantly urban does not have a CHA program. Rural health facilities in the country, including Bromley Clinic, which was visited, had a gCHV program in place. Most activities of the gCHV for Bromley centred on mental health initiatives sponsored by MSF. According to hospital staff, urban communities in Nimba and Bomi counties, which did not have CHVs or any form of community volunteers, had a lag in effective severe malaria case management because of poorer community awareness.

Communities visited demonstrated high levels of awareness of severe malaria danger signs. All communities mentioned convulsions, jerking, anaemia and severe weakness as the most common dangers of not diagnosing and treating malaria early. Communities served by CHAs seemed to be more aware of severe malaria danger signs. Members of the community knew that pregnant women and children with malaria should seek treatment early. They mentioned other pre-referral intervention and support options, including paracetamol and sponge baths for fever. Use of traditional medicines were mentioned in some FGDs, but only in contexts where community members thought that they would not be able to get medicines at the health facility (due to cost or stock outs).

Of the seven communities visited, 5 were situated more than 5km for the nearest health facility; and three had a CHA. Hard-to-reach communities without a CHA had higher number of cases of malaria reaching health facilities (up to 40% more cases based on facility records observed at one facility). Referrals were timely made by CHAs from communities to health facilities; and with a referral slip that also was used for counter-referral. Counter referrals were sent back to the CHA. Records of referrals were available with CHAs, but not well kept or recorded at facility level.

## 3.2. Treatment of severe malaria in assessed facilities

### 3.2.1. *Treatment guidelines in use*

Severe malaria case management in Liberia is informed by the World Health Organization's (WHO's) Guidelines for the Treatment of Malaria; as well as the local context, including drug availability, infrastructure and other resources. In 2011, the National Malaria Control Program (NMCP) adopted WHO's Guidelines for the Treatment of Malaria, Second Edition, which recommended the T3 approach; that is, Test, Treat and Track.

For treatment of severe malaria, cases should be managed using three regimens separately based on the decision of the screener or attending physician. In the order of recommended choice, they are: artesunate IM/IV, artemether IM and quinine IV. After three doses of parenteral treatment, a full dose of ACT should follow for three days. Guidelines mention that parenteral artesunate is the drug of choice for the treatment of severe and complicated malaria in pregnancy in all trimesters. The guidelines also note that in the cases where the health care worker cannot handle severe malaria, the pre-referral intervention should be RAS for children <6 years; IM artemether or artesunate for adults or children >5 (and children <6 where RAS is not available); or IM quinine where artesunate or artemether are not available.

**TABLE 8: SEVERE MALARIA CASE MANAGEMENT GUIDELINES IN LIBERIA**

Regimen	Drugs	Status (January 2019)
First-line treatment for uncomplicated <i>P. falciparum</i> malaria	<b>Artesunate-amodiaquine</b>	<b>Yes</b>
<b>Alternative-first line treatment for uncomplicated <i>P. falciparum</i> malaria</b>	Artemether-lumefantrine	Yes. Limited training has been conducted to support nationwide implementation*
<b>First-line treatment for severe malaria</b>	Artesunate IM/IV or artemether IM/IV Quinine	Yes. Preferred order for treatment:
		- artesunate (IV/IM)
		- artemether (IM)
		- quinine (IM)
		- take blood test and provide concomitant antibiotics
<b>In pregnancy, the first-line treatment for uncomplicated <i>P. falciparum</i> malaria in the first trimester</b>	Oral quinine	Yes
<b>In pregnancy, the first-line treatment for uncomplicated <i>P. falciparum</i> malaria in the second and third trimesters</b>	Artesunate-amodiaquine or Artemether-lumefantrine	Yes.
<b>In pregnancy, the first-line treatment for severe malaria</b>	Artesunate IM/IV or artemether IM/IV Quinine	Yes
<b>Pre-referral intervention of severe disease recommended at peripheral health facilities</b>	Rectal artesunate (RAS) for children < 6 years	Yes. IM artemether is being phased out and RAS is yet to be rolled-out country wide.
	IM artemether or artesunate for adults or children ≥6 (and children <6 where RAS is not available)	
<b>Pre-referral intervention of severe disease recommended for community health workers</b>	RAS for children <6 years	RAS is yet to be rolled-out country wide.
<b>Pre-referral RAS is recommended, for (note: current international guidelines do not recommend administering to those ≥6 years)</b>	Children <6 years	RAS is yet to be rolled-out country wide.

The assessment found that 4% (26/707) of professional health staff had received training in severe malaria management. Training that been focussed on clinics only and did not include malaria diagnosis.

### 3.2.2. *Malaria testing and diagnosis*

To reach the national goal of reducing the prevalence of malaria in Liberia, every person presenting with fever is evaluated for malaria with a parasitological test (microscopy or mRDT) and treated appropriately based on the results of that test. Ministry of Health treats complicated or severe

malaria as life threatening diseases; and urge prompt management with a full course of the recommended medicines. The standard for malaria diagnostic equipment at hospital and health centre levels is microscope and mRDT. All three hospitals assessed had both mRDT and microscopes for malaria diagnostic. However, Ganta United Methodist Hospital was out of stock of Field Stain A<sup>8</sup> for about three weeks. On the day of visit, only mRDT was in stock for malaria diagnostics. The three health centres assessed were all performing mRDTs and microscope testing. Karnplay Health centre had only one microscope for the entire facility, and its use was limited by low supply of slides.

Malaria microscopy is the goal standard for malaria diagnostic at all levels of the health system, however mRDT is widely used at clinic levels of the Liberian health system. The 12 clinics were assessed on availability of diagnostic equipment, and three, all private (Zoe Geh, Sime-Diaby and Ahmadiyya) had both malaria microscopy and mRDT. This was a sharp contrast to the situation prevailing in government clinics which had malaria rapid diagnostic tests only.

To diagnose severe malaria, health workers correctly mentioned fever and positive mRDT or microscopy, accompanied by either convulsions, anaemia, fast breathing, severe weakness, lethargic, anaemic heart failure, splenomegaly, hepatomegaly as signs and symptoms or complications. Sometimes severe diarrhoea, sepsis and respiratory tract infections were also mentioned as being associated with severe malaria. In general, health workers at all levels demonstrated knowledge of complications of malaria, and the associated need to treat cases as health emergencies.

The assessment team observed diagnosis practice at health facilities. Findings from the assessment show that all 18 facilities visited had triage areas where patients made their first contact with the health facility. It was observed and confirmed by both facility staff and patients that severely ill patients were given first preference to see medical personnel. Vital signs were taken at all triage areas seen but limited to temperature and weight in most cases. Severe malaria cases were reportedly assessed and treated within 30 minutes of entering emergency rooms. This was confirmed by 37 emergency case patients who were asked their average waiting times before being attendant to (average of 25min: clinics 15min, health centres 18min; hospitals 40min).

Data on malaria cases tested was collected for the months of May, June and July 2018, and for all assessed facilities. Findings from the assessment show that 12,602 <5 and 24,487 ≥5 suspected malaria cases were seen by the 18 facilities during this period. Out of these cases, 11,430 <5 patients representing 87% and 22,397 ≥5 patients representing 84% were tested with mRDT or microscopy. All cases presented at hospitals were tested using microscopy. These high percentages show compliance to confirmatory diagnosis as required for the best treatment of malaria.

**TABLE 9: PROPORTION OF SUSPECTED MALARIA CASES TESTED (MAY, JUNE AND JULY, 2018)**

Facility	Suspected Malaria Cases	Total Malaria Cases tested	Proportion Tested
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<sup>8</sup>Field stain is a histological method for staining of blood smears. It is used for staining thick blood films in order to discover malarial parasites. Field's stain is a version of a Romanowsky stain, used for rapid processing of the specimens.

	< 5	≥ 5	< 5	≥ 5	< 5	≥ 5
<b>ELWA Hospital</b>	4359	4714	4359	4714	100%	100%
<b>Barbara Ann Health Centre</b>	785	4666	785	4666	100%	100%
<b>Bromley Clinic</b>	444	910	444	910	100%	100%
<b>Ganta Methodist Hospital</b>	606	2111	606	1784	100%	85%
<b>Bahn Health Centre</b>	750	1382	102	508	14%	37%
<b>Karnplay Health Centre</b>	1098	1451	1046	1340	95%	92%
<b>Zoe-Geh Medical Clinic</b>	42	69	42	69	100%	100%
<b>Vayenglay Clinic</b>	155	260	131	112	85%	43%
<b>LGH</b>	985	2362	836	2361	85%	99.9%
<b>Ahmadiyya Muslim Clinic</b>	193	882	193	882	100%	100%
<b>Mulbah Town Clinic</b>	267	473	267	377	100%	80%
<b>Fefeh Town</b>	233	562	210	502	90%	89%
<b>Weawolo Clinic</b>	187	340	131	244	60%	72%
<b>Gogehn Clinic</b>	194	278	186	261	96%	94%
<b>Sasstown Clinic</b>	415	686	295	463	71%	67%
<b>Beh Town Clinic</b>	253	431	172	315	68%	73%
<b>Malema Clinic</b>	192	339	192	339	100%	100%
<b>Sami Darby Clinic</b>	1444	2571	1433	2550	99%	99%
	<b>12602</b>	<b>24487</b>	<b>11430</b>	<b>22397</b>	<b>87%</b>	<b>84%</b>

Hospitals and health centres assessed had adequate laboratory space. Out of the eighteen facilities assessed, one facility, Mulbah Town clinic, reported not having laboratory staff. MRDTs were done by screeners. Even though laboratory staff were performing malaria blood smear and mRDTs in the other 17 facilities, the assessment found that none of them had received malaria specific diagnosis training. This may explain the large number of mRDTs with negative results seen in some facilities. There has not been any formal training for laboratory technicians at a national level since the last training done in 2014. Private facilities such as ELWA have conducted in-service training for its technicians, but without referring to the most recent technical malaria in pregnancy guidelines.

An example from a treatment register is shown below. This pattern of use of scarce mRDT commodities was associated with stock outs.

50 <sup>5</sup> / <sub>12</sub>	RDT(+) malaria / ART	73/9	Diclo 75mg Im ampropr...
61 <sup>10</sup> / <sub>12</sub>	RDT(+) malaria / ART	73/9	Act 100mg / 250mg Artemether...
38 <sup>9</sup> / <sub>12</sub>	RDT(+) malaria /	73/1	Act 100mg / 270mg PCm 500mg
20 <sup>3</sup> / <sub>12</sub>	RDT(-) Myalgia		Act 100mg / 270mg PCm 500mg
6yrs	RDT(+) malaria / ART	73/9	Act 100mg / 270mg PCm 500mg
29 <sup>1</sup> / <sub>12</sub>	RDT(-) Enteric fever / zantido		Erythromycin 250mg
20 <sup>1</sup> / <sub>12</sub>	RDT(-) check up		C.A.F 250mg ampicillin 250...
19 <sup>1</sup> / <sub>12</sub>	RDT(-) S.T.I / OB	108	Fefo 200mg PCm 500mg
20 <sup>7</sup> / <sub>12</sub>	RDT(-) check up		Vitamin A IPT 525mg
35yrs	check up		F/acid 500mg ORS 2PKs PCm 500mg
12 <sup>4</sup> / <sub>12</sub>	RDT(+) malaria	73	Act 100mg / 270mg PCm 500mg
28	OB / ring 200m		F/acid 500mg PCm 500mg I...
31 <sup>5</sup> / <sub>12</sub>	RDT(-) S.T.I / Gastritis	108	Vitamin A IPT 525mg
41 <sup>1</sup> / <sub>12</sub>	RDT(-) Zempal woor / skin inf		Ampr 2g IV Erythromycin
44 <sup>2</sup> / <sub>12</sub>	RDT(+) malaria	73	Diclo 75mg Im ampropr...
50	RDT(-) Enteric Fever		Act 100mg / 270mg PCm 500mg
9 <sup>5</sup> / <sub>12</sub>	Wound		Act 100mg / 270mg PCm 500mg
49 <sup>6</sup> / <sub>12</sub>	RDT(+) malaria	73	Act 100mg / 270mg PCm 500mg
37yrs	RDT(-) ANC visit		F/acid 500mg Vitamin A 0...
32 <sup>7</sup> / <sub>12</sub>	RDT(+) malaria	73	Act 100mg / 270mg PCm 500mg
32 <sup>1</sup> / <sub>12</sub>	RDT(-) ANC visit		Fefo 750mg R/A 500
7.6	Hypertension	61	F/acid 500mg Vitamin A 0...

FIGURE 1: USE OF MRDTs AT ONE CLINIC

### 3.2.3. Treatment practice

A review of treatment registers was conducted for all 18 facilities visited. First-line treatment for uncomplicated malaria was largely ACTs - artesunate-amodiaquine (AsAq) or artemether lumefantrine (AL) tablets as per guidelines. Only one facility, Weawolo Clinic, had a stockout of ACTs. All the facilities, including all the 12 clinics, were managing cases of severe malaria. Recordings in treatment registers indicate that clinics were managing severe malaria cases effectively; referring cases only when there was stockout of injectables; when the patients could not afford to procure transcription medication on their own; or for complications that required advanced treatment (such as coma, blood transfusion). This finding contradicted set policies which indicate that clinics should refer severe malaria cases upwards; but, supported existing malaria guidelines which allow clinicians to manage what they can, and refer what they cannot.<sup>9</sup> In one facility, Fefeh Town, it was observed that even though severe malaria cases were being managed, they were not recorded onto registers, or HMIS. There was no clear explanation given. In this case, most patients could not afford the cost of referral to the next level facility, and health workers had limited choices apart from managing most cases.

<sup>9</sup>The stakeholder meeting noted ongoing discussions between NMCP and MoH to update policies to match advances in recommended treatment practice.

Patient's Name and Registration/OPD No.		MUAC - 14.6cm
Temperature: 38.1°C		PR:
Weight: 16.2 Kg		
Assessment, Classification/Diagnosis/Treatment		
c/c: fever, jerking x2, weakness x this morning		
HPI: According to pt mom pt jerk 2 times this morning. & hx of home Rx.		
O/E - vitals - Alert		
Skin - febrile (sponge bath, 2 Pcm spong stat).		
Cong - pink		
Lungs - clear		
Abd - soft		
Ext - NAD.		
LAB		
MRDT - post.		
Imp - Comp mal.		
<ul style="list-style-type: none"> <li>- <del>QZP</del> 5.2 ml rectally stat (30mg)</li> <li>- Artemeter 0.6ml IM stat then 0.3ml IM qdx2 followed by ACT (1-545) 1tab po qdx3.</li> <li>- Pcm spong po stat then spong 1 tab TID x3</li> <li>- FIA 5mg 1tab po qdx10</li> <li>- Multit 1tab po qdx10</li> <li>- ORS 1PK regular.</li> <li>- Health Education</li> <li>- Flup in 3dys</li> </ul>		
S. K. S. RIN		

FIGURE 2: EXAMPLE OF A TREATMENT CHART SEEN AT A CLINIC

While treatment guidelines are clear on recommended order of treatment options (artesunate, artemether then quinine), for various reasons, actual rollout showed inconsistencies at clinic level. Out of the 12 clinics visited in the 3 counties, 6 (Zoe-Geh Medical Centre, Bromley, Sass Town, Goghen, Malema and Sime-Darby) were treating severe malariacases with quinine IV in three divided doses in 24 hrs and following that with ACT for 3 days or quinine tablets for 5 days. Five clinics (Fefeh Town, Mulbah, Weawolo, Beh and Vayenglay) were using IM artemether to treat severe malaria or 3 days and following up with ACTs for 3 days. One clinic (Ahmadiyya Muslim Clinic) had all the severe malaria drugs available (IM/IV artesunate, IM artemether and IV quinine) with Acts, and using all three without following the order proposed in treatment guidelines. The treatment charts reviewed showed that this facility was choosing an option based on the ability of the patient to pay for the treatment. The assessment observed that recommendation on administration of antibiotics as part of severe malaria management (as recommended in national guidelines) was followed at all the three hospitals visited, and clinics where there were no antibiotic drug shortages.

The assessment team noted some deviations from set guidelines at hospitals and health centres visited. ELWA Hospital, which had both artesunate and quinine, was treating children under 5 years of age with IM/IV artesunate followed up with AL for 3 days; while in the OB ward, patients were treated with quinine IV and followed by ACT for 3 days. Inj AS was not being used for pregnant women at this facility. At LGH, due to drug shortages, pregnant women with severe malaria were treated with IM artemether for 5 days (monotherapy); while children and other adults with severe malaria were treated with either quinine IV or IM artemether then ACTs for 3 days. Severe malaria injectables at this facility were often out of stock and patients were given prescriptions to buy the full dose from pharmacies. As a result, many cases of re-admission were observed due to failure by patients to buy the medications.

Deviations were also observed at the three health centres visited. All three were predominantly treating severe malaria cases with quinine IV in 3 divided doses and followed by quinine oral for 6 days or ACT for 3 days. At Barbara Ann, some uncomplicated malaria cases were treated with I Artemether with short shelf life to avoid wastage. Bahn had a stockout of IM/IV artesunate and IM artemether; and patients' relatives were given prescriptions to buy these medicines from

pharmacies and bring to the facilities for treatment. At Sass Town Clinic, deviations were associated with gaps in testing. For example, severe malaria cases were treated based on clinical symptoms due to stock outs of mRDTs.

Some deviations from guidelines were associated with health worker knowledge. At Karnplay, for example, all injectables for severe malaria, i.e. artesunate, artemether and quinine were available, but some staff members did not seem to know the correct dosage for quinine,<sup>10</sup> and mentioned that they used what they were more comfortable with. At Bromley clinic, records showed that different staff prescribed different drugs for uncomplicated malaria- some opting for ACTs and others using injectables. There were no clear explanations for this. At Vayenglay Clinic, it was observed that some patients presenting with signs and symptoms of uncomplicated malaria were treated with IM artemether even when ACTs were available.

The results indicate that cadres were not strictly following treatment guidelines due to:

- Lack of training of staff on the updated treatment protocols
- Stock outs of antimalarial for severe or uncomplicated malaria
- Stock outs of lab test kits or functional labs to test
- Staff preferences.

### 3.3. Availability of malaria drugs

As part of the assessment, stock audits of severe malaria drugs and essential supplies were conducted at each facility. The audit also checked availability of relevant equipment and ancillary supplies. The table below shows availability of selected severe malaria drugs.

**TABLE 10: AVAILABILITY OF MALARIA COMMODITIES AND SUPPLIES AT VISITED HEALTH FACILITIES**

Facility	Inj AS	Inj Artem	Quinine IV	ACT	Quinine tabs	Parace Tamol	IV diazepam
Liberia Government Hospital	•		•	•			
ELWA Hospital	•	•	•	•	•	•	•
Ganta Methodist Hospital		•	•	•	•	•	•
Barbara Ann Health Centre		•	•	•	•	•	•
Karnplay Health Centre	•	•	•	•			•
Bahn Health Centre	•	•	•	•	•		•
Sami Darby Clinic		•	•	•	•	•	•
Ahmadiyya Clinic	•	•	•	•			
Zeo-Geh Medical Clinic				•		•	
Vayenglay Clinic		•	•	•			•
Beh Town Clinic		•	•	•		•	
Fefeh Town Clinic		•	•	•			
Goghen Clinic		•	•	•			
Malema Clinic		•	•	•			
Mulbah Town Clinic		•		•		•	
Sasstown Clinic		•	•	•			

<sup>10</sup>Based on the descriptions provided to researchers.

Weawolo Clinic	•					
Bromley Clinic		•	•		•	•
Key: • commodity available						

There were significant gaps in availability of severe malaria drugs in the facilities visited. Inj AS, the recommended first line treatment option, was largely unavailable in most clinics. Injectable AS was available at 5 of the 18 centers: at the two private hospitals, at two health centres, and one private clinic. However, Inj artemether was available at 16 of the 18 health facilities visited, including at clinics where it is also used for pre-referral intervention. One clinic, Weawolo, only had Inj artemether which it was using to treat both complicated and uncomplicated cases. One private clinic, Zoe Geh, did not have any medications for managing severe malaria, although they had ACTs. Inj quinine was available at 16 of the 18 facilities visited, while quinine tablets were available at four health facilities. At most centers, health personnel indicated that patients could also access these at affordable prices at pharmacies.

There was limited availability of the other drugs used to manage severe malaria effects such as pain and fever. Managing certain complications such as convulsions at most facilities is a challenge, especially in clinics, because of stock out of Injectable diazepam and Injectable phenobarbitone known to help with reducing convulsions. Paracetamol was available at 8 facilities only, while IV diazepam was available at only 8 facilities as well. IV dextrose (5%) was available in 17 of 18 health facilities, while IV dextrose (50%) was available in just seven. Two facilities (LGH and Zoe Geh) indicated that they had run out of gloves- a basic commodity. Two clinics and a health centre did not have fluid giving sets.

**TABLE 11: AVAILABILITY OF MALARIA COMMODITIES AND SUPPLIES AT VISITED HEALTH FACILITIES**

Facility	IV dextrose 50%	IV dextrose 5%	Normal saline	Ringer lactate	Lubricant jelly	Gloves	IV cannula	Fluid giving set
ELWA Hospital	•	•	•	•	•	•	•	•
Ganta Methodist Hospital	•	•	•	•	•	•	•	•
Liberia Government Hospital		•						
Barbara Ann Health Centre	•	•	•	•		•	•	•
Bahn Health Centre		•				•	•	•
Karnplay Health Centre						•		
Sami Darby Clinic	•	•	•	•	•	•	•	•
Ahmadiyya Clinic	•	•	•	•	•	•	•	•
Zoe-Geh Medical Clinic		•	•	•	•		•	•
Vayenglay Clinic		•			•	•	•	•
Beh Town Clinic		•	•	•		•	•	•
Fefeh Town Clinic		•				•		
Goghen Clinic		•				•	•	•
Malema Clinic		•	•	•		•	•	•
Mulbah Town Clinic	•	•	•	•	•	•		
Sasstown Clinic		•				•		
Weawolo Clinic	•	•		•		•	•	•
Bromley Clinic		•				•	•	•

At community level, malaria drugs for under 5s were not available in all the CHA communities visited. One CHA in Nimba mentioned that malaria drugs were out of stock since early 2018 (they had gone for more than 12 months without stock). In Bomi, the CHA who was met last received

supplies in April 2018. Their last supply prior to that was in 2017. Once clinics run out of antimalarial supplies, the CHAs are also affected. Implementers of the CHA programme mentioned that unavailability of essential drugs for CHAs was a main reason for reduced effectiveness of the programme.

### **3.4. Availability of reference materials**

At the national level, policies and guidelines were developed and training of National and Regional Training of Trainers (TOTs) conducted. National level officials supervise county and district level trainings. At the county level, the Community Health Department (CHD) is responsible for policy dissemination and enforcement, training and supervision, data compilation and reporting. The district level is responsible for supervision, training and policy dissemination to each health facility. This level also supervises community level implementation of malaria case management, which is implemented by Community Health Assistants (CHAs).

Out of the eighteen facilities visited, 10 had the 2017 versions of the malaria case management and malaria in pregnancy guidelines; and none of these were the three hospitals. No facility reported having any job aides and standard operating procedures (SOP). NMCP confirmed that they had not produced any job aides or SOPs on malaria case management. In the facilities without the 2017 guidelines, the main reference for treatment of malaria was mentioned as the WHO recommendations for treatment for uncomplicated and severe malaria which is available on the WHO website.<sup>11</sup>Two facilities mentioned relying on guidelines provided on medicine packs.

### **3.5. Data management practices**

In Liberia, health data are collected at facility level. Clinicians record results of patient testing and subsequent treatment on 'patient treatment charts' which are stored at the health facility. At the end of each day, these charts are collated by a registrar or other health facility staff and recorded onto diagnosis and treatment registers. At the end of the month, the registers are used to record statistics onto the appropriate sections of the HMIS reporting form. From the 5<sup>th</sup> to the 15<sup>th</sup> of the following month, all completed HMIS reports are either collected by the District Health Officer or their designated officials and submitted to the district and county M&E Unit for uploading onto the DHIS2 database platform. Data analysis is expected to be done at all levels of the health delivery system (facility, district, county and national). Analysis is dependent on demand for data for use in programmes.

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<sup>11</sup><https://extranet.who.int/prequal/content/prequalified-lists/medicines>.

Malaria												
No. of Children under 5 treated with ACT within 24 hours after onset of fever					44	No. of Children under 5 treated with ACT after 24 hours with Fever					22	
J) Malaria. Check here <input type="checkbox"/> if service was not provided												
Age group	Malaria cases diagnosed by					Total tested	Malaria cases treated with					Artemete + L. A. mefau tri
	Clinically	RDT		Microscope Test			ACT	Quinine Tab	Quinine IV	Artemether Injection	Artesunate Injection	
		+ve	-ve	+ve	-ve							
Under 5 Children	6	100	12			66	36	0	2	0	2	
5 and above	15	60	32			58	5	0	0	0	12	
Pregnant women	0	16	5			15	1	0	0	0	0	

FIGURE 3: RECORDING OF DRUG INFORMATION ON HMIS FORMS

During the assessment, research team members who work on the HMIS database at NMCP sat down with health facility staff in 17 of the 18 facilities to reconstruct and verify data reported on the respective HMIS forms. They focused on cases reported for the months of May, June and July 2018. The purpose of this exercise was two-fold: to check accuracy of data being transferred from treatment registers to HMIS forms, and to also understand how facility staff were doing this. The results are presented in the table below:

TABLE 12: COMPARISON OF MALARIA CASES REPORTED ON HMIS FORMS AND SEEN IN TREATMENT REGISTERS

Facility	Private/Public	HMIS Reported malaria cases <5	Verified malaria cases (registers) <5	Validation rate	HMIS reported malaria cases >5	Verified malaria cases (registers) >5	Validation rate
Ganta Methodist Hospital	Private	596	679	88%	3108	3147	99%
ELWA	Private	0	0	na	0	0	na
LGH	Public	986	861	115%	2363	907	261%
Bahn Health Centre	Public	248	248	100%	407	371	110%
Barbara Ann Health Centre	Private	744	458	162%	4444	2746	162%
Vayenglay Clinic	Public	367	197	186%	521	275	189%
Broomley Clinic	Public	444	385	115%	921	1412	65%
Mulbah Town Clinic	Public	244	307	79%	297	291	102%
Fefeh Town Clinic	Public	167	93	180%	407	426	96%
Beh Town Clinic	Public	237	237	100%	364	364	100%
Goghen Clinic	Public	186	144	129%	290	231	126%
Weawolo Clinic	Public	131	163	80%	260	290	90%
Malema Clinic	Public	192	125	154%	357	278	128%
Sami Darby Clinic	Public	1433	1835	78%	2742	3103	88%
Sasstown Clinic	Public	351	334	105%	362	310	117%
Ahmadiyya Muslim clinic	Private	167	109	153%	591	558	106%
Zoe-Geh Medical	Private	42	23	183%	106	23	461%

Clinic							
Total	Private/Pu blic	6,535	6,198	105%	17,540	14,732	119%

For the 17 facilities included for this task, some important observations were made. Only one facility, Beh Town Clinic had records submitted on their HMIS forms matching what was in their treatment registers. ELWA Hospital was not recording any Malaria data onto HMIS forms at all. Facilities such as Barbra Ann, Vayengley and Ahmadiyya seemed to have the most significant differences. In fact, most discrepancies were seen among private health facilities. Quality of data recorded improved for facilities handling few malaria cases, indicating an effect of work overload. Accuracy of data was higher where clinicians and nurses were also involved in recording data onto HMIS forms.

FIGURE 4: UNDER 5s REGISTER HAS NO PLACE FOR RECORDING SEVERE MALARIA DRUGS USED

HMIS currently uses information on injectable versions of drugs to estimate numbers of severe malaria cases seen. The assessment team compared data on injectable malaria drugs recorded in treatment registers with that recorded on HMIS forms. Recording errors were common in most cases where HMIS forms were being completed by health facility staff other than nurses or clinicians. Closer scrutiny showed that errors were associated with:

- Poor recording of drug names on treatment registers, where ACTs and injectable versions were not being differentiated;
- Inaccurate copying of drug names from treatment charts onto registers (there was no standard way of recording tablet and injectable versions of the key drug regimens (artesunate, artemether or quinine based). In several cases observed, Artesunate lumefantrine (tablet ACTs) and Inj AS were both recorded as artesunate; and onto the HMIS forms either as ACTs or Inj AS.
- Inaccurate counting of uncomplicated and severe malaria cases when recording onto HMIS.
- Use of injectable drugs for uncomplicated cases because of common drug stockouts and for other reasons discussed earlier.
- Inaccuracies in how diagnosis and treatment information is recorded and transferred from treatment charts onto registers and HMIS forms.
- Inadequate time allocation for data management due to work overload.
- Lack of stationery, including Ministry of Health approved diagnoses and treatment registers at facility level, especially in private health facilities
- Lack of Interest in some private health facilities to collate and report onto HMIS forms
- Limited training on data collection and analysis at all levels

In general, cases recorded in treatment registers were much lower than those recorded on HMIS forms, indicating serious unreliability of severe malaria data recorded on HMIS (see table below). For example, 76 cases of under-fives and 231 cases of >5s were recorded in treatment registers at Barbra Ann Health Centre, compared to 153 and 564 respectively recorded on their HMIS forms.

**TABLE 13: DISCREPANCIES IN RECORDING OF SEVERE MALARIA CASES TREATED.**

Facility	Total Malaria cases treated (treatment registers)		Cases on HMIS reporting use of severe malaria drugs		Actual cases of severe malaria recorded in treatment registers	
	< 5	≥ 5	< 5	≥ 5	< 5 <sup>12</sup>	≥ 5
<b>ELWA Hospital</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Barbara Ann Health Centre</b>	744	4444	153	564	76	231
<b>Bromley Clinic</b>	374	715	133	221	-	n/a
<b>Ganta Methodist Hospital</b>	596	3108	324	395	-	n/a
<b>Bahn Health Centre</b>	248	407	35	64	-	<b>37</b>
<b>Karnplay Health Centre</b>	1046	1340	41	122	-	<b>32</b>
<b>Zoe-Geh Medical Clinic</b>	15	29	11	5	-	n/a
<b>Vayenglay Clinic</b>	367	521	4	0	-	<b>1</b>
<b>LGH</b>	986	2363	438	193	<b>397</b>	<b>245</b>
<b>Ahmadiyya Muslim Clinic</b>	167	591	116	350	<b>115</b>	<b>183</b>
<b>Mulbah Town Clinic</b>	244	297	22	14	-	<b>127</b>
<b>Fefeh Town</b>	167	407	<b>0</b>	<b>0</b>	-	<b>0</b>
<b>Weawolo Clinic</b>	110	191	10	2	-	n/a
<b>Gogehn Clinic</b>	152	215	8	42	-	n/a
<b>Sasstown Clinic</b>	231	257	28	6	-	n/a
<b>Beh Town Clinic</b>	152	255	8	17	-	n/a
<b>Malema Clinic</b>	166	262	27	53	-	n/a
<b>Sami Darby Clinic</b>	1149	1674	249	192	-	n/a

- n/a: No verification from the diagnoses and treatment register was done.

<sup>12</sup>Based on the format of treatment column of the <5 register, it was impossible to verify the injectables reported in the HMIS report. Data could not be verified from the <5 register as the two columns for treatment are labelled ACTs; without a provision for recording cases managed with injectables.

## **4. Discussion**

### **4.1. Severe malaria treatment**

The assessment showed that severe malaria treatment guidelines provide for management of cases at clinic level, although this is not explicitly supported by health policies. There were various reasons why clinics are managing most cases of severe malaria, including cases they are expected to refer. The main one relates to distances and cost of traveling to the next level health centre. Most patients cannot afford the cost of motorcycle transport (the most or only viable option); and often go back to the community if referred. Health workers are managing cases also because of their levels of confidence. After administering pre-referral intervention and observing a patient for the stipulated period, they often proceed to offer the full treatment if they feel that the patient is improving.

Another reason is the absence of a functional referral system. For example, health workers at one clinic narrated a case of a child who was referred but the parents could not afford the cost of transport, and the child died the following day. During the assessment, research teams encountered a severe malaria case where the patient refused to be referred because they did not have money for food and transport.

The assessment results show that communities in remote areas are aware of the problems associated with severe malaria and try to seek treatment whenever possible. This change in behaviours could, in large-part, be the result of the CHA program. In the 3 communities with a CHA in place, community members demonstrated better knowledge of severe malaria and referred cases of severe malaria to health facilities more readily. When they have ACTs, CHAs manage cases of uncomplicated malaria, including in children <5. However, the CHA programme is also affected by the main health system challenges, including drug shortages and inadequate supervision.

Guidelines stipulate that Inj AS should be used and the patient observed over a minimum of 24 hrs. However, clinics currently operate for 8 hrs, and if health workers at this level are to administer Inj AS, provisions should be made for training as well as management of cases during hours when the facilities are closed. Treatment guidelines mention RAS as pre-referral intervention at community level, and if this is rolled out, then Inj AS should be made available at clinic level to adequately continue the treatment. The discussion on how best to implement RAS should therefore be conducted alongside that of availability of Inj AS; and clinic operating hours. Opening times should not be a serious barrier, as clinics already manage maternal emergency cases outside operating hours, and in some cases, with the health workers provided incentives from government. A challenge could be associated with basic infrastructure, including beds and lighting.

### **4.2. Drugs and equipment supply chain issues**

Drug stockouts are a serious issue. The assessment has shown that in some cases, there were stockouts in selected facilities in a county, but not at the county depot. All public clinics visited had encountered some drug stock outs in the last year, and some mentioned that they had encountered stockouts of some essential drugs for periods ranging from three to 12 months. Most clinics in Bomi mentioned receiving limited supplies of fast-moving drugs such as pain killers and ACTs. At the time of the assessment, there was one clinic without a supply of gloves. The county hospital only had quinine IV, and no IV artesunate or artemether. These issues raise concerns around supply chain, and potential proliferation of sub-standard medicines into the country because people are being

forced to buy the medicines themselves. The supply chain actors should provide adequate monitoring or forecasting of requirements for each health facility.

Use of injectable severe malaria drugs is largely influenced by what is available, and cost. In public facilities, Inj artemether is provided at all levels of facilities, and artesunate at health centre and hospitals. When available, these are used alongside quinine, but without a clear adherence to set guidelines. In private facilities, quinine is often prescribed because it is cheaper. Private facilities in Monrovia mention Inj AS and artemether as available for sale on the street, and there are strong indications that these drugs may have originated from public health system (research teams saw versions similar to those distributed in the public facilities).

There are cases where treatment is based on clinical observations, although guidelines indicate that cases should be diagnosed with mRDT or microscope. Most clinics are not electrified, and diagnosis for malaria is largely dependent on mRDTs. In the communities where CHAs or community pharmacies exist, patients often go to clinics after they have already started malaria treatment. In these cases, mRDTs often test negative. Health personnel then depend on reported patient history and clinical symptoms and impressions to treat cases. Such cases are often severe (the main reason why patients go to health facilities after starting treatment at the community level), and account for a significant proportion of severe malaria cases managed at clinic level. Health centres and hospitals, especially public ones, often have limitations in availability of microscope slides, or receive many patients such that screening is done by several nurses. Their labs are overwhelmed, and many patients are treated before they get a microscopic malaria diagnosis.

When clinics and hospitals run out of malaria medicines, they often provide prescriptions and ask patients to buy from pharmacies. This is contributing to two kinds of problems: drugs destined for public facilities can find their way onto the street because of the resultant demand; and poorer patients find it harder to effectively treat malaria early. The study could not ascertain the quality or origin of drugs sold on the street, and there is a possibility that some could be substandard or counterfeit. In focus group discussions, some community members mentioned that they often chose not to seek health facility treatment where drugs were not readily available, often resorting to use of herbs. Data collected on relative cost of severe malaria drugs used in private facilities showed that quinine-based regimens were almost five times cheaper than artesunate (US\$3 vs US\$14); and even cheaper on the street. Yet private facilities cost up to US\$30, including consultation fees. This is problematic for communities where the nearest facility is private.

In three of the focus group discussions, respondents mentioned that they were asked to pay for services, including malaria treatment in public health facilities. In one case, patients were asked to pay for medicines, or for services such as delivery or treatment provided outside of working hours. Often, payment was requested in items such as food, fuel or labour. Failure to pay resulted in denial of service or prolonged delays before treatment is eventually provided. Health workers at these facilities and at the county level denied existence of such practices.

### **4.3. Training and capacity development**

Training on the new malaria guidelines is still to reach most health workers, especially those in hospitals. In a few health facilities in Bomi, training had been conducted in December 2018 and January 2019, and this led to changes in how cases were managed. At such health centres, staff basically stopped using quinine soon after the training, and started to use ACTs in all trimesters of

pregnancy. The gaps in training might have contributed for continued use of quinine-based regimens where ACTs are available. Doctors met in Nimba and Bomi mentioned the need to ensure that training is facilitated for doctors as well; and facilitated by fellow doctors. Such trainings could take the form of treatment discussion forums where practitioners share their experiences and acquire new information, especially on guidelines.

#### **4.4. Data management**

Findings from the assessment indicate that the processes for data collection are being followed as laid down, but with significant data quality and omission issues. There are various gaps in how information is collected and recorded, and additional issues on delays by facilities in submitting their HMIS reports upwards. For data that finds its way to the HMIS system, there is no standard process for data analysis, and there are no requirements for production of data analysis reports at any of the levels. As such, there is no immediate system for teasing the information gathered.

Serious flaws were observed with regards to how data on treatment of severe malaria was being recorded. The most common errors were on cases where ACTs (AsAq or AL tablets) were recorded interchangeably with Inj AS and inJ artemether respectively; and wrongly recorded as treatment for severe malaria. This has an effect of over-estimating the number of severe malaria cases seen (which is currently estimated using the drug used to treat a case). As a result, the data provided on severe malaria cases is largely unreliable, and recorded cases are much higher than those managed. It is possible that severe malaria cases recorded are over-estimated by a factor of 5 or more, but more focused research is needed to accurately determine this. Nevertheless, using injectable severe malaria drugs uptake to determine the number of severe malaria cases should be taken with caution.

#### **4.5. Referral system**

The referral system observed in Nimba and Bomi is weak or non-functional for most facilities. It is also largely patient-driven. The research team identified several cases where severe malaria cases managed at clinic level (with IM artemether) were not followed up for monitoring. Referral back to CHAs was not provided either, hence community level support not linked up. Where CHAs are working in the communities and equipped with adequate training and drugs, the numbers of cases of malaria reaching health facilities fell dramatically. In some facilities the number of malaria cases, fell by as much as 60% when comparing the months May-June 2016, when there was no CHA programme and the same months in 2018 when the CHA programme was in place. CHAs interviewed actively followed up clients to check outcomes of treatment. CHAs who are iCCM trained have the potential to administer pre-referral RAS and provide follow up for patients when discharged from health facilities. Their training should include these aspects (currently does not); and this can be added through refresher trainings for those already in service.

## 5. Conclusions and recommendations

### 5.1. Conclusions

This assessment was commissioned by NMCP to provide evidence to inform its policy on management of severe malaria. The assessment has shown important gaps in severe malaria case management from communities to clinics, and up the referral system. The assessment concludes that there is a continuum of care thinking within the health delivery system by design, but several challenges exist. There are clear gaps in treatment, drug supply chain and information management. There are, therefore, many opportunities for improvement.

Health workers demonstrated knowledge of severe malaria, and most are managing cases regularly. Although severe malaria case management guidelines provide for management of cases at clinic level, health policies do not currently support this. Nevertheless, nurses are managing severe malaria cases in clinics, even though Inj AS is largely not available at this level. Health workers are managing cases with Inj artemether or Inj quinine, and only the most severe cases are referred. These include anaemia requiring blood transfusion, and comatose cases.

Training for health workers (including for CHAs) needs urgent attention. There is limited use of case management guidelines; and training has not reached health workers in hospitals. Job aids, flow charts and guidelines are not readily available where patients are treated. While the main sources of information for referring are guidelines, most health workers feel that job aids and flowcharts are more user friendly. Relevant training and support have also not been rolled out to doctors.

Drug stockouts are common and highlight problems with supply chain and information management. At the community level, the CHA programme is not adequately supported with required drugs, although it has demonstrated value in cutting the number of severe cases that reach health facilities. This is limiting the effectiveness of CHAs. Private facilities, however, seem to be well resourced, and are managing cases at a premium.

The quality of reporting in the HMIS forms and database is affected by errors in the interpretation of treatments in patient treatment charts and registers. Errors identified during the assessment span all types of facilities. These errors are not checked, and therefore get recorded onto HMIS forms and uploaded onto the DHIS2 platform. It is possible that some counties are not requesting adequate supplies because they are forecasting needs for lower level health facilities using flawed data. The NMCP is still to roll out training on monitoring and evaluation.

Researchers were not able to visit all counties, although six were represented at the national stakeholders meeting. The research could not, therefore, confirm with certainty that the counties with favourable treatment outcome figures (as recorded on HMIS) were indeed performing better. It could be the result of flaws in recordings in the other counties. Nevertheless, the research did show that there are serious problems with data recording and this problem should be rectified before planners can rely on what is shared through the HMIS.

### 5.2. Recommendations

- 1) NMCP and its partners, including funding and supply chain, should urgently review treatment guidelines in the context of prevailing situations on the ground. They should provide guidance to counties and districts on suitable regimens for managing severe malaria at clinic level, taking into consideration existing situations and their causes.

- 2) Given the large number of severe malaria cases being managed at clinic level, NMCP needs to engage government to revisit policy on referrals at this level.
- 3) NMCP and its partners should review coverage of health worker training programmes and ensure that all relevant facilities and within these cadres, are reached with suitable training. NMCP and its partners should develop job aids and flow charts for use by health workers to ensure that management of severe malaria is enhanced.
- 4) NMCP's monitoring and evaluation unit should urgently design a training programme for data clerks in all health facilities and roll it out to improve data quality collected at health facilities. Such training should be cascaded and include guidance on how to record different drug regimens onto registers and HMIS forms.
- 5) NMCP should strengthen its collaboration with partners implementing the CHA programme, and explore ways for improving information sharing, and for introducing RAS at community level.
- 6) NMCP and programme partners should continue to discuss placement of pre-referral intervention options for communities at lower level facilities. They should discuss and agree optimum deployment strategies for rectal and injectable artesunate and ensure that any decisions reached are possible to implement, are supported with adequate training and that there is support for referral.
- 7) NMCP should strengthen collaboration with supply chain actors (e.g. by including them in malaria training) at national and county level, so that joint monitoring of stock levels can assist in addressing artificial and real stockouts. NMCP should advocate for more capacity development for quantification; and training at the point of care so that stock levels are reported better. At county level, planning should include NMCP staff so that there is wider sharing of quantification information.
- 8) Medical stores should review its system for pushing drugs to health facilities and revise its forecasting approaches to ensure that existing stock outs are minimised.
- 9) The Ministry of health should provide clear guidance on the working relationship with private sector facilities and ensure that agreements reached on collection and sharing of data are implemented.

# Annexes

## Annex 1: County hospital staffing requirement (EPHS 2011-2021)

No	Cadre	Minimum	Maximum
01	Medical director	1	1
02	Assistant medical director	1	1
03	Specialist services		
04	Surgeon	1	2
05	Obstetrician	1	2
06	Paediatrician	1	2
07	Internal medicine	1	2
08	ENT	1	2
09	Dentist	1	2
10	Orthopaedic Surgeon	1	2
11	Ophthalmologist	1	2
12	Laboratory specialist	1	2
13	Radiologist	1	2
14	General practitioner	3	4
15	Physician assistant	15	20
16	Dental assistant	4	6
17	Pharmacist	2	2
18	Pharmacist assistant	1	2
19	Dispenser	6	8
20	X-ray technician	2	3
21	Laboratory Technician	2	3
22	Laboratory assistant	4	6
23	Laboratory aide	4	6
24	Anaesthetist	2	3
25	Anesthetise assistant	3	6
26	Nutritionist	2	3
27	Registered nurse	60	80
28	Nurse midwife	50	80
29	Mid wife	60	80
30	Nurse aide	24	36
31	Environmental health technician	4	5
32	Psychologist	2	3
33	Social worker	5	6
34	Administrator	1	1
35	Administrative assistant	1	1
36	Finance assistant	2	3
37	Supplies	2	3
38	Medical records	3	4
39	Utilities/transport	2	3
40	House keeping	10	15
41	Laundry	10	15
42	Maintenance	8	12
43	Security/guard	8	12

Total	327	442
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## Annex 2: Profile of health centres visited

### Sister Barbara Ann Health Centre:

- Facility has no Senior Consultant, no Midwives and no Paediatrics nurse
- From among the available staff no one has received formal training in malaria case management, Inj AS. and RAS administration.
- Facility has no reference materials in the form of technical guidelines and training manuals for malaria case management
- Staff assigned to IPD and or OPD are trained in resuscitation and not in severe malaria case management
- According to HR records there are 4 Laboratory Technicians but has 16 staff members trained in Malaria microscopy and RDT.
- The clerk is mentioned work overload, and enters cases managed on a daily basis. At times the clerk knocks off before screeners are done attending to new patients, and these cases do not get recorded.
- Due to lack of formal training and a lack of malaria guidelines, the facility is still treating severe malaria cases using the quinine protocol
- Inaccurate data entries by Clerk/Register personnel on number of cases managed is misinforming supply chain and the facility always has stockouts

### Bahn Health Centre:

- This facility has no senior medical staff such as:- consultants, medical doctors, paediatric nurse and no physician assistant
- The only medical staff running this facility are two midwives and seven nurses
- None of the available staff have received formal training in malaria case management, in Inj AS and RAS administration
- Available staff assigned to triage and emergency departments (including all key staff members) are not trained in resuscitation and severe malaria management.
- All staff are not well oriented on most current versions of reference materials on malaria case management

### Karnplay Health Centre:

- This facility has no senior staff such as consultants, medical doctors and no paediatric nurse
- Has two physician assistants,3 midwives and 5 general nurses
- One of the midwives and 1 of the physician assistants have received formal training in malaria case management and administration of Inj AS. and RAS
- The facility has the most current version of guidelines in malaria case management and malaria in pregnancy (2017)
- Staff assigned to OPD and IPD are not trained in severe malaria case management nor in resuscitation.
- Laboratory technician not trained in mRDT and microscopy, this has a major impact quality of results being produced.

## Stakeholder meeting participants

Organization	Name	Position
Bomi Health Team	Augustus G. Guiah	CHO
Bomi Health Team	Fatu J. Holmes	CHRS
Bomi Health Team	John K. Kollie	CHDD
Bomi Health Team	Mohammed M. Dukuly	Clinical supervisor
Bomi Health Team	Thomas Jarsor Young Jr.	County pharmacist
MOH	John M. Kallon	Technical Assistant
Development data	Tendayi Kureya	Consultant
Family Health Division	Veronica Siafa	MNH coordinator
Jhpiego	Anne Fedler	Country director
Last Mile Health	William E. Walker Jr.	Senior tech coordinator
Measure Evaluation	Dr. Eric Diboulo	Residence Advisor
MMV	Hans Rietverd	Access Specialist
MMV	Pierre Hugo	Access Director
MOH	Emmanuel T. S. Dahn	M&E officer
MOH GFATM/PCU	Momolu Massaquio	Malaria focal person
Montserrado CHT	Adolphus Kenta	CHDD
Montserrado CHT	Amos T. Gaye	Driver
Montserrado CHT	Dr. Satta Wape	CHO
Montserrado CHT	Tiamra Poe Saysay	Driver
NDU/MOH	Daniel M. Torla	Administrator
NMCP/MOH	D. Levi Hinneh	SMEOR Manager
NMCP/MOH	Joseph Alade	M&E support
NMCP/MOH	Sam Tannous	Finance Manager
NMCP/MOH	Thomas Quoi	Driver
NMCP/MOH	Asatu M. Dono	iCCM coordinator
NMCP/MOH	Daniel Somah	Coordinator
NMCP/MOH	Dr. Julius Gilayeneh	Deputy Program Manager
NMCP/MOH	Jamesetta Smith	Coordinator
NMCP/MOH	Oliver J. Pratt	Program Manager
NMCP/MOH	Sarah P. Guwaye	Case Manager
NMCP/MOH	Tephen S. Seah Sr.	Data Manager
NMCP/MOH	Victor S. Koko	M&E Research Officer/PI
PACS	Isaac Mwase	M&E advisor
Peace corps	Hengry Kenecht	Malaria coordinator
Plan-Liberia	Mohamed K. Mansaly	Coordinator
USAID/PMI	Jessica Kafoko	Malaria advisor
VectorLink	Dr. Ibrahima Baber	Representative

## Stakeholder meeting discussion points

On 22<sup>nd</sup> May, 2019, NMCP hosted a national stakeholder meeting to discuss the findings of the assessment. The national dissemination meeting showed great levels of engagement from key stakeholders. The following were key points raised at a national stakeholder meeting that was convened to discuss findings from this assessment:

1. Stakeholders proposed that severe malaria treatment at clinic level be guided by a clearly defined protocol that shows what clinics shall be able to handle and define a few additional signs which prompt referral.
2. CHA program partners proposed that NMCP regularly shares information on overall program coverage, and provide statistics on commodities provided to CHAs.
3. Partners proposed that problems with recording of drugs used can be overcome if training for health workers covered this aspect. For example, NMCP can provide guidance on how to report on newly introduced products: ACT / AsAq / AL etc.
4. Partners encouraged closer collaboration between NMCP and supply chain actors at national and county level, so that joint monitoring of stock levels can assist in addressing artificial and real stockouts. Stakeholders agreed that there was a need for more capacity development for quantification; and training at the point of care so that stock levels are reported better. At county level, planning should include NMCP so that there is wider sharing of what is required.
5. Private sector engagement is key to harmonize quality ACT presence in the country. There is urgent need to implement quality assurance and quality control mechanisms for drugs in the private sector. Private facilities should be included in quantification and training, because these facilities serve a significant proportion of the population.
6. The report should include a section on supply chain issues (done).
7. The problems with the referral systems and data management affect many aspects of health programs. As such, all stakeholders should be concerned about this problem, and come together to find practical solutions.
8. There is urgent need to move from knowing the challenges to addressing them. Issues raised in this assessment were known as far back as 2009. There is a need to do these assessments more regularly, and share information on progress on addressing each issue.
9. Training and capacity development need not be expensive, especially if it is cascaded. If done this way, it is possible for national level to train counties every 6 months, and counties doing the same for districts and these cascading to clinic more regularly.
10. Plea for stronger community engagement (patients first): example of referral hospital not being used, not well explained.