Republic of Liberia
Ministry of Health

National Malaria Control Program (NMCP)

MALARIA NATIONAL STRATEGIC PLAN 2021-2025

JUNE 2020

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FOREWORD

The 2018 Mid-Term Review (MTR) and other malaria program reviews have identified factors that contribute to progress towards achievement of set targets for malaria as well as critical issues that constrained effective delivery of malaria interventions thus contributing to reduced progress with malaria control efforts in Liberia. Overall, there is progress reduction in both mortality and morbidity at general population level, and the situation shows some gains with the most vulnerable population. Nonetheless, mortality and morbidity in children under five years has not progressed as expected and likewise uptake of malaria in pregnancy interventions remains low despite the investments.

In line with the World Health Organization's (WHO) Global Technical Strategy (GTS) 2016-2030, this new Malaria National Strategic Plan (NSP) 2021-2025 incorporates all key recommendations and actions from the 2018 MTR as well as from other reports and studies intended to accelerate malaria control in Liberia, to set the stage for a long-term progress towards pre-elimination and eventual malaria elimination. This new malaria NSP redefines the strategic direction and focus of the malaria program, including strengthening of structures, health systems and capacities to achieve greater equity, coverage, quality and more effective delivery of the interventions for achievement of the overall goal of substantial reduction of malaria burden in Liberia.

We extend thanks and appreciation to our partners who have worked with us to develop the new national malaria strategic document. We are grateful for your support in bringing health care to the Liberian people. It is hoped that we can continue to work with our partners in making optimal use of this national document to achieve our vision of zero malaria deaths in Liberia. If implemented to the details, this new strategic plan will usher Liberia into malaria eliminating country by 2025.

The Government commits to working with our partners and all key stakeholders to ensure this malaria NSP is implemented, while focusing on galvanizing political will nationally and globally, as well as implementing best global strategies suitable for Liberia and applying a coordinated country response to significantly reduce malaria to pre-elimination stage in Liberia.

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Additionally, the NMCP remains grateful to the County Health Teams and directors and representatives of HMER, HMIS, M&E, Family Health Division, Health Promotion and Supply Chain Management Unit for their contributions as well as our implementing partners (Plan International, Measure, Chemonics, Vectorlink, Vectorworks, Jhpiego, Starks Foundation and ADAMS Inc.), RBM Partnership to end Malaria (Morris Okumu), and TNIMA that contributed to review, editing and finalization of this malaria NSP.

The NMCP also wants to recognize and express sincere thanks and appreciation to the following NMCP staffs for their tireless efforts and contributions to the development, review and finalization of this document: Dr Julius Gilayeneh, Deputy Program Manager; Mr. Levi Hinneh-Assistant Program Manager-Research, M&E; Mr. Joseph O. Alade, Jamesetta G. Smith, Sam N. Tannous, Mr. Daniel Somah, Mr. Julius Janafo, Tabadeh Collins-Kollah, Agnes Simpson-Janafo Asatu Dono, Chrispin Williams, Hawah Gboyah, Hawah Jabateh, and Patrick Hardy among others. Appreciation goes to Morris Okumu from the RBM Partnership to end Malaria for giving the final document a complete review and alignment.

Finally, we extend special thanks to our National Consultant, Mrs. Yah M. Zolia, for technical expertise and guidance in drafting and finalization of this Strategic Plan.

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ABBREVIATIONS/ACRONYMS

3 Fs	Few, findable and fixed sites
ACT	Artemesinine-based Combination Therapy
AL	Artemether Lumefantrine
ANC	Anti-natal clinic
ASAQ	Artesunate Amodiaquine
BCC	Behavioral change communication
CBIS	Community-based information system
CHA	Community health assistant
CHDC	Community Health Development Committee
CHO	County Health Officers
CHSS	Community Health Service Supervisor
CHT	County Health Team
CMO	Chief Medical Officer
CMS	Central Medicine Store
CSO	Civil society organization
DDT	Dichlorodiphenyltrichloroethane
DHIS2	District health information system II
DHO	District Health Officers
DHT	District Health Team
DOT	Directly observed therapy
EIR	Entomological inoculation rate
EML	Essential Medicines List
EPA	Environment Protection Agency
EPI	Expanded Programme on Immunization
EVD	Ebola Virus Disease
FARA	Fixed Amount Reimbursement Agreement
FY	Fiscal year
GAVI	Global Alliance for Vaccine and Immunization
GDP	Gross domestic product
GFATM	Global Fund for HIV/AIDS, Tuberculosis and Malaria
GIS	Geographic information system
GOL	Government of Liberia
GSK	Glaxo SmithKline
GTS	Global Technical Strategy for malaria 2016-2030
HBR	Human Biting Rates
HFS	Health facility Survey
HMER	HMIS, M&E and Research
HMIS	Health Management information system
iCCM	Integrated community case management
IDDs	Iodine Deficiency Disorders
IDSR	Integrated Disease Surveillance Response
IEC	Information, education, communication
iG2	interceptor second generation Active Ingredient net
INGO	International non-governmental organization
IPTi	Intermittent Preventive Treatment During Infancy
IPTp	Intermittent preventive treatment in pregnancy
IRS	indoor residual spraying
ITNs	Insecticide-treated nets
IVM	Integrated Vector Management
JISS	Joint integrated supportive supervision
KIR	Key Indicator report
LBNM	Liberia Board of Nursing and Midwifery
LCM	Liberia Global Fund Country Coordinating Mechanism
LDHS	Liberia Demographic and Health survey
LLINs	Long-Lasting Insecticide-Treated Nets
LMDC	Liberia Medical and Dental Council
LMHRA	Liberia Medicines and Health Products Regulatory Authority
LMIS	Liberia Malaria Indicator Survey
LPB	Liberia Pharmacy Board
M&E	Monitoring & Evaluation
MCH	Maternal and child health
MDG	Millennium Development Goal
MFDP	Ministry of Finance and Development Planning
MIA	Ministry of Internal Affairs

MIP	Malaria in Pregnancy
MOH	Ministry of Health
mRDT	Rapid diagnostic test for malaria
MSC	Malaria Steering Committee
MTR	Mid-Term Review
NCHA	National Community Health Assistant Programme
NMCP	National Malaria Control Programme
NPHIL	National Public Health Institute of Liberia
NSP	Malaria National Strategic Plan
OIC	Officers in Charge
OR	Operational Research
OTSS	Outreach training and supportive supervision
PACS	Partnership for Advancing Community-Based Services
PAPD	Pro-poor Agenda for Prosperity and Development
PATH	Program for Appropriate Technology in Health
PCU	Programme coordination Unit
PDS	Post-distribution survey
PIH	Partners in Health
PMI	United States President's Malaria Initiative
PSACT	Private Sector ACT strategy
PSM	Procurement and supply chain management
QA/QC	Quality assurance/quality control
QMU	Quality Management Unit
RDT	Rapid diagnostic test
RSSH	Resilient and sustainable systems for health
SBCC	Social and Behavioral Change Communication
SCMU	Supply Chain Management Unit
SDG	Sustainable Development Goals
SMEOR	Surveillance, Monitoring & Evaluation and Operational Research
SOP	Standard operating procedure
SP	Sulfadoxine-Pyrimethamine
STAIP	Strategic technical assistant to improve performance
STG	Standard Treatment Guideline
STWG	Supply chain technical working Group
SWOT	Strength, weakness, opportunity and threat
TBAs	Traditional Birth Attendants
TCC	Technical Coordinating Committee
TES	Therapeutic Efficacy Study
TTMs	Trained Traditional Midwives
TWG	Technical Working Group
U5	Under five years of age
UHC	Universal Health Coverage
UN	United Nations
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
USPHS	United States Public Health Service
WAHO	West Africa Health Organization
WHO	World Health Organization

EXECUTIVE SUMMARY

Introduction

The population of Liberia is estimated at 5,063,40 (2020) with a critical demographic mal distribution between different age strata. This age structure provides a key challenge to delivery of social services including health services where malaria is a critical component. The post-conflict and pre-Ebola period (MDG era) were characterized by enormous progress in the Health Sector. Significant gains, including increased geographical access to health services from 42% to 71% and improvement in selected health indicators, especially child health indicators, were made resulting in Liberia's achievement of MDG 4 (reduction in under five mortality). Notwithstanding this, overall health system challenges persist and were exacerbated by the 2014 Ebola virus Disease. Thus, the general readiness index of the health sector to provide health services is 56%. The health sector has continued to get further challenged with the COVID19 global pandemic.

Malaria Epidemiology

Malaria is endemic in Liberia with continuous transmission throughout the year. The entire population is at risk of the disease, accounting for approximately 34% and 48% of all outpatient and inpatient cases, respectively in 2018. Malaria disproportionately affects children under-five years of age and pregnant women, with children under the age of five years accounting for 35% of all malaria cases and 34%% of in-patient laboratory-confirmed deaths in 2018. Nationally, malaria prevalence is 45% with mRDT based on 2016 Liberia Malaria Indicator Survey.

Achievements and Challenges

Under leadership of the Government of Liberia and with support from key partners (mainly the Global Fund and President's Malaria Initiative of the United States of America), there have been some notable achievements. Overall malaria mortality has reduced by 59%, from 172 per 100,000 persons in 2016 to 71 per 100,000 persons in 2019. Similarly, the under-five malaria mortality has reduced by 52%, from 71 per 100,000 in 2016 to 34 per 100,000 in 2019. Also, the incidence of malaria per 1,000 persons in the population reduced by 37% from 380 (2016) to 238 (2019), while the reduction in incidence in children under-five years of age was 40% (from 1002 to 603) over the same period. Laboratory confirmed malaria diagnosis has increased significantly from 85% in 2018 to 93% in 2019 in the public health facilities. About 63% of those cases received treatment for malaria with 100% in public health facilities receiving correct treatment in 2018. Household ownership of LLINs in 2019 is 55%, with an average of one net per household and 25% of households having at least one LLIN for two persons. LLINs use is 44% for children under five years of age and 47% for pregnant women in 2019. Liberia has made marked progress in entomological and insecticide resistance monitoring, with data informing programming decision over the years. Countrywide coverage

of IPTp 3+ is 40% in 2019, up from 22% in 2016. About 90% of women correctly identify the cause of malaria with 88% correctly identifying the ways to prevent malaria.

Despite these achievements, uptake of available malaria control and prevention services and intervention by the population and target groups is still below expectation. These, along with health system challenges related to access, sustainable financing, supply chain, human resource capacity and equity issues, among others will need to be addressed to significantly reduce malaria burden in Liberia.

Strategic Plan Framework (2021-2025)

This malaria National Strategic Plan (2021-2025) is premised on Liberia's international commitments on malaria with the global vision of "a world without malaria" and is aligned with global targets. At the national level, political commitment and will to reduce malaria burden is also high because malaria prevalence reduction by more than half (from 45% in 2016 to 20% by 2023) is one of eight targets under Pillar One (Expanding Access to Essential Health Services) of the government's Pro-poor Agenda for Prosperity and Development (PAPD), 2018-2023.

The vision of the malaria program is a **A malaria free and healthy Liberia population**". The Mission of the national malaria control program is to provide universal, coordinated, cost effective and evidence-based malaria interventions for the people of Liberia. The guiding principles for this strategic plan shall be: Country ownership and leadership, Inclusive and coordinated partnership, Accountability and transparency, Evidence-based and results-oriented management, Socio-economically inclusive and equitable, Integrated interventions, and Efficiency.

Goal and objectives

Goal: By end of 2025, reduce malaria burden by 75% (11% overall prevalence) compared to 2016 (45% prevalence)

Objectives

1. By end of 2025, reduce malaria mortality rates by at least 75% (43/100,000 population) compared to 2016 (172/100,000 population)
2. By end of 2025, reduce malaria case incidence by at least 75% (95/1,000 population) compared to 2016 (380/1,000 population)
3. By end of 2025, promote and maintain a culture of evidence-based decision making to achieve malaria program performance at all levels
4. By end of 2025, strengthen and maintain capacity for program management, coordination and partnership to achieve malaria program performance at all levels

Strategic Interventions for the malaria NSP 2021-2025

Objective 1: Strategic Interventions*:*

- Improve parasite-based diagnosis at all level of point of care
- Sustain prompt and effective case management of malaria at all levels of the health system
- Improve pharmacovigilance and Therapeutic Efficacy Studies

Objective 2: Strategic interventions:

- Integrated Vector Management (IVM),
- Prevention of Malaria in Pregnancy
- Prevention of Malaria in Infancy and children under five years of age.

Objective 3: Strategic intervention:

- Strengthened and improved surveillance system with quality data and information products to drive decision-making, as well as operational research to bridge implementation gaps.

Objective 4: Strategic Interventions:

- Governance and program management,
- Advocacy and SBC, procurement
- Supply chain management
- Epidemic preparedness and response.

Implementation Framework

Implementation roles and responsibilities for all partners will be determined based on comparative advantage. The program will coordinate annual planning with all partners and at all levels and ensure alignment with the MOH's operational planning. During the next five years, the NMCP will institute a multi-sectoral malaria coordination framework to engage all stakeholders towards a common action agenda for malaria control. Financial resource will be managed using appropriate fund management systems in a transparent and equitable manner for implementation of the strategic plan. The Monitoring & Evaluation framework to be used in measuring progress in implementation of this malaria NSP is described in the performance framework and will be further detailed in the M&E Plan to be developed.

Estimated Cost and Resource Mobilization Plan

The total estimated cost of the malaria NSP over the five-year period is US$ **211,960,857**. Of this estimated need, 49% of required funding has been committed. The Program will develop a business plan and a resource mobilization plan to advocate for and mobilize additional resources (external and domestic) to fill the financial gap.

1 INTRODUCTION

Globally, malaria is the sixth leading cause of death in low-income countries including Liberia.[1] The disease is the number one cause of sickness and death in Liberia. While the entire population is at risk of malaria, children under five and pregnant women are the most affected, with rural communities having the highest prevalence compared to urban areas.[2]

Political commitment to reduce malaria burden and improve the lives of the population exists at the highest level as exemplified by the fact that Liberia is a signatory to the Abuja Declaration on Roll Back Malaria (RBM)[3] and the country has reduced tariffs and taxes from 25% to 2.5% for insecticide treated nets and insecticides. The place of malaria is also high in the Liberian government's development agenda, the Pro-poor Agenda for Prosperity and Development (PAPD), 2018-2023. Malaria prevalence reduction by more than half (from 45% in 2016 to 20% by 2023) is one of eight targets under Pillar One (Expanding Access to Essential Health Services) of the government's PAPD.[4]

This new Malaria National Strategic Plan (NSP) 2021-2025 is being prepared at the time when Liberia and the world is being confronted with another devastating crisis, the global Corvid-19 pandemic. This comes at a time when the country had recovered from the devastation caused by the 2014 Ebola Virus Disease (EVD) outbreak and was focusing on development of the health system decimated by the EVD epidemic. This period is characterized by some uncertainty, but with some hope that the National Public Health Institute of Liberia (NPHIL), established in 2016, will steer the country out of the pandemic with little or no disruption to the already challenged health system. Liberia's successful attainment of political stability is acting as a key enabler of social transformation and economic recovery.

This malaria NSP is based on international best practices and is in line with the WHO recommended Global Technical Strategy (GTS) for malaria (2016-2030) endorsed by the World Health Assembly (WHA) and founded on "A World Free of Malaria." The malaria NSP adapts the WHO-AFRO strategic framework for GTS in malaria endemic countries and is also premised on the need to achieve impact using vital evidence-based malaria interventions to ensure Liberia's attainment of national targets set forth in the Government's PAPD and the Sustainable Development Goals (SDGs) of the United Nations (UN).

This document provides a blueprint for malaria prevention and control in Liberia for the next five years, and builds on recommendations put forth in the 2018 Mid-Term Report (MTR) of the malaria NSP of 2016-2020 and the GTS for malaria (2016-2030) that include surveillance

[1] https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death

[2] Liberia Malaria Indicators Survey, LISGIS, MOH, 2016

[3] World Health Organisation, 2003; Extract of the African Summit on Roll Back Malaria, Abuja, 25 April 2000 (WHO/CDS/RBM/2000.17). available from https://apps.who.int/iris/bitstream/handle/10665/67816/WHO_CDS_RBM_2003.46.pdf?sequence=1

[4] Pro-poor Agenda for Prosperity and Development, Government of Liberia, 2018

as a key intervention. This malaria NSP redefines the strategic direction and focus of the malaria programme, including strengthening of structures, systems and capacities to achieve greater equity, coverage, quality and more effective delivery of the interventions for achievement of the overall goal of reduced burden of malaria in Liberia.

The process of developing this malaria NSP was a participatory and consultative country-led process with multi-sectoral stakeholders, including: government ministries and agencies, development partners, national and international implementing partners, the private sector, academia, local county authorities, civil society actors and community-based organizations. This plan was also reviewed and approved by senior management of the Ministry of Health, Republic of Liberia.

2 COUNTRY PROFILE

2.1 Socio-political system

Founded by freed slaves in 1847, the West African state of Liberia is Africa's oldest republic.[5] Liberia is bounded by Sierra Leone to the northwest, Guinea to the north, Côte d'Ivoire to the east, and the Atlantic Ocean to the south and west.[6] Politically, there are three branches of the Government: The Executive, Legislative and Judiciary with the government being headed by a directly elected president. Liberia is divided into five regions (North Central, North Western, South Central, South Eastern A, and South Eastern B), comprising 15 counties (figures 1 & 2), sub-divided into 93 districts, which are further subdivided into clans.[7] Superintendents, appointed by the President, head the 15 counties.

Figure 1: Geo-political map of Liberia

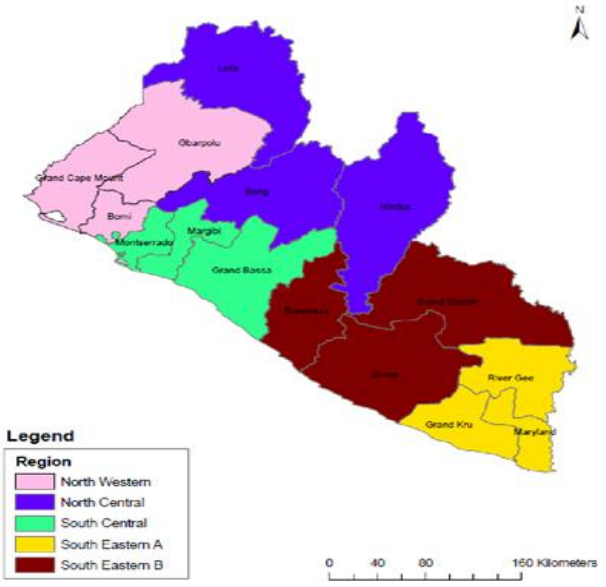


Figure 2: Counties/regions of Liberia (July, 2018)

The country endured 14 years of civil crisis, which resulted in the loss of lives and the destruction of property. Since the end of the civil crisis in 2003, Liberia has held three peaceful general elections including a peaceful change of government in 2017. Despite the economic challenges faced, the country is gradually transitioning from short-term relief and recovery to long-term national development within the context of stability and economic growth under a legitimate government. The successful attainment of political stability in the country is also acting as a key enabler of social transformation and economic recovery. The Pro-poor Agenda

[5] Liberia: Past & Present of Africa's Oldest Republic; accessed on September 15, 2018 from http://www.liberiapastandpresent.org/

[6] https://www.britannica.com/place/Liberia

[7] Ministry of internal affairs, Government of Liberia; directorate of localities. Accessed on September 14, 2018 from http://www.mia.gov.lr/2content.php?sub=210&related=40&third=210&pg=sp

for Prosperity and Development articulates the Government's plans for medium-term development.[8]

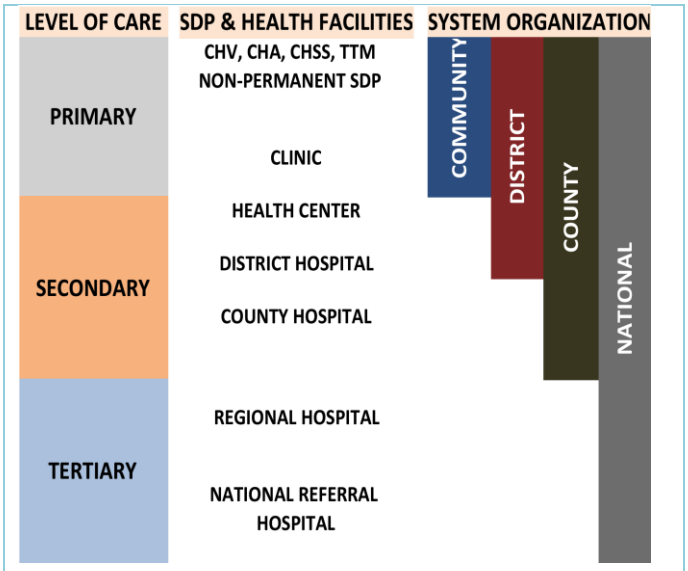


Figure 3: Organization of Liberia's health care system

The health sector, led by the Ministry of Health (MOH), operates in a decentralized manner in line with the overarching government decentralization policy. The MOH is divided into three departments of Health Services (office of Chief Medical Officer); Policy, Planning, and M&E; and Administration. The National Malaria Control Program (NMCP) falls under the Bureau of Preventive Services within the Health Services Department. At the subnational level, health services are led by County Health Teams (CHTs) and District Health Teams (DHTs). The CHTs and DHTs provide supervision and other technical and programmatic support to hospitals, health centers, clinics, and community services. Operationally, the County Health Officers (CHOs) head the health service delivery at the counties and District Health Officers (DHOs) supervise the districts while Medical Directors head the hospitals and Officers in Charge (OICs) head health centers and clinics.

2.2 Demographic situation

The population of Liberia is estimated at 5,063,40 (2020).[9] Disaggregation of the population shows children under-five years constituting approximately 15.37% while population below 25 years of age make up 63.38%.[10,11] There are three ethnic groups in Liberia namely Kwa, Mende, and Mel. These ethnic groups are subdivided into sixteen indigenous tribes: Kpelle, Bassa, Gio, Kru, Grebo, Mano, Krahn, Gola, Gbandi, Loma, Kissi, Vai, Dei, Belle, Mandingo, and

[8] Pro-poor Agenda for Prosperity and Development, Government of Liberia, 2018

[9] http://www.worldometers.info/world-population/liberia-population/

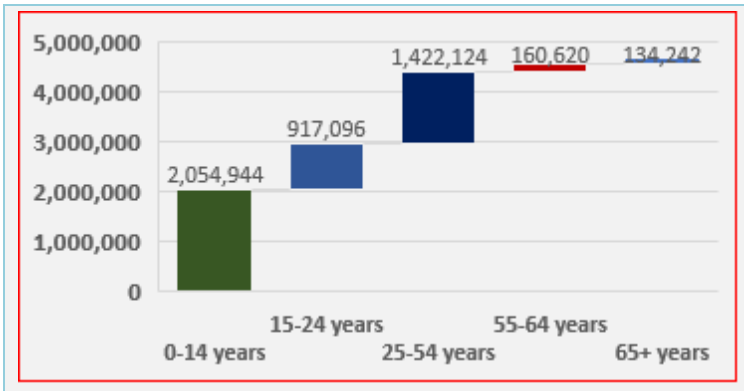
[10] LISGIS (Liberia Institute of Statistics and Geo-Information Services). 2009a. 2008 Population and Housing Census, Final Results, Monrovia, Liberia, May 2009, and Malaria Gap analysis 2017-2020

[11] Malaria Gap analysis 2017-2020

Mende making up 95% of the population, while Americo-Liberians make up the other 5% of the population.

Of the 15 administrative counties, the most populated are Montserrado, Nimba, Bong, Lofa, Grand Bassa and Margibi, accounting for 75.4% of the total population while 24.6% reside in the rest of the nine counties.

The country has a relatively young population with a critical demographic maldistribution between different age strata as illustrated in figure 4. This age structure therefore provides a key challenge to delivery of social services including health services where malaria is a critical component.



Key summary:

- **43.82%** of population below 15 years of age
- **63.38%** of the population is below 25 years of age
- **Only 6.29%** of the total population is above 54 years
- **Incredibly young population with likelihood of high dependency**

Figure 4: Liberia Population Structure, 2018 estimate *(multiple data sources: World Bank, Index Mundi, Worldometer)*

Table 1 provides a summary of the key additional demographic characteristics for Liberia with majority of the population living in urban settlements.

Table 1: Liberia key population statistics[12,13,14,15,16]

Parameter	Statistic/data
Total population:	4,818,973 (2018 worldometer estimate)
Population density	50 per Km^2 (136 people per mi^2)
Proportion of urban population:	62% female; 61% male (KIR/LDHS, 2019-20)
Urbanization rate:	3.24%
Fertility Rate:	4.2 (KIR/LDHS, 2019-20)
Total dependency ratio:	Total dependency ratio: 83.2 (youth dependency ratio: 77.6; elderly dependency ratio: 5.5; potential support ratio: 18.1 (2015)

[12] Worldometer country statistics for Liberia; accessed on May 5, 2020 from http://www.worldometers.info/world-population/liberia-population/

[13] Index Mundi Country data; accessed from https://www.indexmundi.com/liberia/demographics_profile.html on September 24, 2018

[14] UNDP Human Development Index, 2018

[15] http://hdr.undp.org/en/countries/profiles/LBR

[16] LISGIS, MOH and ICF. 2020. Liberia Demographic and Health Survey 2019-20: Key Indicators.

Educational attainment (high school)	46% female; 64% male (KIR/LDHS, 2019-20)
Population growth rate:	2.1% (2008 census)
Mother's mean age at first birth:	19.2 years
Childbearing among children aged 15-19	30% (KIR/LDHS, 2019-20)
Adolescent fertility	30% (KIR/LDHS, 2019-20)
Crude mortality rate	7.6 deaths/1,000 population
Under 5 mortality rate	93 per 1,000 live births (KIR/LDHS, 2019-20)
Infant mortality rate:	63 per 1,000 live births (KIR/LDHS, 2019-20)
Maternal Mortality Ratio:	725 deaths/100,000 live births (2015 estimate, world fact book)
Average life expectancy:	65.0 years both sexes, 2020 est. (Male 66.5, female 63.5)

Three fourths of the population still live below the poverty line on less than US$1.25 a day and the economy is making a modest recovery with gradual improvement in security in rural areas.

2.3 Ecosystem, environment, and climate

Liberia has a tropical and humid climate with temperatures varying between 26ºC and 28ºC all year round. There are two seasons: the rainy season starts in May and ends in October each year, while the dry season starts in November and ends in April of the following year. Most areas have a water surplus for 5-8 months each year.[17] Most of the country lies below 500 meters in altitude; rain forest and swampy areas are common features. The climate is suitable for malaria transmission throughout the year in almost all parts of the country. During the peak of the rainy season of July to September, temperatures average 24.5°C and rise to 26.5°C in December and January when it is predominantly dry.

The country experiences relative humidity ranging from 65-80% and vapour-transpiration is estimated to be between 3-5 mm per day.[18] Along the coast, the average relative humidity is about 82% during the wet season and 78% during the dry.[19] The relative humidity may occasionally fall below 30% during the harmattan (the period between December and March, when dry heavily dust-laden winds from the Sahara Desert blow over the country).[20]

Vegetation in Liberia is mainly mangroves, scattered patches of bushes and savannah woodland.[21] The vegetation and composition of plant communities are dictated by several factors, including hydrological conditions, such as the frequency and duration of flooding, depth of the water level, soil type, and physiography. The savannah plant communities in the coastal plains are potential pasture resources, especially those found in Grand Bassa,

[17] Food and Agriculture Organization, Liberia: Country Pasture and Forage Resource Profile, July 2012
[18] Ibid
[19] Food and Agriculture Organization, Liberia: Country Pasture and Forage Resource Profile, July 2012
[20] Ibid
[21] Ibid

Maryland and Sinoe Counties. Liberia is highly vulnerable to climate change in coastal areas. The country's capacity to adapt to climate change is extremely low, and resilience is limited. This contributes to risk of seasonal malaria transmission in selected areas.

2.4 Socioeconomic situation

Ranked 176th on the UNDP Human Development Index of 2019,[22] Liberia's socio-economic outlook presents a mixed scenario and is rapidly evolving with the on-going changes in governance. Over the years, slow economic performance, high rates of inflation, and a high unemployment rate are manifestations of this unprecedented level of poverty, which affects the health care options for the population. Table 2 provides a summary of the key socio-economic indices for Liberia based on latest available published data.

Table 2: Selected Socio-economic Development Indicators for Liberia[23,24]

Parameter	Statistic/data
GDP, real growth rate	-1.6% (2016 estimate); 2.5% (2017 estimate); Averaged 2.76% from 1961 until 2017
GDP Per Capita estimate	USD 352.30 (2017 estimate)
Total National Budget	FY2019/20: US$525,907,000.00) FY2018/19: US$570,148,000.00)
Total allocation to health in national budget	FY2019/20: US$80,340,072.00 (15.2%) FY2018/19: US$81,704,885 *(14.33%)*
Public debt:	46.5% of GDP (2017 est.) 42.3% of GDP (2016 est.)
Population living below poverty line (US$2.0 per day)	54% (World Bank Estimate, October 2016)
Employment-Informal economy	78% (LISGIS, HIES 2016)
Vulnerable employment- Informal economy	80% - 90% (LISGIS, HIES 2016)

The government's institutional expenditure on health has increased over time: approximately US$49,364,031 in 2015/16, US$54,622,599 in 2016/17 and US$61,702,260 in 2017/18.[25] The Government of Liberia contributes 38% of the total resource envelope of approximately US$181,280,008 for public sector health financing in Liberia while donors make up the rest.[26]

Even though the government's appropriation to the health sector within the national budget rose to 15.2% (80.3 million) in FY 2019/20, in line with the Abuja Declaration, it represents a 1.7% reduction in absolute value compared to FY2018/19 appropriation of $81.7 million

[22] Human Development Report, 2019

[23] All budget figures from Liberia Ministry of Finance & Development Planning (MFDP) website. Exchange rates for US$ to L$ varies annually

[24] Other data are from the World Bank (http://www.worldbank.org/en/country/liberia/overview) and Index Mundi Liberia Economy Profile 2018 (https://www.indexmundi.com/liberia/economy_profile.html) accessed on Oct. 1, 2018 and https://www.afdb.org/en/countries/west-africa/liberia/liberia-economic-outlook

[25] National Health Accounts (NHA) Reports, 2015/16, 2016/17 and 2017/18, MOH

[26] Resource mapping, Health Financing Unit, MOH, 2020

(14.3%). This amount remains inadequate to deliver the required minimum health package.[27] The current per capita health expenditure of $15.33 is below the recommended per capita health expenditure of $86 to achieve Universal Health Coverage (UHC).[28] Similarly, the Government of Liberia's spending on health is 2.26% of GDP, which is still below WHO recommendation of at least 5% of GDP to achieve UHC.

The reliance on external funding creates an insecure and unsustainable health care system where a decrease or withdrawal of donor support could lead to interruption of essential health services to the population. Thus, the public health care system can be characterized as vulnerable to external shocks in terms of financing.

2.5 Health System Analysis

The post-conflict and pre-Ebola period (MDG era) was characterized by enormous progress in the Health Sector. Significant gains, including increased geographical access to health services from 42% to 71% and improvement in selected health indicators, especially child health indicators, were made resulting in Liberia's achievement of MDG 4 (reduction in under five mortality).[29]

Notwithstanding this progress, overall health system challenges persist and were exacerbated by the 2014 Ebola virus Disease.[30] For instance, maternal mortality of 725 deaths/100,000 live births is still very high, ranking third in West Africa after Sierra Leone (1360/100,000 live births) and Nigeria (814/100,000 live births);[31]under five mortality is still high at 93/1,000 live births, with most of the deaths (63/1,000), occurring in the first year of life;[32] out-of-pocket expenditure of 42%[33] is very high and highly regressive; health sector financing is unsustainable due to heavy reliance on donor funding; healthcare is inaccessible for about 29% of largely rural population; bad road condition limits access for poor rural communities; there are looming health threats due to diseases of epidemic potential (Ebola Virus Disease, Lassa Fever and now Covid-19); and there is a relatively large and yet insufficient health workforce that requires substantial investments, skills upgrading and motivation for optimum performance. For example, a 2019 capacity assessment[34] of all 15 counties placed 13 out of 15 counties in the **Limited capacity category,** meaning, although all basic organizational systems and processes are in place, selected domains (including human resources, supply chain, financial management, M&E etc.) have on-going weaknesses. Evidence from one county (Nimba County) attributed the weaknesses to a lack of maintenance of those health

[27] Ministry of Finance and Development Planning, 2019

[28] High Level, Task Force (HLTF) for innovative financing of comprehensive services

[29] MOH 2015 Annual Report, Ministry of Health, 2016

[30] Pro-poor Agenda for Prosperity and Development, Government of Liberia, 2018

[31] https://www.cia.gov/library/publications/the-world-factbook/rankorder/2223rank.html, 2015 estimates.

[32] LISGIS, MOH, ICF, LDHS, KIR, 2019-20

[33] Overview of Health Financing Landscape & Progress toward UHC in Liberia, HF conference 2017

[34]GOL, MOH & USAID Capacity Assessment of 15 CHTs, March 2020.

systems and processes when the supporting partners leave.[35] The general readiness index of the health sector to provide health services is 56% with various parameters summarized in table 3.

Table 3: Density of Health Services per Unit Population[36]

Health Services	Density per population
Population living within 5km of health facility	71%
Health infrastructure per 10,000 population	1 (standard is 2)
Inpatient beds per 10,000 population	16.4 (standard is 30)
Maternity beds per 1,000 pregnant women	4 (standard is 10)
Core health workers per 10,000 population [37]	11 (WHO standard is 23)
Outpatient visits per person per year	1.8 (standard is 3-5)
Presence of basic amenities (water, electricity, and sanitary facilities)	79%
Laboratory diagnostics capacity on average	39% of health facilities
Availability of basic equipment	60%
Standard precautions for infection prevention	68% of health facilities
Essential medicines were available on average	35%

Equity and efficiency issues are also evident in health resource allocation with inequitable distribution of resources across counties. For instance, per capita allocation ranges from a low of USD 32 in Margibi County to a high of USD 89 in Rivergee County. There is also high percentage expenditure on curative care and secondary level care compared to preventive and primary care that are mostly used by the poor and rural communities.[38]

Access to health services remains a challenge especially in rural communities and for patients with special needs including vulnerable or marginalized groups. Health facilities are still a distance away from many communities, and with bad road conditions especially in rural areas, patients walk several hours to get to the nearest health facility.[39]

Additionally, assumptions based on traditional gendered roles perpetuate female subordination and may prevent access to rights of asset ownership and to economic resources. A recent process evaluation[40] shows that adolescents, particularly pregnant girls, faced unique barriers including being frequently unable to access health facilities independently (health worker requiring the presence of an adult), shame related to their pregnancy, poor adherence and refusal to access resources often requiring extensive follow-up from healthcare workers, lack of social support due to absent fathers of their babies and language barriers at the health facility. There is now increasing evidence that poor, rural and

[35] Nimba County Capacity Assessment Report, March 2020

[36] Adapted from PAPD, 2018. Data from SARA, MOH, 2018

[37] Doctor, nurse, physician assistant and midwife

[38] Benefit Incidence Analysis, NHA, 2010

[39] Ten Year Health Policy and Plan (2011-2021) MOH, 2011

[40] Process Evaluation, Plan International, Liberia 2018

marginalized women feel the gender-specific effects of malaria most acutely, indicating that development, gender-equality and health outcomes are intrinsically linked.[41]

The implication of the above health system challenges and barriers to access is that there is need to strengthen health systems in ways that will outlive donor support and sustain gains in disease control efforts, malaria included. Inter-sectoral collaboration and targeted interventions are necessary to address these structural and social barriers to accessing health services. Strengthening and managing health systems, especially those related to human resources, supply chain management, HMIS, health financing, infrastructure, and coordination are key functions of the central MOH as stated in its Ten-Year Policy and Plan, 2011-2021. A strengthened health system is key to malaria control and towards that end, the malaria programme will need to contribute to the health system strengthening efforts of the MoH.

[41] UNDP Discussion Paper on Gender and Malaria

3 MALARIA SITUATION ANALYSIS

3.1 Historical perspective of the malaria problem

3.1.1 Malaria Control Prior to Liberian Civil War (1945-1980)

In October 1944, after signing the Lend-Lease agreement with the United States, Liberia sought assistance in planning for improvements in the sanitation of Monrovia and other coastal towns. The request was folded into the military programme in Liberia that saw the United States Public Health Service (USPHS) mission to Liberia in 1945.

The USPHS team began the use of synthetic insecticides Dichloro-diphenyl-trichloroethane (DDT) in kerosene for indoor residual spraying (IRS) and as a larvicide, along with some drainage operations in Monrovia, with the goal of controlling malaria in the capital. Even though the “mosquito control project" was expensive, observers believed it produced some positive health results. Malaria admissions to the public health hospital in Monrovia decreased by almost 95% from 383 in 1945 to 21 in 1947. The local community’s access to antimalarial drugs that reduced the severity of the malarial attacks, as well as the vector control programme are believed to have contributed to this decline.[42] While the local Americo-Liberians viewed this and the additional benefits of reduction in mosquitoes and nuisance insects positively, the high cost of the programme made it unsustainable and the Americans ended their support. Later in the early ‘50s, the project was “scaled up” by the WHO, in collaboration with UNICEF to reach the surrounding areas in the Central Province (Kpain).

While the Monrovia mosquito control project constituted the first large-scale use of synthetic insecticide to combat malaria in tropical Africa, the “Kpain Project” was one of a first cluster of projects initiated by WHO to explore the efficacy of IRS with the goal of determining the feasibility of malaria eradication in tropical Africa. These projects encountered difficulties that foreshadowed the general retreat from malaria eradication efforts across tropical Africa by the mid-1960s.[43] The Malaria pre-eradication project was folded into the Department of Basic Health Services in January 1968, headquartered in Monrovia. Little is known about malaria control in Liberia in the 70’s and 80's under the stewardship of the Department of Basic Health Services.

3.1.2 Malaria Control during the civil war (1989-2003)

Malaria control interventions during the civil crisis mainly consisted of case management, indoor residual spraying and use of insecticide-treated tarpaulins because of the complex emergency with support from humanitarian agencies. The most significant event in malaria control efforts during this period was the revision of the malaria treatment policy in 2003 from

[42] The First Large-Scale Use of Synthetic Insecticide for Malaria Control in Tropical Africa: Lessons from Liberia, 1945 – 1962

[43] The First Large-Scale Use of Synthetic Insecticide for Malaria Control in Tropical Africa: Lessons from Liberia, 1945 – 1962

chloroquine to Artemisinin-based combination therapy (ACT)[44] following efficacy study findings in 2002 that showed development of parasite resistance to chloroquine and Sulfadoxine-pyrimethamine (SP), the first and second-line drug of choice for treatment of uncomplicated malaria, respectively.[45]

3.1.3 Malaria Control in Post-War Liberia (2005 to present)

In 1998, WHO, UNICEF, UNDP and the World Bank launched the Roll Back Malaria initiative in an effort to provide a coordinated global response to the disease with an overall strategy to reduce malaria morbidity and mortality by reaching universal coverage and strengthening health systems.[46] The RBM strategy together with other initiatives such as the Global Fund for HIV/AIDS, Tuberculosis and Malaria (GFATM) and the United States President's Malaria Initiative (PMI) provided the unique opportunity for renewed efforts by the Government to mobilize resources towards malaria control in Liberia.

Between 2005 and 2020, the programme developed four strategic plans, all aligned with national and international goals and targets, and geared towards reducing the burden of malaria on the population. The Government of Liberia and several international development partners (mainly the GFATM and PMI) have invested extensively in four key malaria control interventions: a) insecticide-treated nets (ITNs), b) IRS in selected areas, c) intermittent preventive treatment in pregnancy (IPTp), and d) prompt and effective malaria case management. Even though the targets have always been 80% population coverage and use, the malaria programme has managed to achieve more than 50% population coverage with key interventions including LLINs, parasite- based diagnosis and treatment with recommended antimalarial and increased knowledge on malaria prevention and control, thus contributing to steady decline of malaria burden over the years.

3.2 Malaria Epidemiology

Malaria is endemic in Liberia with continuous transmission throughout the year. The entire population of approximately 4.8 million people is at risk of the disease, accounting for approximately 34% and 48% of all outpatient and inpatient cases, respectively, presented at health facilities in 2018.[47] Malaria disproportionately affects children under-five years of age and pregnant women. For instance, children under the age of five years accounted for 35% of all malaria cases in 2018 according to the MoH Annual Report. Also, malaria remains the highest cause of death among children under five accounting for about 34%% of in-patient laboratory-confirmed deaths.[48]

[44] NMCP Strategic Plans, 2004-2008 and 2009-2013

[45] Checchi, F *et al* (2002) High *Plasmodium falciparum* resistance to chloroquine and sulfadoxine-pyrimethamine in Harper, Liberia: results *in vivo* and analysis of point mutations

[46] RBM Partnership at https://endmalaria.org/about-us/overview

[47] Health Facility Survey, NMCP, 2018

[48] Health Facility Survey, NMCP, 2018

Since the 2016 Liberia Malaria Indicator Survey (LMIS) that reported malaria prevalence of 45% with mRDT, no other population-based studies have been conducted to determine current prevalence of malaria. The distribution of malaria transmission and incidence is heterogeneous as evidenced by the 2016 malaria indicator survey. For instance, the 2016 LMIS reported malaria prevalence (by mRDT) was highest among children under-five in the south-eastern B region (69%) while the lowest was in Greater Monrovia (12%). This variation is partly due to climate and ecological differences in the regions. Malaria prevalence among children age 6-59 months by region is presented in figure 5.

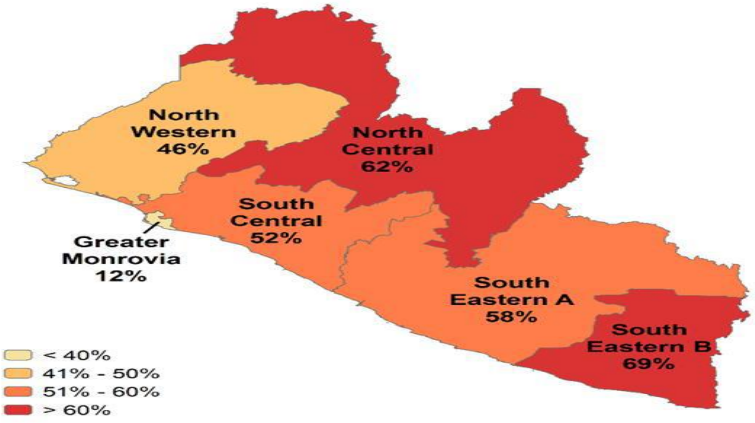


Figure 5: Malaria prevalence among children age 6-59 months by region (Source LMIS, 2016)

While mosquitoes do not discriminate in biting men or women, there are several ways that gender and other biological and social factors can influence who gets malaria and how it is treated. In addition to children and pregnant women being biologically more susceptible to the disease, socio-economic and cultural factors may play a critical role in determining differences in women's and men's vulnerability to malaria and access to malaria prevention and treatment services.[49] This gender difference is more pronounced in access to malaria case management in the private sector where women have less disposable income to pay for services.

3.2.1 Malaria parasites

The dominant species of malaria parasites in Liberia is plasmodium falciparum (pf) (95%). It is the most pathogenic of the five human malaria parasites, which also occur as a mixed species with other plasmodium species. Pf is the most severe strain of the malaria species correlated with almost every malaria death. The other four non-falciparum species are Plasmodium malariae, Plasmodium ovale, Plasmodium vivax, and Plasmodium knowlesi. P. ovale, and P. malariae account for the reaming 5% of malaria parasites in Liberia. Plasmodium vivax, and Plasmodium knowlesi have not been identified in Liberia.

[49] UNDP Discussion Paper, Gender and Malaria

3.2.2 Malaria vectors

The climate in Liberia is favourable for mosquito breeding of malaria vectors: *Anopheles gambiaes s.l.* (major vector*), Anopheles funestus s.l. and An.melas* (secondary vectors). Entomological and parasitological monitoring provide information on the following characteristics of malaria transmission: i) Malaria vector species present including which one is predominant and their distribution; ii) Vector abundance/density; iii) Malaria vector behaviour and iv) Insecticide resistance patterns.

(i) Malaria vector species and distribution

The geographical location close to the Equator enables Liberia to have a nearly year-round warm climate and suitable ecological conditions for malaria vector development. The characteristics of malaria vectors in Liberia are summarized in table 4.

Table 4: Key important parameters for malaria vectors in Liberia

Parameter	MTR situation	Notes/references
Predominant vector species	*Anopheles gambiae* s.l. and *An. funestus*	Current climate favours their breeding across most areas of the country
Peak vector abundance periods	May and June	Source: PMI|Vectorlinks Project, report 2018 & 2019
Main feeding behaviour	Mainly endophagic	Source: PMI|Vectorlinks Project, 2018 & 2019
Main resting behaviour	Endophilic	Source: PMI|Vectorlinks Project, 2018 & 2019
Major biting time	After midnight	Source: PMI|Vectorlinks Project, 2018 & 2019

(ii) Vector Abundance/density

The vector abundance in Liberia shows spikes in the months of May and June each year with a steep decline in subsequent months to December, which is also related to the rise in temperature as well as declining transmission of malaria. Figure 6 shows the 2016 to 2017 vector abundance trend. The Vector densities decreased from July through September, which is the peak rainy season when the heavy rains wash out the breeding areas.

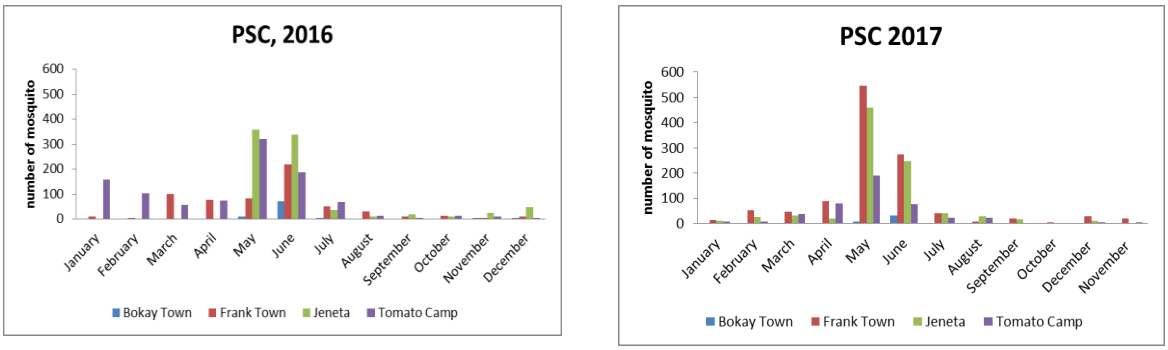


Figure 6: (a to left) and (b to right): An. gambiae s.l., vector abundance 2016 and 2017

Similar trend of vector abundance was observed between October 2018 to September 2019, when 1,936 female *An. gambiae* s.l. were collected using the PSC method in Saint John (57%), Koryah (25%), Madina (14%), and Fissebu (4%). The highest indoor resting density was observed in June in Saint John (11.8 mosquitoes/house). Across the four sentinel sites, the peak vector indoor resting densities were observed from April through June (Figures 7 & 8). Densities decreased from July through September, which is the peak rainy season when the heavy rains wash out the breeding areas.

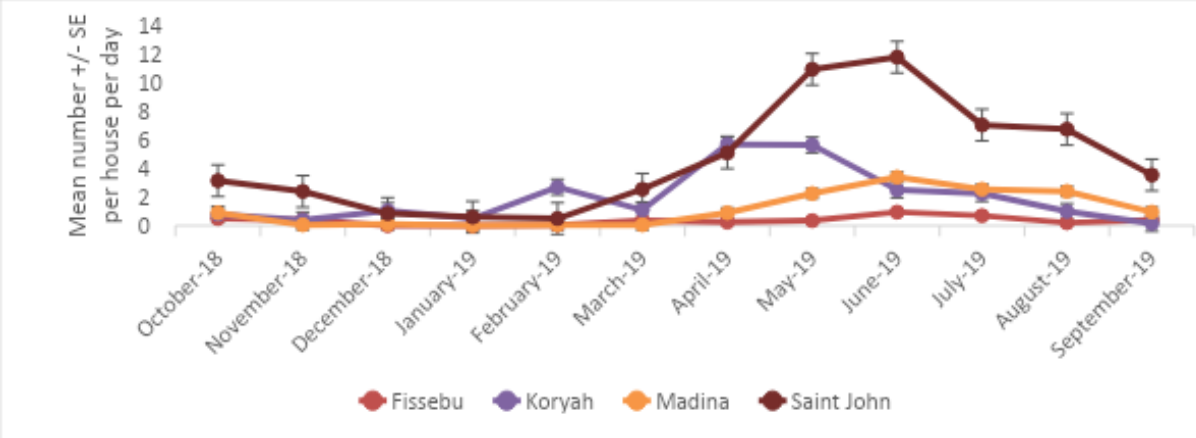


Figure 7: Mean Monthly Indoor resting densities of An. gambiae s.l. as collected by PSC, in four sites, October 2018–September 2019

These findings confirm that the peak of mosquito population coincides with the start of the rainy season, while the decline coincides with the heaviest rains. Therefore, for vector control planning, that period of abundance should be considered for vector control interventions (particularly IRS and larval source management) to have the greatest impact on the populations of *An. gambiae* s.l. and *An. funestus* s.l., the two main malaria vectors in Liberia. The majority of *An. gambiae* s.l. collected by PSC were blood-fed in all four vector bionomics monitoring sites.

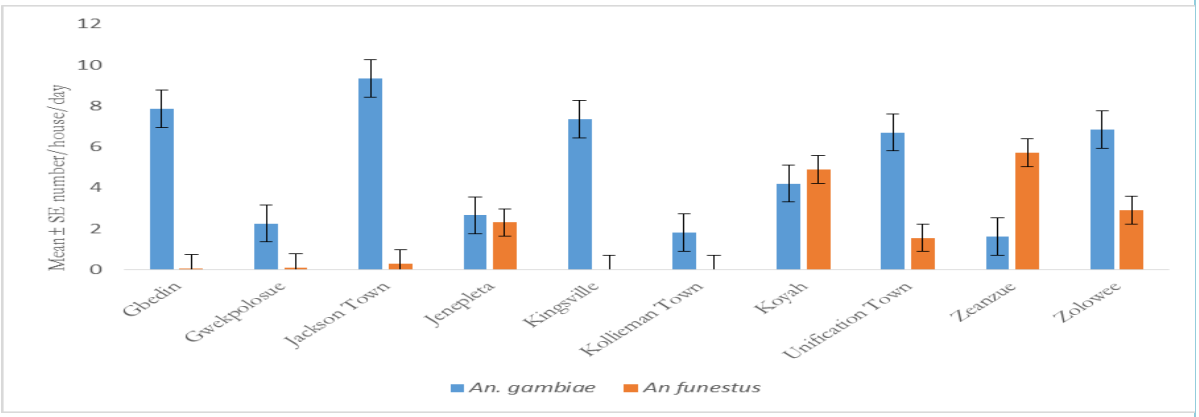


Figure 8: Indoor Resting Density An. gambiae s.l. and An. funestus group from the Transect Sites, May 2018

(iii) Malaria vector behavior

Vector behavior heavily affects the level of transmission of the malaria parasite. The combination of indoor resting behavior, density, host preference and feeding behavior are critical for the choice and deployment of appropriate vector control strategies in the country. A May 2018 assessment by the PMI|Vectorinks project across 10 entomological sites in the country indicates that *An. gambiae* is more predominant indoor while certain regions/areas are showing more *An. funestus*. The resting behavior of these two species is key to understanding the trends and variations in malaria transmission risk in the country.

Further comparison of the Human Biting Rates (HBR) across 2015-2017 shows high biting rates that also peaks in May of each year and is lowest in November of each year. The HBR tends to be lowest in the period of November to March of each year. Aggressive vector control strategies are required, preferably from March to October of each year, if significant reduction in transmission is to happen. Likewise, to maximize impact, focused behavioral malaria prevention interventions would be of highest impact at time of highest vector resting density.

(iv) Insecticide resistance patterns

Understanding the insecticide susceptibility status and underlying resistance mechanisms is key to prediction of vulnerability of vector control interventions. Liberia is not actively conducting IRS despite it being one of the mainstay strategies within the integrated vector management intervention. The country uses Deltamethrin impregnated LLINs that have the same class of insecticides used for IRS. Resistance to any of the insecticides, therefore, can render the insecticidal role of the LLINs obsolete, rendering LLINs as barrier protection only. However, insecticide resistance monitoring is on-going in various sites and the country is increasingly using insecticide resistance data to inform malaria programming.

3.2.3 Malaria stratification and risk mapping

While Liberia is yet to conduct a malaria risk mapping, findings from previous malaria indicator surveys (2005, 2009, 2011 & 2016) show that malaria is hyper-holo-endemic in Liberia. Malaria

prevalence has changed over time with differences in regions. For instance, in the 2009 LMIS, prevalence was highest in the North central region (45.8%) while the 2011 and 2016 LMIS reported the highest prevalence in south-eastern B region of 70.5% and 69% respectively, (with mRDT). While microscopy was not used in the 2016 LMIS, the pattern was the same as in the 2009 and 2011 LMIS. The highest positivity smear (MS) was reported in the north central region (41.8%) in the 2009 LMIS and 49% in south-eastern B region in 2011.

Furthermore, analysis of routine health management information system (HMIS) data shows similar pattern in malaria incidence per 1,000 population in the regions from 2016 to 2019. As shown in figure 9, South-eastern B region consistently shows the highest malaria incidence in 2016 and 2019. While rainfall, temperature, distance to major rivers, and urbanization may account for some of these disparities, poverty is also a major factor. This is evident from the 2016 LMIS report that shows the highest prevalence (68%) among children in the lowest wealth quintile compared with children in the highest wealth quintile (14%).

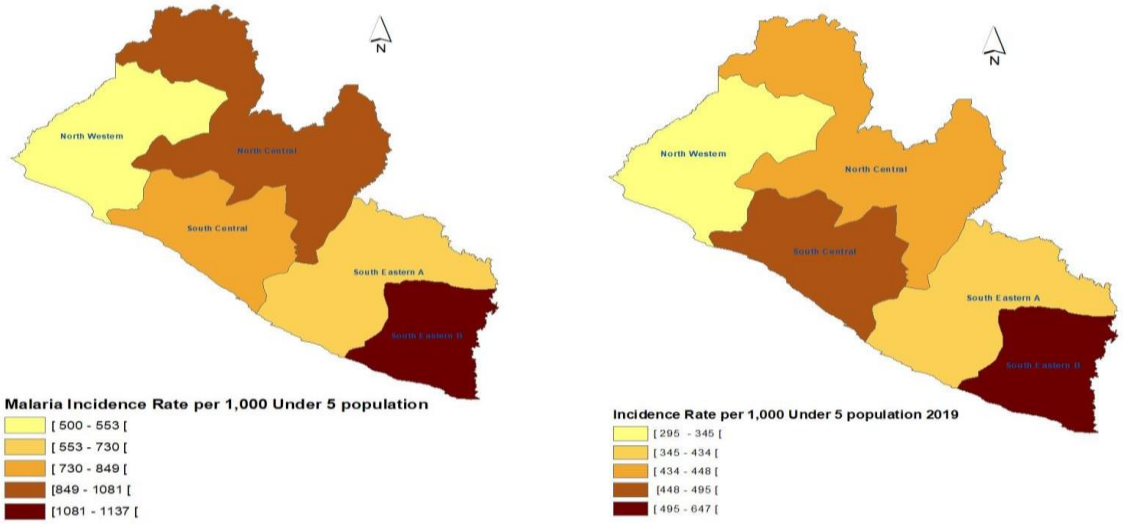


Figure 9: Malaria incidence burden (per 1000 under 5 population) by region in 2016 and 2019 (Source: HMIS data)

3.2.4 Malaria Morbidity and mortality

Malaria remains a major public health concern in Liberia. It presents Liberian families with not only a burden of illness and deaths but also financial drain. The entire population of 4.8 million is at risk with children under the age of five years and pregnant women being the most vulnerable. Malaria accounts for 34% of health facilities' outpatients' attendance and 48% of inpatients' hospitalization.[50] According to the 2016 LMIS, the prevalence of malaria (using mRDT) is 45% among children under five years of age. While a national population survey is yet to establish the actual malaria prevalence in 2020, available evidence suggests that prevalence is reducing. For example, while the percentage of children under-five years of age

[50] Health Facility Survey, NMCP, 2018

with reported fever two weeks before the LMIS was 38% in 2016, that percentage dropped to 25% according to results of the 2019 LDHS, a decline of 12%.

(i) Malaria morbidity

Annual malaria incidence rates, (calculated using HMIS data) showed a downward trend over the period from 2016-2019. The incidence moved from 1002 per 1,000 under five children in 2016, to 945, 787, and 603 respectively in 2017, 2018 and 2019. These figures show a steady progress over the years as evident by the decline in malaria incidence. These improvements are evidence of the surge in access and use of proven malaria control and prevention interventions including access to LLINs, and the scale up of integrated community case management (iCCM) activities throughout the country. Figures 10 and 11 show a steady downward trend in clinical malaria cases (malaria incidence) per 1,000 population by health regions over the past five years, 2016-2019.

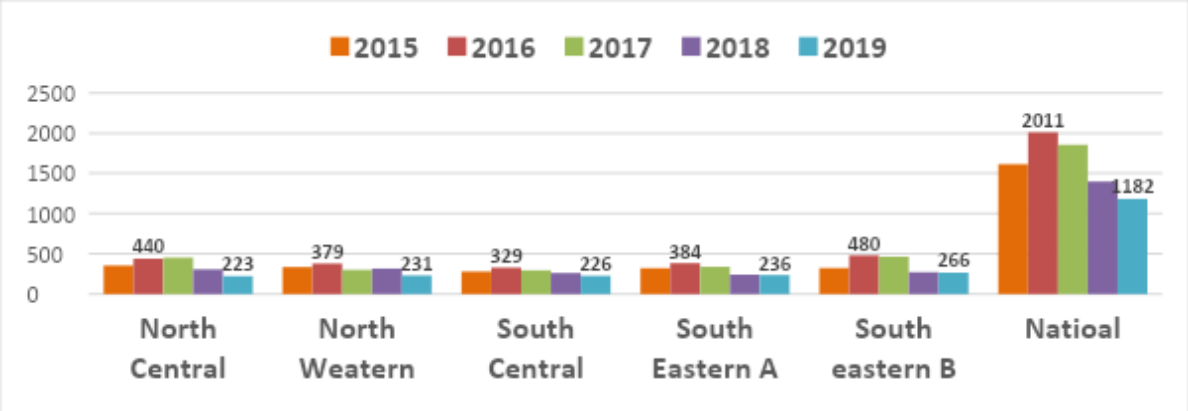


Figure 10: Malaria incidence per 1,000 population *(Source: HMIS Data)*

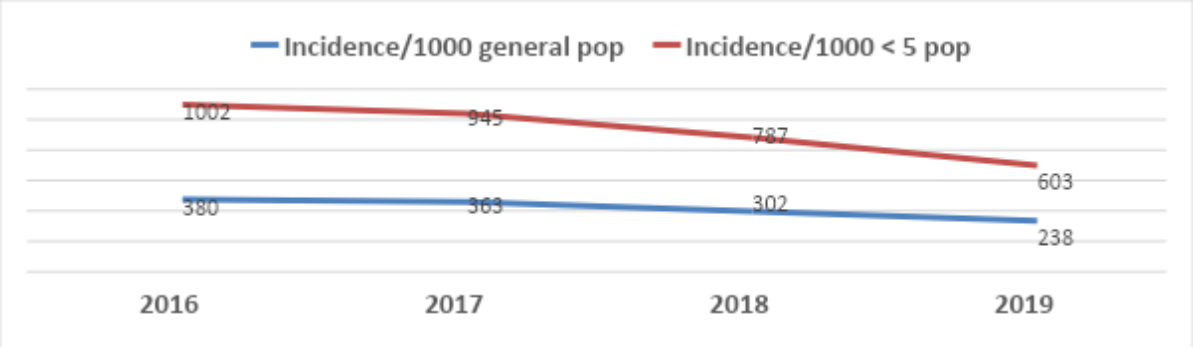


Figure 11: Malaria incidence, general & <5 per 1,000 population *(Source: HMIS Data)*

(ii) Malaria Mortality

The reported proportion of malaria deaths within all deaths reported at the health facility has also declined nationally since 2016 and is demonstrating a key downward trend especially among children under the age of five years Figures 12 and 13. All regions, except South-Eastern B, experienced significant decrease over the last five years. Despite this decline in

malaria-related deaths, there is a need for more effort in ensuring the country has zero reported malaria deaths.

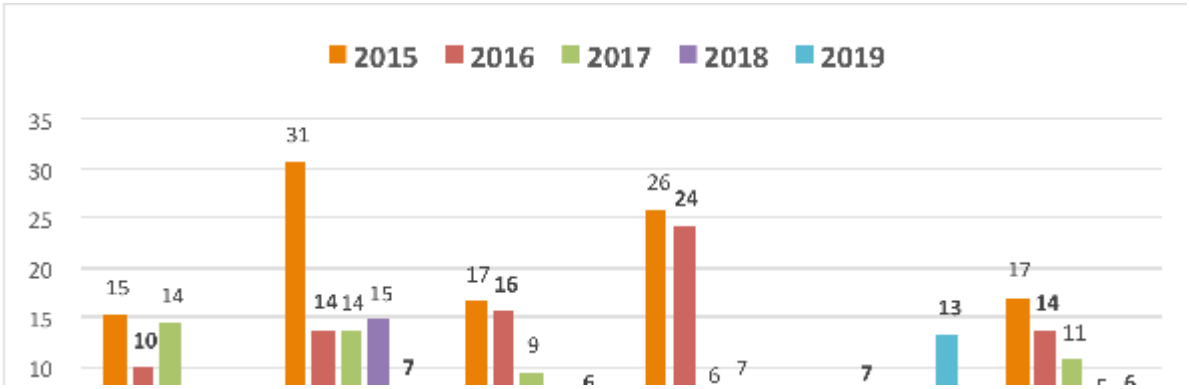


Figure 12: Under-five malaria-related deaths per 100,000 population stratified by regions *(Source: HMIS Data)*

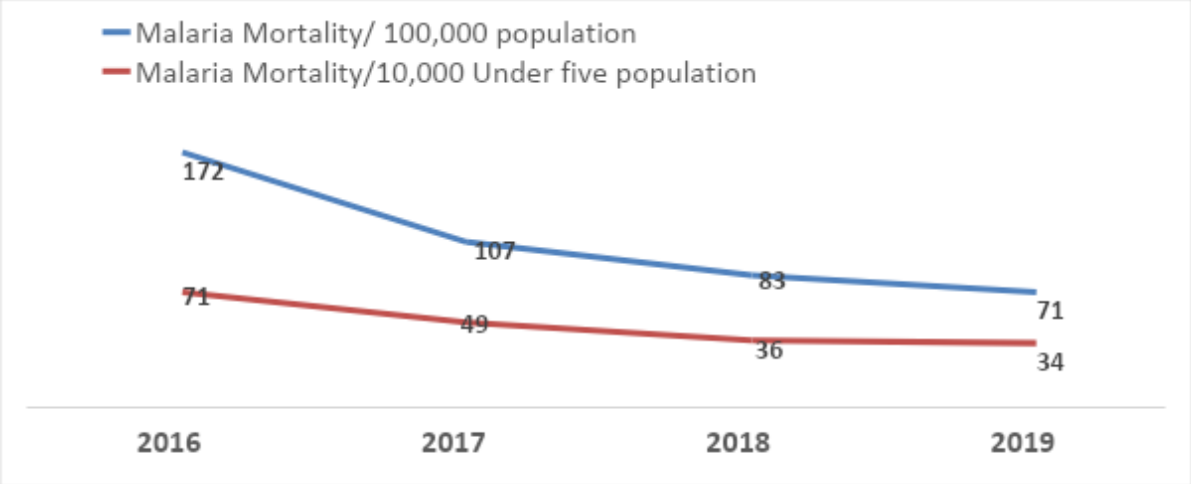


Figure 13: Malaria-related deaths general and <5 per 10,000 population *(Source: HMIS Data, 2019)*

3.3 Malaria Program Performance

Details of the malaria program performance are contained in the report for the 2018 Mid-Term Review of the malaria NSP (2016-2020).[51] This section summarizes key findings from the 2018 MTR report of the malaria NSP 2016-2020 as well as other complementary reports and studies, all intended to guide the next strategic direction beyond 2020.

3.3.1 Main findings of malaria NSP implementation

Governance, Program management and capacity to implement activities

The national malaria control program management plays the role of leading, coordinating and mobilizing resources for implementation of malaria control activities in Liberia. Generally, the

[51] Mid-Term Report 2018, NMCP, Liberia

MTR Report for 2018 and subsequent annual reports showed that the overall performance for program management (including planning, coordination, capacity building, resource mobilization and advocacy) was moderately achieved. The program attributed this to inadequate financing and limited technical support for program management activities, limited and inadequately aligned human resources, poor staff motivation as well as challenging operating environmental context.

The NMCP management has demonstrated limited capacity for overall coordination with implementing partners. The program structure of NMCP is not practical and contributes to poor coordination and lack of synergy observed with administrative and technical operations of the program. The NMCP management has been able to attract resources from major donors including the GFATM and the PMI among others, using a costed strategic plan. However, the management has not been able to develop resource mobilization plan and conduct advocacy and fund-raising meetings to mobilize additional resources (especially from domestic sources and the private sector) to fill gaps identified in the Strategic Plan due to limited capacity.

3.3.2 Key Program Achievements

(i) Malaria Case Management at all levels

Since the introduction of mRDTs, laboratory confirmed malaria diagnosis has increased significantly in the public sector. Also, the percentage of suspected malaria cases that received a parasitological test at public/private health facilities has remained high, increasing from 85% in 2018[52] to 93% in 2019.[53] The emphasis on confirmed cases has also helped to specify the proportion of deaths attributable to malaria.

About 63% of those cases received treatment for malaria with 100% in public sector receiving correct treatment in 2018.[54] With exception of South Central Region that showed declining treatment of uncomplicated cases with ACT, all other regions are well on course with ACT as treatment for uncomplicated malaria despite the constant reports of stock outs at facility level as well as challenges related to compliance to treatment guidelines and adherence to treatment protocol. Also, while most health workers at clinic level have received training in malaria case management, health workers at health centers and hospital level still need additional training in malaria case management

The countrywide coverage of targeted diagnostics activities was not achieved as planned due to capacity constraints and poor coordination. With support, mainly from partners, Integrated Community Case Management (iCCM) strategy is now rolled out in 14 counties with multiple models in place. While the iCCM intervention may have contributed to the observed

[52] Mid-Term Report, NMCP, 2018

[53] 2019 Routine surveillance HMIS, MOH

[54] 2019 Routine surveillance, HMIS, MOH

reduction in severe malaria cases, there are some challenges with harmonization and sustainability of the strategy.

(ii) Integrated Vector Management (IVM)

Although the malaria NSP (2016-2020) articulated IVM as a key component of malaria control, the countrywide coverage of IVM strategies has been mainly in area of LLINs as not much was done in regard to larviciding and IRS over the past five years due to budgetary constraints. Over the years, vector control activities have contributed to reduction of malaria burden in Liberia.

Overall coverage/ownership of LLINs among the population varies depending on source of data. The proportion of population with at least one LLIN increased from 62% in 2016 (LMIS) to 87% in 2019 (Post-distribution survey), with slightly higher ownership in rural communities (88%) compared to urban communities (85.5%).[55] The household coverage achievement of 87% is significant, in that, it is the only time in the long history of malaria control in Liberia that a national outcome level target of 80% was achieved and exceeded. The post-distribution survey was done one year after Liberia distributed 2,477,414 nets through a mass nation-wide distribution campaign. On the other hand, the LDHS key indicators report (KIR) of 2019 shows a decrease in household ownership of LLINs from 62% in 2016 to 55% in 2019, with an average of one net per household in Liberia. LLINs ownership is also higher in rural communities (63%) compared to urban communities (49%), according to the LDHS (2019). Additionally, both the 2016 LMIS and 2019 LDHS show that 25% of households have at least one LLIN for two persons, indicating no change in this indicator from 2016 to 2020, even after mass LLINs distribution in 2018.

The pattern is almost the same with utilization of LLINs from the available data sources. LLINs use among the general population decreased from 39% in 2016 (LMIS) to 37% in 2019 (LDHS). Among children under five and pregnant women, net utilization increased slightly from 44% and 40%, respectively in 2016 (LMIS) to 48% and 42%, respectively in 2019 (post-distribution survey). LLINs use remained the same in 2019 (44%) for children under five years of age but increased to 47% for pregnant women (LDHS 2019).[56]

There is need to sustain the LLINs coverage in rural communities where malaria burden is highest, as well as increasing and sustaining coverage of the general population, while focusing on children under five years of age and pregnant women. Also, more efforts need to be exerted towards understanding and addressing factors that influence uptake of available malaria control interventions by the various target groups and the general population.

Liberia has made marked progress in entomological and insecticide resistance monitoring. Routine entomological monitoring takes place in 4 counties Bong, Lofa, Grand Bassa, and Grand Cape Mount, while insecticide resistance monitoring is conducted across all the 15

[55] NMCP post-distribution survey, 2019

[56] Liberia Demographic and Health Survey, Key Indicators Report, LISGIS, MOH, ICF, 2019-20

counties through seven sites for insecticide resistance testing. The MOH and partners have used the insecticide resistance data to guide the change from the conventional Pyrethroid-treated nets to the new interceptor second generation Active Ingredient (iG2) nets, to begin with the 2021 mass net distribution campaign.

(iii) Malaria in Pregnancy

Since the introduction of IPTp in Liberia in 2005, the coverage of IPTp 1 and IPTp 2 has been increasing, paralleling the gradual increase in access to healthcare. For example, the proportion of pregnant women receiving at least two doses of SP increased from 55% in 2016 (LMIS) to 70% in 2019 (LDHS). Countrywide coverage of IPTp 3+ remains low however, increasing to 40% in 2019 from 22% in 2016, even though the proportion of pregnant women attending the recommended four or more ANC visits is high at 87%.[57] The programme attributes this low uptake to late introduction of the IPTp 3+ policy, which is corroborated by findings elsewhere[58] and highlights the need for any policy change to be more streamlined and coordinated between key stakeholders such as NMCP and Family Health Division of MOH, with more real-time data reporting. A move to the WHO recommendation of at least eight ANC contacts for pregnant women could create additional opportunities for IPTp administration.

Overall, uptake of MIP services (LLINs and IPTp) remains low. Few studies with limited scope,[59,60,61] have attributed this to factors including dislike for mosquito nets, hindered access to clinic-based malaria care for pregnant girls and women due to lack of financial means, unofficial user fees requested by healthcare workers, male partners' preference for traditional medicine and worry about the side effects of IPTp. Thus, there is need for a study to determine the main factors or barriers to uptake of these services by pregnant women to inform delivery of these interventions for better outcome.

(iv) Procurement and supply chain management (PSM)

Malaria remains a commodity-heavy program in Liberia with bulk of the financing going to provide malaria commodities and supplies. A comparative assessment indicated that in 2018, approximately 39% and 35% of health facilities had diagnostics and medicines/commodities respectively available on day of visit,[62] which partly explains the proportion of patients who are diagnosed and not treated. The Liberia Supply Chain Diagnostic Report of 2018 found that up to 28% of health facilities didn't have stock cards available and up to date with clinics and health center standing at 58% and 76% respectively.[63] This situation of lack of functional

[57] Liberia Demographic and Health Survey, Key Indicators Report, LISGIS, MOH, ICF, 2019-20

[58] Henry et al. Malar J (2018). An analysis of country adoption and implementation of the 2012 WHO recommendations for intermittent preventive treatment for pregnant women in sub-Saharan Africa

[59] Process Evaluation Report from Plan International, 2018

[60] Tarr-Attia et al. Malar J, 2018 Community-informed research on malaria in pregnancy in Monrovia, Liberia

[61] Liberia Malaria Indicators Survey, LIGIS, MOH, 2016

[62] WHO and MoH, 2018; Liberia Services Availability and Readiness Assessment (SARA) 2018

[63] John Snow, Inc., Jan. 2018; Liberia Supply Chain Diagnostic: Technical Report; Submitted to the Global Fund

inventory management systems at health facilities as well and poor reporting upwards has been documented multiple times since 2015 across multiple review and PSM related assessments in Liberia.[64,65,66] Unfortunately, although PSM is a core function in malaria control it is largely controlled and managed externally at level of the Supply Chain Management Unit (SCMU) at MOH and the Central Medicine Store (CMS) with limited influence of the NMCP on the strategic decision-making and oversight and allocation of resources.

(v) Monitoring & Evaluation and Operational Research

There is an integrated monthly report covering key malaria indicators that are captured through the Health Information System (HIS) that uses the District Health Information System Version II (DHIS2) platform for health facilities data management and the Community Based Information System (CBIS) for integrated Community Case Management. The reports cover the following: outpatient attendance, inpatient admissions, treatment therapies, deaths, and RDT and/or microscopy test results. The reports are transmitted from the health facilities and communities at the end of each month to the County Health Office for entry and reporting. More than 85% of health facilities are submitting timely reports according to national guidelines. In addition to the HMIS, there is quarterly monitoring and evaluation of malaria control activities such as data verification, end users verification and other data quality assessments conducted every quarter.

Monitoring and evaluation staff of all 15 counties were trained in 2019 in basic monitoring and evaluation concepts. Additional training was conducted in 2019 for District Health Officers and District Data Officers in DHIS2 and data quality assessment. An adapted Data Quality Assurance (DQA) Protocol was updated in 2019. The NMCP has a Technical Working Group (TWG) for Surveillance, Monitoring, Evaluation and Operations Research that provide guidance and direction for implementation issues.

Major operational research conducted since 2015 to inform key decisions in programme planning and implementation include: Malaria Episodes study, Therapeutic Efficacy Study (TES) 2018 and ACT compliance study. The Episode study results in 2015 showed statistically significant difference in the mean number of confirmed malaria episodes between the age groups: 2-11 months and 1-5 years, 6-13 years and above 14 years and 1-5 years and 6-13 years. These results have thus far helped NMCP in quantification decisions and planning malaria control interventions. The TES showed that the first-line ACTs are highly efficacious, thus justifying the continued use of this type of ACTs for treatment of uncomplicated malaria. The ACT compliance study showed that both types of ACTs are used at heath facilities for the management of uncomplicated malaria with Artemether Lumefantrine (AL) preferred by 40% of prescribers and Artesunate Amodiaquine (ASAQ) by 60% of prescribers. The findings guided

[64] John Snow, Inc., Jan. 2018; Liberia Supply Chain Diagnostic: Technical Report; Submitted to the Global Fund

[65] People that Deliver, et al, 2015; Supply Chain Management Training Road Map for Liberia: A Sustainable Solution for Supply Chain Capacity Development

[66] MoH & Liberia Coordinating Mechanism (LCM), 2017; Baseline Assessment for Provision of Nutritional Support under the TB/HIV Grant

the split of AL and ASAQ in the ACT procurement plan. Additional studies that informed malaria programming include Health Facility Survey, 2018 and Barriers to Case Management Study in 2019.

The last Liberia Malaria Indicator Survey and Demographic Health Survey were conducted in 2016 and 2019, respectively. Together with HIS, these surveys continue to provide data sources for tracking progress on malaria prevalence, fever, case management, net ownership access and use, Malaria in Pregnancy, and SBC.

A key challenge in data for decision-making is the concentration of M&E efforts on HMIS reports with limited effort on monitoring NMCP implemented activities, thus leading to a paucity of NMCP's own reports that should inform decision-making. Even with availability of HMIS system, there is the lack of advanced statistical analysis tools and training for improved data analysis, which will increase program data utilization and demand for decision-making. Also, timely collection and reporting of data, especially in Montserrado County and the private sector, remain a challenge. Montserrado County has over 75% of private health facilities most of whom are not reporting regularly. Also, data prioritization and use at all levels remains a challenge for evidence-based decision making in all counties

(vi) Social and Behavioral Change Communication

Following lessons learnt from community engagement in successfully combating the deadly Ebola Virus Disease, the MOH has developed the framework for community involvement in health and the NMCP has strong collaboration with partners for the promotion of IEC/BCC and community involvement in malaria control.

The previous IEC/BCC strategy was reviewed and revised to develop the Malaria Communication Strategy in line with findings from the 2016 LMIS that adoption of behavioral change was slow despite the high knowledge among the population. Social and behavior-change communication (SBC) materials, Community Health Development Committees (CHDC), and integrated community-based health program have been developed and are contributing to raising awareness on malaria at community level. Training materials, fact sheets, posters, and other tools are also used to engage schools, community-based organizations, and local authorities. Most of the activities are community-based using house-to-house awareness campaigns, health talks at facilities, and mass media (radio and Television). The countrywide coverage of awareness level on malaria causes, prevention and management is high at 98%. About 90% of women correctly identify the cause of malaria with 88% correctly identifying the ways to prevent malaria.[67]

Unfortunately, translating knowledge into practice is still lagging knowledge on malaria, perhaps due to wrong perception on malaria treatment and prevention, among others. For instance, among women who have heard of malaria and know that it can be avoided, almost half (49%) perceive that people do not take actions to prevent themselves from getting

[67] Liberia Malaria Indicators Survey, LISGIS, MOH 2016

malaria because they don't take malaria seriously or perceive that there is no risk. Also, among women who know SP/Fansidar is used to prevent malaria in pregnant women, 45% perceive that pregnant women do not use SP/Fansidar because they are worried about the side effects.[68] Thus, there is need to focus on strategies that will bridge this knowledge-practice gap for achievement of desired results.

3.3.3 Malaria financing landscape and partnership

The estimated cost to implement the previous Liberia malaria NSP 2016-2020 was USD 209,025,748 as of January 2016, with a funding gap of USD 24,508,718 (equivalent to 23.6% of total cost) at MTR in 2018. Excluding out-of-pocket expenditure for malaria, the malaria program relies on three main sources of direct financing: Government of Liberia (16.0%), The Global Fund (36.4%) and PMI (47.6%). While majority of PMI funding is considered off-budget support channeled through a number of implementing partners at national, county and district level including community-based partners, the Global Fund support is a direct budget support and therefore easily traceable within the national system, despite the somewhat complex mechanisms for accessing funds.

Compared with the global expectations and figures in other countries in the West African region, Liberia has had a much higher average funding per person at risk. Nonetheless, this funding is not sufficient when compared with the current international average that is nearly 2.5 times what is being made available. There is therefore a need to increase the current malaria control financing if the country must make substantial progress towards attainment of the global goal of elimination (by 2030) quickly.

3.3.4 Progress on achieving national, regional, and global objectives

i) Levels of achievement of malaria NSP targets (2016-2020)

Despite challenges with achieving desired results, Liberia has, on average achieved 55% coverage of the general population with LLINs, 63% coverage with treatment using ACT according to national policy at health facility level and 95% knowledge on malaria control and prevention among women, among others. These interventions have contributed to the observed reduction in malaria incidence and deaths. Table 5 shows Liberia's steady progress towards achievement of malaria NSP targets for 2020.

Table 5: Progress towards achievement of malaria NSP targets

Level	Indicator	Baseline 2016	Target 2020	Achieved 2018-2019	Source & year
Impact	Malaria Parasite Prevalence in children U5 (Slide)	45%	7%	N/A	LMIS
	Malaria incidence per 1,000 population	380	117	238	HMIS

[68] Liberia Malaria Indicators Survey, LISGIS, MOH 2016

	Malaria incidence in children under five per 1,000	1002	N/A	603	HMIS
	% Children aged 6–59 months with hemoglobin measurement of <8g/dl)	8%	N/A	3% (<7g/dl)	LMIS, LDHS
	Malaria mortality per 100,000 population	172	N/A	71	HMIS
	Malaria mortality in children U5 per100,000 population	71	N/A	34	HMIS
Outcome	% of Suspected malaria cases that received a parasitological test at public and private health facilities	85%	90%	93%	HMIS
	% of Confirmed malaria cases that received first-line antimalarial treatment according to national policy at public and private health facilities	83%	90%	63%	HMIS
	% of pregnant women who received IPTp 2 during antenatal care visits (in public & private facilities)	55%	80%	70%	LMIS, LDHS
	% of pregnant women who received IPTp 3+ during antenatal care visits (in public & private facilities)	22%	80%	40%	LMIS, LDHS
	% of households owning at least one LLIN	62%	80%	87%, 55%	LMIS, PDS LDHS
	% of households with at least **1** LLINs for two persons	25%	80%	25%	LMIS, LDHS
	% of under-5 Children who slept inside an LLIN the previous night	44%	80%	48%, 44%	LMIS, PDS, LDHS
	% of pregnant women who slept inside an LLIN the previous night	40%	80%	42%, 47%	LMIS, PDS, LDHS
	% of women with knowledge on malaria prevention	95%	N/A	N/A	LMIS

ii) Progress towards epidemiological impact

Liberia made some progress towards epidemiological impact over the years. Overall malaria mortality was reduced by 59%, from 172 per 100,000 persons in 2016 to 71 per 100,000 persons in 2019. Similarly, the under-five malaria mortality has reduced by 52%, from 71 per 100,000 in 2016 to 34 per 100,000 in 2019. Also, the incidence of malaria per 1,000 persons in the population reduced by 37% from 380 (2016) to 238 (2019), while the reduction in incidence in children under-five years of age was 40% (from 1002 to 603) over the same period. This progress is a step into the future, but too slow for the desired impact required to attain greater alignment to national, regional, and global targets towards malaria elimination.

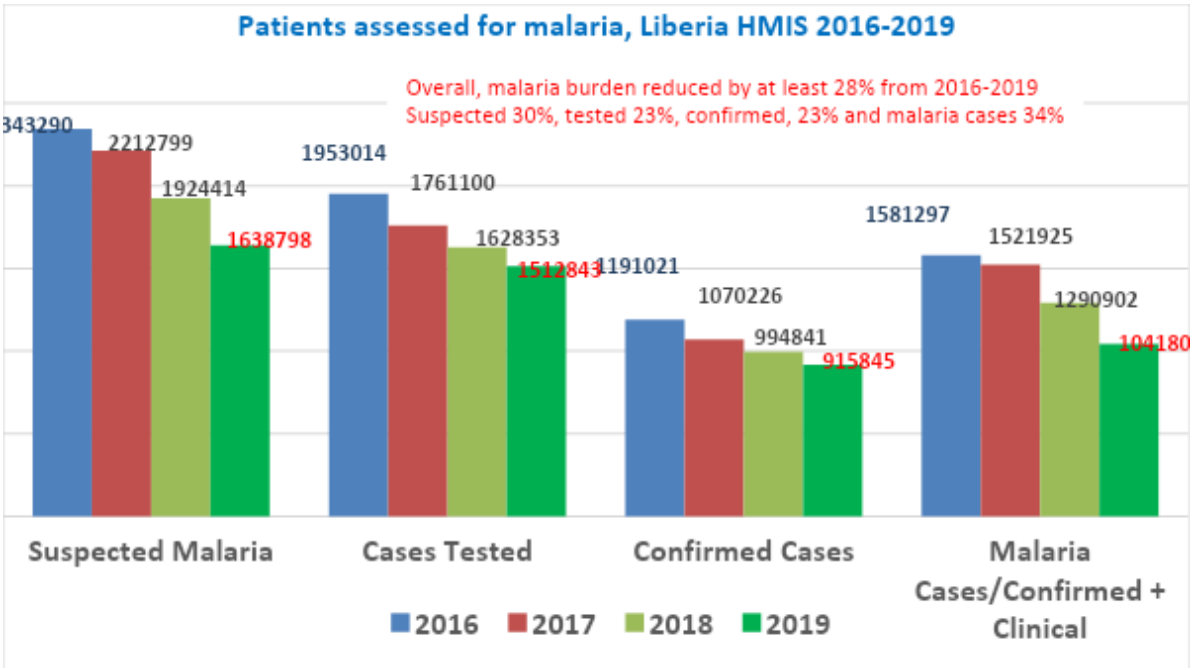


Figure 14: Trend in malaria cases from 2016 to 2019 at health facilities *(source, HMIS)*

Reduction in malaria incidence and deaths correlate with figure 11 that shows overall reduction in malaria burden (confirmed malaria cases at health facility level) by 34% from 2016 to 2019.

iii) Progress towards entomological impact

With exception of interventions that targeted interruption of transmission using LLINs, no vector control intervention targeted at reducing vector population was initiated.

3.3.5 Malaria Program contribution to Health System Strengthening

A strong health system is essential to achievement of desired outcomes and impact of malaria control interventions. The malaria program in Liberia has contributed immensely to strengthening the health system in various areas. Specifically, from 2016 to 2020, the NMCP contributed through its two major donors, PMI/USAID and Global Fund for HIV/AIDS, TB & Malaria, a combined total of $20,713,983.00USD[69] towards strengthening supply chain/PSM, human resources, monitoring & evaluation, HMIS and financial management.[70]

3.4 Malaria program Summary SWOT analysis

An analysis of strengths, weaknesses, opportunities, and threats of the Liberia malaria program is summarized in table 6.

[69] This **excludes** contributions to malaria-specific health service delivery that includes drugs, LLINs etc.

[70] Total amount does not include contributions towards malaria-specific health service delivery. PMI/USAID contributed approximately US$8,360,000 through MOP of 2016-2018 and GFATM contributed approximately US$12,353,983 through HSS support from 2016-2020

Table 6: SWOT analysis of malaria program

Strengths	Opportunities
- Updated technical guidelines (case management, MIP) and policy documents available - Demonstrated national ownership and commitment - Improved testing and case management capacity of health workers - Uniform approach for malaria case management and MIP in public sector - Available funding malaria control from Global Funds & PMI/USAID - Some human Resources available at national, county and community - Existence of coordination structures at all levels - Functional technical working groups in place with participation of key stakeholders - Malaria focal persons now available in all counties - Integration of reporting system as well as trainings and supervision approach for case management and MIP - Expansion of the community health assistant (CHA) program in 14 counties - Upgrading for laboratory personnel	- GOL commitment and social corporate funds - Potential technical support from donors and other partners (Plan, PACS, UNICEF, Last mile, STAIP, FARA, IDDS, PIH etc.) - Integrated training and supervision approach for case management and MIP through partners - Partnership with the NEW Generation Net Project
Weaknesses	**Threats**
- Limited technical capacity of some units in NMCP - Weak supply chain management that leads to persistent stock out of commodities - Irregular OTSS and training due to MOH bureaucracy - Weak supply chain, diagnostics, recording and reporting systems - Low coverage with IPTp3, LLINs use, diagnostics despite availability of commodities - Limited Private Sector engagement - Limited funding due to inability of program to mobilize funding outside of two major donors - Inadequate Human Resources, particularly laboratory - Lack of convenient working space - Discontinuation of Indoor Residual Spraying contributing to program unmet program goal	- Inadequate domestic budgetary allotment - Bottlenecks in dispensing funding - Limited HR capacity - staff attrition - Emerging and re-emerging of infectious diseases outbreak might disrupt intervention - Donor fatigue due to competing priorities and limited impact overtime - Potential increase in morbidity and mortality - Reduced productivities due to disease burden (economic) - The political situation might affect the program - Different partners' interests - Coronavirus pandemic (may affect the implementation of 2021

	campaign)

4 STRATEGIC PLAN FRAMEWORK (2021-2025)

This malaria NSP is premised on Liberia's international commitments on malaria with the global vision of "a world without malaria". Its goal is aligned with the SDG goal three and the WHO GTS for malaria 2016-2030 that recommends more than 75% reduction in malaria burden by 2025. The malaria NSP framework is aligned with the WHO/AFRO framework for implementing the GTS as well as the West Africa Health Organization's (WAHO) malaria NSP, which recommend that countries with moderate to high malaria transmission ensure maximal reduction of morbidity and mortality through universal access to quality-assured vector control, diagnosis and treatment with support from an efficient surveillance system.

At the national level, political commitment to reduce malaria burden and improve the lives of the population exists at the highest level. Liberia is a signatory to the Abuja Declaration on Roll Back Malaria (RBM) and the country has reduced tariffs and taxes from 25% to 2.5% for insecticide treated nets and insecticides. The place of malaria is also high in the Liberian government's development agenda, because malaria prevalence reduction by more than half (from 45% in 2016 to 20% by 2023) is one of eight targets under Pillar One (Expanding Access to Essential Health Services) of the government's PAPD.

4.1 Program vision

The **vision** of the malaria program is "**A malaria free and healthy Liberia population**"

4.2 Program mission

The **Mission** of the national malaria control program is to provide universal, coordinated, cost effective and evidence-based malaria interventions for the people of Liberia.

4.3 Program guiding principles

4.3.1 Country ownership and leadership

The malaria control effort in Liberia is owned and led by the MoH, which has the general mandate to formulate and implement curative and preventive interventions for the health of the population of Liberia. A national government program, the NMCP, leads the specific mandate for malaria control with direct supervision by the Assistant Minister for Preventive Services. The malaria NSP is aligned with the national development agenda of the Government of Liberia, the Pro-poor Agenda for Prosperity and Development (PAPD), 2018-2023 as well as the Ministry of Health's Ten Year National Health Policy and Plan, 2011-2021 and the post-Ebola Plan for Building a Resilient Health System (2015-2021). It is also aligned with the national planning and financial cycles.

4.3.2 Inclusive and coordinated partnership

Malaria prevention and control in Liberia is inclusive and involves several actors at various levels. Led by the NMCP, the program is supported by many stakeholders and partners at all levels of the health system. This malaria NSP supports a harmonized joint action by all partners to ensure that efforts and utilization of resources are as efficient and effective as possible leading to reduction in duplication, all in support of the principle of the "Three Ones:" one national malaria control coordinating authority where implementation is a country-led process, one comprehensive plan for malaria control including costed work plans, one country level monitoring and evaluation framework.[71]

In the context of the principle of multi-sectoral approach, various malaria stakeholders and partners participated in all stages of the malaria NSP development. This will continue during implementation and partners will be mobilized according to their comparative advantages to ensure better coordination, harmonization, and alignment.

4.3.3 Accountability and transparency

The 2021-2025 malaria NSP will be used as a tool to hold all stakeholders (MoH, NMCP, donors, implementing partners, CSOs and local county authorities) accountable to their commitments and responsibilities and to their beneficiaries. All resources for prevention and control of malaria, whether from government, donors or implementing partners, shall be accounted for, and transparently reported on. The monitoring system for the malaria NSP will be designed to include performance review of both program and expenditure.

4.3.4 Evidence-based and results-oriented management

This malaria NSP is a product of a situation analysis informed by MTR, conducted in 2018 according to the WHO manual and guidelines and other sources of information. It must therefore achieve the most effective and efficient use of resources as well as ensure rapid action and a strong feedback loop. All this will guarantee results-based management. Thus, the following are quality requirements that were considered for the malaria NSP:

- Strategies and activities are evidence-based, affordable, feasible and relevant to the country and in-line with WHO recommendations
- Providers and users will comply, and the health system is able to deliver malaria services;
- Available resources will be maximized for provision of malaria services to reduce morbidity and mortality due to the disease

i) Socio-economically inclusive and equitable

The Ministry of Health, in its Ten-Year Health & Social Welfare Policy and Plan, 2011-2021 recognizes that "all people in Liberia shall have access to effective health and social welfare

[71] Adapted from the UNAIDS three-ones principle for HIV/AIDS, 2004

services irrespective of socioeconomic status, origin, ethnicity, gender, age and geographic location without discrimination." As reflected in the malaria situation analysis, pregnant women, children under five, rural and hard-to-reach communities are the most likely to be affected by malaria and the program shall ensure they are appropriately targeted with malaria services. As equity between rural and urban areas is of critical importance for universal coverage, planning, resource allocation and implementation of malaria prevention and control interventions shall include mechanisms to reach the poor, highly vulnerable such as children under five, pregnant girls and women, prisoners and orphans, hard-to-reach and displaced populations. The program recognizes that access to life-saving malaria prevention and control interventions, especially for the most vulnerable groups, is a "human right," and so will, whenever possible, promote free access to services for those groups.

ii) Integrated interventions

Most malaria prevention and control interventions and services are integrated, especially at health facilities and community level. Where operationally feasible and efficient, the program will endeavor to integrate as much as possible to reduce duplication and waste of resources.

iii) Efficiency

In the context of a multi-sectoral approach to malaria prevention and control, inputs from all stakeholders are necessary to realize the greatest gains, while ensuring efficiency by striving to achieve more within existing levels of resources. Resource allocation will be determined by disease burden and potential for maximum impact. The program will endeavor to prioritize improvement of coordination of all efforts and actors in a way that alleviate duplication and minimize gaps.

4.4 Strategic directions and policy priorities

Based on the current malaria epidemiological profile as shown by findings from the 2018 MTR including recent HMIS data, and to achieve the vision of a healthier Liberia with no malaria death, malaria control efforts will be focused on:

- Strengthening parasitological diagnosis with mRDT or microscopy, prompt treatment with effective ACT at all levels (including community) and improving coverage with IPTp 3+
- Intensifying social and behavior change communication
- Sustaining coverage with LLINs in areas of high coverage while focusing on achieving universal access to LLIN as well as improving use and care for the nets
- Reintroducing IRS with environmental compliance components

Also, the 2018 MTR recommended the need to align with existing national and global strategies and technical direction to drive acceleration towards attainment of malaria pre-elimination. Consequently, the new malaria NSP will additionally focus on:

- Galvanizing political will nationally and globally to reduce malaria deaths

- Using strategic information to drive impact
- Applying a coordinated country response
- Development of a sustainable financing mechanism for malaria
- Implementing best global guidance, policies, and strategies
- Making malaria a multi-sectoral disease of social and economic importance
- Applying a gender lens to malaria control and prevention interventions
- Improved surveillance, monitoring and evaluation, as well as stratification by malaria burden, required to optimize the implementation of malaria interventions

4.5 Goal and objectives

4.5.1 Goal:

By end of 2025, reduce malaria burden by 75% (11% overall prevalence) compared to 2016 (45% prevalence)

Liberia aims to gradually transition from high burden (>10% transmission) to medium to low burden (<10% transmission) in preparation for elimination phase. The most appropriate way to record progress towards achieving this goal is to effectively track the number of malaria cases and deaths nationally through the HMIS. Thus, an improved and robust national surveillance system based on quality HMIS data, complemented by population-based surveys that estimate prevalence, will be used to measure malaria burden reduction.

4.5.2 Objectives

1. By end of 2025, reduce malaria mortality rates by at least 75% (43/100,000 population) compared to 2016 (172/100,000 population)
2. By end of 2025, reduce malaria case incidence by at least 75% (95/1,000 population) compared to 2016 (380/1,000 population)
3. By end of 2025, promote and maintain a culture of evidence-based decision making to achieve malaria program performance at all levels
4. By end of 2025, strengthen and maintain capacity for program management, coordination and partnership to achieve malaria program performance at all levels

4.6 Description of required strategies and main activities

Objective 1: By end of 2025, reduce malaria mortality rates by at least 75% (43/100,000 population) compared to 2016 (172/100,000 population)

Strategic interventions to achieve this objective of substantial mortality rate reduction will include the following:

- Improve parasite-based diagnosis at all level of point of care
- Sustain prompt and effective case management of malaria at all levels of the health care system
- Improve pharmacovigilance and Therapeutic Efficacy Studies

- Strengthen and institute routine malaria mortality audits

Expected Results:

The expected results of implementation of this strategic plan shall be:

i) At least 95% of all patients with suspected malaria cases will have been correctly tested at public and private health facilities in accordance with national guidelines;
ii) At least 90% of all patients with confirmed uncomplicated malaria cases will have been correctly managed at public and private health facilities in accordance with national guidelines;
iii) At least 90% of all patients with confirmed severe malaria cases have been correctly managed at public and private health facilities in accordance with national guidelines;
iv) At least 95% of all pregnant women with confirmed uncomplicated and complicated malaria cases will have been correctly managed at public and private health facilities in accordance with national guidelines
v) At least 95% of under-fives with confirmed uncomplicated and complicated malaria cases will have been correctly managed at public and private health facilities in accordance with national guidelines
vi) At least 90% of children under 5 years old with suspected uncomplicated malaria will have been tested and treated appropriately at communities in accordance with national guidelines;
vii) At least 90% of complicated cases referred will receive appropriate pre-referral treatment

4.6.1 Strategic Intervention 1: Improve parasite-based diagnosis at all health facilities

Strategy 1.1: Strengthen clinical laboratory capacity of health workers and health facilities

The NMCP adopted the World Health Organization (WHO) recommendation on parasite-based malaria diagnosis in 2012 and continues to implement that policy for all diagnostic purposes. This is consistent with the GTS, which recommends universal diagnostic testing of all suspected malaria cases. To date, the proportion of suspected malaria cases that received parasitological test is 93%.[72]

Building on this progress, suspected malaria cases will continue to be confirmed by quality-assured microscopy or a rapid diagnostic test at all service delivery points before antimalarial treatment is administered. Based on international best practice, the programme will review, revise and print all diagnostic documents including guidelines, standard operating procedures (SOPs), training manuals and diagnostics registries as the need arises and make them available to all public and private health facilities. Following conduct of a malaria competency assessment, diagnostic health workers/personnel (laboratory technicians and assistants) of

[72] Health Management Information System, MOH, 2019

health facilities will be identified and trained in use of the guidelines, tools and SOPs for malaria diagnostics. The programme recently conducted a baseline laboratory assessment in all 15 counties and the report will inform provision of diagnostic equipment, supplies and tools in health facilities (clinics, health centers, and hospitals). The MOH will recruit and deploy a laboratory technologist or technician at NMCP to oversee implementation of diagnostic activities

Strategy 1.2 Improve QA/QC for RDT and Blood Slides (Microscopy)

WHO guidelines on quality control of malaria microscopy involve collection of a sample of blood slides from clinical specimens and re-examination of those slides by expert microscopists. This will entail the identification of laboratory Technologist to be trained in malaria microscopy accreditation course (WHO –Level 1 or 2) to conduct cross checking of blood slides, carry on proficient testing and conduct on-site evaluation and mentorship at all levels. The program will support training of laboratory technologist for transfer of knowledge to lower levels through use of validated reference slide sets for training of diagnostic personnel/health workers on quality assurance and control. Facility and community-based (point of service) quality control of RDTs will also be conducted. Annually, the program will strengthen quality of microscopy by conducting the annual WHO competency training for microcospists.

4.6.2 Strategic Intervention 2: Sustain prompt and effective case management of malaria at all levels of the health care system

Strategy 1.3: Strengthen Health worker capacity to manage uncomplicated and complicated malaria

Malaria case management services are integrated into the health care delivery system and are available at all levels of care: national, county, district, and community levels. Access to prompt diagnosis and effective treatment is the cornerstone of NMCP's national strategy for case management in all public and private health facilities. In addition to malaria commodities, health worker capacity to manage malaria cases (uncomplicated and complicated) is key to successful treatment outcome.

The management of uncomplicated and severe cases of malaria has largely been handled at public and private health facilities. But to increase access to prompt diagnosis and effective treatment, all private pharmacies and medicine stores have also been targeted for the roll out of malaria case management using the Private Sector ACT (PSACT) strategy to be developed.

Confirmed malaria cases have reduced by 23% from 1,191,021 cases in 2016 to 915,845 cases in 2019. Severe malaria cases overall have also dropped in the country and this has had a relationship to the sharp decline in mortality by 59% from 172 per 100,000 persons in 2016 to 71 per 100,000 persons in 2019. This had some correlation with the performance of iCCM in 14 counties. However, there was an increase from 2.99% in 2016 to 6.17% in 2018 in the

overall percentage of severe malaria as a proportion of all cases diagnosed at health facility level. While about 83%[73] of confirmed malaria cases received treatment in 2018, the proportion reduced to 63% by December 2019.[74] Persistent stock outs due to partly dysfunctional last-mile distribution may have contributed to this.

The programme will continue to support case management of malaria in health facilities by making antimalarial commodities and essential supplies available for use by health workers to treat patients with uncomplicated or complicated malaria. Pre-referral treatments will be made available at clinic level where in-patient facilities are lacking to facilitate prompt and effective referral. Health center and hospital personnel capacity will be built to manage severe malaria cases referred from clinics and community level.

The programme has developed necessary protocols, guidelines and modules for malaria case management and malaria in pregnancy and will be printed for dissemination. As new information and guidelines become available from the WHO, the programme will update all case management and MIP implementing documents (technical guidelines, treatment protocols, training manuals and SOP/Job aides/pocket guides), print and distribute them for use at public and private health facilities, as needed. The programme will leverage on the expansion of Internet connectivity to counties, using platforms such as the mHero, to provide continued professional development for health professionals. Where necessary, the NMCP will collaborate with the Liberian Board for Nursing and Midwifery and other professional health training institutions on updating or development of school curriculums for pre-service training programs.

The MOH has institutionalized joint integrated supportive supervision (JISS). In collaboration with the Quality Management Unit (QMU), the program will conduct JISS, and on-site coaching and mentoring for care providers in both public and private health facilities. The program will also promote rational use of drug and commodities, accurate data collection, compilation, and timely reporting and feedback to health facilities and counties.

Strategy 1.4: Strengthen Community Health Assistant capacity for malaria case management

Integrated Community Case Management (iCCM) interventions are implemented by CHAs in hard-to reach communities beyond 5km from the health facilities in rural and remote areas in 14 counties (with the exception of Montserrado County), where health infrastructure is not accessible and malaria transmission is high. The strategic use of CHAs in malaria prevention and care management at the community level bridges the existing health system gaps as well as ensures a continuum of care for the most vulnerable populations, in this case children under five and pregnant women. The iCCM strategy specifically targets children under five who are the most severely affected by malaria.

Findings from the 2018 MTR report revealed that iCCM interventions, implemented by CHAs

[73] Mid-Term Report, NMCP, 2018

[74] Health Management Information System, MOH, 2019

in hard-to reach communities, contributed greatly to the decrease of severe malaria. It was therefore recommended that support be increased for full-scale implementation of this strategy across the country. Even though the Government of Liberia has begun to support salary payments for Community Health Service Supervisors (CHSS), iCCM activities are heavily donor-driven with various donors (PMI/USAID, Global Fund, World Bank and private sector) supporting the iCCM strategy. Resources will be mobilized once a sustainability and effective financing strategy and plan are developed for the National Community Health Assistant Program (NCHAP). The NMCP will contribute to the strategy/plan and develop an annual comprehensive mapping exercise of partners to ensure strategic fit for all implementing partners. All iCCM implementation documents including technical guidelines, manuals and treatment protocols needing revisions will be revised, validated, printed and made available for use by CHAs, where necessary.

Availability of malaria treatment at the community level is improving with the proportion of CHAs with no stock out of malaria commodities reported at 81%, while 78% of confirmed cases received treatment by December 2019.[75] The program will ensure uninterrupted supply of malaria commodities for use by CHAs. Parasite antigen-based diagnosis using mRDTs will be promoted, in line with WHO recommendation adopted by Liberia in 2012 and the GTS recommendations. CHAs' capacities will be built for appropriate use of mRDT at community level. Regular mRDT supply and resupply will be coordinated by the relevant health facilities and care will be taken to ensure mRDTs supplied are assured of quality.

Early identification of danger signs and prompt referral creates a sound basis for effective management of complicated malaria cases. CHAs are making referrals and with proper documentation. They are yet to be trained in administering pre-referral treat (rectal Artesunate). There is a planned pilot, which will inform roll out. Therefore, special focus will be placed on enhancing CHAs' capacities to effectively identify malaria danger signs in children under five in accordance with iCCM guidelines, provide pre-referral treatment and promptly refer.

Strategy 1.5 Sustain and Maintain case management for vulnerable population (children under five and pregnant women)

Pregnant women and children are most vulnerable and stand high risk of Malaria infection due to low immunity. Malaria infection in pregnancy can result in a wide range of adverse consequence for a pregnant woman, the developing of fetus, newborn and infant. Malaria in pregnant woman may result in anemia, low birth weight, pre-term delivery, stillbirth, and perinatal mortality. Liberia has adopted the World Health Organization (WHO) approach to improved outcomes for women and children. This approach includes the provision of effective diagnosis and treatment. All pregnant women and children U-5 with uncomplicated malaria

[75] Routine surveillance data, HIMS, MOH, 2019

will be tested and receive urgent treatment to avoid delay that might progress to severe or complicated malaria.

Testing for malaria with RDTs or microscopy will be provided to the pregnant women that present with fever, and given appropriate treatment, depending on the gestation age of the pregnancy. Pregnant women with severe malaria will receive the highest level of inpatient care because of the high-risk of maternal and perinatal mortality. Hypoglycemia and anemia are a significant risk for all pregnant women and children U- five with malaria. Severe anemia is the main maternal effect of malaria infection during pregnancy and may be life threatening when not recognized and treated effectively. In children, delay in managing malaria may result to anemia, hypoglycemia, Convulsion, and death. Therefore, it is essential that children are recognized and managed within 24hrs onset of fever.

Strategy 1.6 Gender-responsive and adolescent-friendly health services

Even though mosquitoes do not discriminate in biting men or women, factors such as access to malaria case management in the private sector where women have less disposable income to pay for services can influence who gets malaria and how it is treated. Additionally, adolescent girls face unique barriers in accessing health services that need to be addressed.

The NMCP and its partners will liaise with the Family Health Division and Gender Ministry to leverage existing gender-responsive and youth friendly health services to benefit women and young girls. The NMCP will also liaise with these institutions to remove barriers through provision of adolescent-friendly and inclusive health services all over the country. This strategy will focus on integration of malaria into other health services delivery particularly (1) mental health, sexual and reproductive health including malaria; (2) innovation and digital health interventions created with and for adolescent boys and girls.

4.6.3 Strategic Intervention 3: Improve pharmacovigilance and Therapeutic Efficacy Studies

Strategy 1.7 Strengthen monitoring of adverse event

Enhanced pharmacovigilance of antimalarial medicines are essential in order to detect unexpected adverse events. While patient on malaria drugs rarely experience adverse events, the program will need to be aware of and prepared for any potential adverse events.

The program will partner with the Liberia Medicines and Health Products Regulatory Authority (LMHRA) to monitor adverse reaction to antimalarial drugs at all levels in order to: detect and report suspected adverse drug reactions following the introduction of new drug(s); to assess suspected adverse reaction so as to evaluate causality, clinical relevance, frequency and distribution in particular population groups; to communicate and recommend relevant actions to authorities and the public regarding such adverse effects; and provide health education and training to health care providers about suspected adverse effects in order to improve patient's compliance and to respond appropriately to any adverse effects.

Strategy 1.8: To conduct Therapeutic Efficacy Studies (TES) of antimalarial

Monitoring efficacy of antimalarial medicines is essential to detect reduced efficacy so that the most appropriate ACT can be selected for national treatment policies. WHO advises countries to monitor the efficacy of first-line malaria therapies – against both falciparum and vivax malaria – using the standard WHO protocol for therapeutic efficacy studies every two years. A treatment failure rate exceeding 10% should prompt a change in the national antimalarial treatment policy.[76] Currently, the first line ACTs used in Liberia (Artemether Lumefantrine (AL) and Artesunate Amodiaquine (ASAQ)) are highly efficacious according to TES report of 2015. TES will continue to be conducted every two years in line with WHO recommendation using standard or adapted WHO protocol.

Strategy 1.9: Ensure rational use of malaria commodities

According to WHO estimates, more than half of all medicines are prescribed, dispensed or sold inappropriately, and that half of all patients fail to take them correctly.[77] The result of overuse, underuse or misuse of medicines include wastage of scarce resources and health hazards. Under this strategy, the program will work with the MOH, partners and the county health teams to ensure availability and correct use of clinical guidelines as well as provision of public education about correct use of malaria commodities. Opportunities for supervision and monitoring visits will be used to reinforce prescription practices that promote adherence to dosing regimes. In order to promote the rational use of malaria commodities, routine refresher training shall be provided to all screeners and dispensers in both public and private facilities.

Objective 2: By end of 2025, reduce malaria case incidence by at least 75% (95/1,000 population) compared to 2015 (380/1,000 population)

Attaining this objective will entail targeting both the vectors and parasites. Preventing contact between people and vectors will reduce onward transmission of new infections. The program will employ the following three key strategic interventions to achieve this objective: Integrated Vector Management (IVM), Prevention of Malaria in Pregnancy and Prevention of Malaria in Infancy and children under five years of age.

Expected Results:

The expected results of implementation of this strategic plan shall be:

i) At least 90% of the population have one net for every two persons
ii) At least 80% of the population slept under a LLIN the previous night before the survey;
iii) At least 80% of pregnant women (disaggregated by age) slept under LLIN the previous night before the survey;

[76] Global Technical Strategy, WHO 2016
[77] https://www.who.int/medicines/areas/rational_use/en/

iv) At least 80% of children under 5 years slept under a LLIN the previous night before the survey;
v) At least 80% of pregnant women (disaggregated by age) using ANC services will have been protected with appropriate IPTp3+ doses during their pregnancy;
vi) At least 85% of the population in targeted districts will have been protected by IRS;
vii) At least 50% of the population residing in areas with few, findable and targeted breeding sites will have been protected by larval source management;
viii) At least 25% of children under two years using EPI services have been protected with appropriate IPTi3 and malaria vaccine, where applicable.

4.6.4 Strategic Intervention 4: Integrated Vector Management (IVM)

Strategy 2.1: Ensure and sustain universal access to LLINs

LLINs coverage of a net for every two persons is currently estimated at 25% after mass distribution campaign in 2018 (LDHS 2019). Utilization is also still below desired coverage (39% for general population compared to 80% target) and this will be improved. To achieve universal coverage of malaria preventive interventions, the NMCP will increase household access, coverage, and use of LLINs, and maintain adequate LLINs stock at health facilities. The program will seek inter-sectorial collaboration with relevant actors to achieve impact.

The LLIN strategy will include LLINs mass household distribution campaigns and Institutional distribution through health facilities, schools, orphanages, and barracks. Mass campaigns will be conducted after every three years covering all households with the aim of universal coverage. NMCP and partners will conduct durability monitoring that will further inform the timing for mass LLIN distribution campaigns. Health facility distribution will include providing a net to pregnant women at the first ANC visit and at delivery.

Strategy 2.2: Indoor Residual Spraying in targeted districts

Subject to availability of funds, indoor residual spraying (IRS) will be implemented in targeted areas that have high prevalence as per malaria epidemiological profile. The NMCP will advocate and collaborate with local and international partners and mobilize funds for IRS. The IRS program will use only insecticides on the WHO prequalified list that show acceptable susceptibility for Liberia.

The program will target reaching a target of ensuring that at least 85% of structures in the targeted areas will be sprayed with approved insecticide. Quality assessments will also be done on spray quality (cone test) as well as vector monitoring in control and test sites. The NMCP and partners will conduct longitudinal insecticide resistance monitoring to inform the choice of insecticide for IRS and LLINs.

Strategy 2.3: Insecticide Resistance Monitoring

Currently, insecticide resistance monitoring is being conducted across all the 15 counties through seven sites for insecticide resistance testing. Findings from these monitoring exercises

have informed the program of a widespread resistance of pyrethriod across all 15 Counties. Additional findings from field data show that synergist + pyrethrioid did not restore full susceptibility of An. Gambiae sl population to pyrethriod.

Based on these findings, the MoH has switched from the conventional pyrethroid-treated nets to the New GenNet (chlorfenapyr + pyrethroid) for the 2021 mass campaign. To assess the new net efficacy, NMCP and PMI have decided to increase the number of sites for insecticide resistance and vector monitoring (VM). Insecticide resistance monitoring will continue and be expanded to include additional sites. This expansion will begin with engagement and assessment at the county level, followed by training of Environmental Health Technicians and CHAs.

Strategy 2.4: Entomological Surveillance

There has been marked progress in entomological monitoring in Liberia. Routine entomological monitoring is currently being carried out in 8 sites in 7 counties (Bomi, Grand Cape Mount, Grand Bassa, Margibi, Bong, Nimba and Lofa). This will be continued and expanded to cover all counties in line with recommendations. Entomological Indicators to be assessed in the new sites they will include vector composition, vector density, feeding behavior, resting behavior and host preference. Sporozoite rate or entomological inoculation rate (EIR) and supervision of vector control activities of Concession companies will also be conducted.

In line with the National IVM Policy and Strategy, the vector control unit will coordinate with relevant partners to expand surveillance sites, strengthen infrastructure and entomological monitoring across the country. A vector prevalence map of the country will be developed highlighting vector behavior, entomological inoculation rate, susceptibility, and location. The NMCP's insectary will be the central point for the rearing of laboratory malaria vector colonies in the country. It will serve as a testing site for new insecticides as they become available.

Strategy 2.5: Environmental and Larval Source Management

Based on current evidence, Liberia does not meet the WHO 3 Fs criteria (sites are few, findable and fixed) for effective larviciding. Therefore, activities will be conditional such as conducting larviciding in targeted areas that meet the WHO recommended principle of 3 Fs. To that end, the NMCP will continue planning and preparing for larviciding should the conditions become right in the period of this strategic plan.

Stakeholders will be engaged, and resources mobilized for larva source management. Relevant environmental technicians will be trained to identify and map breeding sites. Demonstration and awareness will be conducted in communities for basic larva identification and mechanical means used to reduce breeding sites while larviciding will target larva density reduction when the 3Fs criteria are met.

4.6.5 Strategic Intervention: Prevention of Malaria in Pregnancy (MIP)

Strategy 2.6: Strengthen and sustain IPTp at health facilities

Recognizing the adverse impacts of malaria on maternal and newborn health, Liberia has adopted the World Health Organization's (WHO) approach of addressing MIP. This approach includes the use of Sulfadoxine-Pyrimethamine (SP) as Intermittent Preventive Treatment of Malaria in pregnancy and is implemented at the health facility level. While ANC 4+ attendance is relatively high at 87%, coverage of IPTp 3+ remains low at 40%, and the program attributes this to late introduction of WHO IPTp policy. While more efforts will be made to better coordinate with the Family Health Division for IPTp intervention, a study to determine factors or barriers to uptake of IPTp services by pregnant women will be conducted to inform appropriate targeting of IPTp intervention.

SP will continue to be regularly supplied at health facilities for use by pregnant women as directly observed therapy (DOT) at every ANC visit after the first semester, a month between doses. The strategy will adopt the 2016 WHO policy that commends pregnant women to have at least eight ANC contacts during each pregnancy at recommended intervals. The first IPTp DOT will be given at 13 weeks. Pregnant women will be counselled to attend ANC as early as possible and encouraged to deliver in the health facilities. During health talks at health facilities, SBC activities will be included to improve use of IPTp services. All technical guidelines and IPTp schedule cards will be reviewed and revised where necessary and health workers trained in their use as appropriate.

Strategy 2.7: Gender-responsive, adolescent-friendly health services

This strategy specifically targets adolescents, particularly pregnant girls, who face unique barriers to accessing health facilities. The NMCP and its partners will liaise with the Family Health Division and Gender Ministry to leverage existing gender-responsive and youth friendly health services to benefit young and pregnant girls. This strategy will focus on (1) mental health, sexual and reproductive health including malaria; (2) innovation and digital health interventions created with and for adolescent boys and girls.

Strategy 2.8: Ensure availability of LLINs through ANC, EPI and institutional channels

While the mass LLINs campaign targets all members of the community, it does not specifically target pregnant women and infants that are most biologically vulnerable to malaria. Cumulatively, a total of 85,024 LLINs were distributed, through about 90% of health facilities, to pregnant women during first ANC visit and those who gave birth at those health facilities.[78] LLINs use by pregnant women is still low at 47%. Therefore, the LLINs distribution at health facility during routine services such as ANC and delivery will continue to ensure that those most at risk from complicated malaria are continuously protected and have access to LLINs.

[78] Health Facility Survey, NMCP, 2018

The NMCP will during the lifespan of this strategic plan consider using other channels such as schools as well.

Strategy 2.9: Building capacity of Trained Traditional Midwives (TTMs)/Traditional Birth Attendants (TBAs), CHA and CHSS to reach every pregnant woman

Community-based approaches to MIP (i.e. Community Intermittent Preventive Treatment for Malaria in Pregnancy) have been piloted and are part of WHO recommendations on implementation of MIP to expand the use of quality assured Sulfadoxine-Pyrimethamine by pregnant women. The NMCP will consider approaches such as decentralizing the administration of IPTp to the community level to address factors that limit access to health facilities such as, bad roads, hard-to-reach areas, difficulty in movement due to advanced stages of pregnancy, etc.

At the community level, the MCH Supervisor works with the CHAs especially the Trained Traditional Midwives (TTMs) to create awareness on MIP services and to improve coverage. The NMCP and partners will support TTMs/TBAs, CHAs and CHSS to continue community awareness on the importance of IPTp and LLINs usage by pregnant women. Emphasis will be placed on SBC to change wrong perceptions of some women that SP drugs have side effects, which could possibly explain the low uptake of IPT3+ even though ANC 4+ visit is high. They will be trained to conduct prompt referral of pregnant women to health facilities as well as data collection, compilation, and reporting.

In the second grant of the Global Fund's New Funding Grant for Malaria, innovative strategies, such as training TTMs and male partners on identifying gender related issues in relation to malaria prevention and treatment were tested and will be built on to further increase uptake of IPTp by pregnant women. Men's engagement strategies will be used to increase their involvement in maternal health and support their wives during pregnancy (emotional support, accompaniment to health services, transportation, and domestic responsibilities).

4.6.6 Strategic Intervention 5: Prevention of Malaria in Infants and children under five

Strategy 2.10: Intermittent Preventive Treatment During Infancy (IPTi)

Intermittent preventive treatment in infants (IPTi), a WHO approved strategy, involves the administration of an antimalarial drug (currently SP) three times to infants during routine vaccinations.[79] An increasing number of countries in sub-Saharan Africa are considering IPTi as recommended by the WHO. Given the high malaria burden in children under 5 years in Liberia, coupled with overall higher death burden in infants (about 67% of deaths in children under the age of five occur during the first year of life),[80] the programme will explore the possibility of introduction of IPTi-SP during the second to third year of this strategic plan after

[79] WHO Policy recommendation on IPTi-SP for P. falciparum malaria in Africa, 2010
[80] Key Indicators Report, Liberia Demographic and Health Survey, LIGIS, MOH, ICF, 2019-2020

gathering enough evidence to inform decision. Once the decision is made to introduce IPTi, the programme will plan and engage the EPI Division on the integration of IPTi service with routine EPI vaccine schedules at health facility and community level.

Strategy 2.11: Introduction of a Malaria Vaccine for children under five years

In 2019, WHO, with support from International organizations and donors launched the world's first malaria vaccine, RTSS in the pilot counties of Ghana, Malawi, and Kenya. Liberia will introduce the malaria vaccine if: 1) WHO recommends it for scale up beyond the pilot countries; 2) malaria vaccine is included in the Liberia Expanded Programme on Immunization (EPI) programme; and, 3) funds are available. When available, the vaccine will be given in four doses: three doses between 6 months and 9 months of age, and the fourth dose at 24 months (age of two years).

Objective 3: By 2025, promote and maintain a culture of evidence-based decision making to strengthen malaria program performance at all levels

The Surveillance, Monitoring, Evaluation and Operational Research (SMEOR) unit is composed of three sub-units: Surveillance, Monitoring and Evaluation and Operational Research within NMCP. At the sub-national level, the unit works with the county monitoring and evaluation officers, districts health officers, Officer In-Charge (OIC) and Registrars of health facilities to generate malaria data and routine reports.

The MTR Report of 2018 recognized that Surveillance, a key strategy for the Global Technical Strategy for WHO, was not well articulated in malaria control interventions and recommended that the Country fast-track the introduction of surveillance as a core intervention into their routine program management and M&E as a way of enhancing timely decision making. Strategic intervention for this objective will include a strengthened and improved surveillance system with quality data and information products to drive decision-making, as well as operational research to bridge implementation gaps.

Expected Results:

The expected results of implementation of this strategic objective shall be:

i) At least 90% of public and private health facilities have reported malaria cases and deaths on monthly basis
ii) At least 90% of estimated cases and deaths have been reported by the routine surveillance system
iii) Ensure 100% of all antimalarial commodities meet quality standards
iv) A responsive SMEOR that supports programmatic decision making
v) Regular availability of quarterly dashboards and quarterly and annual reports
vi) Availability of LMIS report every two years

4.6.7 Strategic Intervention 6: Malaria Surveillance, Monitoring, and Evaluation (SM&E)

Strategy 3.1: Strengthen and maintain malaria surveillance

Malaria surveillance in high burden settings is a new core intervention borne out of the Global Technical Strategy for 2016-2030. This intervention was initially monitored by the Integrated Disease Surveillance and Response (IDSR) under passive surveillance in Liberia. However, as recommended by the GTS, it has been elevated to a routine intervention for malaria control programs working in burden reduction settings. Under this intervention, the NMCP will conduct epidemiological surveillance, entomological surveillance and Post Market surveillance to guide informed decision-making.

Epidemiological surveillance will be conducted through regular analysis of routine data and to generate evidence-based information to guide program in making informed decisions. Key emphasis will be placed on severe malaria cases and malaria related death using trend analysis to inform the disease burden. Accurate and timely information on numbers of, and trends in malaria-associated deaths will be a key requirement for tracking the progress of malaria control moving forward. Concerted efforts will be made to ensure that all admissions for malaria to hospitals and health centers and malaria-related deaths in those health facilities are confirmed by a parasitological test and reported through a national surveillance system. Additionally, every confirmed case of malaria will be tracked and reported in the surveillance system to inform programme planning and implementation. Malaria surveillance will be facility based or, when necessary, community based. Community level surveillance will be implemented in areas that move to very low transmission level. The Program will develop a surveillance strategy to outline the methodology and key activities under epidemiological surveillance.

Entomological surveillance will be conducted through the collection of adult mosquitoes as well as larva to provide information malaria vector bionomics and dynamics, and insecticide resistance. Details of this strategy are contained in IVM Strategy under Objective Two. The updated National Policy and Strategic Plan for Integrated Vector Management will continue to guide all vector surveillance activities in the country.

Post-marketing surveillance is monitoring of the safety and quality of a pharmaceutical drug or medical device after been released on the market with the aim of identifying problems that may not have been recognized prior to approval, or that originate from the product not being manufactured or used correctly.

The GTS recommends that all countries in which malaria is endemic should ensure that all inappropriate antimalarial medicines are removed from private sector markets. National regulatory authorities are urged to regulate against production, marketing authorization, export, import and use of oral artemisinin-based monotherapies. Countries are also advised to take decisive steps, including surveillance and regulatory action as well as stringent follow-

up, to remove ineffective antimalarial medicines from health facilities and pharmacies, including their provision through informal providers. These efforts are crucial for preserving the efficacy of artemisinin-based combination therapies and will make a substantial contribution to accelerating progress on the path to eventual elimination.

The Liberia Medicines and Health Products Regulatory Authority (LMHRA) supports the Ministry of Health to ensure the quality, safety and efficacy of health commodities. In order to continue promotion of quality of antimalarial medicines in Liberia, the programme will support the LMHRA to conduct inspection of malaria medicines in public and private pharmacies, medicine stores and private and public health facilities in all 15 counties to determine the quality of medicine through quality control and quality assurance. The NMCP will also partner with LMHRA to conduct QA/QC for malaria diagnostic test kits, as well as conduct of malaria pharmacovigilance. Additionally, NMCP and partners will work with the LMHRA to enforce recommendations of the GTS such as:

- Removal of all inappropriate antimalarial medicines from private sector markets.
- Regulating against production, marketing authorization, export, import and use of oral artemisinin-based monotherapies
- Removal of ineffective antimalarial medicines from health facilities and pharmacies, including their provision through informal providers
- Creation of awareness on substandard and counterfeit medicines

Strategy 3.2: Improve data quality and use at all levels

The MoH has an integrated health management information system that collects and collates data at the level of health facilities and transmits to the district/county level for entry and use for decision-making. The District Health Information System version two software, (DHIS-2), is used to enter and transmit data from the county level to the national level. Since the HMIS is integrated, the system will need to be strengthened to benefit malaria control efforts as well. Periodic data quality review and national data harmonization meetings will be implemented along with the county health teams. Counties and districts will also be supported in data management and reporting. Special attention, in the form of focused training and mentorship, will be given to poor performing counties and health facilities, as well as high volume facilities.

Data quality improvement will be done through presentations using local and regional reporting templates, publication of quarterly malaria bulletin showing trends of incidence and key indicators, hosting of data review meetings at national and county levels, development of data quality improvement plans for use by all levels of the health systems, field coaching and mentorship for frontline data collectors and creating data demand and use at all levels. The SMEOR will also commission joint field visit along with county health teams and partners to implement data quality assessments in communities and health facilities that will trigger data quality improvement

Through provision of short-term data analysis training in the use of specialized statistical packages (STATA, NVIVO) and provision of statistical packages (GIS, NVIVO & STATA), national staff capacities will be built to better analyze data for decision-making. At lower levels, data analysis and use training will be cascaded for all data managers.

Considering that approximately 40% of the health sector is private, the private sector reporting has already been integrated into HMIS. In the past, collecting and reporting data from the private sector has often been challenging in some instances. The program in collaboration with other departments of MOH will support the improvement of reporting from the private sector through various means: sensitizing the private sector on HMIS reporting, training in HMIS and continuously collecting, collating and reporting malaria data through HMIS.

Strategy 3.3: Generate high quality information for decision-making

Periodic monitoring is conducted in collaboration with partners to track program interventions and provide technical support to the sub-national M&E functionaries (Registrars, OICs, DHOs and county M&E staffs). Annual review meetings are held to assess the program's performance aimed at mitigating implementation challenges. A Technical Working Group at the national level provides advisory and mitigates emerging challenges.

The role of program M&E is to track progress towards achievement of set targets. High quality information is necessary for programming decisions in this regard. The 2018 MTR findings revealed, among other things, the paucity of NMCP's own reports that should inform program management's decision-making. Even with the availability of HMIS system, there is lack of advanced statistical analytical tools and training for improved data analysis, which would increase program data utilization, and demand for decision-making.

To ensure availability of high-quality information for decision-making, the following will be implemented. M&E personnel capacities will be enhanced to coordinate M&E activities, data quality audits/assessments.

The culture of regular production of quarterly dashboards and quarterly and annual reports will be encouraged to track performances, document lessons learned, and disseminate results. These reports will be reviewed through regular SMEOR unit and TWG meetings. Performance reviews will be institutionalized at all levels, with annual and semi-annual reviews conducted at the national and county levels, respectively. Program reviews will be conducted at the mid-term and end-term of this malaria NSP. As part of its contribution to the general health system strengthening efforts, the program will provide support for the update, printing, and dissemination of the national indicators reference book. The NMCP will oversee and coordinate various activities and surveys that generate data for the program. These include population-based surveys like LMIS, post LLIN mass distribution survey, malaria behavior survey, health facility survey and other surveys. The Program will also partner with LISGIS to

conduct other population surveys (like the LDHS) with aim of capturing malaria-specific information, where necessary.

Strategy 3.4: Operational Research: Generate evidence to bridge implementation gaps

The purpose of operational or implementation research is to generate information to guide the implementation and management of the malaria control program. Findings help policymakers and program managers identify and solve program problems in a timely manner by making evidence-based program decisions to improve outcomes and achieve desired impact. The program already has an inventory of research activities, which will be updated and used to set an annual research agenda. Emerging research areas include studies on barriers to uptake of MIP services and factors influencing the periodic regional changes observed in malaria prevalence. Other studies will include TES, Malaria Episode Study, Compliance study and other studies on emerging gaps as the need arises.

Findings from priority research will provide evidence for programming decisions and stakeholders' meetings will be convened to disseminate research findings. Capacities will be built to conduct operational research, produce quality reports for presentation and publication, where necessary. NMCP will collaborate with other partners and institutions involved in operational research on malaria and efforts will be made to coordinate with all key stakeholders to widen the scope of information sources to periodically inform malaria-programming decisions.

Objective 4: By end of 2025, strengthen and maintain capacity for program management, coordination, and partnership to achieve malaria program performance at all levels

Over the next five years, the NMCP will strengthen its management and technical capacity to improve performance by establishing a clear organizational structure, fostering communication, collaboration and engagement with partners and other departments of MOH and various TWGs as well as planning for staff development. In addition, the NMCP will address the challenges identified during the mid-term review of the last strategic plan (2016-2020) in order to improve the overall program performance in areas of governance and program management, advocacy and SBC, procurement and supply chain management and epidemic preparedness and response.

Expected Results:

The expected results of implementation of this fourth strategic objective shall be:

i) At least 90% of health facilities have copies of national strategic plan, guidelines, SOPs and Job aids
ii) At least 90% partners' activities are aligned with NMCP annual work plan
iii) At least 20% of the funding for malaria control have been financed by domestic sources

iv) At least 80% of available funds were used
v) A costed business plan and work plan available for the malaria NSP
vi) The ZERO MALARIA STARTS WITH ME initiative begun in Liberia
vii) Capacity strengthened at all levels and Institutions strengthen to support malaria implementation
viii) A functional Malaria Steering Committee (MSC)
ix) A functional dashboard to routinely monitor key malaria indicators
x) At least 90% of caregivers and/or mothers of under five are familiar with malaria prevention signs and symptoms and take appropriate actions
xi) At least 90% of health facilities did not experience any out-of-stock of antimalarial
xii) Quarterly status report of malaria commodities

4.6.8 Strategic Intervention 7: Governance and program management

Strategy 4.1: Strengthen individual, institutional, and managerial capacities of the NMCP to plan and implement malaria control activities nationwide from a human rights-based perspective

Under this strategy, the program will disseminate the 2021-2025 malaria NSP, the updated programmatic guidelines, SOPs and Job aids in order to strengthen the national and sub-national capacity to deliver quality malaria control services at all levels. In addition, the NMCP/MOH, together with partners, will develop sustainability plan to avoid services interruption when the supporting donor and/or partner leaves the county. At the national level, capacity-building efforts for malaria control will concentrate in areas of program management for better planning, coordination of implementation, monitoring and evaluation as well as coordination of resources and partners towards a common goal. Capacities will also be built in technical areas as required according to assessment results.

Despite improvements in some counties, assessment results show that county health teams' capacities need to be improved in selected domains (including HR, supply chain, financial management, gender analysis and M&E). Also, counties need to be provided support to plan their activities. At the county level, the program will continue to provide technical and financial support to fully implement all core malaria control strategies defined in the strategic plan.

The program will liaise with central MOH to update health workers at all levels with skills and knowledge of malaria in areas of case management, integrated vector management, MIP, IEC/BCC, supply chain and surveillance, research, monitoring and evaluation. Under the new grant, health workers were trained on gender equality, human rights, and safeguarding children and young people in malaria program and this will continue.

Quarterly management visits will be conducted from central to counties, districts, and communities for feedback and to assess the progress of malaria interventions. Regular onsite mentoring will be conducted to enhance financial and program management capacities at

county level. County health teams will be supported to enhance their monthly supervision, M&E activities and last-mile distribution of commodities and supplies. County malaria focal persons will be trained to carry out their functions in the counties.

In collaboration with partners, a comprehensive annual operational plan (incorporating partners' plans) will be developed to guide implementation of malaria control activities. Through conduct of regular annual program review, the program will monitor the overall performance to ensure alignment with the malaria NSP and achievement of targets.

Management will routinely monitor progress toward achievement of the malaria NSP targets at midway and at the end of the malaria NSP to determine whether the program is on track in achieving targets as planned. The NMCP and stakeholders will decide whether there is a need to introduce remedial measures midway or revise the plan accordingly.

Strategy 4.2: Strengthen coordination, partnership, and private sector engagement

During the next five years, the program capacities will be strengthened to effectively collaborate with other government sectors and agencies, donors, implementing partners, corporate private sector, county, and civil society stakeholders. The program will provide leadership and information on malaria control and prevention strategies, policies and guidelines through various platforms like Malaria Steering Committee, Technical Working Groups, Technical Coordinating Committee and the Liberia Coordinating Mechanism to ensure that policies, norms and guidelines are understood and adopted by partners.

Under this strategy, the program aims to maximize partnership and contribution from the private sector, which constitutes about 40% of the health sector.[81] A private sector engagement strategy development is on-going to provide guidance for such engagement. The Program will work with other departments of the MOH to develop a strategy on how to engage the private sector for their involvement in malaria control. The program will develop a memorandum of understanding that will guide capacity-building efforts, provision of technical guidelines, treatment protocols and other tools to all private health facilities as needed.

Strategy 4.3: Advocacy and resource mobilization

The program will continue advocacy at higher levels of the Ministry of Health, Ministry of Finance and Development Planning and the Legislature for the purpose of elevating malaria control nationally. Currently, apart from the Government of Liberia, there are two major donors to the malaria control program in Liberia, the GFATM and PMI through USAID. The program will need to broaden the resource envelope if the multisectorial approach to malaria control is to be adequately supported to achieve the goal of malaria burden reduction in

[81] Data from Liberia Medicines and Health products Regulatory Authority

Liberia. Therefore, a programmatic and resource gap analysis will be conducted during the costing exercise to inform the development of a malaria business plan and resources mobilization strategy and plan (2021-2025) that is aligned to this strategic plan. The NMCP will use the business plan and resource mobilization plan to actively seek funding from other development partners, the corporate private sector as well as other domestic resources. The program and partners will conduct advocacy/fundraising meetings for domestic resource mobilization to endure a sustainable financing mechanism for malaria.

Strategy 4.4: Galvanize political will nationally and globally

The program will apply a coordinated country response to malaria control by instituting a multi-sectoral malaria coordination framework under the country's RBM structure to engage the presidency, ministries, parliament/legislature, local government, partners and private sector towards a common action framework for malaria control. This will be achieved by organizing several forums for engagement of political actors at all levels. Malaria control will now be a multi-sectoral disease of social and economic importance. To this end, a wide range of actors at all levels (national, county, district, health facility, community, and household) will be mobilized to implement key interventions and activities for maximum impact. Efforts will be made to implement best global guidance, policies, and strategies by all actors.

4.6.9 Strategic Intervention 8: Advocacy & SBC

Strategy 4.5: Reinforce advocacy for malaria prevention

Under this strategy, the program will identify and provide orientation for Malaria Ambassadors, who will be in various categories (national, county, health facility, youth community, pen-pen and *keh-keh* riders, celebrity artists, religious leaders, and the media). An advocacy plan will be developed and shared to promote and implement the SBC strategy. Advocacy meetings will be held with key stakeholders (Lawmakers, private companies, and other policy makers) to mobilize additional resources for malaria prevention and control. Also, advocacy for malaria prevention and control will be increased through training media, CSO, IEC/BCC, SBC stakeholders. Similarly, advocacy will be enhanced through routine talk shows.

The design and scope of SBC activities will be informed by data from population-based surveys like LDHS, LMIS, and malaria behavior survey; routine information systems like HMIS and CBIS; operational research, annual knowledge attitude and practice surveys; and other surveys. The NMCP and partners will develop an SBC strategic plan that will guide the implementation of all SBC activities, along with a new malaria slogan and song that aligns with the new vision and malaria epidemiology.

Strategy 4.6: Promote prevention by strengthening Information, education, and communication (IEC)

Knowledge and perceptions of malaria prevention has had the highest coverage. Since 2016, almost all women have heard of malaria (99%); among women who have heard of malaria,

95% know that the illness can be avoided, and 90% know that mosquitos transmit malaria from person to person.[82] The IEC activities that contributed to this high coverage will be maintained as the program focuses on social and behavior change as well. The 2016 LMIS results showed that the number of cell phone users has increased over the past years and the program will use that opportunity for transmission of malaria messages. As an added value to gains made, IEC materials that will be produced will also consider messaging involving both mother and father as key partners in malaria prevention for themselves and their children. Given that social media is currently one of the most frequently used medium for broadcasting and publication of information, whereby the public has grown high interest, the establishment of a social media platform to increase awareness on malaria prevention and control Is imperative. NMCP shall create a social media platform to dissimilate malaria information to social media users. NMCP shall endeavor to host periodic talk show on radio aimed at spreading malaria prevention and control messages.

Standardized materials on malaria that present its causes, prevention and situation in the country and county, will be produced, and distributed using various media including print, electronic, social media as well as during daily health talks at health facilities. SBC interventions will also create awareness on availability of substandard, falsified, and counterfeit medicines on the market. The 2020 malaria behavior survey will guide the program in identifying the SBC gaps and the best strategies and channels to address the gaps.

Strategy 4.7: Improve Social Mobilization and Marketing

The NMCP will develop a Malaria SBC partner mapping to ensure coordination of SBC activities. The Malaria SBC technical working group will coordinate SBC activities and form a link with the MOH Health Promotion Division. The program will support revision, printing and dissemination of SBC materials including guide for service providers, health talks for facilities and provide orientation to health workers on the use of SBC guide. In collaboration with partners, the program will develop a social marketing strategy for the procurement and distribution of antimalarial medicines and LLINs for private-for-profit health facilities and private medicines stores.

Strategy 4.8: Strengthen and sustain community engagement to promote effective health seeking behavior amongst the population

Community participation and support is key to enhanced access and utilization of available services. The SBC strategy recommends use of a multi-channel approach, with a combination of various communication channels mutually reinforcing each other, to scale up BCC activities at the community level. At the individual level, the programme will support the conduct of interpersonal communication meetings in high burden communities using Community Health

[82] Liberia Malaria Indicators Survey, LISIGIS & MOH, 2016

Assistants. CHAs will be empowered to educate target audience through interpersonal communication and provision of provider and client support materials.

At the community level, various groups will be identified and provided orientation to enhance malaria prevention and control activities following the launch of the zero malaria death campaign. The programme will support town hall meetings with communities and monthly advocacy and sensitization meetings with local leaders (youth, women, teachers, Religious leaders, traditional healers) in all 15 counties.

The countrywide coverage of awareness level on malaria causes, prevention and management is high at 98% and about 90% of women correctly identify the cause of malaria with 88% correctly identifying the ways to prevent malaria. Translating knowledge into practice is still lagging and more community engagement strategies are needed to bridge this gap. For instance, although 97% of the population knew that malaria could be treated, 78% of children with fever were sent to health provider for management, while timely care seeking occurred for only 32%.[83] Thus, a study will be conducted to determine barriers preventing parents from translating knowledge on malaria into practice (use of ITNs, sending children with fever to health facility on a timely basis and adults going to health facilities).

County and community level communication activities will be supported with aim to change social norms influencing care for the child's health within the home and community, the use of ITNs for pregnant women and children under five and IPTp for pregnant women. A national level media campaign will be conducted to address and empower parents regarding home-based management of malaria, treatment adherence, use of ITNs and importance of IPTp for pregnant women.

Strategy 4.9: Address gender gaps to promote access to, and use of malaria services

As shown in a 2018 process evaluation report,[84] adolescents, particularly pregnant girls, faced unique barriers including: 1) being frequently unable to access health facilities independently (health staff requiring the presence of an adult), 2) shame related to their pregnancy, 3) poor adherence and refusal to access resources often requiring extensive follow-up from healthcare workers, 4) lack of social support due to absent fathers of their babies, and 5) language barriers at the health facility.

The NMCP will work with other departments of MOH and other ministries to remove these barriers through provision of gender-responsive, adolescent-friendly, and inclusive health services all over the country. SBC activities will target adolescent girls, health workers, parents, and the general public to reduce barriers associated with attitude and behavior that affects access to better health services for adolescent girls and children under five.

Strategy 4.10: Strengthen SBC at health facilities

[83] Liberia Malaria Indicator Survey, LIGIS, MOH, 2016

[84] Process Evaluation Report, Plan International, 2018

Interpersonal communication strategies targeting health workers at all levels will be employed in order to increase uptake of malaria prevention and control interventions such as LLINs use and benefit, especially among pregnant women and children under five; IPTp and IPTi benefit and use among pregnant women and children, respectively; and promote adherence to national strategic plan and guidelines for patient management.

4.6.10 Strategic Intervention 9: Procurement and Supply Chain Management (PSM)

Strategy 4.11: Ensure availability and access to antimalarial drugs and other commodities at all levels

PSM is a key support function for the implementation of malaria control strategy because malaria remains a commodity-heavy program in Liberia with bulk of financing going to procuring malaria commodities and supplies. PSM, a core input function in malaria control is largely controlled and managed externally by the Supply Chain Management Unit (SCMU) at MOH and Central Medicine Store (CMS) with limited influence of the program on the strategic decision-making and oversight and allocation of resources. Additionally, the continued use of the push system at county level has led to both overstock and under stock of commodities across different health facilities. Stock out of antimalarial medicines and commodities adversely impact malaria control efforts.

Technicians will continue to be trained on the use of quantification tools/software to conduct quantification exercise for all anti-malaria commodities nationally. Quantification workshops will be conducted to appropriately forecast, procure needed malaria commodities, and distribute to all health facilities and communities.

The NMCP will collaborate with the CMS and SCMU to share data and stock status for antimalarial commodities including LLINs at all levels. In collaboration with the CMS, a targeted supply chain and distribution plan for all levels (Public, Non-for-Profit and Community) will be developed to guide distribution decisions. Programmatic data on malaria burden and geographic areas will be used to guide malaria commodity distribution in the country.

The programme will continue monitoring of health facilities and provision of on the job training (OJT) where necessary. A reward system will be established for facilities that report PSM information regularly and on time. Actions shall be taken against facilities that will be irregular in submitting PSM reports.

Strategy 4.12: Strengthen commodity security and diagnostic functions to prevent stock outs and expiries

A dedicated PSM officer/specialist with the appropriate expertise and skillsets (to be determined by TWG) will be provided to manage all malaria supply chain issues at program level including conducting regular malaria commodities gap analysis, supply planning as well

as critical supply chain reviews. The program will institute a mechanism to quarterly publish malaria (and other health commodities) stock status and pipeline situation indicative of stock on hand at national, county and if possible, health facility levels. The program will participate in regular commodity security coordination meetings with key stakeholders for information sharing, decision-making and actions that promote commodity security across the country.

In collaboration with the SCMU, the entire timing, process and utilization of the post-distribution checks and assessments will be revisited to ensure use of the information for real-time corrective action as opposed to meeting financial utilization purposes. National quantification reports and joint supply plan for the entire country will be regularly produced, irrespective of supply sources.

Strategy 4.13: Strengthen systems and provide tools for PSM

The NMCP will advocate and provide technical expertise to the Pharmacy Division for the revision and production of the Essential Medicines List (EML) and the Standard Treatment Guidelines (STG). The NMCP will contribute and participate in the training conducted for clinicians and mentors on the EML & STG. The program will support the roll out of full implementation of m-Supply software to the 15 counties depots, including introduction of barcoding technology to improve inventory management at that level. Support will be provided in the use of wambo by training of supply chain officers and logisticians. Additionally, the program will collaborate with the SCMU to revise and ensure continuous availability and use of logistics management and information system tools and SOPs (technical guidelines, manuals and treatment protocols and supervisory checklist).

4.6.11 Strategic Intervention: Epidemic Preparedness and Response

Strategy 4.14: Preparedness and timely response during emergencies

Epidemics, such as the Ebola virus disease outbreak of 2014 and the current Lassa fever outbreak and Covid-19 pandemic disrupt routine health care service delivery (including malaria services). Consequently, this can lead to increase in the number of malaria cases and deaths. Because Liberia cannot afford such reversal in the gains made with malaria control, it is essential that the NMCP provides specific technical guidance for the continuity of malaria interventions, including prevention of infection and disease, care and treatment of cases, testing, clinical services, supply chain, laboratory and SBC activities in the context of public health emergencies.

The NMCP will use evidence from HMIS data to identify areas of increased malaria transmission to put in place a trigger mechanism for timely response. The NMCP, in collaboration with the National Public Health Institute (NPHIL), will work to determine the magnitude of any emergency by conducting assessment of the area(s) affected and responding appropriately. Where necessary, the Program will evidence-based recommendations to tailor malaria services to ensure that the prevention of malaria infection,

illness and death through preventive and case management services is maintained in a safe environment for patients, clients, and staff. NMCP also recognizes that every disease outbreak or crisis affects people differently based on their gender identities. Therefore, as part of the assessment, applying gender analysis will be considered.

5 IMPLEMENTATION FRAMEWORK OF THE MSP

5.1 Implementation plan

Together with partners and key stakeholders, detailed activities based on main activities for each strategy per objective will be defined and years of implementation determined. The unit, partner, or agency responsible for each key activity will also be clearly defined to ensure accountability and avoid duplication. **Annex II** contains detailed activities for the five-year period of this Strategic Plan.

5.2 Implementation arrangements

5.2.1 Planning and implementation mechanisms

The NMCP's strategic and operational plans are developed in line with the objectives of the Essential Package of Health Services of the Health Services Department. The CMO of the Health Services Department approves the Program's quarterly activities.

All malaria stakeholders will be encouraged to contribute to information sharing, joint planning, and the monitoring of performance of malaria interventions. Annual operational planning for the Ministry of Health begins after Annual Health Review, which coincides with the national budgeting period. The program will coordinate annual planning with all partners and at all levels and ensure alignment with the MOH's operational planning. A detailed mapping and inventory of all partners involved in malaria activities in the country will provide basis for engagement and rationalization of resources. Implementation roles and responsibilities will be determined based on comparative advantage. Table 7 describes the proposed implementation levels and roles of the different partners in the malaria program.

Table 7: Proposed implementation levels and roles of key stakeholders

Implementation Level	Stakeholder	Role
	Ministry of Health, NMCP	Policy formulation, supervision, capacity building, quality assurance, setting standards, guidelines, partner coordination, planning, reviews, surveys, monitoring and evaluation, resource mobilization, surveillance, operational research
	MFDP	Resource mobilization, budget allocation and financing the Malaria National Strategic Plan
	Other ministries and agencies (education, agriculture, EPA, MIA etc.)	Foster a multi-sectoral partnership with MOH in malaria control leveraging on their respective mandates

National	WHO	● Technical guidance in the implementation of malaria control interventions. ● Financial support to implement malaria control interventions; ● Evidence-based norms/standards to guide the implementation of interventions. ● Technical assistance in procurement and distribution of commodities. ● Assistance in conducting monitoring and evaluation activities such as surveys and operational research
	Global Fund	● Financial/commodity support to implement malaria control interventions. ● Technical assistance in procurement and distribution of commodities; ● Assistance in conducting monitoring and evaluation activities such as surveys and operational research ● Technical guidance in the implementation of malaria interventions ● Monitoring drugs quality
	U.S. President's Malaria Initiative (PM)	● Financial/commodity support to implement malaria control interventions; ● Technical assistance in procurement and distribution of commodities; ● Assistance in conducting monitoring and evaluation activities such as surveys and operational research. ● Technical guidance in the implementation of malaria interventions ● Technical expertise in SBC strategy development and implementation ● Vector control and monitoring
	Other Bilateral & Multilateral Partners	● Financial/commodity support to implement malaria control interventions; ● Technical assistance in procurement and distribution of commodities; ● Assistance in conducting monitoring and evaluation activities such as surveys and operational research. ● Technical guidance in the implementation of malaria interventions
	Regulatory authorities (LMHRA, LMDC, LBNM, LPB)	● Quality control of malaria products ● Regulate professional standards of Doctors, Nurses, Midwives, Pharmacists, etc

	Local and INGOs	Implementation of malaria prevention, treatment and control
	Health training institutions	Collaborate in capacity building for malaria control
	Corporate entities	Provide financial support through corporate social responsibility
	Universities and research institutions	Conduct research to provide technical evidence for policy formulation and capacity building
	Media Institutions	Promote malaria prevention and control through airing of messages
Regional	Regional Support Teams	Provide support to regionally planned malaria interventions and studies such as sentinel sites and LMIS
County	Superintendents	Chair county health board, advocacy, resource and community mobilization, supervision of implementation
	County Health Teams	● Planning, management and supervision of health facilities, community and private sector/NGO ● Data compilation and transmission to MOH ● Coordination of partners at county level
	Local political leadership	Advocacy, resource and community mobilization, supervision of implementation
	INGOs	Support implementation of malaria prevention, treatment and control
	Civil Society Organizations	Advocacy, community mobilization & holding implementers accountable to citizens and beneficiaries
	County Hospitals	Implementation and supervision of health centers and clinics, data collection and transmission to county
District	District Health Teams	Planning and implementation of malaria control interventions Supervision of health centers, clinics and communities, data collection and transmission to county health teams
	Health Facilities	Service provision for malaria case management, MIP, supervision of communities, data generation for collection and transmission by district health teams
Community	CHAs	Health promotion, iCCM implementation, referrals and keeping health records
	TTMs, TBAs	Implementing community IPTp, defaulter tracing of pregnant women, referrals
	Community-based organizations	Advocacy, community mobilization & holding implementers accountable to citizens and beneficiaries

At time of development of the strategic plan, several partners were already operating in Liberia. Table 8 below provides the summary of their nature of program, area of work and

geographical coverage. Annually, the program will continue to update this table to reflect the overall changing partnership landscape.

Table 8: Partners' area of work and geographical coverage

Implementing partner	Name of Program	Area of work	Geographical Areas
Ministry of Health	Fixed Agreement Reimbursement Agreement (FARA0	Implementation of MIP and Case Management activities by CHTs.	**6 Counties:** Bong, Lofa, Nimba, Grand Cape Mount, Grand Gedeh, River Gee
World Health Organization	N/A	Technical guidance, protocols, guidelines and standards and implementation support	National
Jhpiego	Strategic Technical Assistance for Improved Health Systems (STAIP)	Technical assistance to CHTs for MIP, Case Management, and SM&E activities; OR addressing IPTp uptake.	**12 Counties:** Bong, Lofa, Nimba, Grand Cape Mount, Grand Gedeh, River Gee; Bomi, Montserrado, Margibi, Grand Bassa, Grand Kru, Maryland
International Rescue Committee (IRC)	Partnership for Advancing Community-based Services (PACS)	Technical assistance, training, and materials for iCCM	**6 Counties:** Bong, Lofa, Nimba
Abt Associates	PMI VectorLink	Entomologic monitoring; entomological and epi monitoring of impact of nets distributed in 2021 campaign.	National
Research Triangle International (RTI)	Read Liberia	School-based LLIN distribution	**Initially will cover 3 counties**: Nimba, Margibi, Montserrado
Chemonics	Global Health Supply Chain Procurement and Supply Management (GHSC PSM) Malaria	Procurement of ITNs, SP, RDTs, ACTs, and severe malaria medicines; warehousing and distribution of commodities; strengthening the supply chain system at the CMS and CHT levels; EUVs; eLMIS.	National
U.S. Pharmacopeial Convention (UPS)	Promoting the Quality of Medicines Plus (PQM+)	Antimalarial drug quality monitoring; support to LMHRA.	National
John Hopkins Center for Communication Programs (JH/CCP)	Breakthrough Action	SBCC technical assistance at the central, county, school, and community level.	National
ICF International	PMI Measure Malaria	LTTA to strengthen NMCP M&E capacity.	National

ICF International	MEASURE DHS	Support the 2022 MIS	National
U.S. Government	Peace Corps	Inclusion of malaria messages in schools, as well as community activities.	National
National Technical Information Service (NTIS)	Malaria Data Integration and Visualization for Elimination (M-DIVE)	Develop Liberia PMI and NMCP capacity for data analysis and use	Central Level
PATH	Digital Square	Develop digital systems and structures for accessing information in real time	Central Level
Plan International		iCCM	Bomi, Margibi, Parts of Lofa and Nimba
Partners in Health			
Last mile Health	National Community Health Systems (NCHS)	1. Direct implementation of NCHAP; program monitoring and quality improvement; program research and innovation 2. Technical support for CHSD/NCHAP and County Health Teams	1. Grand Bassa, Rivercess, parts of Grand Gedeh 2. National level and in Grand Bassa, Rivercess, Grand Gedeh
UNICEF		Integrated Community Case Management (iCCM)	
World Bank		Case management, MIP, SBC, SM&E	River Cess, Sinoe, Gbarpolu
Clinton Health Access			

Capacity Building Plan

In year one of this malaria NSP, a robust capacity assessment will be conducted to determine individual and institutional capacity needs. A revised capacity building plan will then be developed and implemented throughout the period of implementation of the strategic plan. The **proposed organogram** for NMCP is shown in figure 15.

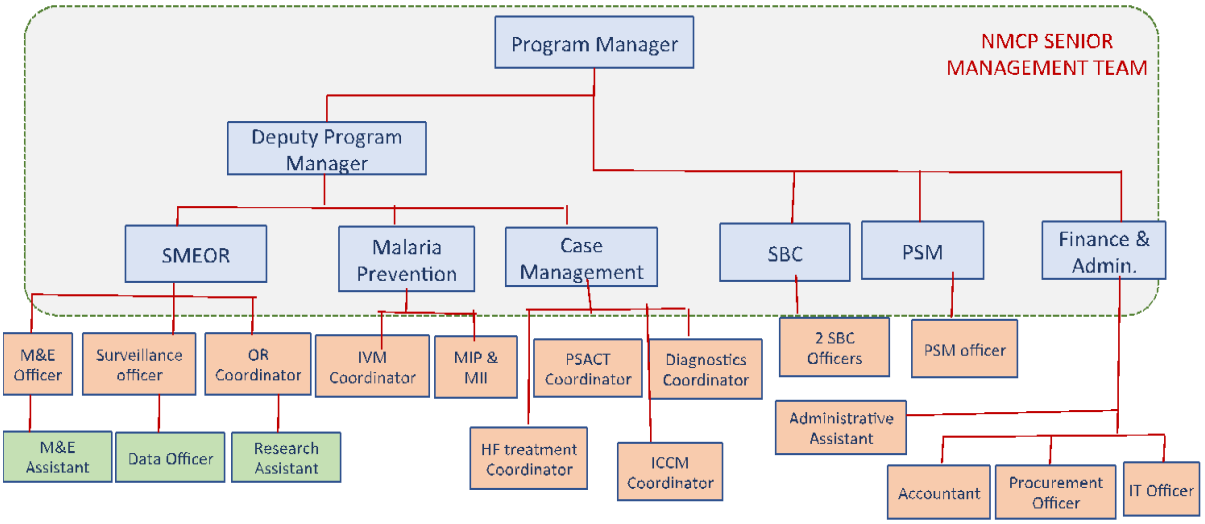


Figure 15: Proposed NMCP organogram

5.2.2 Partnership and coordination system

During the next five years, the NMCP will institute a multi-sectoral malaria coordination framework under the country's RBM structure to engage the presidency, ministries, parliament/legislature, local government, partners and private sector towards a common action framework for malaria control. This will be instituted and will be the focus for national level coordination and galvanization for common action for malaria control and reduction towards the GTS goal for 2030.

The existing malaria coordination mechanism is the Malaria Steering Committee diagrammed in Figure 13. This will be strengthened at all levels to bring together all partners implementing malaria control activities and key stakeholders to discuss malaria control related activities and find solutions to implementation challenges.

LEVEL	MECHANISM IN PLACE	TOR/MANDATE	MEMBERSHIP
MoH Ministerial Level	Health Coordinating Committee (HCC)	Multisectoral partners coordination within the health sector, policy direction	MoH Management, Health Dev't Partners
Program (NMCP) Level	Malaria Steering Committee (MSC)	Malaria program strategy, malaria program partners coordination, strategic reviews, program quality	NMCP Management Malaria Partners
County Health Services Level	General CHT Mechanism	County health services provision, quality and management	County Health Management Team, Partners in counties
District Health Services Level	General CHT Mechanism	District health services provision, quality and management	DHMT, Partners in districts

Figure 16: Current Malaria Coordination Structures/Mechanisms in Liberia

Functional coordination structures also exist for the two major donors (PMI and The Global Fund) and other implementing partners and will be regularly attended by the programme management to enhance its coordination and stewardship role.

There are several TWGs established for coordination of malaria control per thematic area, including case management, M&E, private sector engagement mechanisms, malaria commodity security, integrated vector control/management and malaria health promotion/SBC and these will continue to be strengthened to play those roles as necessary.

5.2.3 Financial resource management

Funds for implementation of the strategic plan will be mobilized from the GOL, donors and the private sector. Financial resource management will be based on both government and donors' financial management policies, where necessary. Funds allocated to NMCP, county health teams, other sectors, implementing partners, research institutions and civil society will flow to these entities according to established processes and procedures and will be managed using appropriate fund management systems in a transparent and equitable manner for implementation of the strategic plan. During implementation of the strategic plan, financial reviews and audits will be conducted to ensure value for money and financial compliance.

5.2.4 Risk management plans

The malaria interventions may be hampered by the following anticipated risks, which should be mitigated for the successful implementation of the malaria NSP as outlined in table 9.

Table 9: Potential Risk and Mitigation Plan

Potential Risk	Potential impact *(high, moderate or low)*	Risk mitigation plan
Inadequate funding	High	Rationalize and integrate interventions using available resources where necessary and use evidence to advocate for additional funding
Complex financing mechanisms	Moderate	Advocate for simplified financing mechanisms using evidence to justify
Over-reliance on donor funding	High	Use evidence and resource mobilization plan to mobilize domestic resources
Fragmented programming and implementation	Moderate	Use evidence to advocate for a harmonized joint planning and implementation
A non-responsive health supply chain system with dysfunctional last mile component	High	Support SCMU through by mobilizing needed resources for RSSH and support last mile distribution and system strengthening
Low profile of the NMCP within MOH structure	Low	Advocate for elevation of NMCP within MOH structure
Poor working environment	High	Engage MOH and partners for support
Inadequate and poorly motivated staff	High	Advocate for adequate support for staff
Continuous low coverage of SBC interventions	High	Use evidence to inform intervention decision

Increasing resistance to insecticides	High	Use evidence from insecticide monitoring to inform selection of insecticides
Limited use of private sector	Moderate	Engage private sector using

5.3 Budget and resource mobilization plan

5.3.1 Costing methodology

The costing was guided by the WHO guide "Estimating cost implications of a national health policy, strategy or plan[85]" and other best practices. The goal-oriented approach was the costing principle used where costing was made on basis of which interventions and strategic approaches will make the most impact on the long-term results. Activity-based costing approach was applied with every cost item estimated based on activity level estimation of need, burden, and direct linkage to the overall national strategic direction. Unit costs for every key aspect was obtained from previous budgets and factor of inflation applied where required. Where none is available, industry level estimates were obtained and adapted to country context as much as possible. The detailed analysis of costs by component and interventions is provided in Annex 3 while costing tool applied is a standalone document.

5.3.2 Summary of Estimated Cost of five-year Malaria Strategic Plan

The total estimated cost of implementing this strategic plan to attain the acceleration of country target towards malaria elimination is **USD 211,960,857.28** over the five years period. The estimated cost per annum is shown in table 10 below while the detailed costs and financial gap analysis presented in **Annex 3**.

Table 10: Summary cost of the strategic plan by year *(All costs are in USD)*

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Objective 1	14,344,877	15,208,497	12,999,594	6,653,549	15,238,998	64,445,515
Objective 2	774,106	599,115	10,622,838	223,755	3,077,976	15,297,791
Objective 3	12,734,791	16,581,125	18,263,918	18,142,367	16,874,515	82,596,715
Objective 4	9,309,048	9,646,786	11,655,146	9,454,646	9,555,211	49,620,836
Totals	**37,162,823**	**42,035,523**	**53,541,495**	**34,474,316**	**44,746,700**	**211,960,857**

5.3.3 Resource mobilization plan

The main sources of financing for malaria response in Libera are GoL, The Global Fund and US Government. It is estimated that over the period of this strategic plan, with GoL taken to maintain same trend, 49% of the estimated cost of this strategic plan will be funded jointly. There is greater need to mobilize further resources domestically to increase the overall resources envelope.

[85] Stenberg K, Rajan D. Chapter 7. Estimating cost implications of a national health policy, strategy or plan. In: Schmets G, Rajan D, Kadandale S, editors. Strategizing national health in the 21st century: a handbook. Geneva: World Health Organization; 2016.

In this strategic plan, regular gap analysis will be conducted and linked to the overarching malaria business plan that will focus on tapping into new avenues for planning. In first year of the MSP, the country will develop a business plan, engage state and non-state actors, and explore immediate and long term approaches for integrating and mainstreaming malaria into other sectors as a mechanism of finding additional direct and indirect investments.

6 MONITORING AND EVALUATION FRAMEWORK

The Monitoring & Evaluation framework to be used in measuring progress in implementation of this malaria NSP is described in the performance framework and will be further detailed in the M&E Plan to be developed. The two main M&E responsibilities will be: a) tracking progress in implementing malaria control and prevention interventions and b) tracking progress in meeting set targets and milestones. The M&E framework consists of the performance framework, data management system and M&E coordination mechanisms.

6.1 Performance framework

There are sets of indicators proposed in this performance framework outlined in **Annex I**, which will be used in tracking performance towards achieving outcomes and impact of the malaria NSP objectives and goal, respectively. The agreed indicators (adapted mostly from WHO) and corresponding targets are. Additional details, including definitions, methods for tracking of program progress for impact, outcome, output, process and inputs, will be presented in the monitoring and evaluation plan.

The tracking of achievement of outputs, outcomes and impact will use a variety of sources of information including: routine HMIS, the weekly IDSR system, population-based household surveys (LDHS and LMIS) and other surveys such as: health facility surveys. Other information sources will include, sentinel surveillance system, IRS monitoring system, drug efficacy testing, insecticide resistance monitoring, pharmacovigilance, demographic surveillance systems, supervision, administrative information systems (e.g., commodity procurement and distribution data) and operational research studies.

HMIS will provide continuous data from patient care settings; while surveys will compliment this data with population-based information but only on an intermittent basis (LDHS every 5 years; Liberia Malaria indicator Surveys [LMIS] every 2-3 years); Information will be compiled and synthesized and feedback provided through periodic reports, bulletins, and newsletters and various presentations to summarize the information obtained. This collective documentation will be made available to partners, donors and the communities through various opportunities and channels including conferences/workshops, coordination and technical working group meetings, annual review and planning meetings, peer-reviewed publications, and the NMCP and partner websites.

6.2 Data management system and flow

At the county level, malaria data are collected from communities and health facilities using standardized ledgers for various interventions and entered from a paper-based reporting form into the DHIS2 platform at the county level. The central MOH hosts a server that is the repository of routine data. Figure 16 presents a schematic view of the HMIS data flow from

the community to national level. Specialized studies and research data are managed on computers, external drives and web sites.

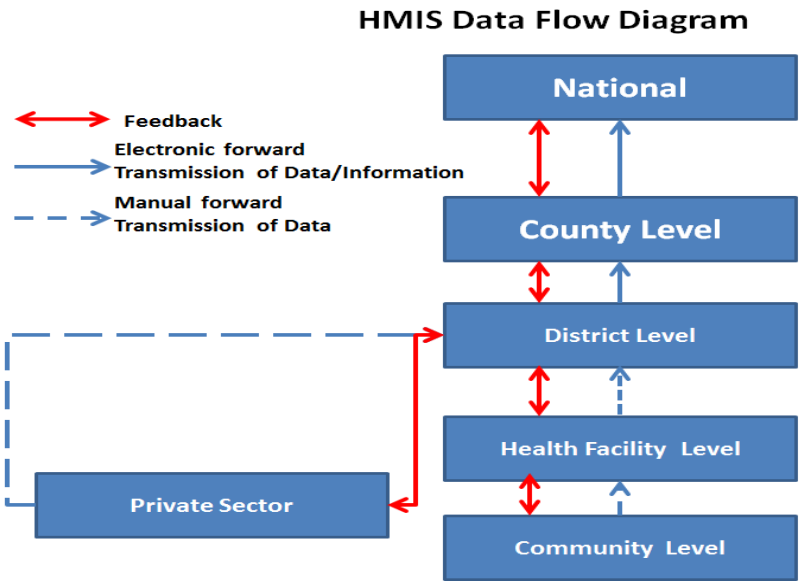


Figure 19: A schematic view of HMIS data flow- Source, Final Draft M&E Plan, NMCP, 2015

6.2.1 Data quality assurance

Quality information is essential to improving health outcomes. Therefore, vigorous effort shall be made to improve the quality of data that will be used for decision-making. The NMCP, collaborating with the central MOH, will continue to use instituted measures for data quality assurance which includes quarterly data verification or data quality audits, quarterly data review meetings, and training in data use for action.

6.2.2 Data warehousing and processing

MOH has an integrated data management system (including data on malaria) with data warehousing at central MOH and county kevels using the DHIS2 platform. The program will contribute to data managers' capacity-building efforts in managing all data generation processes that include data collection, analysis and reporting.

6.3 Dissemination and use of information products

To improve coordination and information sharing, the NMCP will make information and information products accessible to the general public through various platforms including the Ministry of Health website (www.moh.gov.lr); media; and coordination and review meetings. Periodically, and depending on the level, the below information and information products shall be made available and accessible:

- Monthly, quarterly and annual reports on the implementation status of the malaria program
- Quarterly and annual dashboards, newsletters, bulletins, fact sheets and brochure

- Publications on research and other specialized studies and surveys
- Presentations at local and international scientific meetings

6.4 Malaria M&E coordination mechanisms

Various coordination mechanisms exist at all levels as previously described. At the program level, the Malaria Steering Committee brings together key partners to discuss and make decisions while various thematic working groups (TWG) exist to coordinate technical aspects of their specific intervention.

All heads of thematic areas of NMCP work closely with their counterparts either at the MOH or other implementing partners to coordinate their respective activities. For example, the PSM TWG group works with Supply Chain Unit of MOH, PCU of Global Fund, the Central Medicine Store, Chemonics and other partners, while the SMEOR TWG works closely with HMER, NPHIL, Measure Evaluation and other partners in coordinating malaria M&E activities. The only TWG with evidence of holding quarterly review meetings with counties is the SMEOR Unit. The unit has recently begun meeting with the Montserrado County Health team on a quarterly basis to discuss data related issues, a move that contributes to strengthening malaria M&E, considering Montserrado County has close to 30% of health facilities in the country, more than two-third of which are private-for-profit. This will be further strengthened and expanded where applicable to improve M&E coordination.

ANNEXES

List of Annexes:

Annex I: Glossary

Annex II: Performance Framework

Annex III: Estimated Cost of Strategic Plan and gap analysis

Annex 1: Glossary

Artemisinin-based combination therapy	A combination of an artemisinin derivative with a longer-acting antimalarial drug that has a different mode of action
Coverage	A general term referring to the fraction of the population of a specific area that receives a intervention
Diagnosis	The process of establishing the cause of an illness, including both clinical assessment and diagnostic testing
Directly observed therapy	Treatment administered under the direct observation of a health care worker
Drug Efficacy	Capacity of an antimalarial medicine to achieve the therapeutic objective when administered at a recommended dose, which is well tolerated and has minimal toxicity
Endemicity, Level of	Degree of malaria transmission in an area
Endophagy	Tendency of mosquitoes to blood-feed indoors
Endophily	Tendency of mosquitoes to rest indoors
Entomological inoculation rate	Number of infective bites received per person in a given unit of time, in a human population
Epidemic	Occurrence of a number of malaria cases highly in excess of that expected in a given place and time. Where the disease occurs on a consistent basis.
Epidemiology	The study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to the control of health problems
Essential Medicines List	A list of basic medicines that satisfy the health care needs of the majority of the population.
First-line drug	First-line drugs are first administered for diseases, and are usually chosen due to less side effects and high clinical effectiveness
First-line treatment	Treatment recommended in national treatment guidelines as the medicine of choice for treating malaria
Global Technical Strategy	The Global Technical Strategy for Malaria 2016–2030 was adopted by the World Health Assembly in May 2015 and provides a comprehensive framework to guide countries in their efforts to accelerate progress towards malaria elimination
Household	The ecosystem, including people and animals occupying the same house and the accompanying vectors
Incidence	Number of newly diagnosed malaria cases during a defined period in a specified population

Indoor residual spraying	Operational procedure and strategy for malaria vector control involving spraying interior surfaces of dwellings with a residual insecticide to kill or repel endophilic mosquitoes
Insecticide	Chemical product (natural or synthetic) that kills insects
Insecticide resistance	Property of mosquitoes to survive exposure to a standard dose of insecticide; may be the result of physiological or behavioral adaptation
Insecticide-treated net	A net (usually a bed net), designed to block mosquitoes physically, that has been treated with safe, residual insecticide for the purpose of killing and repelling mosquitoes, which carry malaria
Integrated Vector Management	Rational decision-making for optimal use of resources for vector control with the aim to improve the efficacy, cost-effectiveness, ecological soundness, and sustainability of vector control activities against vector-borne diseases.
Intermittent preventive treatment in infants	A full therapeutic course of sulfadoxine-pyrimethamine delivered to infants in co-administration with DTP2/Penta2, DTP3/Penta3 and measles immunization, regardless of whether the infant is infected with malaria
Intermittent preventive treatment in pregnancy	A full therapeutic course of antimalarial medicine given to pregnant women at routine prenatal visits, regardless of whether the woman is infected with malaria
Larvae	An immature stage of a developing mosquito
Larvicide	Substance used to kill mosquito larvae
Long-lasting Insecticide-treated nets	A factory-treated mosquito net made of material into which insecticide is incorporated or bound around the fibres. The net must retain its effective biological activity for at least 20 WHO standard washes under laboratory conditions and 3 years of recommended use under field conditions
Malaria Case Management	Diagnosis, treatment, clinical care, counseling, and follow-up of symptomatic malaria infections
Malaria control	Reduction of disease incidence, prevalence, morbidity, or mortality to a locally acceptable level as a result of deliberate efforts.
Malaria Eradication	Permanent reduction to zero of the worldwide incidences of infection caused by human malaria parasites as a result of deliberate activities
Malaria incidence	The number of newly diagnosed malaria cases during a specified time in a specified population
Malaria mortality rate	Number of deaths from malaria per unit of population during a defined period
Malaria risk stratification	Classification of geographical areas or localities according to factors that determine receptivity and vulnerability to malaria transmission

Malaria/parasite Prevalence	Proportion of a specified population with malaria infection at one time
NVivo	A qualitative data analytical program
Parasite	Any organism that lives in or on another organism without benefiting the host organism
Parasite density	Number of asexual parasites per unit volume of blood or per number of red blood cells
Plasmodium	Genus of protozoan blood parasites of vertebrates that includes the causal agents of malaria. *P. falciparum*, *P. malariae*, *P. ovale* and *P. vivax* cause malaria in humans
Plasmodium falciparum	Dominant species of malaria in Liberia
Population at risk	Population living in a geographical area where locally acquired malaria cases have occurred in the past 3 years
Population, target	An implementation unit targeted for activities or services (e.g. prevention, treatment)
Post-marketing surveillance	The practice of monitoring the safety of a pharmaceutical drug or medical device after it has been released on the market and is an important part of the science of pharmacovigilance
Rapid diagnostic test	Immunochromatographic lateral flow device for rapid detection of malaria parasite antigens
Resistance	The ability of an organism to develop ways to be impervious to specific threats to their existence.
RTS,S	WHO Malaria vaccine candidate and represents its composition
Seasonal transmission	Transmission that occurs only during some months of the year and is markedly reduced during other months
Severe adverse event	An adverse event is any undesirable experience associated with the use of a medical product in a patient
Severe/complicated malaria	Acute falciparum malaria with signs of severe illness and/or evidence of vital organ dysfunction.
Slide positivity rate	Proportion of blood smears found to be positive for *Plasmodium* among all blood smears examined
Social Mobilization	The process of bringing together all societal and personal influences to raise awareness of and demand for health care, assist in the delivery of resources and services, and cultivate sustainable individual and community

Sporozoite rate	Percentage of female *Anopheles* mosquitoes with sporozoites in the salivary glands
Standard Treatment Guidelines	List of the preferred pharmaceutical and non-pharmaceutical treatments for common health problems experienced by people in a specific health system
Sulfadoxine-Pyrimethamine	A drug used to prevent malaria in certain vulnerable groups
Surveillance	Continuous, systematic collection, analysis and interpretation of disease-specific data and use in planning, implementing and evaluating public health practice
Suspected malaria	Illness suspected by a health worker to be due to malaria, generally on the basis of the presence of fever with or without other symptoms
Transmission season	Period of the year during which most mosquito-borne transmission of malaria infection occurs
Uncomplicated malaria	Symptomatic malaria parasitaemia without signs of severity or evidence of vital organ dysfunction
Vaccine	A preparation that stimulates an immune response that can prevent an infection or create resistance to an infection
Vector	In malaria, adult females of any mosquito species in which Plasmodium undergoes its sexual cycle (whereby the mosquito is the definitive host of the parasite) to the infective sporozoite stage (completion of extrinsic development), ready for transmission when a vertebrate host is bitten
Vector control	Measures of any kind against malaria-transmitting mosquitoes, intended to limit their ability to transmit the disease

Annex 2: Performance Framework

Indicators	Baseline		Targets				
	Year/Source	Value	2021	2022	2023	2024	2025
Goal: To reduce malaria incidence and deaths by at least 75 percent of the 2016 levels by 2025							
Malaria Parasite Prevalence in children U5 (Slide)	2016/MIS	45%		28%			11%
% Children aged 6–59 months with haemoglobin measurement of <8g/dl)	2016/MIS	8% (<7g/dl)		5%			2%
Objective 1: By end of 2025, reduce malaria mortality rates by at least 75% (18/100,000 population) compared to 2016 (172/100,000 population)							
Malaria deaths per 100,000 population	2019/HMIS, MIS	71	53	46	36	25	18
Malaria mortality in children U5 per100,000 population	2019/MIS, HMIS	338	253	219	169	118	85
% of suspected malaria cases that received a parasitological test at public health facilities according to national guidelines	2019/HMIS	93%	95%	96%	97%	98%	98%
% of suspected malaria cases that received a parasitological test at private health facilities according to national guidelines	2019/HMIS	??	50%	65%	70%	75%	80%
% of Suspected malaria cases that received a parasitological test in private Pharmacies and Medicine stores (PSACT)	TBD/HMIS	TBD	TBD	TBD	TBD	TBD	TBD
% of suspected malaria cases in children under five that received a parasitological test at community level (ICCM)	2021/HMIS	TBD	50%	60%	70%	80%	90%
% of confirmed uncomplicated malaria cases that received first-line antimalarial treatment according to national guidelines at public health facilities	2019/HMIS	63%	68%	73%	78%	83%	90%
% of confirmed uncomplicated malaria cases that received first-line antimalarial treatment according to national guidelines at private health facilities	2019/HMIS	35%	46%	57%	68%	79%	90%

% of Confirmed uncomplicated malaria cases that received first-line antimalarial treatment according to national policy in private pharmacies and medicine stores (PSACT)	TBD/HMIS	TBD	TBD	TBD	TBD	TBD	TBD
% of confirmed uncomplicated malaria cases that received first-line antimalarial treatment according to national guidelines at community level	2019/HMIS	78%	80%	82%	84%	86%	90%
% of confirmed severe/complicated malaria cases managed at public health facilities according to nationally recommended treatment guidelines	2019/HMIS	25%	35%	50%	65%	80%	80%
% of confirmed severe/complicated malaria cases managed at private health facilities according to nationally recommended treatment guidelines	2019/HMIS	35%	46%	57%	68%	79%	90%
Proportion of children under five years old with fever in the last two weeks for whom treatment was sought within 24 hours	2016/MIS, DHS	32%		39%			46%
% of children under five with severe/complicated cases that received appropriate pre-referral treatment according to national guidelines (iCCM)	TBD/HMIS	TBD	25%	35%	50%	75%	90%
% of community health assistants with no stock-out of antimalarial medicines over last or over last seven days	2019/eLMIS	81%	83%	85%	87%	89%	90%
Proportion of anti-malarials that are efficacious	2018/TES report	100%	100%	100%	100%	100%	100%
Objective 2: By end of 2025, reduce malaria case incidence by at least 75% (76/1,000 population) compared to 2016 (380/1,000 population)							
Malaria incidence per 1,000 population	2019/HMIS	238	209	180	151	122	95
Malaria incidence in children under five per 1,000 population	2019/HMIS	603	532	451	380	321	228
% of households with at least one LLINs for two persons	2019/MIS, DHS	25%	55%			85%	
% of households owning at least one LLINs	2019/MIS, DHS	55%		73%			90%

% of general population at risk of malaria that slept under an ITN the previous night before the survey	2019/MIS, DHS	39%		55%			65%
% of under-5 Children who slept inside an LLIN the previous night	2019/MIS, DHS	44%		62%			80%
% of pregnant women who slept inside an LLINs the previous night	2019/MIS, DHS	47%		64%			80%
% of pregnant women using ANC services who received appropriate IPT 3+ during their pregnancies in ANC health facilities	2019/HMIS, MIS, DHS	40%	45%	50%	60%	66%	69%
% of children under one year who received appropriate IPTi 3 during EPI services	TBD/HMIS	TBD	TBD	25%	35%	45%	55%
% of population in targeted districts protected by IRS	TBD/Annual reports	TBD	60%	63%	80%	85%	85%
% of structures targeted for IRS that are sprayed	IRS Annual reports	N/A	65%	70%	80%	85%	85%
% of population residing in areas with few, findable and targeted vector breeding sites protected by larval source management larvicides	TBD/Annual report	TBD	TBD	10%	25%	45%	60%
Objective 3: By end of 2025, promote and maintain a culture of evidence-based decision making to achieve malaria program performance at all levels							
% of public/private health facilities reporting malaria cases and deaths on a monthly basis	2019/HMIS	85%	88%	90%	90%	90%	90%
% of estimated cases reported by the routine surveillance system	TBD/ HMIS	TBD	50%	80%	90%	90%	90%
% of estimated deaths reported by the routine surveillance system	TBD/HMIS	TBD	50%	80%	90%	90%	90%
Number of instances where studies were used to inform program decision	2019/Annual reports	3	5	5	5	5	5
Number of post-market quality assessments conducted on malaria medicines	2018/LMHRA report	3	2	2	2	2	10

Objective 4: By end of 2025, strengthen and maintain capacity for program management, coordination and partnership to achieve malaria program performance at all levels							
% of caregivers and/or mothers of under 5 familiar with malaria signs and symptoms who take appropriate actions	2016/MIS, DHS	78%		84%			90%
% of pregnant girls (aged 10-19) with knowledge of malaria prevention methods who utilized MIP services	TBD/MIS, DHS	TBD		25%			50%
% of partners' activities that are aligned with NMCP annual work plan	TBD/Annual report	TBD	50%	75%	90%	90%	90%
% of health facilities no stock out of antimalarial and diagnostics (RDTs) over last one month	TBD/LMIS	TBD	75%	90%	90%	90%	90%
Proportion of health facilities with no stockout of all tracer malaria commodities over last one moth			60%	70%	80%	85%	90%
% of total funding for malaria control financed	TBD/ Financial report		50%	70%	85%	90%	90%
% of total funding utilized	TBD/ Financial report		50%	65%	75%	80%	80%
% of the funding for malaria control financed by domestic sources	2016/ Financial report	16%	17%	18%	19%	20%	20%
% of domestic funds utilized	TBD/Financial report		40%	55%	65%	75%	80%
% of women correctly identifying the cause of malaria	2016/MIS, DHS	90%		95%			95%
% of women correctly identifying the ways to prevent malaria	2016/MIS, DHS	88%		95%			95%

Annex 2: Detailed breakdown of Strategic Plan costing

Annex 2A: Cost by strategy (all costs in USD)

Summary by Strategy	Year 1	Year 2	Year 3	Year 4	Year 5	MSP Total
Strategy 1.1: Strengthen clinical laboratory capacity of health workers and health facilities	2,293,568	2,697,707	2,880,412	2,051,342	2,223,747	**12,146,777**
Strategy 1.2 Improve QA/QC for RDT and Blood Slides (Microscopy)	249,939	256,769	1,467,779	274,829	346,829	**2,596,146**
Strategy 1.3: Strengthen Health worker capacity to manage uncomplicated and complicated malaria	2,192,493	1,435,546	1,984,577	116,222	242,696	**5,971,535**
Strategy 1.8: To conduct Therapeutic Efficacy Studies (TES) of antimalarial	-	2,876,517	-	-	-	**2,876,517**
Strategy 1.9: Ensure rational use of malaria commodities	-	384,515	-	-	-	**384,515**
Strategy 2.7: Gender-responsive, adolescent-friendly health services	129,720	149,790	129,720	-	-	**409,230**
Strategy 2.9: Building capacity of Trained Traditional Midwives (TTMs)/Traditional Birth Attendants (TBAs), CHA and CHSS to reach every pregnant woman	211,970	211,970	211,970	-	-	**635,910**
Strategy 2.11: Introduction of a Malaria Vaccine for children under five years	-	237,355	237,355	223,755	237,355	**935,820**
Strategy 3.1: Strengthen and maintain malaria surveillance (Epidemiological, entomological & post-marketing)	512,744	496,294	357,782	325,782	325,782	**2,018,384**
Strategy 3.2: Improve data quality and use at all levels	3,160,110	3,034,466	3,193,691	2,702,716	2,702,716	**14,793,699**
Strategy 3.3: Generate high quality information for decision-making	1,518,900	33,450	1,517,500	17,500	1,551,500	**4,638,850**
Strategy 3.4: Operational Research: Generate evidence to bridge implementation gaps	4,417,123	3,993,233	1,597,853	1,165,158	7,845,728	**19,019,093**
Strategy 4.5: Reinforce advocacy for malaria prevention	581,909	97,886	216,931	97,886	254,399	**1,249,011**
Strategy 4.6: Promote prevention by strengthening Information, education and communication (IEC)	1,161,111	4,172,705	4,367,705	3,821,245	1,084,125	**14,606,891**
Strategy 4.7: Improve Social Mobilization and Marketing	-	1,199,340	1,062,900	1,199,340	1,199,340	**4,660,920**

Strategy 4.8: Strengthen and sustain community engagement to promote effective health seeking behaviour amongst the population	1,707,735	2,213,640	1,744,665	2,213,640	2,213,640	**10,093,320**
Strategy 4.9: Address gender gaps to promote access to, and use of malaria services	249,321	353,801	334,761	269,801	353,801	**1,561,483**
Strategy 4.11: Ensure availability and access to antimalarial drugs and other commodities at all levels	9,034,716	8,543,754	10,536,956	10,540,455	11,769,210	**50,425,091**
Strategy 4.1: Strengthen individual, institutional and managerial capacities of the NMCP to plan and implement malaria control activities nationwide from a human rights-based perspective	9,298,049	9,635,786	11,644,146	9,443,646	9,544,211	**49,565,836**
Strategy 2.6: Strengthen and sustain Intermittent Preventive Treatment in pregnancy at health facilities	432,417	-	8,415,313	-	2,840,621	**11,688,351**
Strategy 4.2: Strengthen coordination, partnership and private sector engagement	11,000	11,000	11,000	11,000	11,000	**55,000**
Strategy 2.1: Ensure and sustain universal access to LLINs	-	-	1,628,480	-	-	**1,628,480**
Total	**37,162,824**	**42,035,523**	**53,541,495**	**34,474,316**	**44,746,700**	**211,960,857**

Annex 2B: Financial gap analysis

Note: This gap analysis build on the previous data from 2018 to show the country landscape. All costs in US Dollars

	2018	2019	2020	2021	2022	2023	2024	2025	2021-2025 total costs
Total MSP need	28,264,686	30,473,516	34,469,129	37,162,824	42,035,523	53,541,495	34,474,316	44,746,700	211,960,858
Funded	15,376,547	24,091,672	31,305,376	33,947,628	16,648,508	4,981,796	5,081,432	5,181,068	65,840,432
Gap	12,888,139	6,381,844	3,163,753	3,215,196	25,387,015	48,559,699	29,392,884	39,565,632	146,120,426
Known Funding sources									
GoL	2,081,328	4,602,409	4,694,457	4,788,346	4,884,113	4,981,796	5,081,432	5,181,068	24,916,755
USG	13,295,219	12,392,277	12,588,959	13,715,054	11,764,395	0			25,479,449
Global Fund		7,096,986	14,021,960	15,444,228					15,444,228
Others									0