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MALI MALARIA PROFILE

I. ABOUT

Launched in 2005, the U.S. President's Malaria Initiative (PMI) supports implementation of malaria prevention and treatment measures as well as cross-cutting interventions. PMI's 2021–2026 strategy, *End Malaria Faster*, envisions a world free of malaria within our generation with the goal of preventing malaria cases, reducing malaria deaths and illness, and eliminating malaria in PMI partner countries. PMI currently supports 24 countries in sub-Saharan Africa and three programs across the Greater Mekong Subregion in Southeast Asia to control and eliminate malaria. Mali began implementation as a PMI focus country in FY 2007. Please see the Mali Malaria Operational Plan for more information on PMI's approach and investments.

II. CONTEXT

Malaria remains a major public health concern and priority for Mali because it is the leading cause of morbidity and mortality, particularly in children less than five years of age and pregnant women. According to data from the district health information system 2 (DHIS-2), 37 percent of outpatient consultations and 33 percent of deaths at health facilities were due to malaria in 2021.[1]

Table 1: General Demographics and Malaria Situation

Population	22,294,000 (As of the end of 2023, National Directorate of Population/*Direction Nationale de la Population* Mali population projection)
Population at risk of malaria	22,294,000
Malaria prevalence	19 percent (Malaria Indicator Survey [MIS], 2021)
Malaria incidence/1,000 population at risk	150 /1000 (DHIS2, 2021)

[1] DHIS2, Extracted on 4/24/2022 (Percent of death = Number of deaths due to malaria / all-cause of deaths)

The government of Mali, in partnership with funding partners, research institutions, and national and international organizations, has achieved impressive gains in malaria control over the past decade. Malaria prevalence in children under five years of age declined from 47 percent in 2012[2] to 19 percent in 2021,[3] and all-cause child mortality decreased by 28 percent, from 126 deaths per 1,000 live births in 2009 to 101 deaths per 1,000 live births in 2018.[4] However, between 2018 and 2021, Mali experienced a dramatic upsurge in malaria cases. During that period, malaria cases increased from 133 per 1,000 population in 2018 (2,613,592 million cases) to 150 per 1,000 population in 2021 (3,204,488 million cases).[1] This could be explained by 1) improved reporting; 2) the impact of COVID-19 on malaria activity implementation; and 3) no seasonal malaria chemoprevention (SMC) implementation in 2021 in 16 health districts due to a lack of funding.

Malaria prevalence varies across regions, from a minimum of less than 2 percent in Bamako to a maximum of 26.6 percent in Mopti region.[3] *Plasmodium falciparum* accounts for 85 percent of malaria infection, and the main malaria vectors are *An. gambiae* and *An. funestus.*[5]

STRATIFICATION

In 2021, the National Malaria Control Program (NMCP) conducted a national malaria stratification exercise using malaria incidence adjusted for health center attendance rate and ecological determinants. The stratification differentiated four transmission levels based on the World Health Organization (WHO) classification scheme: very low, low, moderate, and high transmission. This new stratification will help the NMCP to tailor malaria interventions to the geographical context, orient resources and actions to areas with the highest malaria burden, increase efficiency, and guide actions to prevent resurgence where cases have been extremely low.

Based on the new malaria classification, the NMCP recommends diagnosis and treatment for case management, insecticide-treated mosquito nets (ITNs), indoor residual spraying (IRS), intermittent preventive treatment in pregnancy (IPTp), and SMC in the areas of low to high malaria transmission. In the very low malaria transmission area, all the interventions combined with mass drug administration, case investigation, and epidemic responses are recommended.

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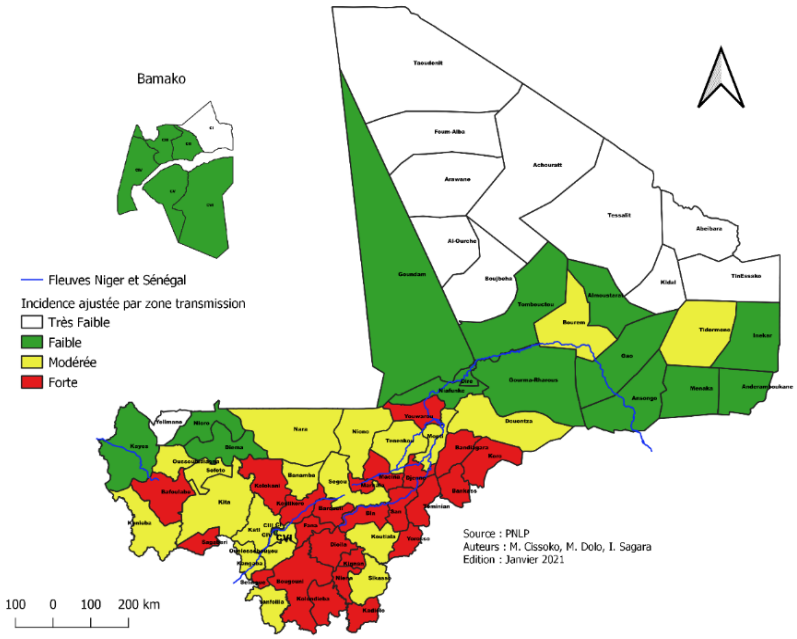
[2] Demographic and Health Survey (DHS), 2012

[3] MIS, December 2021

[4] DHS, 2018

[5] Keïta M, Baber I, Sogoba N, Maïga HM, Diallo M, Doumbia S, et al. *Transmission vectorielle du paludisme dans un village du bord du fleuve Niger et son hameau de pêche* (Kéniéroba et Fourda, Mali). Bull Soc Pathol Exot. 2014;107:356–68.

Figure 1: Malaria Stratification Adjusted by Health Facility Attendance Rate, 2021

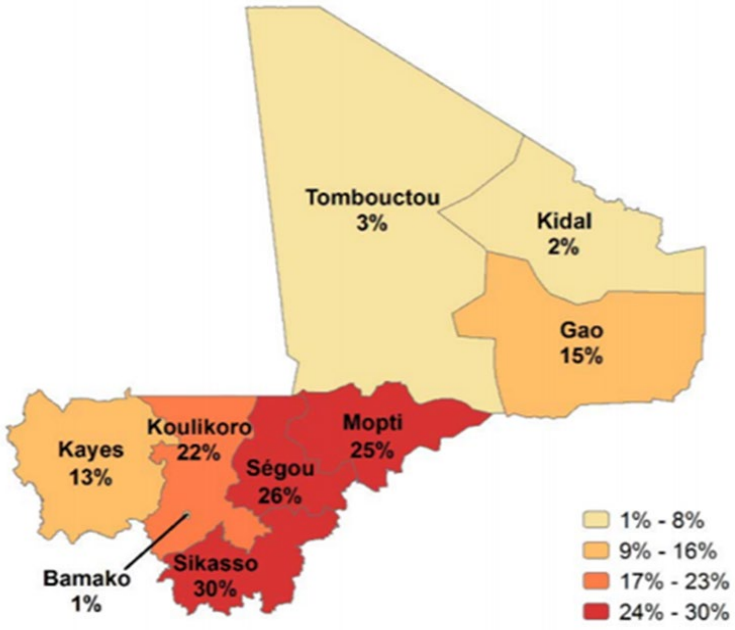


Source: 2021 NMCP Malaria Stratification in Mali

The following maps show results from recent national surveys (DHS, 2018 and MIS, 2021). The prevalence of malaria in children under five years of age remained at 19 percent.

Figure 2a: Map of Malaria Prevalence by Region, 2018

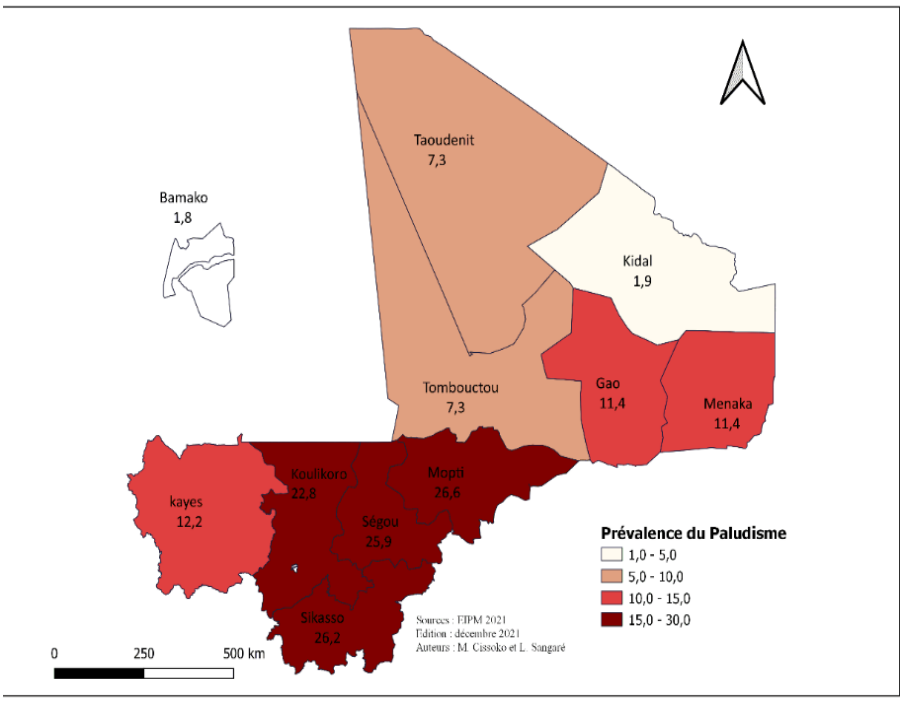
Children 6 to 59 months of age who tested positive for malaria by rapid diagnostic test (RDT).



Source: DHS, 2018

Figure 2b: Map of Malaria Prevalence by Region, 2021

Children 6 to 59 months of age who tested positive for malaria by RDT.



Source: MIS, 2021

Figure 3: Malaria Incidence Adjusted by Health Facility Attendance Rate, 2021

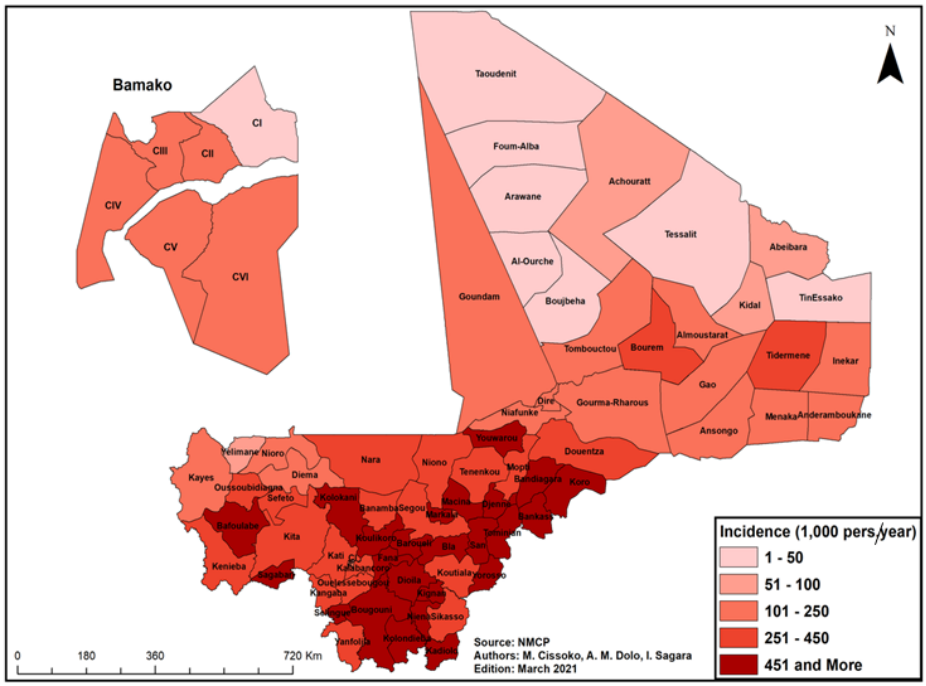


Table 2: Malaria Parasites and Vectors

Principle Malaria Parasites	*Plasmodium falciparum*, *Plasmodium malariae*, *Plasmodium vivax* and *Plasmodium ovale*.
Principle Malaria Vectors*	*An. gambiae* s.l *An. funestus*, *An. pharoensis*, *An. Rufipes*

*See **Entomological Monitoring** section of the Malaria Operational Plan for more details on vector bionomics and insecticide resistance and **Indoor Residual Spraying** section for details on residual efficacy.

COUNTRY HEALTH SYSTEM

The health system in Mali is made up of all the public, private, and community-based sectors, as well as the professional health orders. The administrative head of the health system is the Ministry of Health and Social Development (MHSD). The NMCP falls under the MHSD. Mali's public health system is structured by levels, each having a defined technical and administrative platform:

1. The operational level consists of Health Districts, which have an administrative office, a Referral Health Center (CSREF), community health centers (CSCOMS), and community health workers (CHWs). CSREFs are managed by a doctor, offer specialized services, and serve as the first level of patient referral. CSCOMs are managed by a doctor-in-charge, with assistance from nursing and administrative staff. CHWs provide integrated community case management (iCCM) services for children less than 5 years of age nationwide, and malaria community activities. At the end of 2021, there were 72 CSREFs, 1,495 CSCOMs, and about 3,303 CHWs. Malaria diagnosis is performed using RDTs at the community level while microscopy is used at the district health facility level.

2. The regional level consists of eight hospitals, which provide technical support to the first level and serve as the next level of referral facilities, including for severe malaria cases.

3. The central level is primarily responsible for defining health policy, providing overall strategic and technical direction, investments, and operations.

As of 2018, there were 2,343 private health facilities, including 628 care facilities, 163 clinics, and 13 polyclinics (Health Statistics Directory, 2018), all capacitated to provide malaria diagnostic and management. The private sector remains insufficiently involved in the implementation of health programs in the country.

Recent studies indicate that geographic distance, the quality and cost of health services, as well as social and cultural factors continue to constrain access to care for

women living in rural communities.[6] In Mali, more than 40 percent of the population lives more than five kms from a health facility.[7] To address access challenges, the Malaria in Pregnancy Technical Working Group, co-chaired by the NMCP and the National Reproductive Health Sub-Directorate, is actively advocating for the administration of IPTp by CHWs once a pregnant woman has initiated antenatal care (ANC).

The objective of the National Pharmaceutical Policy is to make medications accessible to the population and promote their rational use. The Central Medical Store (*Pharmacie Populaire du Mali*) is responsible for supplying, storing, and distributing essential medicines (including malaria commodities) throughout the country. It works in close collaboration with the drug regulatory authority and the NMCP.

The Health Management Information System (HMIS) is used to collect routine data for the country's health statistics. This system uses specific tools for collecting data and preparing monthly activity reports. The transmission and storage and analysis of data is done through the DHIS2 platform. Routine malaria data are disseminated through monthly bulletins, malaria annual reports, and dashboards. The Integrated Disease Surveillance and Response system is used to collect data on specific diseases, including malaria, from health facilities on a weekly basis to allow a prompt reaction in case of an epidemic situation. Data from mass campaigns (ITNs, IRS, SMC) are collected through DHIS2-specific systems. Data quality control is done through data reviews, semi-annual data quality audits, and supervision.

OTHER CONTEXTUAL INFORMATION

The socio-political and security shocks facing Mali since 2012 have led to a significant number of internally displaced persons and the number of food-insecure people remains very high. Terrorism in the northern and central regions of the country have hampered health service provision, access to care and quality of care. Sanctions imposed by the Economic Community of West African States in response to the coup threaten to impact revenue, commercial investments, and cross-border transactions. Additionally, the COVID-19 pandemic worsened an already deteriorating human resources situation within the health sector. As a result, the country experienced substantial declines in access to health care, which translated into increased morbidity and mortality.

[6] Hill et al, 2014 Webster et al, 2013 and Breakthrough Research, 2020.
[7] HMIS, 2018.

III. NMCP STRATEGIC PLAN

In 2021, the National Malaria Strategic Plan was revised and extended to 2024. The Strategic Plan builds on the success achieved and lessons learned during the implementation of the previous strategies and reflects the country's aspiration to reach the epidemiological threshold of pre-elimination by 2030. To do so, control actions will be strategically oriented according to epidemiological characteristics.

By the end of 2024 the NMCP aims to:

- Reduce the malaria mortality rate by at least 50 percent compared to 2015.
- Reduce the incidence of malaria by at least 50 percent compared to 2015.
- Strengthen the coordination and management capacities of the Program at all levels.

To achieve this, the NMCP will implement eight primary intervention areas: program management and coordination; integrated vector management; malaria in pregnancy; SMC; diagnosis and case management; social mobilization and advocacy; malaria epidemic response; surveillance, monitoring, evaluation; and operations research.

The 2022-2024 strategic plan is founded on the principles and values of:

- Equity in access to quality care for all
- Policy and management decision-making based on data
- Improvement of health governance
- Synergy with the MHSD and other ministries for more integrated control
- Increased support from all malaria partners
- Effective involvement of communities in the malaria control process

IV. KEY MALARIA DATA

EVOLUTION OF KEY SURVEY-BASED MALARIA INDICATORS

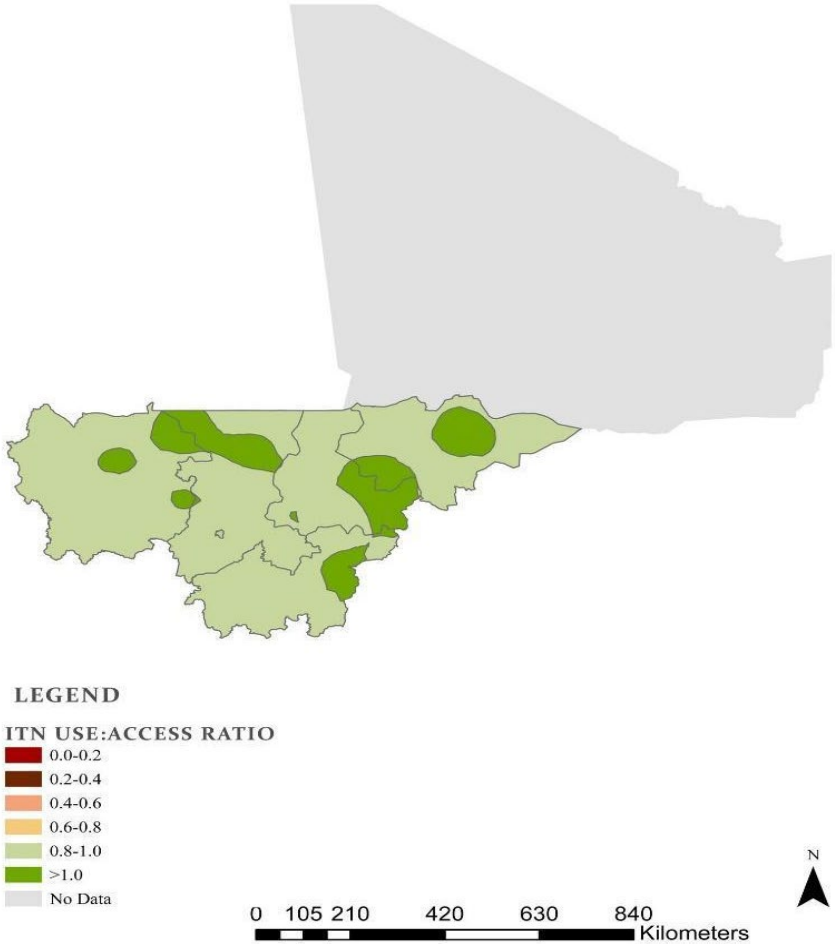
Table 3. Key Survey Indicators

Indicator	2006, DHS	2015, MIS	2018, DHS	2021, MIS
% Households with at least one ITN	50	93	90	91
% Households with at least one ITN for every two people	16	39	55	44
% Population with access to an ITN	30	70	75	72
% Population that slept under an ITN the previous night*	21	64	73	73
% Children <5 years of age who slept under an ITN the previous night*	27	71	79	74
% Pregnant women who slept under an ITN the previous night*	29	78	84	76
% Children <5 years of age with a fever in the last two weeks for whom advice or treatment was sought	56	49	53	60
% Children <5 years of age with a fever in the last two weeks who had a finger or heel stick	N/A	14	16	24
% Children receiving an ACT among children <5 years of age with a fever in the last two weeks who received any antimalarial drug	N/A	29	31	15
% Women who attended 4 ANC visits during their last pregnancy	35	37	43	n/a
% Women who received three or more doses of IPTp during their last pregnancy in the last two years	6	21	28	35
<5 mortality rate per 1,000 live births	191	N/A	101	N/A
% Children <5 years of age with parasitemia by microscopy*	N/A	36	N/A	N/A
% Children <5 years of age with parasitemia by RDT*	N/A	32	19	19

DHS: Demographic and Health Survey; MIS: Malaria Indicator Survey

*The 2018 DHS and the 2015 and 2021 MIS were conducted during the high transmission season.

Figure 4: ITN Use:Access Ratio Map



Source: DHS, 2018

Table 4: Evolution of Key Malaria Indicators Reported through Routine Surveillance Systems

Community-level data are integrated into the broader HMIS, and these numbers are inclusive of both community- and health facility-level data.

Indicator	2017	2018	2019	2020	2021
# All-cause patient consultations	N/A	N/A	5,565,689	5,803,617	6,257,879
# Suspect malaria cases[1]	2,910,831	3,572,794	4,500,669	4,335,950	4,849,246
# Patients receiving diagnostic test for malaria[2]	3,013,954	3,456,601	4,251,656	3,664,852	4,551,537
Total # malaria cases[3]	2,215,846	2,613,592	3,270,384	3,373,227	3,561,574
# Confirmed cases[4]	2,215,846	2,613,592	2,884,372	2,667,070	3,204,488
# Presumed cases[5]	N/A	N/A	386,014	706,095	357,086
% Malaria cases confirmed[6]	100%	100%	88%	79%	90%
Test positivity rate (TPR)[7]	74%	76%	68%	73%	70%
Total # children <5 years of age malaria cases[8]	905,282	1,020,499	1,065,218	916,244	1,185,827
% Cases in children <5 years of age[9]	43%	44%	37%	38%	33%
Total # severe cases[10]	667,268	756,404	877,213	849,086	1,229,414
Total # malaria deaths[11]	1,050	1,001	1,454	1,708	1,480
# Facilities reporting[12]	1,357	1,376	1,455	1,535	1,533
% Data completeness[13]	96%	97%	99%	98%	98%

1 Number of patients presenting with signs or symptoms possibly due to malaria (person with a fever or history of fever without any other warning signs that can cause fever); 2 RDT or microscopy, all ages, outpatient and inpatient; 3 Total reported malaria cases; all ages, outpatient and inpatient, confirmed and unconfirmed cases; 4 Diagnostically confirmed; all ages, outpatient and inpatient; 5 Clinical/presumed/unconfirmed; all ages, outpatient and inpatient. N/A indicates that data are missing in DHIS2; 6 # confirmed cases divided by total # cases; 7 Confirmed cases divided by # patients receiving a diagnostic test for malaria (RDT or microscopy); 8 Outpatient and inpatient, confirmed and unconfirmed; 9 Total # children <5 years of age cases divided by total # of cases; 10 Confirmed malaria cases, outpatient and inpatient with severe malaria signs; 11 All ages, outpatient, inpatient, confirmed, and unconfirmed; 12 Total # of health facilities reporting data into the HMIS/DHIS2 system that year; 13 # monthly reports from health facilities divided by # health facility reports expected (average for the calendar year).

Table 5: Disaggregated Community-Level Data

Indicator	2019	2020	2021
# Patients receiving diagnostic test for malaria from a CHW	422,175	343,131	376,809
Total # of malaria cases reported by CHWs[1]	435,892	380,052	389,668
% of CHW reported cases (among total malaria cases)[2]	15%	16%	11%

1 Includes all ages, confirmed and unconfirmed.
2 Total # malaria cases reported by CHWs/Total # malaria cases in previous table.

V. OTHER IMPLEMENTATION INFORMATION

Table 6: Results of Standard Durability Monitoring

Site / Net Type	Survey and Time Since Distribution (months)	Attrition to Wear and Tear (%)	Nets in Serviceable Condition (%)	Optimal Insecticidal Effectiveness in Bioassay (%)	Mean Surface Insecticide Concentration (mg/m2) +/-	% Insecticide Decrease Compared with Baseline
Kenieba/ Yorkool	6 (baseline)	0.0	99.1	66.6	0.69 (0.5-0.8)	
	12	1.7	84.9	70.0	0.20 (0.1-0.2)	71.0
	24	10.7	70.3	70.0	0.19 (0.1-0.2)	72.4
	36	45.3	48.8	31.0	0.08 (0.06-0.11)	88.4
Kita/ PermaNet 2.0	6 (baseline)	0.0	100	66.6	0.46 (0.3-0.5)	
	12	0.0	95.4	76.6	0.24 (0.1-0.2)	47.8
	24	17.2	91.8	56.6	0.17 (0.1-0.2)	63.0
	36	22.4	77.7	20.0	0.06 (0.05-0.08)	86.9

A three-year standard net durability monitoring study was conducted from 2017 to 2020 in Kenieba (Yorkool) and Kita (PermaNet 2.0). The final proportion of net attrition due to wear and tear was 45.3 percent in Kenieba and 22.4 percent in Kita. The proportion of serviceable nets at 36 months was below the recommended threshold of 50 percent for Yorkool (48.8 percent) and above the threshold for PermaNet (77.7 percent). The proportion of Yorkool and PermaNet ITNs that meet optimal effectiveness after 36 months were 31 percent and 20 percent respectively. The estimated median survival at 36 months was 2.1 years for Yorkool nets and 3.4 years for PermaNet 2.0.

Table 7: Summary of Completed Therapeutic Efficacy Studies

Year	Site	Treatment arm(s)	Efficacy (PCR-corrected adequate clinical and parasitological result) for each drug at each site
2015–2016[a]	Selingue	AL	91.0%
2015–2016[a]	Selingue	ASAQ	97.1%
2017[b]	Selingue	AL	98.6%
2017[b]	Selingue	ASAQ	97.1%
2017[b]	Missira	AL	100.0%
2017[b]	Missira	ASAQ	100.0%
2020–2021	Missira, Selingue, Dioro	AL, DP	TBD

PCR = polymerase chain reaction; AL = artemether-lumefantrine; ASAQ = artesunate-amodiaquine; DP = dihydroartemisinin-piperaquine; TBD = to be determined

[a] Diarra, Y., Koné, O., Sangaré, L., Doumbia, L., Haidara, D., Diallo, M., Maiga, A., Sango, H. A., Sidibé, H., Mihigo, J., Nace, D., Ljolje, D., Talundzic, E., Udhayakumar, V., Eckert, E., Woodfill, C. J., Moriarty, L. F., Lim, P., Krogstad, D. J., Halsey, E. S., … Koita, O. A. (2021). Therapeutic efficacy of artemether-lumefantrine and artesunate-amodiaquine for the treatment of uncomplicated Plasmodium falciparum malaria in Mali, 2015-2016. Malaria journal, 20(1), 235. https://doi.org/10.1186/s12936-021-03760-9

[b] Final report of the TES 2017

Table 7 presents data from two consecutive in vivo therapeutic efficacy studies carried out to assess the clinical and parasitological responses to artemether-lumefantrine (AL) and artesunate-amodiaquine (ASAQ). In 2015 in Selingué, the per protocol polymerase chain reaction (PCR)-corrected efficacy at day 28 was 91.0 percent in the AL arm and 97.1 percent in the ASAQ arm. No mutations associated with artemisinin resistance were identified in the Pfk13 gene. Overall, for Pfmdr1, the N86 allele and the NFD haplotype were the most common.

In 2017 in Sélingué, the 28-days corrected efficacy was 98.6 percent in the AL group versus 97.1 percent in the ASAQ group. In Missira, the corrected efficacy for the 28-days follow-up was 100 percent in both the AL group and ASAQ groups, while for the 42-days follow-up the efficacy was 96.4 percent in the AL group and 100 percent in the ASAQ group. The majority of recurrent parasitemias during the 28-days follow-up were new infections.

VI. KEY POLICIES

Table 8: Policies in Mali

National Strategic Plan (2018-2024)	
National Surveillance, Monitoring, and Evaluation Plan (2018)	
National Social Behavior Change/Communication Strategy (2021)	
National Supply Chain Strategy/Master Plan (2021-2025)	
National Vector Control Strategy and/or **Integrated Vector Management Plan** (included in National Strategic Plan)	
Malaria Case Management Guidelines (2020)	
What is/are the first-line treatment(s) for uncomplicated *P. falciparum* malaria*?	AL
What is/are the second-line treatment(s) for uncomplicated *P. falciparum* malaria*?	Dihydroartesiminine-pypéraquine (DP) or artésunate-pyronaridine (AP)
What is the first-line treatment for severe malaria?	Artesunate, artemether or quinine injections
In pregnancy, what is the first-line treatment for uncomplicated *P. falciparum* malaria in the first trimester?	Oral quinine

In pregnancy, what is/are the first-line treatment(s) for uncomplicated *P. falciparum* malaria in the second and third trimesters?	ACT: AL, DP, AP
In pregnancy, what is the first-line treatment for severe malaria?	Artesunate injection
Is pre-referral treatment of severe disease recommended at peripheral health facilities? If so, with what drug(s)?	Yes, rectal artesunate capsule
Is pre-referral treatment of severe disease with rectal artesunate recommended for community health workers?	Yes
Community Health Policy (2021)	
What is the # of CHWs currently providing iCCM?	3,303
What is the country's target (by 2025) for number of CHWs providing iCCM?	13,982
What percent of the country's target is met?	24%
Does the country have a policy that enables the routine, regular payment of salaries/stipends for CHWs?	No
Do CHWs have the authority to test and treat all ages for malaria?	Yes
Prevention of Malaria in Pregnancy Policy (2020)	
At what gestational age is the first dose of IPTp-SP to be given to pregnant women according to the national guidelines for malaria and MCH?	13 weeks
Do the national ANC guidelines reflect the WHO 2016 recommendation of 8 ANC scheduled contacts (plus one additional contact for early initiation of IPTp at 13-16 weeks)? If not, how many ANC contacts are recommended?	Yes
What is the status of training ANC providers on the WHO recommended 8+ contacts?	All ANC providers have been trained on the WHO recommended 8+ contacts in PMI focus regions

Have HMIS/DHIS2 and ANC registers been updated to include 8+ contacts?	Yes
Are IPTp data collected as single months where the January 2022 data represent the number of doses administered in January 2022, or cohort data, representing the cumulative data from pregnancies which began 6 months prior?	IPTp data are collected as single months
Is ANC/IPTp provided by facility staff conducting ANC outreach to communities?	Yes, however funding is often a challenge
Can CHWs deliver IPTp and if so, which specific cadres and beginning with which dose?	A pilot for community-based IPTp is in the planning stages in two districts

VII. PARTNER LANDSCAPE

The table below summarizes contributions by key external partners and the Government of Mali. Of note, two mining companies (*Société de Mines de Komana* [SMK] and *Société de Mines de Loulo* [SOMILO] support IRS for employees' homes and neighboring villages. Multiple donors may support the same technical interventions, but in different geographic areas. WHO and UNICEF provide technical assistance for limited interventions. Other partners such as *Médecins Sans Frontières*, *Terre des Hommes*, *Médecins du Monde*, Save the Children, and MUSO operate in specific health districts in support of the Government of Mali.

Table 9: Partner Landscape

Partner	Key technical interventions	Geographic coverage	Funding amount or in-kind contribution	Timeframe
Global Fund	• Support for nationwide mass campaign • SMC • Training and supportive supervision • Malaria community case management • Surveillance, monitoring, and evaluation • Social and behavior change • ITN	• Nationwide, excluding Bamako • 25 districts • Nationwide • Regions of Kayes, Koulikoro, Sikasso, Ségou, and Mopti • Nationwide • Nationwide • Nationwide	USD 87.3 million	Current grant 2021 to 2024
Government of Mali	• SMC • Case management • ITN	• Nationwide • Nationwide • Nationwide	USD 5.6 million	2021 -2024
UNICEF	• SMC distribution • iCCM	• Kéniéba, Mopti, Youwarou, Tenenkou, Diré	USD 6.3 million	2023
WHO	• Elaboration of strategic documents • Training and supportive supervision • Epidemiological Surveillance activities	• Nationwide • Nationwide • District with epidemic risk	USD 152,500	2018 - 2020
SMK (Mining Company)	• IRS for their employees' homes	Yanfolila health district	USD 297,600	2018-2021
SOMILO SA (Mining company)	• IRS for their employees' homes	Kenieba health district	USD 559,415	2017-2020