Federal Ministry of Health

General Directorate of Primary Health Care

Diseases Control Directorate (DCD), Environmental Health & Health Promotion Directorates

Sudan Malaria Strategic Plan

2021 - 2025

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Contents

This plan has been developed through teamwork involving all directorates, departments and units at Federal Ministry of Health. The efforts were organized by the Directorate of Disease Control at Primary Health Care Directorate through a steering committee involving malaria partners in the country.

The plan was informed by the findings and recommendations of the Malaria Programme Review in 2018. For more details related to situation analysis, readers may consult: “Malaria Programme Review Report, 2018” and “Malaria Indicators Survey, 2016”.

The preparation of the plan was supported by a national and international WHO consultants

Cover photo:
The picture on the front cover was kindly provided by the Director of South Darfur Malaria control Programme. It shows how a district programme officer meets the challenge and manages to bring anti-malarial medicines to his area during rainy season.

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The Sudan National Malaria Strategic Plan for 2021 to 2025 at a glance

The total population of Sudan (47.9 million) is at risk of malaria. In 2018, the disease lead to estimated 2 million cases and 5000 deaths. From 2016 to 2018, the confirmed malaria cases increased from 14.2/1000 population to 38.4/1000. The worsening situation is due to flooding in 2018-19 and constraints in the implementation of the programme.

Goal

- To reduce malaria morbidity and mortality by 30% by 2025 (taking 2018 as a base line) and accelerate efforts towards malaria elimination where feasible (in the northernmost states).

Objectives

1. To ensure universal coverage of at risk population with integrated vector management as per operational stratification (with LLINs, IRS or LSM) and to maximize LLIN utilization rates from less than 53% to more than 85%

   Strategies include larval source management in urban areas, indoor residual spraying in irrigation areas and long-lasting insecticidal nets through mass campaigns for a population of 12 million in areas of seasonal endemic malaria. Emphasis is placed on accompanying communication activities.
2. To ensure universal access of malaria patients to quality-assured malaria case management (testing, treatment) and to encourage seeking treatment within 24 hours of fever initiation

   Strategies include community-based case management for remote communities, widespread use and promotion of rapid diagnostic tests, improved distribution system for antimalarial medicines, involvement of private health services and strengthened quality assurance for microscopy.
3. To control malaria in pregnancy including its effects on low birth weight through case management, distribution of LLINs to all pregnant women in LLIN and IRS targeted areas and intermittent preventive treatment in high endemicity areas in the south.
4. To provide timely and reliable information to monitor the progress, trend in malaria cases and deaths and to early detect and contain epidemics
5. To coordinate and sustain evidence-based and cost-effective malaria control activities at national, state and locality level

Budget

US$ 631 million for the five-year period

List of abbreviation:

ACT	Artemisinin-based Combination Therapy
AL	Artemether-lumefantrine
AS+SP	Artesunate + sulfadoxine-pyrimethamine
CHW	Community Health Worker
DCD	Disease Control Directorate in FMOH
DGOP	Directorate General of Pharmacy
DHAP	Dihydroartemisinin + piperaquine
DHIS2	District Health Information system 2
ECAMM	External Competency Assessment for Malaria Microscopy
EHFC	Environmental Health and Food Control
ERP	Enterprise Resource Planning
FMOH	Federal Ministry of Health
GDP	Growth Domestic Product
GF/ GFATM	Global Fund to fight HIV/AIDS, TB and Malaria
GTS	Global Technical Strategy for malaria
HiAP	Health in All Policies
HMM	Home-based Management of Malaria
HRH	Human Resources for Health
HSS	Health system strengthening
iCCM	Integrated Community Case Management
IDP	Internally Displaced people
IRS	Indoor Residual Spraying
IPTp	Intermittent Preventive Treatment in pregnancy
IPTi	Intermittent Preventive Treatment in infant
IVM	Integrated vector Management
JANS	Joint Assessment of a National Health Strategy
LLINs	Long-lasting Insecticide Treated Nets
LMIS	Logistic Management Information System
LSM	Larval Source Management
OOP	Out-Of-Pocket
M&E	Monitoring and Evaluation
MCH	Maternal and Child Health
MDGs	Millennium Development Goals
MIS	Malaria Indicators Survey
MPR	Malaria Programme Review
MSP	Malaria Strategic Plan
NBHS	National-based line Household Survey
NPC	National Pesticides Council
NGO	Non-Governmental Organization
NHIF	National Health Insurance Fund
NHP	National Health Policy
NHSCC	National Health Sector Coordination Council
NHSSP	National Health Sector Strategic Plan
NICD	National Institute for Communicable Diseases
NMCP	National Malaria Control programme
NMPB	National Medicines and Poisons Board
NMRL	National Malaria Reference laboratory
NMSF	National Medical Supplies Fund
NTDs	Neglected Tropical Diseases
PHC	Primary Health care
PR	Principal Recipient
PSM	Procurement and Supply Management
RBM	Roll Back Malaria
RDTs	Rapid Diagnostics Tests
SDG	Sudanese Pound
SDGs	Sustainable Development Goals
SMC	Seasonal Malaria Chemoprevention
SMCP	State Malaria Control Programme
SMOH	State Ministry of Health
SMRL	State Malaria Reference laboratory
SST	States Sponsored for Terrorism list
TAC	Technical advisory committee for malaria
TOT	Training of trainers
VCNA	Vector Control Need Assessment
VBDs	Vector-borne Diseases
UHC	Universal Health Coverage
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
WHO	World Health Organization
WHO/EMRO	WHO's Regional Office for the Eastern Mediterranean, Cairo, Egypt

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Foreword

Malaria remains a major public health problem in Sudan. It is a leading cause of morbidity and mortality. The Federal Ministry of Health leads the effort of states and partners to scale up efforts where most needed and maintain the gains that have been achieved so far.

This new Malaria Strategic Plan (Sudan Malaria Strategic Plan) outlines the key technical and supporting strategies in the ongoing fight against malaria in the period 2021 -2025. The strategies build on the lessons learned during the previous strategic planning period and new data on malaria risk.

The plan has been developed to guide the implementation, coordination and monitoring of malaria activities in Sudan at all levels based on clear operational stratification. States, UN agencies, NGOs, Civil societies, related sectors, academic institutions, and the private sector are all expected to maintain the previous contribution and to involve in evaluation.

The Federal Ministry of Health puts great value on a strong and well-coordinated action to overcome the gap in funding. I would like to thank all of our partners in the ongoing fight against malaria. It is my sincere hope that partners will consider this National Malaria Strategic Plan as a beginning to renewed commitment to partnership, its coordination and efficient and effective use of resources at our disposal.

Dr Akrm Ali Eltom
Minister of Health, Sudan

Acknowledgement

The Federal Ministry of Health wishes to express its sincere and deep appreciation to the various partners, stakeholders and individuals who contributed to the development and finalization of this National Malaria Strategic Plan. On behalf of the FMOH, I would like to acknowledge the contribution

of all the following organisations and programmes: WHO, UNICEF, UNHCR, UNDP, PHC Directorate, DCD, IVM department, MCH, EPI, and NMSF. Special acknowledgement to the writing team.

The FMOH is grateful for the contribution of Dr Allan Schapira for his guidance and strategic contribution. We are proud of the inputs from Dr Ghasem Zamani (WHO Malaria Regional Advisor) and for the contribution of Abraham Mnzava (ALMA) in issues related to vector control. Our thanks extended to Dr. Elfatih Mohamed Malik (Faculty of Medicine, University of Khartoum) for his great efforts in putting all the input of international and national experts together and overarching the efforts to have this document.

Finally, the FMOH would like to recognise the dedication and hard work of the members of states and localities, health facilities, NGOs and civil societies, private companies, and communities in translating the strategy into concrete actions to fight malaria.

Dr. Sara Abdelazaim Hasanain
Undersecretary of Health, FMOH, Sudan

Executive summary

The development of the present plan was informed by a Malaria Programme Review carried out in 2018, a Malaria Indicator Survey (MIS) in 2016, and an analysis of achievements in the malaria strategic Plan, 2018 – 2020. The plan has been prepared on the background of a number of converging factors, each of which challenge public health planning and implementation, namely: extreme climatic instability since 2018 leading to widespread flooding and epidemics in 2019; the proliferation of irrigation schemes; precarious economic situation with rapid staff turnover and attrition related to low salaries and difficult working conditions; the aftermath of the Sudanese Revolution, where high-level decision-making is still affected by transition processes as much as there clearly are intentions to improve equity and coverage; the continued international sanctions; and the spread of COVID-19. All these factors mean that on one hand, the human resources are under pressure, so that the adoption of novel interventions and a transition to elimination in the North, where this would be technically feasible, need to be dealt with cautiously, as any neglect of so-called routine case management and vector control could have disastrous consequences. At the same time, it is necessary to plan with relatively large buffer stocks of the basic commodities, because there is a high risk of recurring epidemics.

Malaria situation

The total population of Sudan (41.9 million) is at risk of malaria. In 2018, the disease lead to estimated 2 million cases and 5,000 deaths. The MIS 2016 found an overall parasite prevalence of 5.9% with a declining gradient from south to north. The major transmission season is during September - December following the main rainy season in the North, and June to November in the South. The reported confirmed malaria cases increased from 14.2/1000 population in 2016 to 17.7/1000 in 2017 and 38.4/1000 in 2018, and the increase of the "reported confirmed and presumed" was even sharper. Malaria mortality increased from 1.8 to 3.8 to 7.5 per 100,000 population in 2016, 2017 and 2018 respectively.

Current malaria control

The current policy is to examine all suspected malaria cases by microscopy or RDTs. Microscopy services are available in all hospitals and health centers, but with variable quality, and is paid for by the patient, even in the governmental sector. RDTs are free, but most confirmed cases are diagnosed by microscopy. The national treatment protocol includes artemether-lumefantrine, to which there is so far no resistance, as first-line treatment for *P.falciparum* malaria, parenteral artesunate for severe malaria, artesunate suppositories as pre-referral treatment, primaquine for 14 days as anti-relapse treatment for *P. vivax* and single-dose primaquine as gametocytocidal for *P.falciparum* malaria in northern states, where prevalence is low. In public and private services, there is still a widespread tendency to treat despite negative or lacking test results. The programme does not have permanent staff qualified in

training health care providers in malaria case management, and only 50% of targeted personnel were trained in 2018-19. There is no functional sub-programme for community case management (iCCM) at present, but in collaboration with maternity and child health, over 7,000 communities have been identified as preliminary target, and it has been agreed that community-based malaria case management will target all age-groups (iCCM+).

Antimalarial medicines and RDT are procured by UNICEF as part of the Global Fund Grant to be distributed free of charge in the public health facilities. The malaria supply system has been integrated within the National Medical Supplies Fund with its branches since 2012. Frequent stock-outs of ACTs and RDTs were reported in many health facilities in 2019. As a result, many patients buy their prescribed treatment from private pharmacies.

For malaria in pregnancy, there is currently a policy of free distribution of one LLIN to pregnant women through ante-natal care services (and to infants through EPI), but there is no intermittent preventive treatment in practice. There is consensus that this intervention needs to be implemented in the southern part of the country. Intermittent preventive treatment for infants and seasonal malaria chemoprevention are under consideration and may be adopted during the period covered by the present plan.

Sudan has developed a comprehensive Vector Control Response Strategic Plan 2021 - 2025 addressing all vectors of human disease. All vector control efforts are integrated and led by the integrated vector management department (IVM department). Indoor residual spraying (IRS) is implemented in Gezira and Sennar, the two states with the most extensive irrigation schemes, for the last 10 years with considerable impact. Other irrigation areas targeted for IRS were not covered due to lack of resources. Implementation of long-lasting insecticidal nets (LLINs) now covers all of 12 targeted states. Larval source management (LSM) has been initiated in all the 110 targeted urban settings but only 75 of them maintained the intervention because of lack of resources. There is a system for the routine vector surveillance and monitoring of insecticide resistance. Recent results (2018) showed that in Gezira, Gadarif, Kassala, Red Sea and River Nile states, *Anopheles arabiensis* is not susceptible to bendiocarb, which has been in use for IRS since 2008, so adoption of an alternative insecticide and a long-term rotation policy are warranted. Bioassay tests are conducted to evaluate the quality and bio-efficacy of IRS. An attempt to involve communities is ongoing, particularly during LLIN and IRS campaigns. Civil societies and NGOs are part of the forum where plans are developed to involve communities. The IVM conducted a joint mission with the "Alliance for Malaria Prevention (AMP)" to assess the communication approaches implemented during the LLIN distribution campaigns considering the low percentage of use of nets by owners. The recommendations have been adopted in the present plan.

Currently, the Integrated Disease Surveillance and Response (IDSR) unit carries out all surveillance activities on a weekly basis. More data about malaria situation comes through HMIS/ DHIS2 monthly

reporting. The weekly shared data have been used to compute epidemic threshold by locality in late 2019 and early 2020.

After 2013, and as part of integration strategy, the malaria IEC activities are assigned to the Directorate of Health Promotion (DHP) which is part of PHC General Directorate. Disease control programmes, including malaria, coordinate ahead with DHP for advocacy, IEC or community mobilization. Although there is a "malaria IEC strategic plan, 2014 -2017", the main activities are those driven by IVM (see above).

Currently, malaria control activities are coordinated by the Disease Control Directorate of the Primary Health Care General Directorate. The DCD is responsible for strategic planning, resource mobilization, M&E, and capacity building at all levels, and the major malaria intervention areas are integrated in the relevant sections. In the majority of the states there is a still state malaria control programme, and at locality level, there is a malaria unit with at least two trained persons mainly in vector control for all vector-borne diseases The programme has developed a network of partners and stakeholders. Broad based malaria technical committees and thematic area sub-groups with membership drawn from other health departments, universities and research institutions exist for malaria case management, monitoring and evaluation and vector control. Malaria control has received support from the Government of Egypt, Islamic Development Bank, the Global Fund, WHO, UNDP and UNICEF.

The national strategic plan 2021-25

The vision of the strategy is to reach a status where malaria in Sudan is no longer a major public health problem. The mission of malaria control in Sudan is to ensure universal access to quality-assured preventive measures, diagnostics and antimalarial medicines, and to back-up this by efficient disease surveillance as well as strong advocacy and behavioural change communication. The goal of the plan is to reduce malaria morbidity and mortality by 30% by 2025 (taking 2018 as a base line) and accelerate efforts towards malaria elimination where feasible.

Taking into consideration the risk map and ecology, socioeconomic activities and human settlements an operational stratification determines which strategies will be implemented where as shown in the table.

Operational stratification of malaria in Sudan				
Stratum	**Transmission risk**	**Population**	**Areas /states**	**Main interventions**

1. Potential target for elimination	- Very low transmission	3,000,000	-Mostly semi-desert, desert-fringe areas or arid areas -Irrigated farms around the Nile, which are not included in stratum 3 **-River Nile, Northern and Red Sea States**	-Case management including single dose of PQ -Adjusted surveillance system -Case and foci investigation
2. Seasonal malaria	- Low to moderate transmission areas -Transmission related to rainfall - Parasite prevalence <5%	12,000,000	-Mostly rural areas -All localities with <5% prevalence, which are not included in Stratum 1 or 3. **-Kassala, White Nile, North Kordofan, North Darfur States, and Rural Khartoum**	-Case management including single dose of PQ, through iCCM in remote areas -LLINs -Surveillance and EPR
3. Irrigated schemes malaria	- Moderate to high transmission - Transmission throughout the year	5,000,000	-Large-scale irrigated schemes **- Gezira, and Sennar States, and irrigated areas in Kassala, Gedarif, White Nile, River Nile and Northern States**	-Case management including single dose of PQ -IRS -LLINs for pregnant women -Surveillance and EPR -Partnership with irrigated schemes boards
4. Urban malaria	-Low to moderate transmission	9,000,000	-All urban settings including Khartoum -Other man-made malaria **-All big cities and towns in all states including Khartoum**	-Case management including single dose of PQ -LSM -Surveillance and EPR -Partnership with localities and private sector
5. People of special concern	-Low to high transmission areas	6,000,000	-People living in camps (IDPs and refugees), nomads and traditional gold miners **-Mainly in Darfur, Kordofan, White Nile, Blue Nile and Kassala states**	-Case management (mainly through iCCM) -LLINs -Surveillance and EPR -IPTp -Partnership with NGOs
6. High transmissio n areas	- High transmission areas - Long rainy season - Parasite prevalence >5%	7,000,000	-The southern belt bordering South Sudan -Low access to services **- Gedarif, Blue Nile, South and West Kordofan, East, Central, South and West Darfur**	-Case management (through iCCM in remote areas) -LLINs -IPTp -Surveillance and EPR

The **objectives** and strategies are as follows:

1. **To ensure universal coverage of at risk population with integrated vector management as per operational stratification (with LLINs, IRS or LSM) and to maximize LLIN utilization rates from less than 53% (community advocacy survey) to more than 85%**

1.1. LSM using chemical larviciding, environmental management and larvivorous fish in big urban settings (including major towns/ cities at states and localities) corresponding to stratum 4 (urban areas)

1.2. LLIN mass distribution every 3 years in the 12 targeted states and rural Khartoum corresponding to stratum 2, 5 and 6.

1.3. IRS (2 rounds per year) in irrigated developmental projects in Gezira, Sennar, Kassala, Gedarif, White Nile, River Nile and Northern States corresponding to stratum 3 and part of stratum 1 and 2

1.4. Entomological surveillance, monitoring of insecticide resistance in sentinel sites, bio-assay following IRS and for monitoring quality of LLINs

1.5. Communication for high utilization rate of LLINs, IRS and LSM

2. **To ensure universal access of malaria patients to quality-assured malaria case management (testing, treatment) and to encourage seeking treatment within 24 hours of fever initiation**

2.1. Quality assured RDT diagnosis available at all times for fever cases in all iCCM points-of-care, public and private health facilities at all levels and quality assured microscopy available for fever cases and other suspected malaria cases in family health centres and hospitals

2.2. Recommended ACTs available for all confirmed uncomplicated cases in all iCCM points-of-care, public and private health facilities, together with artesunate suppositories for pre-referral treatment of severe malaria at primary health care level and injectable (IV) artesunate available for all severe malaria cases where there is admission facilities

2.3. Primaquine as one dose of 0.25 mg/kg body weight with ACT to patient with *P. falciparum* malaria to reduce transmission in low transmission areas (corresponding to stratum 1-4) and primaquine 0.25 mg/kg body weight daily for 14 days to prevent relapse of *P. vivax* without testing for G6PD but with warnings to patient and close supervision for potential primaquine induced haemolysis

2.4. Malaria case management through iCCM and iCCM+ (i.e. including older children and adults) where coverage with health facilities is low in stratum 2, 5 and 6.

2.5. Monitoring anti-malarial drugs' efficacy

2.6. Communication for timely seeking treatment for fever

3. **To control malaria in pregnancy including its effects on low birth weight through case management (under objective 2), distribution of LLINs to all pregnant women in LLIN and IRS targeted areas (under strategy 1.3) and IPTp in stratum 5 and 6**

3.1. IPTp through ANC for pregnant women in areas where the prevalence is higher than 10% (mainly in stratum 3, 5 and 6)

3.2. Distribution of LLINs thorough EPI and ANC clinics to all pregnant women and children under one year in LLIN areas (as replacement) and IRS targeted areas

4. **To provide timely and reliable information to monitor the progress, trend in malaria cases and deaths and to early detect and contain epidemics**
   4.1. Utilizing IDSR, HMIS/ DHIS2, programme data and climate and population movement data to disseminate weekly, monthly and quarterly malaria reports
   4.2. EPR for malaria integrated with Health Emergency and Epidemic Control (HEEC) RRT with emphasis of foci investigation in stratum 1 (pre-elimination areas)
5. **To coordinate and sustain evidence-based and cost-effective malaria control activities at national, state and locality level**
   5.1. Capacity building through training in programme management, epidemiology and vector control/ entomology with regular supportive supervision from national level to state and locality level
   5.2. Avoid stock outs of RDT, ACTs and artesunate suppositories and IV through development of one-layer PSM system ie from state to facility
   5.3. Retention of trained malaria and vector control specialists at all level through better payment scheme, continuous professional development and job satisfaction
   5.4. Strengthen political commitment and institutional support
   5.5. Harmonization of the efforts of national, states, localities, relevant governmental sectors and partners for better malaria control and outcome

The plan includes detailed activities for each strategy, and each activity is translated to output targets year by year. The strategies and activities address all the epidemiological and operational problems identified above under the description of the malaria situation and the current programme. The activities with their outputs have provided the basis for the budget of the plan.

The plan includes an M&E framework to guide the tracking of progress in implementation. The "Planning and M&E Department" at DCD is responsible for compilation of reports generated by directorates, departments, units or related sectors and partners on monthly and quarterly basis. The reports will reflect the progress in implementation using different sources of information. The department will arrange quarterly meetings for information sharing. This meeting and report are expected to revise the progress in the strategy implementation on a quarterly basis and to provide a comprehensive assessment of strategic areas to ensure that all the aspects are adequately covered. To encourage multi-partnership efforts in implementation, the DCD will ensure that various partners and stakeholders are involved in annual assessments, a mid-term review in 2023, and a program performance review in 2025.

The evaluation of the malaria strategic plan will be based on outcome and impact indicators to be tracked using a variety of sources of information and means of verification such as the weekly disease surveillance system, entomological surveys, DHIS2, SMCP reports, national programmatic data, population-based household surveys (MICs and MIS), health facility surveys, special studies, including medicine and insecticide resistance studies, and administrative information systems (e.g. PSM reports). The six impact indicators, with 2018 baseline, 2025 target and percent reduction are as follows:

1. Inpatient malaria deaths/ 100,000 population: reduced from 7.5 to 5.3 (30%).
2. Inpatient malaria deaths/ total inpatient deaths: reduced from 3.6 to 2.5 (30%)
3. Reported malaria cases (presumed and confirmed): reducted from 3,581,302 to 2,506,911 (30%)
4. Confirmed malaria cases (microscopy or RDT)/ 1000 persons: reduced from 38.3 to 26.8 (30%)
5. Test (slide + microscopy) positivity rate reduced from 18.9 to 13.3 (30%)
6. Under-5 mortality rate per 1000 live births reduced from 68.4 to 51.3 (25%)

The plan includes targets year by year for these indicators as well as for the outcome indicators, which have been established for each strategy.

The total budget for this plan is US$ 631 million for the five-year period.

1. Introduction

Malaria remains a major public health problem in Sudan. The total population is considered to be at risk of malaria and 36,325,531 people (86.7%) are at high risk. In 2018, the disease lead to a mid-point estimated 1,954,302 cases (904,000; 3,686,000) and 5,003 deaths (120; 12,300) 1[1]. The disease is considered as a priority in the "National Health Policy, 2017 -2030" and in the National Health Recovery and Reform Policy and Strategic Plan, 2020 -2022 (NHRRP-SP) [2, 3]. Both documents considered progress in malaria control as an important landmark for poverty reduction and Sustainable Development Goals (SDGs).

The development of this strategy was informed by the Global Technical Strategy 2016 – 2030 [4]; Malaria Regional Plan of action 2020 – 2025 [5], Malaria Programme Review 2018 [6]; Sudan Malaria Indicators Survey, 2016 [7]; analysis of achievements in the malaria strategic Plan, 2018 - 2020 and Global Fund Grant Review documents 2018 -2020. The driving force to have this plan now (and not later) is to meet the requirements of government as well as partners. The strategy was developed by a committee established by Primary Health Care General Director and composed of different relevant directorates and departments which have link to malaria control. These efforts were supported by an international and a national consultant.

2. Country profile

Demographics

The total population of the country is 41,984,512 in 2018 (projected from the 2008 census with an annual growth rate of 2.53%)[8]. Urban settlements constitute 33% of the population while rural areas represent 55%. Nomads constitute around 8% of the population. There are 2.2 million internally displaced people (IDP), and there are over 1 million refugees and asylum-seekers from neighbouring countries[9]. In recent years significant movement of population took place from rural to urban areas especially to Khartoum. The average family size is 6 members. The country has a relatively young population, with 45.6 % under the age of 15 years, 15.2% under the age of five years and less than 4% for population 60 years and more. Male: female ratio is almost 1:1. The crude birth rate is 31.2/1000 population and the crude mortality rate has been estimated at 7.7/1000 population for the period 2010-2015[10]. Although the country showed good progress towards achievement of MDGs by 2015, death

[1] WMR 2019
[2] National health policy 2016 -2030
[3] National health policy and recovery strategy 2020 -2022
[4] GTS 2016-2030
[5] Malaria regional plan of action, 2020 -2025
[6] MPR 2018
[7] MIS 2016
[8] Sudan Census Report 2008
[9] http://reporting.unhcr.org/sudan (Revised on June 29, 2020)
[10] www.population.un.org/wpp/Data query/

rates among pregnant women and children are still high. According to Sudan Multi-indicators Survey-MICS 2014[11], neonatal mortality rate (deaths within 1st month of life/1000 live-births), infant mortality rate (deaths within 1st year of life/1000 live-births), under-5 mortality rate (deaths before fifth birthday/1000 live-births) were 32.6, 52.0 and 68.4 respectively for the period 2010-2014. The under-five mortality rate was very high in the States of East Darfur (111.7), South Kordofan (95.4), West Darfur (91.4), North Darfur (90.3) and more moderate in Northern (29.9), River Nile (35.1), North Kordofan (41.9) and Khartoum (49.8) States. These figures are in line with malaria prevalence as reported by Sudan malaria indicator survey 2016. Under-five mortality and infant mortality rates were respectively 56.5 and 11.8 in urban area, 72.8 and 19.3 in rural area. For 2018, lower figures were reported by the UN Inter-agency Group for Child Mortality Estimation, which found neonatal mortality rate, 28.6, infant mortality rate, 42.1, and under-5 mortality rate, 60.5[12]. Low birth rate was reported in 32.3% of infants who were weighed at birth (only 16.3% were weighed). Again higher rates were reported from Darfur and Kordofan states. Maternal mortality rate (MMR) has been estimated at 295 (207 – 408) per 100,000 live-births in 2017[13].

Geography

Sudan with an area of 1,882,000 square kilometers is traversed by the Nile and its tributaries, and has 853 kilometers coastline along the Red Sea. It shares international borders with 7 countries. Five of these countries are malaria endemic (Chad, Central African Republic, South Sudan, Ethiopia and Eritrea) and have open borders with Sudan throughout the year. The country is located within the arid and semi-arid part of Sub-Saharan Africa. Its topography includes generally flat plains, broken by several mountains, dams, Niles, small rivers and streams in addition to desert in the North. Sudan's main climate regions include tropical rain, tropical monsoon, and seasonal tropical grassland or savannah. The average annual rainfall is 106 mm which increases steadily towards the south. The rainy season varies from about three months (July to September) in the north, to six months (June to November) in South Kordofan, Blue Nile and South Darfur states resulting in various levels of malaria endemicity. In the northern and western semi-desert areas, people rely on the scant rainfall for basic agriculture and many are nomadic, travelling with their herds of sheep and camels. Near the River Nile, there are well-irrigated farms growing cash crops.

A number of irrigated agricultural schemes have been established in the country in Gezira, Gadarif, River Nile, Khartoum and White Nile States. These schemes, being irrigated throughout the year add pressures on malaria control efforts. In recent years huge irrigated agricultural schemes have been

[11] MICS 2014

[12] UN Inter-agency Group for Child Mortality Estimation. Most recent child mortality estimates for Sudan, 2018. Access on March 30, 2020 form: https://childmortality.org/?r=site/graph&ID=SDN_Sudan

[13] UN Inter-agency Group for Maternal Mortality Estimation. Most recent maternal mortality estimates for Sudan, 2017. Access on March 30, 2020 form: https://www.who.int/gho/maternal_health/countries/sdn.pdf?ua=1

established in Northern and River Nile States. The effect of these schemes on malaria transmission was observed through reports of increasing case numbers in some areas of River Nile State in 2019. Such schemes represent a serious threat to malaria control, unless the authorities would conduct comprehensive health impact assessments and act on their recommendations before the establishment, and unless government and private sector would commit to control malaria (and other health problems) in the areas concerned.

Economy and political situation

Sudan is classified as a lower middle income country. The estimated GDP per capita in Sudan for 2020 amounts to around 759.71 USD[14]. According to North Sudan National Baseline Household Survey (NBHS) 2009[15], poverty remains widespread with 46.5% of the population living below the poverty line according to the national definition of poverty: less than one USD per person per day. Agriculture remains the most important sector, employing 80% of the workforce and contributing to 39% of the GDP. Starting from 2008, the country has suffered a series of economic setbacks that severely hampered development. This was worsened following the split into two countries in 2011, where 80% of oil production went to the new nation of South Sudan. All this was compounded by the unilateral American sanctions imposed on the country between 1997 and 2017. Unrest in some neighboring countries is posing more strain on the country's resources and public services, as thousands of refugees continue to arrive to Sudan almost on a daily basis.

The Sudanese Revolution has recently led to a major shift of political power. It started with street protests throughout the country on 19 December 2018 and led to a 39-month phase of transitional state institutions and procedures which are mandated to establish civilian democracy. The new arrangements are struggling to overcome many obstacles; the most important is the economic hardship. The new situation is expected to increase resources for Health, which is considered one of the transitional government's priorities. Efforts are undertaken to attract investments and donations particularly from Europe, USA, Japan and many other countries are ongoing. However, support to Sudan is currently affected by the fact that the country is still on the American "*State Sponsors of Terrorism (SST)* list*".* Local government support to health is also affected by the transition. At the time of preparation of this plan, the situation, as in other areas in the world, is affected further by the COVID-19 pandemic.

3. Health System profile

Governance

The health system in Sudan is decentralized comprising of federal, state and locality levels. The national level (namely the Federal Ministry of Health- FMOH), is concerned with development of strategic plans,

[14] WHO (Global Health Expenditure Database). Health expenditure profile, Sudan. Access on March 30, 2020 form: https://apps.who.int/nha/database/country_profile/Index/en

[15] Central Bureau of Statistics (Sudan), Food and Agriculture Organization of the United Nations (FAO), Statistics Norway. North Sudan National Baseline Household Survey (NBHS) 2009. Khartoum, Sudan: Central Bureau of Statistics (Sudan).

policies, health legislation, standards and guidelines, training of different health care personnel and overseeing and monitoring performance of State Ministries of Health (SMOHs) in addition to financial and technical support to the states. It is also responsible for regional and international relations in addition to declaration and control of epidemics (including malaria epidemics). SMOHs share the FMOH responsibilities of planning for health at state level, developing health legislations that do not contradict federal health laws in force and satisfy special needs at state level. SMOHs also have the mandate of implementing national health policies, standards and guidelines, establishment of PHC facilities and overseeing performance of locality governments. SMOHs also have the responsibility of implementing outbreak control and containment measures under guidance of FMOH as well capacity building. Locality governments are responsible for PHC service delivery under direct support and guidance of SMOHs. This includes communicable disease control such as malaria and other vector-borne diseases. Inadequate capacity and inadequate resources are real hindrances for management and development facing SMOHs and localities. This is further worsened by weak managerial, planning and monitoring capacity.

There are several governmental health agencies at central level: MOH, the national health insurance fund, the military and universities. To avoid duplication and irrational allocation of resources, the need for coordination was recognized early; coordination bodies have been established, but have not been completely effective.

Health Policy

The transitional government developed the "National Health Recovery and Reform policy, 2020 -2022" to guide the health sector. The health finance policy calls for comprehensive, bottom-up and coordinated approach to health based on PHC with greater emphasis to prevention and continuum of services. The policy stresses the role of pre-payment schemes and community-based health education and calls for addressing the social determinants of health and investing in universal health coverage. The policy recognizes that malaria is one of the main causes of outpatient attendance and mortality and sets reduction of communicable and non-communicable diseases burden as one of its objectives. Many health polices to reorient the health system were developed, including HRH policy, Health Finance Policy, Mother & Child Health Policies, National Medicine Policy 2014, etc. However, there have been problems in these policies' implementation; probably mainly due to two factors, namely (1) the unclear implementation arrangements as written in the policy documents, and (2) the poor capacities for implementation at the lower levels of the health system, i.e the states, the localities, the service delivery points, and community level. In fact, the latter has been completely neglected in the development of almost all policies, and strategic plans for health. Poverty and food insecurity are common challenges and affecting considerable number population. Recognizing the overwhelming importance of environmental and social determinants, a health in all policies roadmap was developed as a collaborative

approach to improve peoples' health by incorporating health considerations into decision-making across sectors and policy areas. The inter-sectoral assessment preceding this roadmap identified several modes of coordination, but effective and systematic coordination across many sectors still needs to be developed, for example in relation to irrigation schemes, as mentioned above.

The FMOH led a strong endeavor to strengthen the planning system and leading the strategic planning for health and improve harmonization of donors' plans with country priorities, but in most programme areas, the results are still to be seen. The main challenges facing the health system is the involvement of the private sector and lack of coordination of its activities. Accountability is another challenge; there are some regulatory structures at the federal level, but most have no branches at states, and lack sufficient financial and human resources.

Health Service Delivery

Three levels of health care services currently exist in Sudan: the primary health care level (PHC), secondary and tertiary health care levels. PHC services are provided through family Health Centers and Family Health Units, secondary health care through hospitals and tertiary care through the specialized centers. There are no clearly defined and strictly implemented referral mechanisms between the three levels. In response to this, FMOH adopted universal coverage with PHC services with 3 major components: infrastructure, equipment and human resources for health. As a result, the coverage with PHC facilities and with the minimum PHC package increased by the end of 2016, from 86% to 95% and the coverage with the minimum PHC package increased from 24% to 62%. The coverage with health facilities varies between states. Two issues hampering this progress; the coverage with health facilities is still low in some states and most of the newly established facilities are not functioning due to lack of healthcare providers.

Although the share of the private sector in health care provision is significantly increasing over the last ten years, government is the main provider of health care services through public health facilities of the different governmental sectors. According to Sudan MIS 2016, 9017 (19.0% of the total sample) individuals reported to have had fever 2 weeks prior the survey. Almost two thirds (62.6%) of them consulted health care providers at public facilities while 30.2% preferred the private sector. The Ministry of Health is the main provider of health care services in the country. Other governmental sectors involved in health care service delivery on a varying scale include Ministry of High Education and Research, National Health Insurance Fund (NHIF), Ministry of Defense, Ministry of Interior and Security and Intelligence Department.

Health Financing

According to National Health Account, 2018[16]; the per capita annual health expenditure in Sudan is 58 USD representing 7.6% of GDP. Government expenditure on health represents 9.8% of general

[16] National Health account, 2018

government expenditure and 24% of total health expenditure. Limited fiscal space, primarily due to weak capacity to collect taxes, and the low priority given to health in public spending has affected the level of public revenue allocated for health. Domestic private health spending constituted 69.3% of current health expenditure in 2018, while external funding represented 6.6%. At 67% population coverage, the National Health Insurance fund's share of current health expenditure was 6.7% in 2018. Despite significant increases in health insurance coverage, out-of-pocket (OOP) payments, as a share of current health expenditure, is still very high at 69% in 2018. According to the Household Health Utilization and Expenditure Survey 2012, OOP payment caused 7.8% of households to face catastrophic expenditures on health with 47% of households reporting adverse impact on their household income due to healthcare. There is no recent data to reflect country expenditure. Despite increasing expenditure on health, the Government commitment to the Abuja Declaration (allocating at least 15% of annual budget to health) was never fulfilled.

The health system in Sudan is financed through different modalities including taxes, health insurance, out-of-pocket mechanisms, and international support. Currently, more than 50% of the population is covered by health insurance. The Global Fund to Fight AIDS, TB and Malaria (GFATM) currently supports malaria, TB and HIV control and health system strengthening (HSS). Other donor supported disease control programmes are the neglected tropical diseases through multiple donors. EPI and other maternal and child health services are also donor-supported, mainly by GAVI.

The FMOH in collaboration with WHO and the World Bank developed a health system financing policy. Based on the policy a strategy was developed in line with the national health sector strategy for the period 2017 – 2020. The policy recognized NHIF as the main source of health financing; Government of Sudan will insure all Sudanese residents for PHC services irrespective of economic situation and will support provision of free secondary health care services to the poorer. All Government funds currently available for free of charge services for under five children and other patient groups and funds available for health insurance of uniformed services will be pooled in the HHIF. As stated by the policy, NHIF will shift from a health service provider to a purchaser of health care services and will pay for service providers the cost of services provided to clients according to quality of services which in turn is based on certain criteria.

Since the start of acceleration of malaria control in Sudan following adoption of the RBM initiative, there were many fund raising proposals submitted by the national programme to external donors which in addition to the locally committed resources for the initiative, played an important role in supporting the first acceleration efforts. Starting from 2002, the National Malaria Control Programme (NMCP) engaged in a number of funding rounds from the GFATM). While there were many donors for acceleration of malaria control in Sudan in the RBM era such as UNICEF, WHO and the Islamic Development Bank, nowadays the main donor is the GFATM.

Health Workforce

There are many public and private institutions in Sudan which educate and train health care providers. Despite that, the ratio of medical doctors to population is 5.6 per 10,000 population, and the ratio of nurses and midwives per 10,000 population is 47.6. The ratio of doctors to nurses in 2015 is 1 to 1.14 (The international standard is 1 to 4) and the ratio of urban to rural health workforce was 60% to 40%. Urban bias is more acute for specialized cadres as 65% of specialist doctors and 58% of technicians are in the big urban settings. Another challenge facing public sector, even at the urban settings, is the movement of the staff towards private sector. The majority of health workers are both public and private service providers. This sometimes is at the cost of the commitment towards poor patients at public sector, as private is demanding, attractive and time-bound. This is further aggravated by migration to Gulf States and other countries. In the past this phenomenon was mostly seen among medical doctors but nowadays it applies to public health specialists, including entomologists, who are the backbone of malaria control at state and locality levels. Career structure, incentive regimen, and mechanism for retention and equitable deployment in rural, underserved and conflict and emergency prone areas are not yet well established.

Health Information System

There are ongoing efforts to meet the requirements of information needed by different programmes and directorates through an integrated health information system based on District Health Information System (DHIS2). There is a need to continue supporting DHIS2 system to fully configure for national responses and all Global Fund grants to produce accurate programmatic data. As part of the Capacity Development and Transition plan, the Health Information System Directorate will be supported to improve the quality of data reported and to enhance information use. This support will include proper customization of MCH, HIV, TB and Malaria indicators. The DHIS2 system is struggling to get quality data. The data collected at facility level flows directly to DHIS2 system at central level with no attempts for analysis and use at states and localities. No mechanisms are in place to include private sector, national health insurance and military facilities data yet but some private facilities report to MOH.

Medical Products, Vaccines and Supply Chain Management

All interventions in this area are governed by the National Drug Policy which was developed and endorsed by FMOH in 2014. The National Medicines and Poisons Board (NMPB) is the regulatory authority in the country for medicines, laboratory reagents and testing kits; and medical equipment and devices. The NMPB has the mandate of registration of medicines in the country and monitoring its quality and rational use and taking corrective measures. It is also responsible for quality control and regular inspection. Investments to further equip the NMPB with the necessary facilities and power are ongoing. This keeps Sudan relatively immune from counterfeit drugs.

The FMOH decided in 2012 to move from the vertical, programme-based approach of procurement and supply management (PSM) to a unified supply system integrated into the National Medical Supplies

Fund (NMSF). All medicines, testing kits, laboratory reagents, medical consumables and medical equipment of malaria, TB, HIV, free drugs for under five children/ other patient groups and other programmes procured, stored, distributed and monitored through NMSF regardless of source of fund. Drugs and commodities procured through the WHO and other donors (e.g. NTDs programme) were also fully integrated into the NMSF. Procurement of donor funded free commodities is not through NMSF. Availing the drugs at the health facilities is part of NMSF and its branches' responsibility. Only supplies of the EPI are not yet integrated into the NMSF, which was purposefully delayed in the first two phases of integration due to its vast network of supply and huge supplies. Accordingly "disease control programmes including malaria" no longer have any implementation responsibilities regarding the logistic part of PSM (storage, distribution and LMIS) . DCD established a coordinating unit to work with the NMSF and other stakeholders (NMPB, DGOP and UN agencies) along all the lines of the supply chain management starting from quantification through procurement to disbursement to states and health facilities. Coordination mechanisms include joint planning, meetings and supervision to states' medical supplies departments and health facilities and shared reports and feedbacks. This is further consolidated in 2016 by a Presidential Decree (NHSCC initiative) unifying procurement of medical supplies for all public health services (MOH, NHIF, uniform services) under the NMSF. This streamlining resulted in saving for the government of almost 10 million US$ annually. These efforts paved the road for the future. Still in most of the states, supply with essential drugs is in practice the responsibility of the manager of the health facility i.e. a health care provider has to leave his facility and come to the drug store to get the drugs he/ she needs. The main challenge now is to ensure last mile availability through efficient supply system (the optimal is the pull system in which health facilities can determine their actual need and satisfy it) depending on accurate data and robust transportation system. .

4. Malaria situation in Sudan

Malaria parasites

According to Sudan MIS 2016, *P. falciparum* is still the most dominant malaria parasite in Sudan (87.6%) while *P. vivax* accounts for an increasing proportion. The prevalence of *P. vivax* alone was 8.1% and that of mixed infection (*P. vivax* with *P. falciparum*) 4.3%. The most striking feature of the Sudan MIS 2016 is that *P. vivax* is now seen everywhere in Sudan. The increasing prevalence of *P. vivax* was clearly noticed in River Nile State, Khartoum State, Kassala State, Darfur States and West Kordofan State. The trend was stronger in urban than in rural areas. A recent facility-based study confirmed this situation where the overall prevalence of P. vivax among the malaria cases reported to be 26.6% with significant variations between the states and between urban and rural)[17]. *P. vivax* is also

[17] Elgoraish AG, Elzaki SEG, Ahmed RT, Ahmed AI, Fadlalmula HA, Abdalgader Mohamed S, et al. Epidemiology and distribution of Plasmodium vivax malaria in Sudan. Trans R Soc Trop Med Hyg. 2019. https://doi.org/10.1093/trstmh/trz044

reported to cause severe malaria in Sudan[18]. The situation could be explained by population movement, the presence of refugees and increased influx from endemic neighbouring countries (Ethiopia and Eritrea). The emergence and marked increase of *P. vivax* poses new challenges to malaria treatment and control in Sudan.

Malaria vectors

Mosquitoes of *Anopheles gambiae* Giles complex are the main malaria vectors in Sudan. Out of 38 *Anopheles* species described in Sudan, *An. arabiensis* is the most important vector in all states, while *An. gambiae* s.s and *An. funestus* are increasingly reported in several southern parts of the country. *An. rivulorum* and *An. pharoensis* have been reported but it is not clear yet whether they play a role in malaria transmission in Sudan. The current challenge is the emergence of *An. stephensi* as an efficient and highly competent malaria vector for both *P. falciparum* and *P. vivax* in the Horn of Africa including Sudan[19]. This vector is strongly adapted to man-made breeding sites, particularly in urban areas, and it is highly anthropophilic. It appears to have spread from Djibouti to other parts of the Horn of Africa since 2012 and recently, it has been found in Sudan as far north as River Nile State and also in White Nile States (IVM department data). Continued monitoring of the spread of this species in the country and collaboration with neighboring countries is necessary.

Malaria burden

Malaria transmission in Sudan is characterized by a seasonal and unstable pattern. This temporal and spatial distribution is mainly determined by the diverse eco-climatic conditions. The rainfall diversity (ranging between 3 to 237 mm), irrigation pattern and habitation play a major role. The major transmission season is during the period September - December following the main rainy season (July - September) in the North, and (June to November) in the South. A shorter transmission season follows during the January - March season in some parts of the country. Almost all population groups in Sudan are at risk of malaria. According to MIS 2016, the overall parasite prevalence was 5.9% (95% CI: 5.7% - 6.2%). Prevalence varies between states and clusters (Figure 1 and 2). Central Darfur reported the highest prevalence in this survey (21.8%) followed by South Kordofan (14.4%) and Blue Nile (12.1%). Khartoum, River Nile, Northern, White Nile and Red Sea states reported prevalence of less than 1%. The prevalence among populations in camps was triple that among urban populations and double that among rural people. Higher prevalence was reported among population of economical lowest, second-lowest and middle quintiles. Due to the unstable and seasonal pattern of malaria transmission, malaria was seen in all age groups (Figure 3) but prevalence was significantly higher in children than in adults, in males than in females and in pregnant women compared to non-pregnant. The ratios between the

[18] Mukhtar, M.M., Eisawi, O.A., Amanfo, S.A. et al. Plasmodium vivax cerebral malaria in an adult patient in Sudan. Malar J 18, 316 (2019). https://doi.org/10.1186/s12936-019-2961-1

[19] WHO: Global Malaria Programme. Vector alert: Anopheles stephensi invasion and spread (Horn of Africa, the Republic of the Sudan and surrounding geographical areas, and Sri Lanka). Information Note, December 2019. WHO/HTM/GMP/2019.09 © World Health Organization 2019

prevalence rates in 2016 vs. 2012 were higher in the higher age-groups than among young children. Thus, there was a (modest) shift of burden towards higher age-groups suggesting lower transmission intensity in recent years compared to around 2012. On the other hand, the prevalence in all age-groups was higher in 2016 than in 2012 (Figure 4)[20].

Figure 1: Malaria parasite prevalence per state, MIS 2016

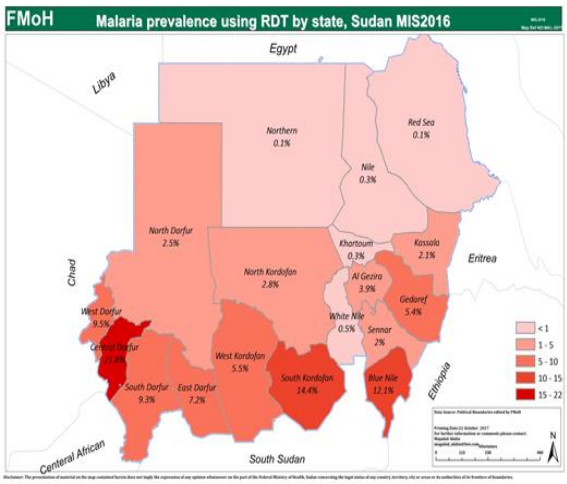


Figure 2: Distribution of malaria parasite species by clusters, Sudan MIS 2016

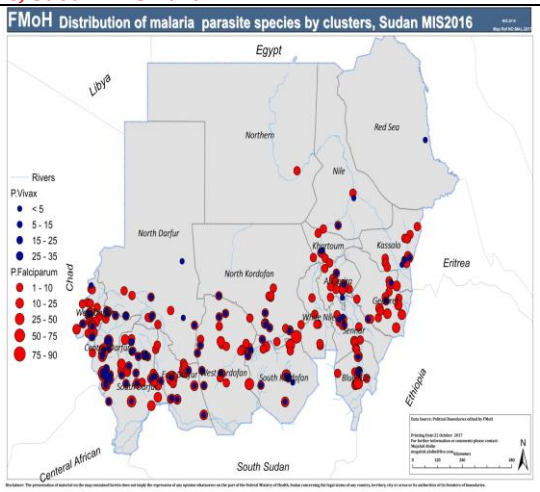


Figure 3: Malaria parasite prevalence per age group, 2016

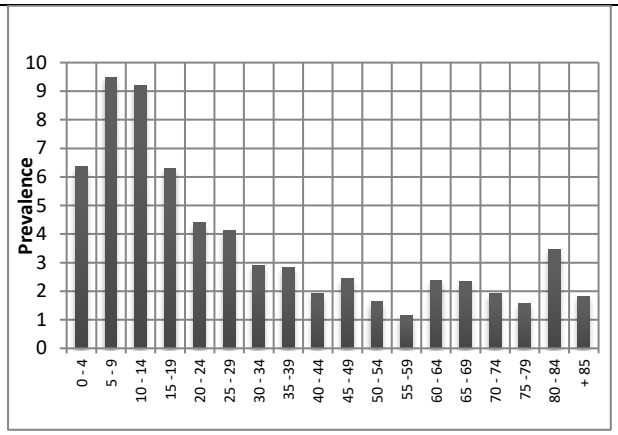
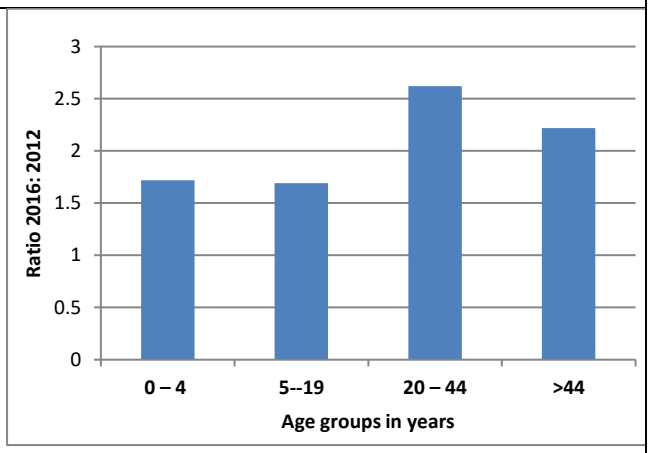


Figure 4: Ratio of parasite prevalence (MIS 2016 : MIS 2012) in different age group in Sudan



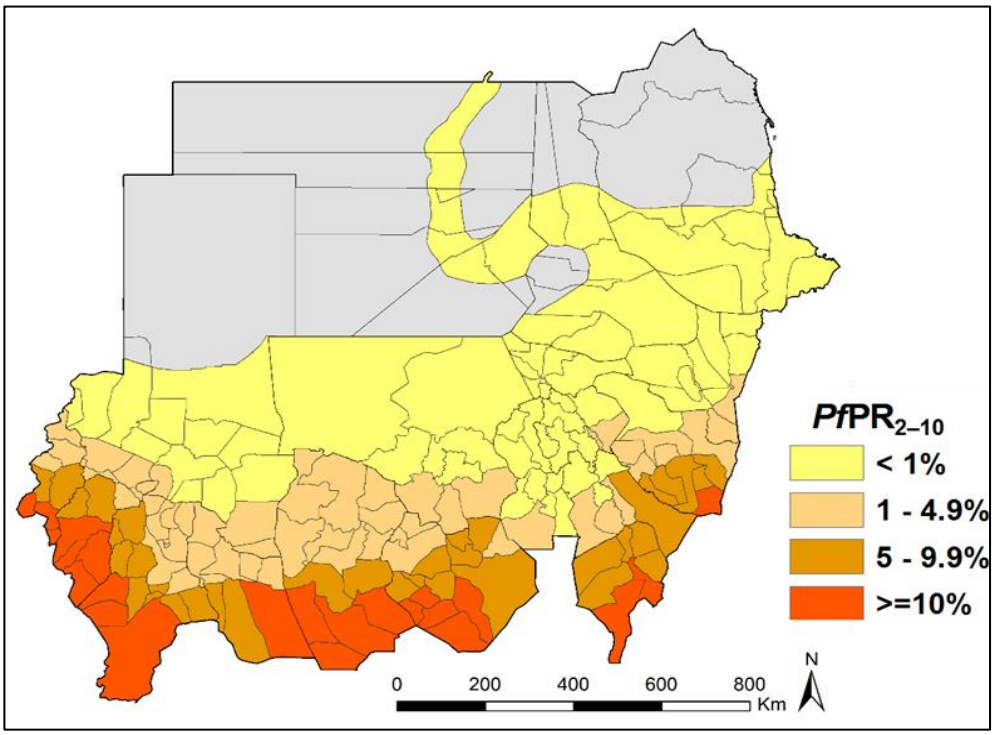
Malaria risk map

Parasite prevalence data from Sudan MIS 2016 and from other sources were computed together. Maps were developed reflecting the diversity in transmission and the risk per locality. The majority of Sudan's population is at risk of malaria transmission with variable degrees of intensity. However, large strips of the arid localities north of the 18th parallel do not support malaria transmission. As part of the LINK

[20] MPR 2018

programme in Africa[21], consolidated *P. falciparum* prevalence data from previous studies and national surveys (2010 - 2016) have been used for mapping malaria risk (Figure 5).

Figure 5: *P. falciparum* prevalence data from surveys conducted from 2010 to 2016. $PfPR_{2-10}$: Prevalence of *P. falciparum* in children aged 2-10 years. (Courtesy R. Snow).



The risk map reflects malaria risk locality by locality. The majority of localities are in the area with <1% malaria prevalence and few (23 out of Sudan 189 localities) are in the area with prevalence more >10%.

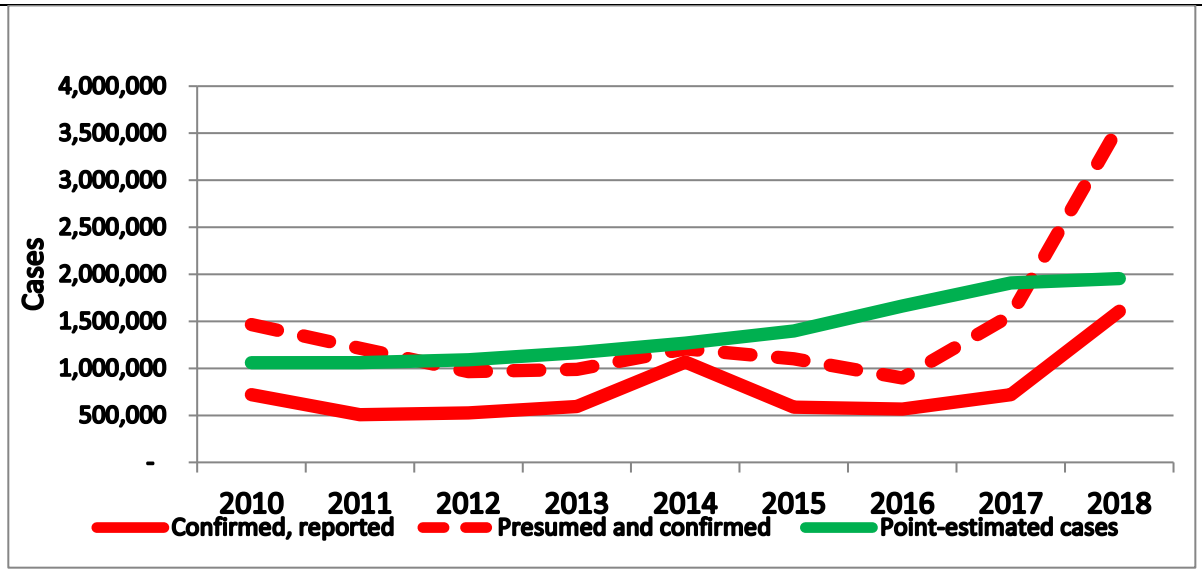
[21] Courtesy R. Snow

This pattern follows the ecology, vegetation distribution and rainfall with few exceptions. As the map is based on the prevalence at locality level, national and state malaria control efforts should take into consideration this when designing malaria control interventions.

Malaria cases and death

From 2010 to 2018, the "reported confirmed" and the "reported confirmed and presumed" were increasing with notable jump in 2017 and 2018 (Fig. 6)[22]. In 2018, the "reported confirmed and presumed" cases exceeded the mid-point estimates. The reported confirmed malaria cases increased from 14.2/1000 population in 2016 to 17.7/1000 in 2017 and 38.4/1000 in 2018. The increase of the "reported confirmed and presumed" was even sharper: from 22.5 to 38.3 and 85.7 per 1000 over the same years (Fig. 7). During the same period (2010 -2018), reported malaria deaths were far below the estimated figures but the trend was similar with notable increase in 2017 and 2018 (Fig 8). The malaria deaths rate showed steady increase; from 1.8 to 3.8 to 7.5 per 100,000 population in 2016, 2017 and 2018 respectively (Figure 9).

Fig 6: Mid-point estimated, reported confirmed and reported presumed and confirmed malaria cases in Sudan, 2010 - 2018



[22] WMR 2019

Fig 7: **Reported malaria cases/ 1000 population in Sudan, 2010-2018**

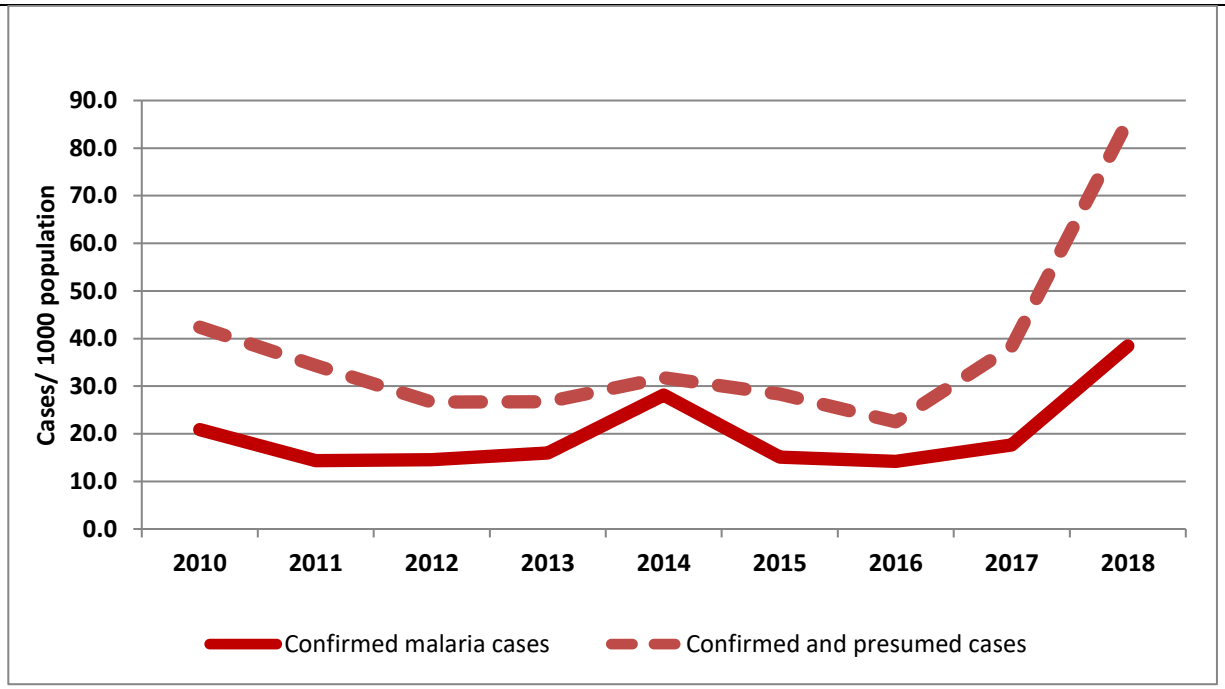


Fig 8: Upper estimated deaths and reported malaria deaths in Sudan, 2010 -2018

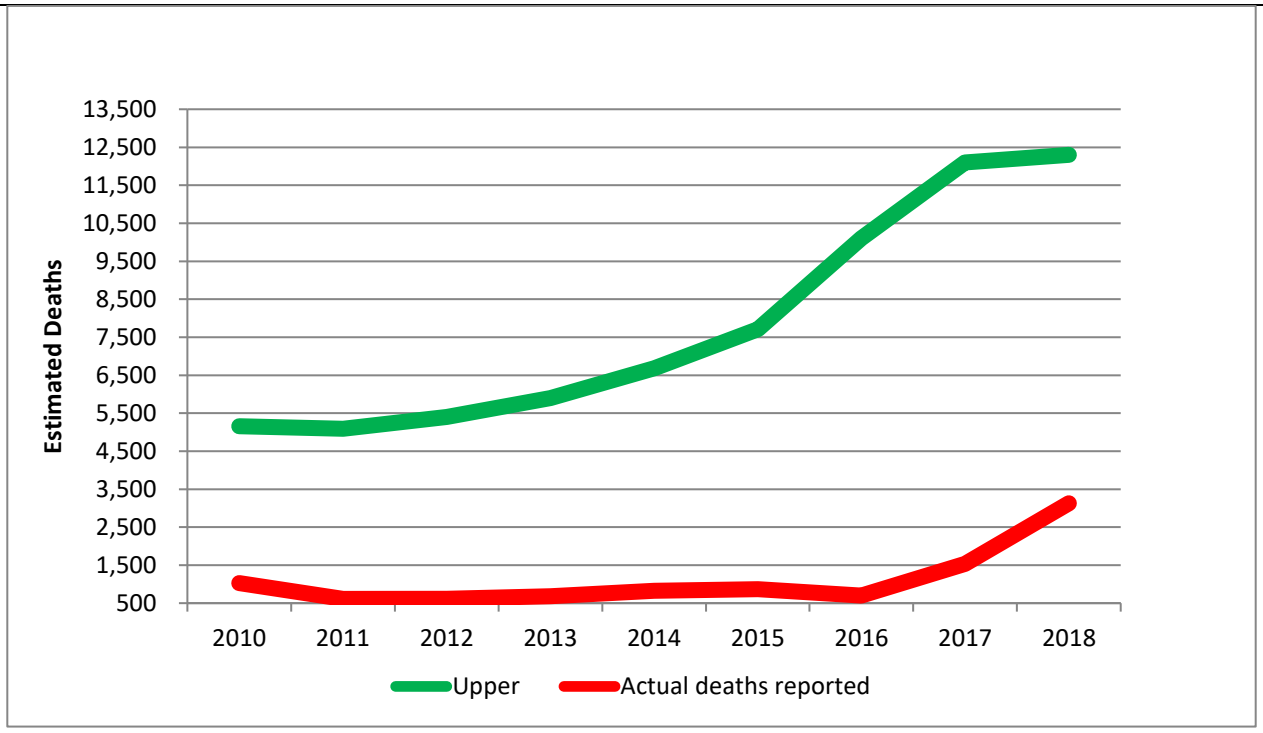
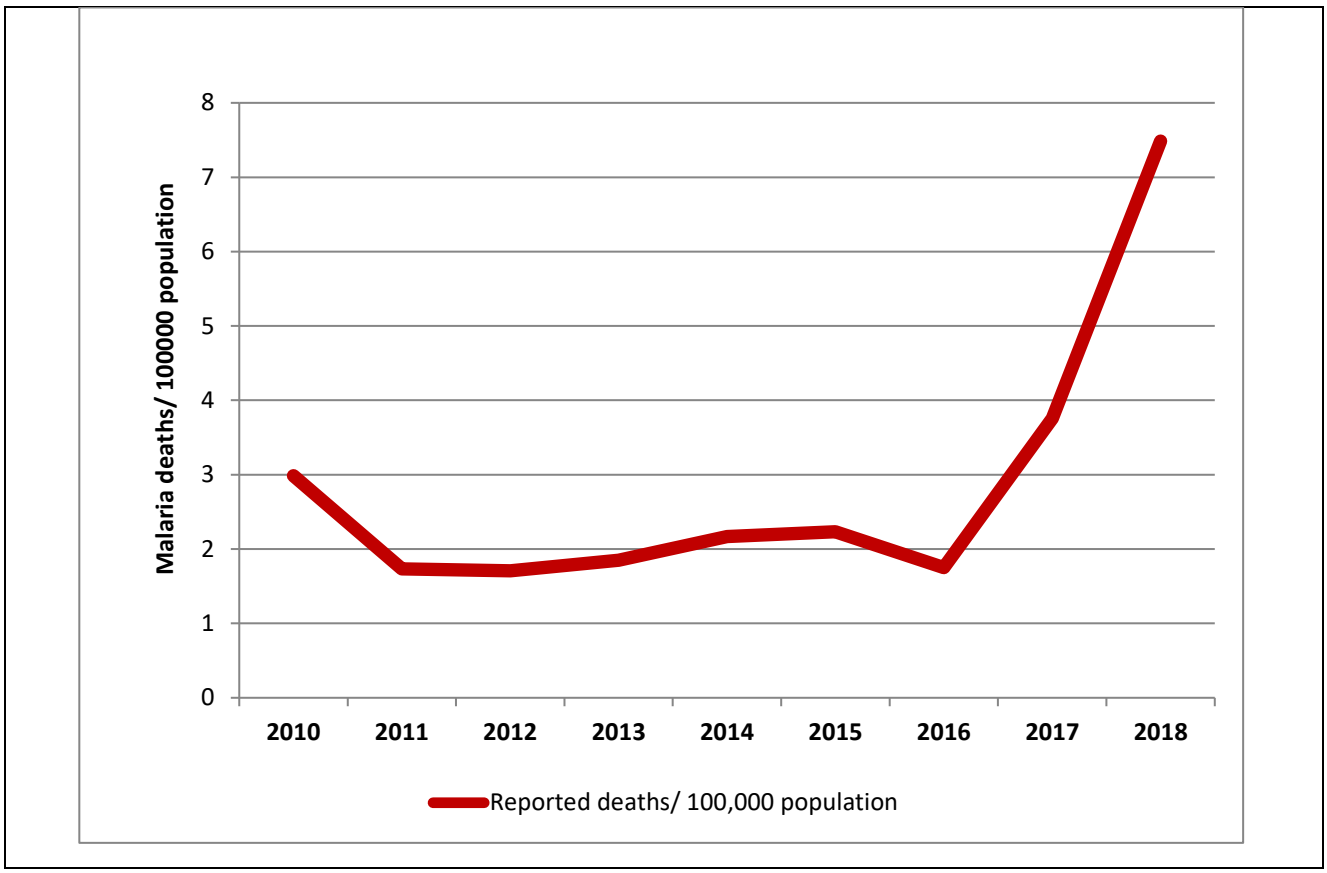


Fig 9: Reported malaria deaths/ 100,000 population in Sudan 2010-18



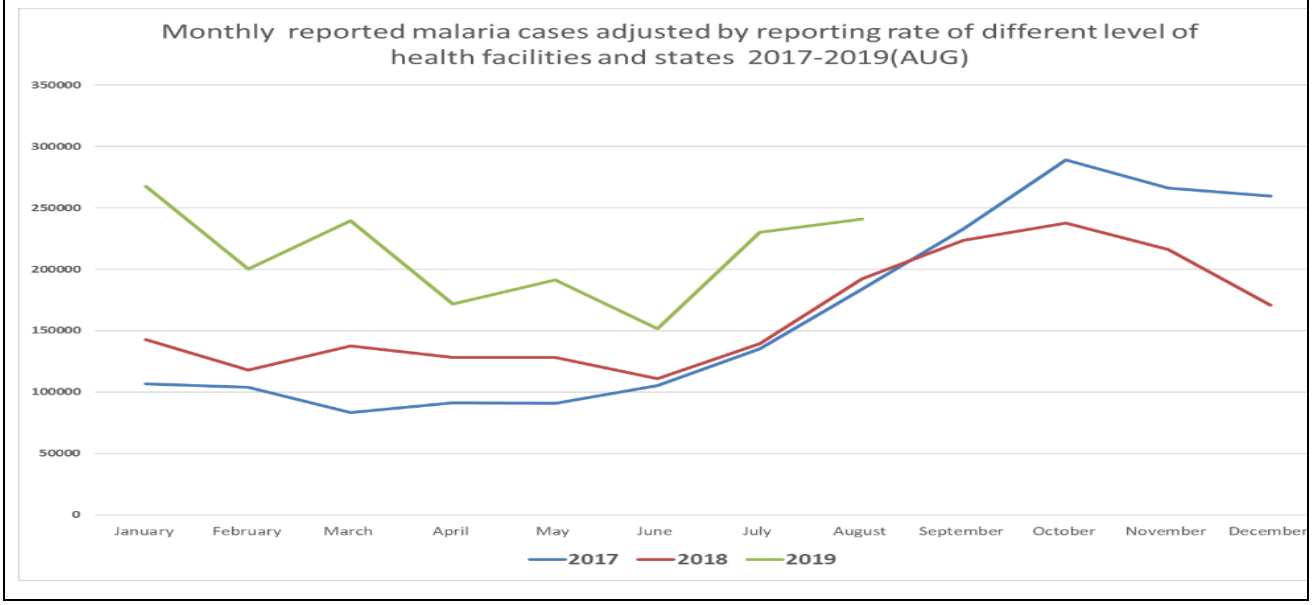
A WHO mission report in October 2019[23] stated that during the first two years of the NMSP (2018 - 2020) implementation, the country witnessed a nationwide outbreak. HMIS reported total and confirmed cases from public health facilities increased from 900,000 in 2017 to 1.6 million in 2018. However, with adjustment for the reporting completeness for different levels of health facilities and by states there is not much difference between the two years; the true number of confirmed cases would be close to 2 million in each year, considering significant increase in reporting rate by HMIS in 2018 (Figure 10). Reported confirmed malaria cases till the end of August 2019 were at the same level as of end of August 2018, that is more than 930,000. However with adjustment for a sharp decrease in reporting rate in 2019, attributable to political crisis, dysfunctional health facilities, and insufficient supervision, the estimated number of cases will be much higher than in 2018. The preliminary estimation of malaria cases in public health facilities can be as high as 1.6 million, noting that all figures do not include Khartoum State as it is not part of DHIS2 system yet.

Malaria transmission in Sudan is seasonal, as mentioned above. It seems that in 2019 the second season became much more prominent compared to previous years. Widespread flooding in 15 states of the country started from August and the extended rainy season to October has increased the risk of malaria and other VBDs, especially arboviruses. October has been the peak of malaria reported cases during

[23] Joint WHO HQ and EMRO mission report, October 2019

the last 2 years from HMIS data; likewise, weekly surveillance data have shown peaks in week 38 to43 over the last 5 years. Noting current conditions, it seems likely that this peak will extend to November starting from 2020 particularly in southern areas.

Fig 10: Monthly reported malaria cases adjusted by reporting rate of different level of health facilities and states, 2017 -2019



5. Malaria control in Sudan

5.1 Malaria case management

Malaria Treatment Protocol: The therapeutic efficacy studies (2011 – 2015) showed reduced sensitivity of *P. falciparum* to the first line treatment (artesunate + sulfadoxine-pyrimethamine -AS+SP). Based on this, the treatment protocol was updated in 2017. The new protocol states that artemether-lumefantrine (AL), dihydroartemisinin-piperaquine (DHAP), and oral quinine are recommended treatment for uncomplicated *P. falciparum* malaria as first, second and third lines of treatment respectively. The protocol also recommends adding primaquine to AL in case of *P. vivax* considering its increasing prevalence. Two issues are facing this so far: The provision of free of charge primaquine is not part of the previous Global Fund applications and there is no clear picture about G6PHD deficiency.

In accordance with WHO guidelines regarding the management of severe malaria and the MPR recommendations, artesunate injection (IV artesunate) will be the first choice for treatment of severe malaria (including during the first trimester of pregnancy). However, given the stocks in the country, quinine injection stocks will be used initially, and then replaced with artesunate injection stocks. Artesunate suppositories are recommended as pre-referral management of severe malaria for children; however, it is not available in the country, so procurement will start from 2021.

The programme monitors the therapeutic efficacy of the first- and second-lines treatment on regular basis at sentinel sites. Recent studies showed high efficacy for both AL and DHAP. The enforcement of

the malaria treatment policy, regular follow-up and the quality of anti-malarial medicines available in the market are the responsibility of the NMPB. Of particular interest currently is the use of artemether injection for severe malaria management despite the fact that it was officially banned by ministerial decree (31st December 2017); it is –still- available in the market.

Overall, there is a good adherence to the National Malaria Treatment Protocol according to the malaria quality of care surveys, 2018- 2019 and NHIF audit. Healthcare providers asked the suspected malaria patients to be tested (using microscopy or RDT) and they prescribed anti-malarial as per protocol. Yet there are care providers prescribe antimalarial although test result is negative or no test at all. Nevertheless, more emphasis and trainings are needed to improve the dosing schedule and to maintain high level of adherence to the protocol considering the high turnover.

Training of malaria case management mentors from national and states level was done in 2018. The training was designed to establish state malaria case management mentors. The mentors are trained to train and supervise malaria case management at hospitals in states, with focus on severe malaria. Currently, not all trained mentors are available in their states; furthermore, they are not utilized by the state malaria control programmes to conduct their planned activities, as there are no clear term of reference and no action plans. There is a need for a formal retention mechanism for these state malaria case management mentors. States' health insurance funds contributed to 15% of care provider training conducted in different states in 2018 and 2019. Data related to training showed a big gap[24]. Only 50% of targeted nurses (4000), medical doctors, medical assistants and pharmacists (22,000) were trained in 2018-19. Greater emphasis in training should be given to CHWs who are covering the iCCM service points, as the majority of them serve people of special concern (nomads, refugees, IDPs and those from neighbouring countries)

Integrated Community Case Management (iCCM): This initiative builds on the success story of the malaria home-based management implemented in five states; four of them are regularly reporting. The implementation of iCCM is currently the responsibility of maternal and child health department (MCH). Since the endorsement of iCCM in April 2017, several meetings with key players were held. An iCCM manual (based on the iCCM manual for under-five) is currently under development. Moreover, more than 7,000 communities were identified as preliminary target and of them 20% have initiated the implementation.

The implementation of IMCI/ iCCM has faced many challenges in Sudan. The most important are the scope of services for CHWs is not clear; the job description is not finalized; the retention policy of the trained CHWs; lack of clear guidance and accountability frame; supply systems and referral pathways are not clear. However, from the implementation experience the programme has learnt that the use of

[24] States training data: https://docs.google.com/spreadsheets/d/1vnrZATim62fYnzKR0JcDwLevCfr-vWleDzo66RaWKOc/edit?usp=sharing

CHWs even in areas where there are health facilities has improved the health seeking behavior and early detection and decreased the work load on the health facilities. Some states, during implementation of IMCI/iCCM training, managed to cover malaria in adults (iCCM+) and maintained the supply from the state programme by creating a link between the facilitators, CHWs and the malaria programme at the state level.

Malaria diagnosis

The current malaria diagnosis policy is to examine all suspected malaria cases by microscopy or RDTs. The policy is also to provide RDTs free of charge in all health facilities as per national treatment protocol. Microscopy services are available in all hospitals and health centers, but with variable quality, and the patient has to pay 30-80 SDG per test in the governmental sector and 70-200 SDG in the private sector. The majority of reported confirmed cases are diagnosed by microscopy. Noting the low quality of microscopy in majority of centers that has been confirmed repeatedly in many previous assessments and also weak quality control and quality assurance system in the country there is high level of misdiagnosis particularly over-diagnosis and false positive reports that increase the risk of reporting of other febrile diseases including vector borne diseases as malaria.

The MPR recommendations included "Access to RDTs where and when microscopy is not feasible should be expanded. Health facilities, including those with unreliable quality or unstable electricity or crowded facilities microscopy, should always have RDTs available and not allow any delay in diagnosis related to overload of microscopy staff". Following the MPR recommendations, DCD issued an official letter asking the states to avail RDT tests in all health facilities including those with microscopy but the uptake of this is very low although more RDTs were procured and distributed to states and facilities. Supervision teams reported that even in health facilities with high load of patients, health care providers tend to use microscopy because they do not trust RDT results or because use of hospital microscopy increases their income. The malaria quality of care survey 2019 showed that only 10% of health facilities have no malaria diagnostic facilities. So, the sharp increase in presumed malaria cases in 2018 and 2019 remains unexplained.

There is no national malaria reference laboratory. Efforts to establish it are ongoing with the national public health laboratory. There are reference laboratories in 16 states with variable functionality and equipment. Each state has a malaria laboratory coordinator and 1-5 assistant quality assurance personnel. The function of each member varies from conducting the quality assurance slide quality check at health facility level to the double-checking of slides.

The adopted method for quality assurance system is termed 3x3 system which classified the laboratories into 3 categories namely A, B and C; the classification depends on an evaluating of the general setup of the laboratory, adherence to SOPs, and evaluation of the skills of the microscopists in malaria microscopy. The classified laboratories should be monitored according to their classification, for example laboratories A should visited every year, B every 6 months and C every 3 months. The Khartoum state report in 2019

showed that 110 health facilities were visited, 85% of them are governmental sectors while the rest are private and NGOs facilities. Overall, 34% of the lab categorized as C, 30% as B and 27% as A. The system is covering few facilities in few states because of limited resources.

The refresher Malaria microscopy training course is good option to raise the knowledge and the skills of the microscopists, and it is implemented once a year per state with funding from GFATM plus an effort of some states to implement more with their own resources. Basic Malaria microscopy training has not been conducted since 2015. The WHO "External Competency Assessment for Malaria Microscopy" (ECAMM), was conducted twice in Sudan and efforts to establish a "National Competency Assessment for Malaria Microscopy" are ongoing with attempts to introduce e-learning.

The prevalence of *pf* gene mutation in Sudan was studied through a joint WHO/ MOH survey in 2018 targeting the states bordering Eretria (Kassala and Gadarif). Results showed that there is no public health implication related to gene deletion and recommended to continue monitoring the situation. Efforts to improve malaria diagnosis may need to consider the result of "The *pf* Gene Deletion Survey" conducted in 2019 in Gadarif and Kassala States where a 1720 blood samples were collected to determine the prevalence of the *pf* gene mutation.

Antimalarial medicines procurement and distribution: ACTs, artesunate IV and RDT are procured by UNICEF as part of the Global Fund Grant to be distributed free of charge in the public health facilities. UNICEF also procures ACTs and RDTs from other funding sources and distributes them to fill gaps in some state or to respond to malaria outbreak in some states. However, considerable number of patients seeks treatment at private health facilities and need to be considered in future planning. The malaria supply system has been integrated within the National Medical Supplies Fund with its branches since 2012. Following this, the storage and logistics support for delivery of malaria diagnosis and treatment commodities has been strengthened from locality to state and central levels. However, some localities have not been covered with the strengthening activities (improving the PSM capacity, storage and LMIS) yet. As part of this, a monthly paper-based report (on RDT and ACT and malaria cases treated) from all health units to locality level and then from localities to state level is established. States report to national level through the computerized eLMIS. At state level, all reports are aggregated by the supply focal person into an informative report that generated using the Enterprise Resource Planning (ERP) system ie stock received, dispensed and remaining stock at facility level.

Although a target of "no locality stores to report stock-outs of ACTs drugs for more than 7 days" was reached during the period 2011-2015 and reflected on the availability of ACTs and RDT at facility level, frequent stock-outs of ACTs and RDTs were reported in a number of health facilities in 2019 raising many questions about sustainability. As a result, many patients with uncomplicated malaria experienced difficulties to get drugs through the public health system as revealed by malaria quality of care surveys. They get their prescription from any nearby private pharmacy but not free of charge.

Gaps and priorities in case management: Based on the above observations and the MPR, the programme priorities should be:

1. Improving access to RDTs.
2. Ensuring quality assured microscopy by establishing a national reference laboratory and revitalization of states' reference laboratories and application of updated protocols.
3. Training of care providers (including those at iCCM services) based on state case management mentors and utilizing health insurance resources.
4. Establish a single layer distribution system for ACTs and RDTs to avoid stock out
5. Malaria community home management within a package of integrated community case management (iCCM) should be revitalized and expanded as per WHO guidelines.
6. Malaria control programme to work with private sector to provide quality-assured microscopy and avail free of charge ACTs, RDT and artesunate IV for malaria patients. The programme can make use of the experience of other countries supported by GFATM.

5.2 Control of malaria in pregnancy

According to the MIS 2016, the parasite prevalence among pregnant women was 5.1% (95% CI: 3.9%-6.5%), compared to 3.8% (95% CI: 3.4%- 4.3%) among non-pregnant women.

a) *Intermittent Preventive Therapy for Pregnant (IPTp)*: In consideration of the high malaria burden in some parts of the country and the potential for reducing the proportion of neonates with low birth weight there, IPTp was part of the strategic plan 2018-2020 for southern states. Because of the many operational constraints, this was not implemented, but there is now consensus that IPTp will be implemented from 2021 in stratum 5 and 6 (see below).

b) b) *LLINs for pregnant and under one year*: see vector control section below

c) c) *Case management in pregnancy*: see case management section above

5.2.1 IPTi and SMC

Intermittent preventive therapy for infants (IPTi) and seasonal malaria chemoprevention (SMC) are not currently part of national malaria control policy. As part of the NSP 2021-25, assessments, consultations and possibly operational research will be undertaken to assess the potential effect and feasibility of these interventions.

5.3 Malaria vector control

As stated in the "Global Vector Control Response (GVCR), 2017 -2030", malaria and VBDs can be prevented through vector control, but only if implemented effectively. Identified challenges for effective implementation include: lack of capacity and capability; lack of a comprehensive national strategy for vector control and the necessary legal framework; a limited toolbox of interventions; lack of community

involvement; and ongoing environmental and social changes that result in the proliferation and geographic expansion of vectors[25].

Sudan has had an exemplary history of successful vector control initiatives going back to the early 1930s. It was also the first country in the WHO Eastern Mediterranean Region to have implemented IVM since 2003. The recent report on vector control needs assessment report, 2019 (VCNA report, 2019) identifies the major achievements, issues, enabling and constraining factors in each of the four key areas (identified by GVCR plan) to attain effective, locally adapted and sustainable vector control[26].

Based on the VCNA report, 2019; the country developed a comprehensive Vector Control Response Strategic Plan 2021 - 2025[27] addressing all vectors of human disease. The main objective of the plan is to implement effective locally-adaptive and sustainable vector control interventions by strengthening inter- and intra- sectoral action and collaboration; enhancing entomological surveillance, monitoring and evaluation; scaling up and integrating tools and approaches; and engaging and mobilizing communities. The priority actions of the plan include recruitment of mosquito men/house inspectors for the control of urban malaria, introduction and rotation of innovative vector control products prequalified by WHO, and behavior change communication to enhance community engagement.

In Sudan all vector control efforts are integrated and led by the integrated vector management department (IVM department). Currently there are 185 medical entomologists and 32 public health officers working as professionals at different levels of health services for vector control. In addition, there are 45 mosquito technicians, and 5106 workers for larval source management (LSM) and support staff. In Sudan there are two insectaries and 10 entomological laboratories which are well equipped and supported with trained personnel to conduct all aspects of vector surveillance and insecticide resistance including molecular biology. The main financial contributors for vector control in Sudan are GFATM and the Government of Sudan. The contribution of WHO is mainly technical, but also financial during epidemics and emergencies. UNICEF supports procurement of LLINs for response to different emergencies, flood and for any other mosquito borne outbreak using different funding sources. During 2019, UNICEF procured 250,000 LLINs for these purposes.

Scaling-up and integration of tools and approaches: Malaria vector control is generally the preventive arm (together with targeted IPTp) of malaria control, where case management is the curative component. In some areas in Sennar and Gezira, a combination of LSM with IRS is applied, and in many areas, where LSM is applied, there is an integrated use of environmental and chemical measures. **In IRS areas, while pregnant women could benefit from the use of LLINs, these have not been provided to them**. IRS has been implemented in Gezira and Sennar for the last 10 years with the support

[25] GVCR 2017-2030
[26] VCNA report 2019
[27] Sudan VCR plan 2021-2025

from GFATM with considerable impact on malaria transmission. Implementation of LLINs was extended to 12 states (the target) with regular monitoring and efforts to improve net utilization.

A total of 5,489,927, 3,077,319 and 8,564,825 LLINs were distributed in the targeted states in 2017, 2018 and 2019 respectively. Thus, by the end of 2019, a total of 31.3 million population (representing 96% of the target) were covered by LLINs as per distribution data. In Gezira and Sennar a total of 3,900,066 population (97.5% of the target population in the 2 states) were covered by IRS (2 rounds per year) every year. The population covered in Gezira and Sennar with IRS represents 76% of the total population targeted for IRS in Sudan; the rest (24%) were not covered because of lack of resources. LSM has been initiated in all the 110 targeted urban settings (representing Khartoum and all capital towns/ cities of states and localities) but only 75 (68%) of them implemented the intervention as recommended by the National IVM department because of lack of resources.

Entomological surveillance, monitoring and evaluation: There are 106 and 73 sentinel sites for routine vector surveillance and insecticide resistance monitoring respectively. The IVM Department at national level leads the work and the sub-national level contributes significantly in the field implementation. Data is collected through routine weekly and monthly reporting system to monitor and evaluate the implementation of the planned activities and the progress in various projects. There is a list of indicators used for monitoring selected from global indicators.

There is a system for the routine monitoring of insecticide resistance. Currently, routine monitoring of insecticide resistance is well established for *Anopheles*, *Culex*, *Aedes* mosquitoes, sandflies and houseflies. The monitoring investigates both the phenotypes and genotypes of the resistance. Recent results (2018) showed that the population of *Anopheles arabiensis* was susceptible to bendiocarb (carbamate) except in Gezira, Gadarif, Kassala, Red Sea and River Nile states. Primiphos-methyl (organophosphorus) was also susceptible in all the areas tested. On the other hand, *An. arabiensis* was found to be resistant to pyrethroids and DDT (organochlorines). Bendiocarb has been in use for IRS since 2008. This is not a good resistance management practice. Other available insecticides for which the vectors are susceptible need to be used in rotation, preferably after every two years.

For bio-assay tests the department collaborates with WHO (for mosquitos) and TMRI (for sandflies). Bioassay test (cone bioassay) is conducted to evaluate the quality and bio-efficacy of indoor residual spraying (IRS) targeted areas in Gezira and Sennar state where 35 sentinel sites were identified for this purpose. The bioassay tests are conducted using a susceptible laboratory strain (Dongola colony of *An. arabiensis*). Following each IRS round the bio-efficacy of the insecticide on wall is monitored for 4 months.

The surveillance and monitoring activities is backed by 10 entomological laboratories in 10 states and by two insectaries in two institutes. There are other entomology laboratories, but they have separate

mandate and are rarely used by the programme. This work is severely jeopardized by staff turnover, emigration to neighbouring countries and insufficient funding.

Inter- and intra-sectoral action and collaboration: At FMOH level, there is an official link between IVM department and programmes and directorates concerned with VBDs control. The collaboration with Health Emergency and Epidemic control (HEEC) is well established, particularly for controlling arboviruses outbreaks. To overcome potential negative side-effects of some development projects, the FMOH works with relevant government sectors (irrigation, agriculture, education, finance, social development etc.). This is theoretically supported by the high level adoption of *Health in All Policies – HiAP*, where different sectors have committed to work for health. However, HiAP is not legally binding and not enforced. The IVM department (FMOH) also has established a strong link with the National Pesticide Council (NPC). The NPC (an inter-ministerial body) is responsible for implementing and enforcing the Act (Pesticides and Products for Control of Pests Act, 1994). This is very useful in resistance management. The national inter-sectoral committee (ISC) for vector control was established in January 2005 through the initiative of FMOH. The ISC is composed of 36 members representing relevant stakeholders. From inception, the ISC has been actively involved in the preparation of the VCNA; developed mechanisms for future cooperation and discussed possible means to implement the activities. Integrated Vector management activities are planned at both central and state levels and implemented by localities and municipalities. Joint meetings between officials (at the central and states and within states between State and locality officials and locality council members) resemble the mechanism and procedure that ensures appropriate coordination at all levels. The IVM department develops guidelines for malaria and other vector control in development projects including irrigated schemes. Attempts to implement this are ongoing in the Gezira irrigated scheme, Al Rahad scheme, New Halafa, Kenana, Assalaya, White Nile, West Sennar, Al Gained and New Halfa Sugar Cane Companies. Attempts also extended to Water Corporations which deal with the repair of broken water pipes in urban areas. Issues of concern regarding intra-and inter-sectoral collaboration include poor commitment of some agriculture schemes towards providing infrastructure and support for sustainable implementation of recommended vector control interventions and the fact that the current links and collaboration are not legally binding and lack of human and financial resources.

Community engagement to support IVM: An attempt to involve communities through adoption of Communication for Behavioural Impact (COMBI) is ongoing. This is particularly evident during LLINs and IRS campaigns. Civil societies and NGOs are part of the NGOs Forum where issues are discussed, and plans developed to involve communities. The efforts to promote the use of LLINs through many health promotion activities, including those which are initiated by individuals or organizations through different channels, are directed to behavioural impact.

However, the community engagement activities have not been built on behavioural situation analysis and did not utilize community health system and there is no unique policy or guidelines for community engagement. The enabling factors for engagement is the commitment of the government to offer free broadcasting and the NGOs Forum is a good foundation for community engagement as some NGOs and civil societies have a good understanding of community needs.

The IVM conducted a joint mission with the "Alliance for Malaria Prevention (AMP)" to assess the Social and Behavior Change Communication (SBCC) approaches implemented during the LLIN distribution campaigns considering the low percentage of use of nets by owners. The mission recommended[28] compiling the data from Tracking System Surveys to determine access ratio for each locality as a means of determining which localities are in need of additional research to better understand behaviors and to work with UNICEF Communication for Development to conduct quick Focus Group Discussion in underperforming localities. It also recommended establishing a malaria communication technical working group at national level to create a national message and to involve private sector representatives from the telecoms, to be active participants in the technical working group.

Best practice and success stories: Three success stories are highlighted in the VCNA report. During the past 5 years, the IVM department has invested a lot in human resources and in infrastructural development at all levels. Over 524 staff received long and short-term training courses in different aspects of vector control including MSc and PhD in entomology and vector control. The challenge is to retain these trained personnel for malaria and other VBDs. To strengthen vector surveillance capacity at all levels, IVM department has established ten entomological laboratories in 10 of the 18 states and has provided these facilities with all the necessary equipment and supplies. Of these, Sennar molecular biology and medical entomology laboratory is serving as a reference facility. All these facilities were funded through direct support from the Sudan Government, GFATM, Islamic Development Bank and other partners. These facilities are used for routine vector control surveillance and for monitoring insecticide resistance. They are also used for the MSc and PhD students. The IVM Department was able to convince the Government of Sudan to contribute to malaria control through supporting larval source management (LSM) in areas, where this is appropriate. The government contribution has supported the recruitment of vector control workers and the procurement of insecticides and spray pumps. The challenge is to sustain this support.

The new vector control response plan, 2021-2025 gives greater considerations to the following malaria control related issues raised in the last MPR and highlighted by VCNA report:

[28] Sudan IVM Department and AMP: The recommendations for Social and Behavior Change Communication (SBCC). Sudan, 2019 (unpublished report)

1. Nationwide mass campaigns for LLINs every three years (rather than staggered annual) to reduce the operations costs. However, replacement schemes, mainly through routine distribution integrated with ANC and EPI, will still be required between the campaigns. Routine distribution of LLINs for pregnant women should also be introduced in IRS areas.
2. Introduction of LLINs in the periphery of urban areas in Khartoum State, where the ecology transitions towards rural, and there is epidemiological evidence of insufficient impact of LSM.
3. Introduction of the rotation of insecticides in the main IRS areas, beginning with next generation IRS products (three already have WHO recommendations). These have longer residual efficacy than bendiocarb.
4. Revision of the registration procedures for vector control products to align with the new global WHO prequalification criteria to fast-track the uptake of new tools, especially in managing the wide-spread insecticide resistance

5.4 Surveillance, monitoring, evaluation and operational research

Malaria Surveillance: Malaria surveillance is a core intervention as per Global Malaria Technical Strategy. It monitors the trend of malaria morbidity and mortality and informs malaria control programmes at all levels about the impact of control interventions. It also indicates where there is need to accelerate control interventions if trends are increasing, and give alarm when malaria epidemic thresholds are approached. This will enable the programme to plan early enough and mobilize resources to abort malaria epidemics in the right time.

Currently, the Integrated Disease Surveillance and Response (IDSR) at HEEC Directorate carry out all surveillance activities. IDSR shares on weekly basis a unified report with DCD reflecting the malaria situation in Sudan. More data about malaria situation comes through HMIS/ DHIS2 on a monthly basis. The weekly shared data have been used to compute epidemic threshold by locality in late 2019 and early 2020 based on data from previous 3 -5 years. This task is now part of the functions of DCD HMIS and Surveillance Units following rearrangement of the unit in 2017.

Malaria M&E system: Following establishment of DCD in 2015, the Planning, M&E Department in DCD gathers malaria-related data from all relevant departments in FMOH and stakeholder and puts it in one integrated malaria control report. The department during 2016 - 2019 compiled data regarding overall number of malaria cases and deaths from HMIS Department in one report and shared it with WHO EMRO for development of the world malaria report.

At state level, although there are M&E officer as part of the structure of SMCPs in addition to a malaria M&E focal persons at locality level, there is a need to upgrade their capacities in in M&E conceptualization and culture, data management and data use. There is a malaria M&E taskforce with representation from all partners, namely: FMOH HMIS and Surveillance Departments, NMSF, WHO, UNICEF, UNDP and CBOs. Mandate of the taskforce is to periodically review and update malaria data

collection and reporting format, guidelines and manuals and conduct an annual meeting for information and experience sharing. Update of the terms of reference of the taskforce to make it more effective and efficient according to recommendations of the 2018 MPR need to be expedited since during the previous strategy a lot issues hindered the taskforce from being functioning.

Operational research: currently each department at DCD develops its research agenda and carries out its operational research. The two best examples are monitoring anti-malaria drug efficacy and monitoring insecticide resistance. National surveys such as malaria indicator survey are the sole responsibility of the Planning, M&E Department in DCD. An ongoing discussion regarding having all operational research activities in one basket (department) has not been concluded yet. The DCD and malaria control programme need to consider the wider scope of operational research to allow for institutions and researchers to access the research priorities and the program/ DCD to make use of the ongoing research outcomes.

5.5 Epidemics, Emergency Preparedness and Response

Historically, the unstable nature of malaria transmission has been characterized by frequent focal and cyclical epidemics which reach national scale at irregular intervals of 7 – 11 years. Most areas of Sudan are prone to malaria epidemics. During the recent decades, epidemics were reported in Khartoum, Gezira, Sennar, White Nile, Blue Nile, Al-Gadarif, Kassala, Red sea, Northern, River Nile, N. Darfur, W. Darfur, and N. Kordofan states.

The available thresholds in weekly surveillance reports from different states do not show the expected seasonality patterns. This may be due to the current methodology used for determining thresholds at state level instead of locality level, using total cases (confirmed plus presumed cases and/or fever cases) instead of confirmed malaria cases, as well as low reporting or unplanned increase in the number of sentinel sites.

The current approach for developing and using thresholds in the country potentially will create false alarm or in some situations, miss some real outbreaks, with fatal consequences. During the WHO mission in 2019, the collected reported weekly data by surveillance unit was used to update epidemic thresholds for all the states and generate threshold by localities. The current reported data are not ideal and should be used with triangulation with other reports and field missions and investigations. With all limitations, available data show that nine states have been above the defined threshold for outbreaks for more than 5 weeks in 2019. This is most prominent in White Nile, Khartoum, Blue Nile, West Kordofan, North Darfur and South Darfur.

While it is clear that we have increasing number of cases and malaria outbreak in some localities of states particularly North Darfur, South Darfur, White Nile, concurrent outbreaks of Dengue and chikungunya is partly reason for high number of cases reported as malaria in these sates. There is confirmed outbreak of dengue and chikungunya at the same time of the increase of malaria cases in

these states including north Darfur (dengue) and south Darfur (dengue and chikungunya). It reemphasizes the importance of using proper diagnosis of all suspected malaria cases and not treating all fever cases as malaria. It should be mentioned that number of mortalities reported by surveillance department and investigation teams in North Darfur and White Nile is limited. Previous observations and recent visits to states confirmed that majority of hospitalized patients are not severe malaria, and this has resulted in increasing burden on health facilities, inappropriate and incomplete treatment of cases.

5.6 Advocacy, Information, Education, Communication and Community Mobilization

After 2013, and as part of integration strategy, the malaria IEC activities are assigned to the Directorate of Health Promotion (DHP) which is part of PHC General Directorate. Disease control programmes, including malaria, coordinate ahead with DHP for advocacy, IEC or community mobilization. The directorate suffers from staff turnover resulting in weak utilization of allocated fund during the last implementation period of the malaria grant from GFATM. To meet the needs of all directorates and programmes, the DHP has recruited more personnel and has established functioning units. At state level, the majority of activities are linked to the main malaria interventions and implemented during the malaria season. The malaria desk in the directorate builds on past experience and has succeeded to keep the IEC stakeholders. These include different radio and TV stations, newspapers, school health unit at the Ministry of Education and many others. Although there is a "malaria IEC strategic plan, 2014 - 2017", the main activities are those driven by IVM and reflected in community engagement section under vector control above. Generally, the ongoing work is neither satisfactory to malaria programme coordinators nor to DHP. There is a felt need for reform mainly in form of joint planning and co-financing.

Sudan MPR 2018 report highlighted the need for evidence-based, professionally implemented and monitored malaria communication strategies and activities. Some advocacy, communication and social mobilization activities have been implemented, however, they are fragmented, not research guided and not tailored to specific diseases and conditions. The main recommendations from MPR are:

1. Conduct targeted research (e.g. KAP studies) to better understand the enabling factors and barriers that influence demand and uptake of key malaria interventions; and use the results to guide malaria communication plans and activities. The KAP surveys should cover a) LLINs ownership and usage; b) malaria treatment seeking behavior; c) adherence to treatment regimens and d) access to malaria services.
2. Document and disseminate, in collaboration with DCD, state lessons learned and success stories on malaria control, including historical background;

3. Develop strategies to work more closely with school pupils, university students, NGOs/CBOs and professional associations for advocacy and IEC for malaria;
4. FMOH should operationalize the 'Health in all Policies' initiative in the field, in collaboration with NGOs and private sector. This should include mapping of stakeholders concerned with environmental and health impact assessment and mechanisms for coordination in line with the roadmap.
5. FMOH should work with other governmental and private sectors to develop "private sector policy" including malaria control activities.

5.7 Programme Management

Currently, malaria control activities are coordinated by the DCD, Primary Health Care general Directorate. This restructuring started in 2013, following the reform in the FMOH based on integration strategy. All partners and government institutions are aligned with it. The DCD is responsible for strategic planning, resource mobilization, M&E, and capacity building at all levels. According to this new structure, the major malaria interventions were integrated in the relevant sections (Fig 11). Malaria case management (including diagnosis and PSM), and malaria M&E/ planning are under DCD. Partnership is newly established for all diseases at DCD. Malaria vector control is led by "integrated vector management (IVM)" department under at environmental health directorate at PHC General Directorate. Malaria routine data is part of "Health Information System" at Planning General Directorate. Malaria health education and promotion activities are part of "health promotion directorate under department, PHC". A national focal person was nominated by DCD to coordinate control efforts and a malaria monthly meeting (3Ms) chaired by PHC Director is the forum to oversee all malaria activities and interventions. This programme structure together with issues related to health system, high turnover, staff demotivation, and lack of accountability contributed to current malaria situation. Case managements and M&E are the most affected components. The new administration at FMOH is initiating an evaluation process of the implementation of integration and the way forward to be recommended accordingly, but this was slowed by COVID-19.

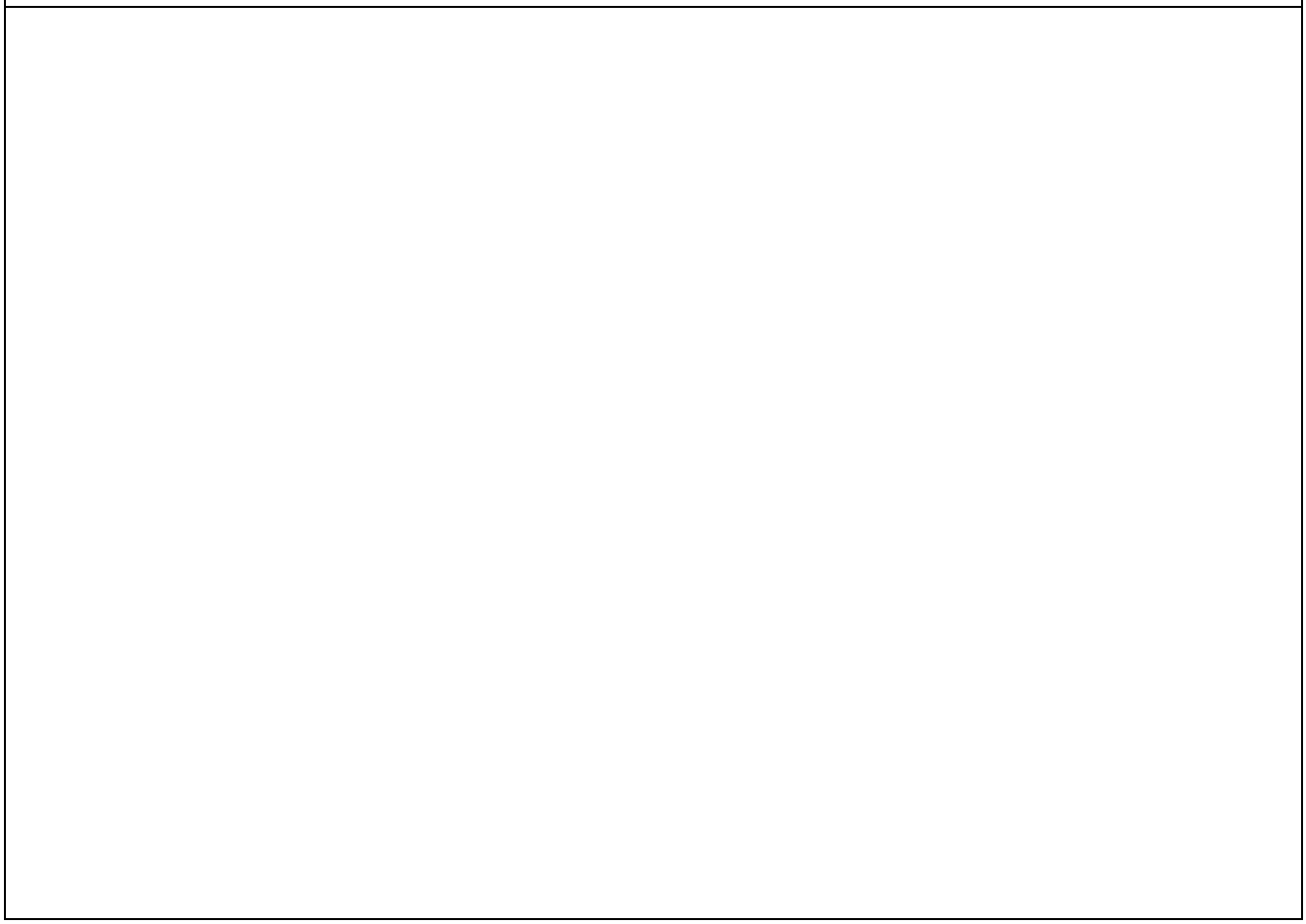
At state level, the structure is expected to align with the national with similar role at state level. However, in the majority of the states there is a still state malaria control programme . MPR clearly recommended keeping the program structure at the state level given the gravity of the malaria situation in most states and the existing health system capacity. To date, there has been no attempt to align state structure with federal structure. At locality level, there is a malaria unit with at least two trained persons mainly executing vector control activities for all vector-borne diseases. Malaria diagnosis and treatment is fully integrated at primary health care level with other diseases (Family health units, family health centres and hospitals). CBOs and private sectors are also involved in the diagnosis and treatment of malaria. In

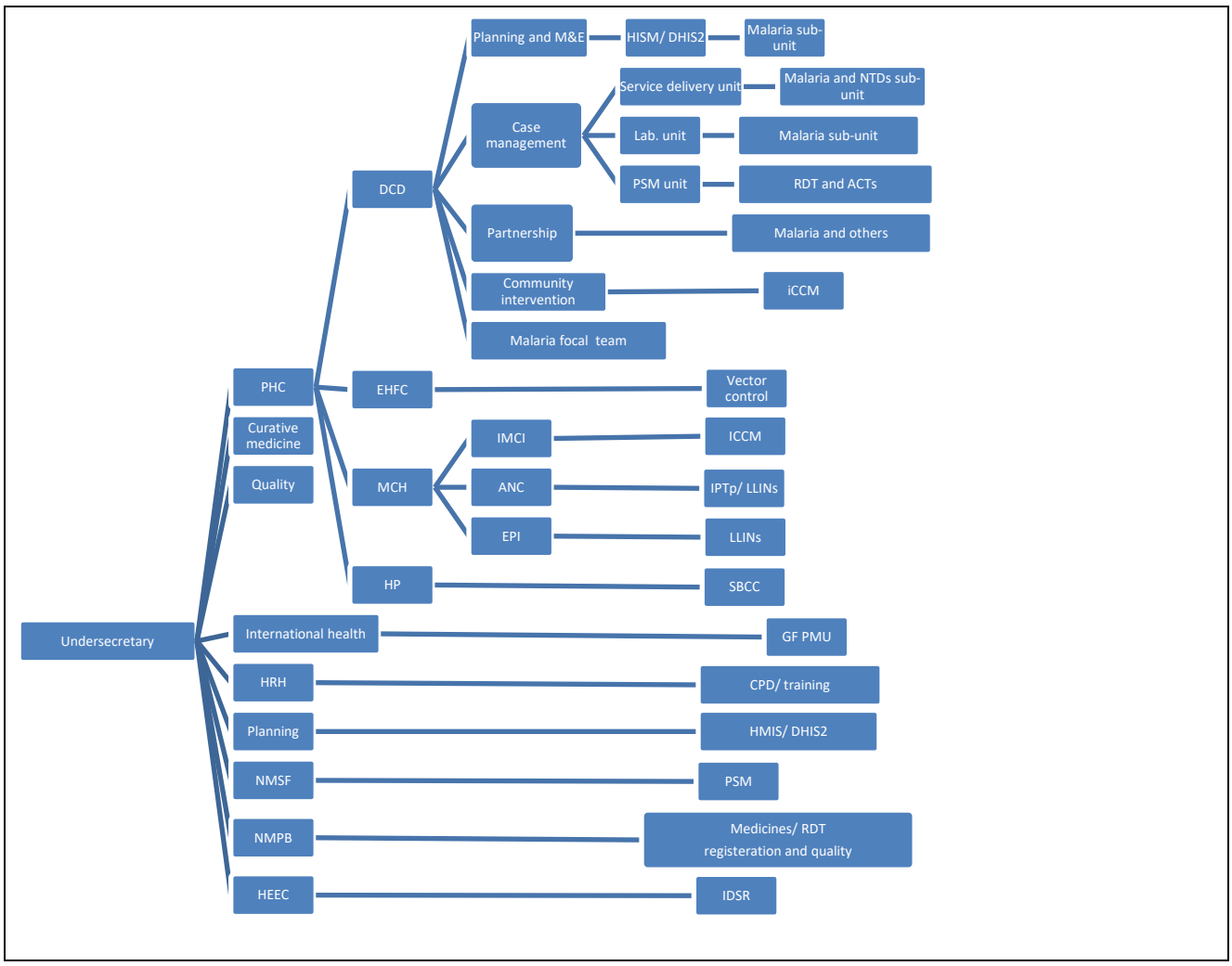
some remote/ inaccessible areas, trained volunteers are dealing with malaria cases at and referring complicated cases to hospitals. An attempt to upgrade the programme to existing iCCM package for under five to cover malaria at all ages (iCCM+) is not yet completed.

The programme has developed a strong network of national and international partners and stakeholders. Broad based malaria technical committees and thematic area sub-groups with membership drawn from other health departments, universities and research institutions exist for malaria case management, monitoring and evaluation and vector control. Malaria control response programme received support from the Government of Egypt, Islamic Development Bank, the Global Fund, WHO, UNDP and UNICEF.

Continuous economic crisis resulted in the disruption of health services in high proportion of health facilities in Sudan. In addition, weakened state malaria programmes mainly due to lack of funding and high turnover of staff resulted in weak and delayed response in the current situation. Human resource capacity for malaria and other vector borne diseases at national level is under extreme pressure with repeated outbreaks in recent years while the high level of staff turnover has become part of a vicious circle.

Figure 11: Placement of malaria control functions among different general directorates, directorates, departments, units and subunits as per April 2018





6. Where is Sudan's national malaria programme and where is it going?

According to MPR 2018, the malaria programme in Sudan distinguishes itself by being highly integrated and by remarkable technical strengths and weaknesses. Its vector control component is strong, with expertise and entomological monitoring at central and state level. This has allowed a differentiated quality response over the last 15-20 years with application of LLINs in rural areas with seasonal malaria, IRS in areas, where transmission is altered by irrigation schemes and larval source management in urban areas. The programme has over the last decades been able to mobilize continuous funding for LLINs and IRS from the Global Fund, and, what is more remarkable, for larval source management, from national and local government.

As a result of vector control over decades, and probably even more, use of pyrethroids in agriculture, the programme has run into insecticide resistance problems. These have been detected in time, and the programme is responding appropriately. Other signal achievements are the operation of an LLIN tracking system, and the recent communication campaign to promote the use of LLINs, which have been distributed by the Government.

For all its merits, the national malaria vector control strategy has become somewhat immobile: While LSM is appropriate in many urban areas of Sudan, there should be more interest in supplementing it

focally with LLINs or IRS, given that the effect of LSM plus one of these anti-imago interventions can be multiplicative.

Case management and surveillance are the two other major – and closely linked - programme components. They do not benefit from a similarly strong human resource base, but weaknesses cannot be ascribed only to this, they are conditioned to a large extent by general health service issues. The malaria indicator survey in 2016 found that most cases treated for malaria in the public sector received the non-recommended treatment, in many cases with injectable monotherapy. For years, studies have shown the preponderance of deviation from recommended treatment as per national treatment protocol in public and private services, but this has not led to the establishment of regular supervision, monitoring or inspection. With the adoption of the new treatment protocol in 2017, rolled out with the support of good supply management, there are signs that the situation may be changing for the better. Indeed, malaria quality of care surveys[29] conducted in 2018, 2019 showed high adherence of healthcare providers to the treatment protocol. However, many challenges need to be vigorously addressed over the next few years, up to 2020: Laboratory quality assurance must be established; the private sector must be engaged; a continuous training-supervision-monitoring-quality assurance for malaria case management must be established with the primary objective of rapidly eliminating monotherapy, abolishing harmful over-treatment with antimalarials and avoiding drug stock-out. These tasks can be addressed by planning and mobilization of resources. The two major challenges are to collaborate synergistically within the integrated system to strengthen health service provision and information systems in southern states combining high malaria burden and instability and, in that context, to expand service provision to the community level.

With few exceptions, the planned activities in the National Malaria Strategic Plan 2018-20 and the epidemiological and operational objectives stated in the plan have not been attained. In fact there has been an increase in malaria morbidity and mortality since 2010, most clearly, based on confirmed cases, from 2016 to 2019. The malaria prevalence also increased from 2012 to 2016 but this can attributed to the difference in survey time and seasonal variation of malaria transmission. Furthermore, there was a dramatic increase in the number of unconfirmed cases from 2016 to 2018 indicating a sharp decline in programme performance (Fig 6 and 7).

One finding of concern in the programme review in 2018 was that the promise of malaria elimination, which was held out to politicians years ago, had been neglected. The most striking example of this is Khartoum State, which is at the bottom of the scale concerning public versus private service provision, use of confirmatory diagnosis, and provider compliance with correct antimalarial combination treatment. As a first step in a revitalization of the Khartoum Malaria-Free Initiative, these issues should

[29] Malaria quality of care surveys, 2018-2019

be addressed by health system research focusing on public and private service providers, followed by a strong programme of regulation, supervision and quality assurance supplemented by education of the public. Even with such measures, elimination in Khartoum is probably a long way off, given the size of the population and the social complexities. For a control programme in Africa contending with high malaria mortality, elimination in fringe areas should not necessarily be a short-term priority. Given the difficulties in implementation and the upsurge in cases in 2018-19 and the still not completely understood epidemic in 2019, it must be realized that local elimination cannot presently be a programme priority. If the developments are favorable over the period 2021-22, this could be re-examined by 2023-24.

6.1 Operational stratification

Taking into consideration the risk map and ecology, socioeconomic activities and human settlements the following operational stratification will be used at national level for delivering various malaria control interventions. The stratification presented in Figure 12 and Table 1 considers human settlements, large irrigation schemes and seasonality of rainfall as well as the prevalence per state (Figure 13).

6.2 Directing principles:

1. Equity with special emphasis of key affected areas and populations
2. Country ownership and leadership
3. Multi-sectorial approach to malaria control and elimination including involvement of local government, agricultural development schemes, private health sector and CBOs, within the concept of social accountability
4. Empowerment of communities and institutions
5. Evidence-based and context-driven solutions and actions to challenging problems and issues
6. Integration with disease control activities and maternity and child health under the umbrella of DCD/ PHC with strong focal team for malaria control and other VBDs at federal level

Figure 12. Malaria operational stratification

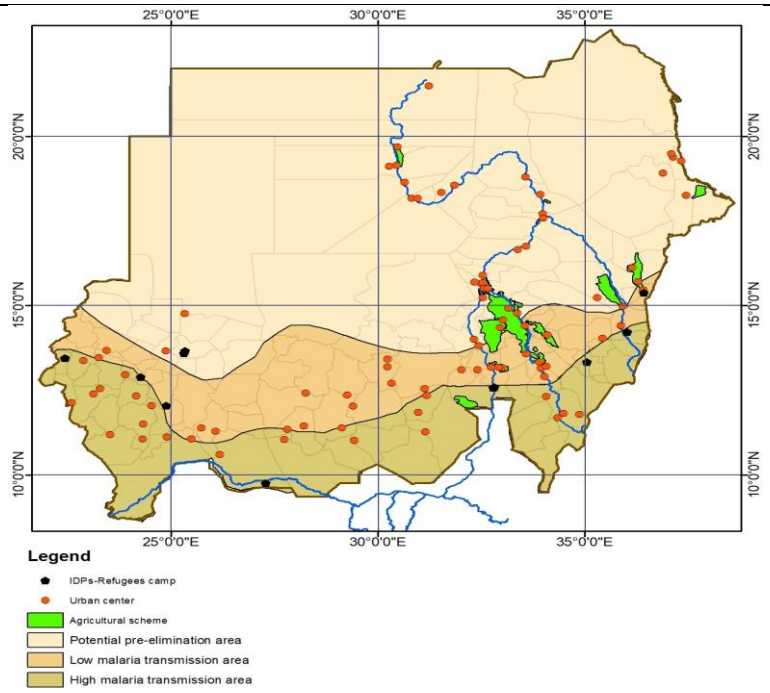


Figure 13. Malaria prevalence per state as per MIS 2016

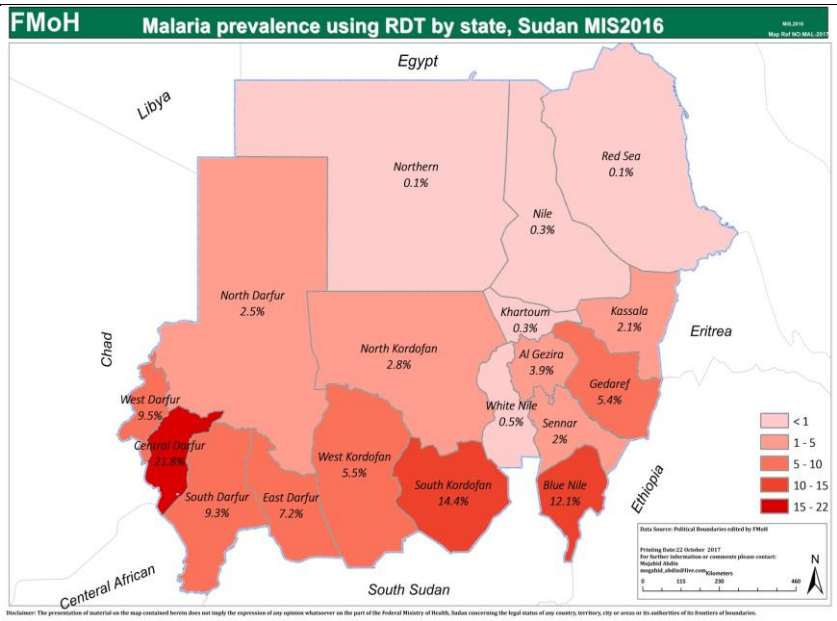


Table 1: Malaria strata, transmission risk and main interventions

Stratum	Transmission risk	Population	Areas /states	Main interventions
1. Potential target for elimination	- Very low transmission	3,000,000	-Mostly semi-desert, desert-fringe areas or arid areas -Irrigated farms around the Nile, which are not included in stratum 3. …… **-River Nile, Northern and Red Sea States**	-Case management including single dose of PQ -Adjusted surveillance system -Case and foci investigation
2. Seasonal malaria	- Low to moderate transmission areas -Transmission related to rainfall - Parasite prevalence <5%	12,000,000	-Mostly rural areas -All localities with <5% prevalence, which are not included in Stratum 1 or 3. …… **-Kassala, White Nile, North Kordofan, North Darfur States, and Rural Khartoum**	-Case management including single dose of PQ, through iCCM in remote areas -LLINs -Surveillance and EPR
3. Irrigated schemes malaria	- Moderate to high transmission - Transmission throughout the year	5,000,000	-Large-scale irrigated schemes …… **- Gezira, and Sennar States, and irrigated areas in Kassala, Gedarif, White Nile, River Nile and Northern States**	-Case management including single dose of PQ -IRS -LLINs for pregnant women -Surveillance and EPR -Partnership with irrigated schemes boards
4. Urban malaria	-Low to moderate transmission	9,000,000	-All urban settings including Khartoum -Other man-made malaria …… **-All big cities and towns in all states including Khartoum**	-Case management including single dose of PQ -LSM -Surveillance and EPR -Partnership with localities and private sector
5. People of special concern (POC)	-Low to high transmission areas	6,000,000	-People living in camps (IDPs and refugees), nomads and traditional gold miners …… **-Mainly in Darfur, Kordofan, White Nile, Blue Nile and Kassala states**	-Case management (mainly through iCCM) -LLINs -Surveillance and EPR -IPTp (where prevalence >10%) -Partnership with NGOs
6. High transmission areas	- High transmission areas - Long rainy season - Parasite prevalence >5%	7,000,000	-The southern belt bordering South Sudan -Low access to services …… **- Gedarif, Blue Nile, South and West Kordofan, East, Central, South and West Darfur**	-Case management (through iCCM in remote areas) -LLINs -IPTp -Surveillance and EPR

7. Malaria National Strategic Plan 2021 -2025

7.1. Vision and mission

The **vision** of this strategy is to reach a status where malaria in Sudan is no longer a major public health problem

The **mission** of malaria control in Sudan is to ensure universal access to quality-assured preventive measures, diagnostics and antimalarial medicines, and to back-up this by efficient disease surveillance as well as strong advocacy and behavioural change communication.

7.2. Goal

Reduce malaria morbidity and mortality by 30% by 2025 (taking 2018 as a base line) and accelerate efforts towards malaria elimination where feasible.

7.3. Objectives

1. To ensure universal coverage of at risk population with integrated vector management as per operational stratification (with LLINs, IRS or LSM) and to maximize LLIN utilization rates from less than 53% (Community advocacy survey) to more than 85%
2. To ensure universal access of malaria patients to quality-assured malaria case management (testing, treatment) and to encourage seeking treatment within 24 hours of fever initiation
3. To control malaria in pregnancy (including its effects on low birth weight) through case management, continuous distribution of LLINs to all pregnant women in LLIN and IRS targeted areas, and IPTp in stratum 5 and 6.
4. To provide timely and reliable information to monitor the progress, trend in malaria cases and deaths and to early detect and contain epidemics
5. To coordinate and sustain evidence-based and cost-effective malaria control interventions at national, state and locality level

7.4. Strategies (by objective)

1. To ensure universal coverage of at risk population with integrated vector management as per operational stratification (with LLINs, IRS or LSM) and to maximize LLIN utilization rates from less than 53% (Community advocacy survey) to more than 85%

1.1. LSM using chemical larviciding, environmental management and larvivorous fish in big urban settings (including major towns/ cities at states and localities) corresponding to stratum 4 (urban areas)

1.2. LLIN mass distribution every 3 years in the 12 targeted states and rural Khartoum corresponding to stratum 2, 5 and 6.

1.3. IRS in irrigated developmental projects in Gezira, Sennar, Kassala, Gedarif, White Nile, River Nile and Northern States corresponding to stratum 3 and part of stratum 1 and 2

1.4. Entomological surveillance, monitoring of insecticide resistance in sentinel sites, bio-assay following IRS and for monitoring quality of LLINs

1.5. Communication for high utilization rate of LLINs, IRS and LSM

2. **To ensure universal access of malaria patients to quality-assured malaria case management (testing, treatment) and to encourage seeking treatment within 24 hours of fever initiation**

2.1. Quality assured RDT diagnosis available at all times for fever cases in all iCCM points-of-care, public and private health facilities at all levels and quality assured microscopy available for fever cases and other suspected malaria cases in family health centres and hospitals

2.2. Recommended ACTs available for all confirmed uncomplicated cases in all iCCM points-of-care, public and private health facilities, together with artesunate suppositories for pre-referral treatment of severe malaria at primary health care level and injectable (IV) artesunate available for all severe malaria cases where there is admission facilities

2.3. Primaquine as one dose of 0.25 mg/kg body weight with ACT to patient with P. falciparum malaria to reduce transmission in low transmission areas (corresponding to stratum 1-4) and primaquine 0.25 mg/kg body weight daily for 14 days to prevent relapse of P. vivax without testing for G6PD but with warnings to patient and close supervision for potential primaquine induced haemolysis

2.4. Malaria case management through iCCM and iCCM+ (i.e. including older children and adults) where coverage with health facilities is low in stratum 2, 5 and 6.

2.5. Monitoring anti-malarial drugs, efficacy

2.6. Communication for timely seeking treatment for fever

3. **To control malaria in pregnancy including its effects on low birth weight through case management (under objective 2), distribution of LLINs to all pregnant women in LLIN and IRS targeted areas (under strategy 1.3) and IPTp in stratum 5 and 6**

3.1. IPTp through ANC for pregnant women in areas where the prevalence is higher than 10% (mainly in stratum 3, 5 and 6)

3.2. Distribution of LLINs thorough EPI and ANC clinics to all pregnant women and children under one year in LLIN areas (as replacement) and IRS targeted areas

4. **To provide timely and reliable information to monitor the progress, trend in malaria cases and deaths and to early detect and contain epidemics**

4.1. Utilizing IDSR, HMIS/ DHIS2, programme data and climate and population movement data to disseminate weekly, monthly and quarterly malaria reports

4.2. EPR for malaria integrated with Health Emergency and Epidemic Control (HEEC) RRT with emphasis of foci investigation in stratum 1 (pre-elimination areas)

5. **To coordinate and sustain evidence-based and cost-effective malaria control activities at national, state and locality level**

5.1. Capacity building through training in programme management, epidemiology and vector control/ entomology with regular supportive supervision from national level to state and locality level

5.2. Avoid stock outs of RDT, ACTs and artesunate suppositories and IV through development of one-layer PSM system ie from state to facility

5.3. Retention of trained malaria and vector control specialists at all level through better payment scheme, continuous professional development and job satisfaction

5.4. Strengthen political commitment and institutional support

5.5. Harmonization of the efforts of national, states, localities, relevant governmental sectors and partners for better malaria control and outcome

7.5. Activities per objective and strategy

1. To ensure universal coverage of at risk population with integrated vector management as per operational stratification (with LLINs, IRS or LSM) and to maximize LLIN utilization rates from less than 53% (Community advocacy survey) to more than 85%

1.1. LSM using chemical larviciding, environmental management and larvivorous fish in urban settings (including major towns/ cities at states and localities) corresponding to stratum 4 (urban areas)

1.1.1. Updating of Geographic Reconnaissance for the 110 towns/cities targeted for LSM by States IVM after refresher training workshop for state entomologists/ VC specialist using GIS / GPS / remote sensing technologies.

1.1.2. Procurement of hand compression pumps, larviciding and PPE as per FMOH and WHO specifications to cover the need of all the 110 towns/cities (including Khartoum) targeted for LSM. The calculations of quantities considered the fact that, the targeted areas are spreading all over Sudan, and larviciding will be throughout the year. Cars for transportation and supervision will be secured trough procurement or renting. The Government of the Sudan and partners (including TGF) will contribute to this.

1.1.3. Recruitment of applicators in each town or city by states' IVM. The number of applicators will be calculated considering the area (1 applicator/ 3 km^2). Training by states' IVM considering their job description on detection of potential breeding sites and application of the suitable larviciding together with recording and reporting

1.1.4. Apply suitable larviciding method such as chemical (temophos) or environmental (intermittent irrigation, filling or drainage) in potential mosquito breeding sites on weekly basis guided by the field supervisors and predetermined map of breeding sites

1.1.5. Supervision of LSM activities by State IVM including managing regular supplies with temophos, maintenance of pumps, checking of treated areas and reporting on daily and weekly basis.rvey) to more than 85%

1.2. LLIN mass distribution every 3 years in the 12 targeted states and rural of Khartoum corresponding to stratum 2, 5 and 6.

1.2.1. Procurement of LLINs (rectangular, family size, 100 denier with 156 holes/ square inch) for mass and continuous distribution. A total of 21,020,216 and 22,656,356 LLINs will be procured for distribution through mass campaigns in 2022 and 2025 respectively. In addition a total of 11,193,150 LLINs will be availed for continuous distribution to pregnant women and children under one year during 2021 -2025. The calculation of nets include 20% buffer. This relatively large buffer takes into consideration the climatic and social instabilities experienced in recent years. The eligible population includes an estimated 2 million living in IDPs camps and over one million living in refugee's camps. UNICEF will carry out the procurement with support from TGF.

1.2.2. Transfer and safe storage of LLINs at targeted states to prepare for the campaigns.

1.2.3. Update national guidelines for mass and continuous distribution of LLINs. A technical committee will revise the existing guideline and will update it in the light of recent operational experiences, MPR 2018 and the AMP report 2019, both for campaigns and for the continuous distribution and reporting through EPI and ANC.

1.2.4. Training of LLIN distributors using the guidelines. This includes TOT training for 2 persons from State IVM and MCH in addition to volunteers (for mass campaigns) and EPI and ANC staff at facility/ point-of-services level. The TOT training will be conducted by National IVM and MCH at national level. Training of distributors will conducted at state level by state IVM and MCH.

1.2.5. Distribution of LLINs through mass campaign to targeted states/ localities. A total of 21,020,216 and 22,656,356 LLINs will be distributed by SMCP, State IVM and National IVM through mass campaigns in 2022 and 2025 respectively in the 12 targeted states to cover a total population of 31,530,324 and 33,984,533 (an average of 1 LLIN for 1.8 persons every 3 years). Simultaneously, the distribution to IDPs (around 2 million population) will be through NGOs working in each camp and will be arranged with UNICEF and states. The distribution to refugees (over one million population) will be arranged by UNCHR.

1.2.6. Conduct LLIN tracking system surveys in target states/ localities. Household-based data regarding ownership of LLINs and LLIN quality (bio-efficacy to monitor the quality and durability effect of nets) will be collected on 3, 12, 24 and 36 month after nets distribution in targeted areas. In each of the 4 regions, 25 clusters will be selected randomly and in each 12 households will be visited and at least one LLIN will be collected by the team for further analysis and replaced by a new one.

1.3. IRS in irrigated developmental projects in Gezira, Sennar, Kassala, Gedarif, White Nile, River Nile and Northern States corresponding to stratum 3 and part of stratum 1 and 2

1.3.1. Procurement of recommended insecticides for IRS, PPE, spraying pumps and spare parts as per FMOH and WHO specifications by IVM department through support from TGF. As per rotational strategy. The national IVM will use Bendiocarb WP 80% in 2021 to cover 2 rounds per year in the targeted areas; the application rate will be 200 mg/ m^2. The IVM will use an alternative insecticide during 2022 – 2025 (Fludora® fusion WP-SB is currently under consideration) and it will be applied in targeted area as one round per year and the application rate will be 200 mg/m2 of clothiandin and 25 mg/ m2 of deltamethrin. The total targeted population each year is 5,439,645 distributed over 1,079,935 household at 33 localities in 7 states; the main are in Gezira and Sennar.

1.3.2. Transfer and storage of insecticide, pumps, PPE and spare parts at targeted states' warehouses prior the campaign period. States warehouses will be inspected by the National IVM to ensure safe storage of insecticides and other IRS campaign commodities.

1.3.3. Recruitment and training of IRS supervisors and applicators by State IVM. Priority will be given for applicators that already have permanent jobs with State IVM. Training will be arranged and conducted by state IVM and national supervisors.

1.3.4. Spraying of targeted households (in each cluster) by trained applicators and under supervision. The spray team composed of 4 persons (2 applicators, 1 mixer and one squad leader). The average area to be sprayed is 250m^2 per house. Each team is expected to spray on average 16 households per day corresponding to, on average, 4000 m^2. There is one field supervisor per 6 spraying teams. The field supervisors inform the community leader and deliver education using mobile microphone in each cluster prior the arrival of spraying team. The team will stay in each cluster till covering all premises (if possible) and will move to the next one as scheduled. The operations are supervised by senior staff (supervisors) from the administration unit, locality, state and national level throughout the campaign.

1.3.5. Monitoring the spraying campaign through planned supervision, daily and weekly reports. The squad leader will report to field supervisor on daily basis and the field supervisor will send a consolidated report to administration unit supervisor who will send locality supervisor. All locality reports will reach state supervisor on daily basis. The state supervisor will compile all these reports and present to IRS campaign committee.

1.4. Entomological surveillance, monitoring of insecticide resistance in sentinel sites, bio-assay following IRS and quality of LLINs

1.4.1. Development of national identification keys for major disease vectors in Sudan in collaboration with SMaRT and faculty of Science, University of Khartoum through identification of collected insects by vector surveillance system in all 18 states.

1.4.2. Update / develop national guidelines, manuals and SOPs for entomological surveillance, bioassay and fro monitoring of insecticides resistance and management.

1.4.3. Complete and strengthen the entomological laboratories at state level through rehabilitation of buildings, training and provision of basic S&E

1.4.4. Conduct vector surveillance in 106 sites monthly and weekly during the peak of transmission and update distribution map of malaria vectors in the country.

1.4.5. Monitoring of insecticide resistance (73 sentinel sites: annually for 49 and bi –annual for 24) and develop distribution maps of insecticide resistance

1.5. Communication for high utilization rate of vector control interventions (LSM, LLINs and IRS)

1.5.1. Conduct of behavioural situation analysis to understand low/ high utilization of vector control interventions through a desk analysis covering available reports, e.g. MIS, AMP, the experience of latest communication campaigns.

1.5.2. Develop /Design communication messages, channels and visibility materials for vector control

1.5.3. Production of communication materials on vector control in written, audio and video format

1.5.4. Conduct and evaluate communication and education on regular basis through mass media (Radio/ TV), social media and at point-of-services. Evaluation to be based mainly on surveys done regularly for LLINs and on operational reports indication quality and coverage of LSM and IRS operations.

2. To ensure universal access of malaria patients to quality-assured malaria case management (testing, treatment) and to encourage seeking treatment within 24 hours of fever initiation

2.1. Quality assured RDT diagnosis available at all times for fever cases in all iCCM points of care, public and private health facilities at all levels and quality assured microscopy available for fever cases and other suspected malaria cases and for follow-up of malaria cases in family health centres and hospitals

2.1.1. Procurement of RDTs, microscopes and reagents as per FMOH and WHO specification. The need including 20% buffer is quantified by the DCD (NRL) based on the estimation of suspected malaria cases in Sudan which is based on the reported confirmed cases and positivity rate in 2019. This was done suing the RBM gap analysis tool. However, the quantities still are subject for revision in the annual review meeting of the "Quantification of anti-malarials and RDTs team" and the possibility of increasing the procured amount is subject to actual consumption and forecasted cases. The procurement will be done by National Medicines and Supply Fund (NMSF) through TGF support.

2.1.2. Training of laboratory personnel/ medical assistants/ volunteers in RDTs and microscopy.

2.1.3. Maintaining supply of RDTs to all health facilities and iCCM points. This is the responsibility of State NMSF and SRL. The starting point will be a quantity which based on

previous consumption and then replacement based on consumption. This will be based on "push system" where NMSF and SRL actively forecast the need and push the supply to facility.

2.1.4. Establishment of national malaria Reference laboratory (NMRL) and states malaria reference laboratory (SMRL) to monitor the quality of malaria diagnosis at state level and at facility/ point of care level.

2.1.5. Regular supportive supervision from NMRL to states and from SMRL to HFs and iCCM

2.1.6. Establish an operational research programme for malaria diagnosis including compliance of health care providers.

2.2. Recommended ACTs available for all confirmed uncomplicated cases in all iCCM points-of-care, public and private health facilities, together with artesunate suppositories for pre-referral treatment of severe malaria at primary health care level and injectable (IV) artesunate available for all severe malaria cases where there is admission facilities

2.2.1. Updating malaria treatment protocol, 2017 to align with the WHO recommendations

2.2.2. Training of care providers on the updated malaria treatment protocol

2.2.3. Procurement of ACTs, artesunate IV and suppositories as per FMOH and WHO specification and will be done by National Medicines and Supply Fund (NMSF) through TGF support.. The need including 9 months rolling over buffer (in the first year of the strategy) is quantified by a team from the DCD, NMSF and PR based on the estimation of suspected malaria cases in Sudan which is based on the reported confirmed cases and positivity rate in 2019. This was done suing the RBM gap analysis tool. The details of quantification for each drug can be seen in the attached excel file and as example the need for the first line (AL) is 11,625,565/ 6,381,593/ 6,027,060/ 5,703,835 and 4,990,856 in 2021, 2022, 2023, 2024 and 2025 respectively. The reduction corresponds to the expected reduction in the number of cases. However, at national level the "Quantification of anti-malarials and RDTs team" meets by the end of each year to review the consumption and remaining stock. Based on this the quantity for the coming year adjusted (maybe more or less than what is stated in the strategy). During the last 3 years, this works very well. According to the last strategy, the forecasted number of cases is around 3 million and the actually procured AL is around 7 million. The clearly high AL quantity in the first year is due to adding a "rolling buffer of 9 months to the yearly calculated quantity ". No added buffer in the following years. In case all the buffer was used, this will be considered in the review meeting.

2.2.4. Distribution of the recommended anti-malaria to PHC facilities, hospitals and iCCM volunteers. This is the responsibility of State NMSF and SMCP. The starting point will be a quantity which based on previous consumption and then replacement based on consumption. This will be based on "push system" where NMSF and SRL actively forecast the need and push the supply to facility using NMSF transport system.

2.2.5. Engagement of private sector organization in malaria diagnosis and treatment starting with engagement workshop, training, provision of RDTs and ACTs; and reporting.

2.2.6. Conduct supportive supervision to care providers at facility level

2.3. Primaquine as one dose of 0.25 mg/kg body weight with ACT to patient with *P. falciparum* malaria to reduce transmission in low transmission areas (corresponding to stratum 1-4) and (in all areas) primaquine 0.25 mg/kg body weight daily for 14 days to prevent relapse of *P. vivax* without testing for G6PD but with warnings to patient and close supervision for potential primaquine induced haemolysis.

2.3.1. Procurement and distribution of primaquine. The need was calculated considering the suspected cases in low transmission areas (for *pf*) and based on the fact that around 13% of malaria cases are either *pv* or mixed *pv* and *pf* cases as per Sudan MIS 2016. The procurement and distribution will follow the same system for AL.

2.3.2. Monitoring the use of primaquine at different setting. The concentration will be on the adverse effect of the drug (haemolysis) as it will be prescribe without testing for G6PD

2.4. Malaria case management through iCCM and iCCM+ (including older children and adults) where coverage with health facilities is low in stratum 2, 5 and 6.

2.4.1. Development of iCCM curriculum and guideline. This will be based on WHO guideline and on the country experience with malaria home management and IMCI.

2.4.2. Selection and training of volunteers. The priority will be given to volunteers nominated by the community provided that they are meeting the selection criteria.

2.4.3. Supply points-of-care with RDTs, ACTs, artesunate supp. and PQ. This will be part of the general supply system of other facilities.

2.5. Monitoring anti-malarial drug efficacy

2.5.1. Conduct on regular frequency efficacy studies and operational researches in selected sites

2.5.2. Share and publish findings of efficacy studies and OR with relevant networks and groups at conferences and meetings

2.6. Communication for timely seeking treatment for fever

2.6.1. Development of case management communication strategy

2.6.2. Develop /Design communication messages to promoter treatment-seeking behaviour

2.6.3. Conduct and evaluate communication and education treatment-seeking behaviour campaign

3. To control malaria in pregnancy including its effects on low birth weight through case management (under objective 2), distribution of LLINs to all pregnant women in LLIN targeted areas as replacement (under strategy 1.3) and IPTp in 5 and 6,

3.1. IPTp through ANC for pregnant women in areas where the prevalence is higher than 10% (mainly in stratum 3, 5 and 6)

3.1.1. Quantify the need in targeted areas and develop implementation guidelines. The MCH programme (ANC) will lead this work together with DCD.

3.1.2. Training of midwives and other ANC staff at state level

3.1.3. Provide regular supply with SP and monitor the use and quality of care using the same system for suppling RDT and AL.

3.2. Distribution of LLINs thorough EPI and ANC clinics to all pregnant women and children under one year in LLIN (as replacement) and IRS targeted areas

3.2.1. Routine distribution of LLINs through ANC and EPI channels. A total of 11,193,150 LLINs will be distributed ranging of 2.1 to 2.4 million nets per year for children under one year and pregnant women.

3.2.2. Incorporate registration and reporting into EPI and ANC ongoing system

4. To provide timely and reliable information to monitor the progress, trend in malaria cases and deaths and to early detect and contain epidemics

4.1. Utilizing IDSR, HMIS/ DHIS2, programme data and climate and population movement data to disseminate weekly, monthly and quarterly malaria reports

4.1.1. Revise the existing facility-based and community-based registers and reporting format to ensure provision of data needed for monitoring and evaluation of the malaria control programme

4.1.2. Provide comprehensive malaria report on weekly, monthly and quarterly basis including case-based data, vector surveillance data, climate-based data (temperature and rainfall), population movement, malaria control interventions and private providers

4.1.3. Conduct malaria surveillance dashboard training at national, state and locality level

4.1.4. Support state and locality communication system (internet, telephone) to facilitate timely reporting

4.1.5. Supportive supervision for surveillance and HMIS officers at state, locality and facility levels

4.2. EPR for malaria integrated with Health Emergency and Epidemic Control (HEEC) RRT with emphasis of foci investigation in stratum 1 (pre-elimination areas)

4.2.1. Establish –in line with HEEC- malaria contingency plan, early warning/ early detection system and epidemic threshold

4.2.2. Assess feasibility for moving towards malaria elimination in very low malaria transmission states and develop road map for elimination.

4.2.3. Re-orient malaria control interventions towards elimination in very low malaria transmission states

5. To coordinate and sustain evidence-based and cost-effective malaria control activities at national, state and locality level

5.1. Capacity building through training in programme management, epidemiology and vector control/ entomology with regular supportive supervision from national level to state and locality level

5.1.1. Training of malaria control staff at national, state and locality level in epidemiology, parasitology, entomology and vector control and in "Planning malaria control programmes".

5.1.2. Provide structured support to staff at state and locality level through mentoring, supervision and at meetings

5.1.3. Analyze, interpret and triangulate the reported incidence and mortality data from different sources (IDRS/ DHIS2/ HMIS) on annual basis and incorporate the analysis in annual malaria programme report.

5.2. Avoid stock outs of RDT, ACTs and artesunate suppositories and IV through development of one-layer PSM system ie from state to facility

5.2.1. Secure adequate maintained stocks of anti-malaria drugs and RDTs at state and facility level.

5.2.2. Develop a system to supply health facilities, ANC clinics and iCCM point from state store directly including the monitoring system

5.3. Retention of trained malaria and vector control specialists at all level through better payment scheme, continuous professional development and job satisfaction

5.3.1. Utilization of the existing system at FMOH and SMOH to retain trained staff

5.3.2. Seek support of partners at national and state level to maximize the benefit from trained staff

5.4. Strengthen political commitment and institutional support

5.4.1. Work with line-ministries to implement Presidential Decrees related to tax/ tariff deletion, health in all policies strategy and the local component of various projects

5.4.2. Involve political and community leaders in malaria control campaigns, workshops and meetings

5.5. Harmonization of the efforts of national, states, localities, relevant governmental sectors and partners for better malaria control and outcome

5.5.1. Align the NGOs plan with NMSP plan

5.5.2. Involve research institution and academia in malaria control

See annex 1 for the target per activity and activity components

7.6. Implementation Framework:

7.6.1. Implementation mechanism

The DCD is currently responsible about coordinating malaria control response. The directorate carries part of this responsibility directly by its departments and units and indirectly through other directorates. However, an increasing dialogue is ongoing regarding the structure of the national malaria control programme (NMCP) and the current integration modality. The general agreement is to have a strong malaria control programme that is able to coordinate all of the below essential interventions and activities:

- Malaria diagnosis and treatment is part of the *Case management department* in DCD
- Malaria medicines and diagnostics are distributed to states through *NMSF* and quality issues managed by *NMPB*.
- Malaria vector control is incorporated into the *IVM department* in EHFC directorate. The National Pesticide Council is the regulatory body.
- IEC activities are the responsibility of the *Health promotion directorate* (HPD), in the General Directorate for PHC.
- Operational data and information is managed by the *M&E and planning department* in DCD.
- Malaria morbidity and mortality data are collected by the *Health information system directorate* in the General Directorate for Planning and International Health.
- Malaria surveillance is integrated with *surveillance of communicable diseases (IDSR)* which is managed by EHA in the General Directorate for PHC and processed by DCD Planning and M&E department.
- Partnership is the responsibility of the *Partnership department* at DCD

At **state level**, there is still a state malaria control programme, (SMCP) usually including four units: Surveillance and M&E, Case Management, IVM, and IEC. In most cases there is no medical doctor to lead the case management unit and this is may contribute to frequent stock outs and low utilization of RDTs. At locality level, there is typically a malaria control unit with 1-3 trained public health officers.

Malaria control in Sudan is under government responsibility at all levels and at each level the programme is working with many partners. At national level, partnership is one of the 6 departments at DCD directorate. It has 3 units with a head of department director and 3 heads of units to deal with governmental bodies, private sector, UN agencies and CBOs. At state level, partnership is part of IEC. Communication with different partners is through meetings, reports and activities. Still, more is needed to consolidate this link. An NGO Forum for control of communicable and non-communicable diseases has recently been established.

7.6.2. Monitoring and Evaluation Framework

The Sudan MSP M&E framework aims to provide guidance to MOH to track progress in the implementation of the strategy and whether strategic targets and milestones will be met. The "Planning and M&E Department" at DCD is responsible for compilation of reports generated by directorates, departments, units or related sectors and partners on monthly and quarterly basis. The reports will reflect the progress in implementation using different sources of information. The department will arrange quarterly meetings for information sharing. The malaria focal team should be responsible for agenda, report of each meeting and follow-up. This meeting and report are expected to revise the progress in the strategy implementation on a quarterly basis and to provide a comprehensive assessment of strategic areas to ensure that all the aspects are adequately covered. Similar meetings are expected at each state level. To encourage multi-partnership efforts in strategy implementation, the DCD should ensure that various partners and stakeholders are involved in the evaluation process through participation in:

- Annual assessment: all stakeholders are expected to meet annually to review achievements against targets and milestones in the strategic plan and annual plans. These meetings will also define and finalize priorities for the new financial year.
- Mid-term review in 2023
- Malaria program performance review in 2025

7.6.3. Measuring the outcomes and impact

The evaluation of the malaria strategic plan will be based on several indicators. The attainment of the outcomes and impact indicators will be tracked using a variety of sources of information and means of verification. These include the weekly disease surveillance system, entomological surveys, DHIS2, SMCP reports, national programmatic data, population-based household surveys (MICs and MIS), health facility surveys, special studies, including medicine and insecticide resistance studies, and administrative information systems (e.g. PSM reports). However, good quality data and usage of this data to feed the planning and strategic direction is an issue which need more efforts to improve. The "Planning and M&E department" in DCD should compile all this data and provide quarterly/ annual reports. The department is expected to present the report in quarterly/ annual meetings. Summary of reports should be disseminated to all implementing bodies, partners and stakeholders in form of online report as feedback on regular basis. The department should also feed the malaria focal person with necessary data to be able to communicate with WHO and other UN agencies and technical partners. For the details of each indicator see table 2 (page 62) and table 3 (page 63).

7.7. Implementation Budget:

The budget of this strategy is estimated considering the international prices of malaria commodities and the local context. The starting point is to define precisely the unit (unit definition) and then to have a

price for each (Unit cost in USD). The exchange rate is 1 USD = 60 SDG. The cost was calculated for activity component and all added to give the total strategy cost. A summary table was presented here giving the cost per objective and strategy year by year. The overall cost is expected to be cover by the Government of the Sudan, the Global Fund and other partners.

The main source of funding currently is the Global Fund. From the fourth quarter of 2017, FMOH has become PR for the Global Fund malaria grant in addition to the Resilient and Sustainable Systems for Health (RSSH) grant. These two grants are managed by a project management unit (PMU) in the FMOH's Directorate General for International Health. The PMU disburses to many implementing units (IUs), including NMSF, and IVM, CNCDCD, Planning & Policy, National Public Health Laboratory and NMPB. While the main commodities (LLINs, RDT, ACTs…etc) are procured by the Global Fund, the Government of Sudan covers the salaries of personnel working for malaria control at different levels. Local governments cover partially the operational costs. The overall cost of this strategy is 631,577,164 USD (See table 4- page 72- for details by objective and strategy year by year).

8. References

1. World malaria report 2019. Geneva: World Health Organization; 2019. Licence: CC BY-NC-SA 3.0 IGO.
2. FMOH 2016. National Health Policy (NHP): 2016-2030, Khartoum- Sudan.
3. FMOH 2020. National health policy and recovery strategy 2020 -2022, Khartoum- Sudan.
4. WHO 2015a. Global technical strategy for malaria, 2016-2030: World Health Organization, Geneva; Available from: http://apps.who.int/iris/bitstream/10665/176712/1/9789241564991_eng.pdf?ua=1
5. Malaria regional plan of action, 2020 -2025
6. FMOH. Sudan Malaria Programme Review, 2018. Federal Ministry of Health, Khartoum, Sudan
7. FMOH. Sudan Malaria Indicator Survey (MIS) 2016. Federal Ministry of Health, Khartoum, Sudan
8. Sudan Census Report 2008
9. UNHCR. Refugees population in Sudan. Obtained on 29.6.2020 from http://reporting.unhcr.org/sudan
10. Sudan demographic data. Obtained on 29.6.2020 from www.population.un.org/wpp/Data query/
11. Central Bureau of Statistics (CBS), UNICEF Sudan. 2014, Multiple Indicator Cluster Survey 2014 of fieldwork, Key Findings. Khartoum, Sudan: UNICEF and Central Bureau of Statistics (CBS).
12. UN Inter-agency Group for Child Mortality Estimation. Most recent child mortality estimates for Sudan, 2018. Access on March 30, 2020 form: https://childmortality.org/?r=site/graph&ID=SDN_Sudan
13. UN Inter-agency Group for Maternal Mortality Estimation. Most recent maternal mortality estimates for Sudan, 2017. Access on March 30, 2020 form: https://www.who.int/gho/maternal_health/countries/sdn.pdf?ua=1
14. WHO (Global Health Expenditure Database). Health expenditure profile, Sudan. Access on March 30, 2020 form: https://apps.who.int/nha/database/country_profile/Index/en
15. Central Bureau of Statistics (Sudan), Food and Agriculture Organization of the United Nations (FAO), Statistics Norway. North Sudan National Baseline Household Survey (NBHS) 2009. Khartoum, Sudan: Central Bureau of Statistics (Sudan).
16. National Health account, 2018
17. Elgoraish AG, Elzaki SEG, Ahmed RT, Ahmed AI, Fadlalmula HA, Abdalgader Mohamed S, et al. Epidemiology and distribution of Plasmodium vivax malaria in Sudan. Trans R Soc Trop Med Hyg. 2019. https://doi.org/10.1093/trstmh/trz044
18. Mukhtar, M.M., Eisawi, O.A., Amanfo, S.A. et al. Plasmodium vivax cerebral malaria in an adult patient in Sudan. Malar J 18, 316 (2019). https://doi.org/10.1186/s12936-019-2961-1
19. WHO: Global Malaria Programme. Vector alert: Anopheles stephensi invasion and spread (Horn of Africa, the Republic of the Sudan and surrounding geographical areas, and Sri Lanka). Information Note, December 2019. WHO/HTM/GMP/2019.09 © World Health Organization 2019
20. FMOH. Sudan Malaria Programme Review, 2018. Federal Ministry of Health, Khartoum, Sudan
21. SNOW RW, SARTORIUS B, KYALO D, MAINA J, AMRATIA P, MUNDIA CW, BEJON B, AM N. 2017. The prevalence of Plasmodium falciparum in sub Saharan Africa since 1900. Nature 550, 515-518.
22. World Malaria Report 2018. Geneva: World Health Organization; 2018. Licence: CC BY-NC-SA 3.0 IGO.
23. Joint WHO HQ and EMRO mission report, October 2019
24. States training data: https://docs.google.com/spreadsheets/d/1vnrZATim62fYnzKR0JcDwLevCfr-vWleDzo66RaWKOc/edit?usp=sharing
25. Global vector control response 2017–2030. Geneva: World Health Organization; 2017. Licence: CC BY-NC-SA 3.0 IGO.FMOH. The Sudan Vector Control Need Assessment report, 2019. Federal Ministry of Health, Khartoum, Sudan. 2019
26. FMOH. The Sudan Vector Control Strategic and Response Plan 2021-2025. Federal Ministry of Health, Khartoum, Sudan. 2020
27. Sudan IVM Department and AMP: The recommendations for Social and Behavior Change Communication (SBCC). Sudan, 2019 (unpublished report)
28. FMOH/ PMU. Malaria quality of care surveys, 2018-2019. Khartoum, Sudan 2019

Impact indicators

A total of 7 impact indicators were identified together with their base-line and targets. Source of information and methods and frequency of data collection are shown in table 2. The baseline figures are for 2018 but these will be revised once the Annual Health Statistical Report 2019 becomes available.

Table 2: Impact indicators and targets

Indicators	Baseline		Target per year (% represents reduction from the baseline)					Source	Frequency	Method/s	Responsible
	Source	2018	2021	2022	2023	2024	2025				
1. Inpatient malaria deaths/ 100,000 population	HMIS	7.5	7.1 (5%)	6.8 (10%)	6.4 (15%)	5.6 (25%)	5.3 (30%)	HMIS	Annual	Routine	HMIS
2. Inpatient malaria deaths/ total inpatient deaths	HMIS	3.6	3.4 (5%)	3.2 (10%)	3.1 (15%)	2.7 (25%)	2.5 (30%)	HMIS	Annual	Routine	HMIS
3. Reported malaria cases (presumed and confirmed)	HMIS	3,581,302	3,402,237	3,223,172	3,044,107	2,685,977	2,506,911	HMIS	Annual	Routine	HMIS
4. Confirmed malaria cases (microscopy or RDT) / 1000 persons	HMIS	38.3	36.4 (5%)	34.5 (10%)	32.5 (15%)	28.7 (25%)	26.8 (30%)	HMIS	Annual	Routine	HMIS
5. Test (slide + microscopy) positivity rate	HMIS	18.9	18.0 (5%)	17.1 (10%)	16.1 (15%)	14.2 (25%)	13.3 (30%)	HMIS	Annual	Routine	HMIS
6. Under-5 mortality rate per 1000 live births	MICS 2014	68.4					51.3 (25%)	MICS	4 -5 Years	Survey	Planning and M&E/ DCD

Strategic and outcome indicators

.Table 3: Outcome indicators by objectives and strategies

Objective 1. To ensure universal coverage of at risk population with integrated vector management as per operational stratification (with LLINs, IRS or LSM) and to maximize LLIN utilization rates from less than 53% (Community advocacy survey) to more than 85%											
Indicators	**Baseline**		**Target per year**					**Source**	**Frequency**	**Method/s**	**Responsible**
	Value	Year	2021	2022	2023	2024	2025				
Strategy 1.1: LSM using chemical larviciding, environmental management and larvivorous fish in big urban settings- including major towns/ cities at states and localities- corresponding to stratum 4 (urban areas)											
1.1.1 Proportion of cities implementing LSM regularly	68% (75)	2019	75%	80%	85%	90%	100% (110)	IVM report	Annual	Routine	IVM
1.1.2 Proportion of urban cities with completed GR	75% (83)	2019	85%	90%	100%	90%	100% (110)	IVM report	Annual	Routine	IVM
1.1.3 Proportion of localities with functioning LSM programme	48% (91)	2019	75%	85%	90%	95%	100% (189)	IVM report	Annual	Routine	IVM
1.1.4 Proportion of localities with permanent mosquito men/ house sprayers full-time employed for LSM	40% (76)	2019	85%	95%	100%	100%	100% (189)	IVM report	Annual	Routine	IVM
Strategy 1.2: LLINs mass distribution every 3 years in 12 targeted states and rural Khartoum corresponding to stratum 2, 5 and 6.											
1.2.1 Proportion of target populations potentially covered by LLINs (1 net/ 1.8 persons)	96% (31.3 million)	2019	100%	100%	100%	100%	100% (32.6 million)	IVM report	Annual	Mass Distributio n	IVM
1.2.2 Proportion of Household owning at least one LLIN	98%	2019	100%	100%	100%	100%	100%	LLINs tracking survey	3, 12, 24 & 36 month after distribution	Periodic Assessment Survey (PAS)	IVM
1.2.3 % of HHs with at least one LLIN per 2 persons	54.7%	2019	100%	100%	100%	100%	100%	LLINs tracking Survey	3, 12, 24 & 36 month after distribution	Periodic Assessment Survey (PAS)	IVM
Strategy 1.3: IRS (2 rounds per year) in irrigated developmental projects in Gezira, Sennar, Kassala, Gedarif, White Nile, River Nile and Northern States corresponding to stratum 3 and part of stratum 1 and 2											

Objective 1. To ensure universal coverage of at risk population with integrated vector management as per operational stratification (with LLINs, IRS or LSM) and to maximize LLIN utilization rates from less than 53% (Community advocacy survey) to more than 85%											
Indicators	**Baseline**		**Target per year**					**Source**	**Frequency**	**Method/s**	**Responsible**
	Value	Year	2021	2022	2023	2024	2025				
1.3.1 Proportion of households covered by IRS in stratum 3 and targeted irrigated schemes in stratum 1 and 2	97.3%	2019	100%	100%	100%	100%	100%	IVM report	Annual	Campaign report	IVM
1.3.2 % of population covered by IRS in stratum 1, 2 and 3	97.5%	2019	100%	100%	100%	100%	100%	IVM report	Annual	Campaign report	IVM
Strategy 1.4: Entomological surveillance on regular basis including monitoring insecticide resistance in sentinel sites, bio-assay following IRS and quality of LLINs											
1.4.1 % of sentinel sites for routine vector surveillance reported on regular basis	75% (80)	2019	85%	90%	100%	100%	100% (106)	IVM report	Annual	Routine	IVM
1.4.2 % of bio-assay tests performed following IRS campaigns	75% (35)	2019	100%	100%	100%	100%	100% (46)	IVM report	Bi-annual	Routine	IVM
1.4.3 % of sites where LLINs bio-efficacy conducted	100% (180)	2019	100% (90)	100% (180)	100% (90)	100% (90)	100% (180)	LLINs Tracking survey	Annual	Survey	IVM
1.4.4 % of sites where IRM performed regularly	100% (73)	2018	100% (73)	100% (46)	100% (73)	100% (46)	100% (73)	IVM report	Annual	Routine	IVM
Strategy 1.5: Communication for high utilization rate of LLINs, IRS and LSM											
1.5.1 % of household population who slept under LLIN the night before survey in targeted states	34.7	MIS 2016	50%	75%	85%	85%	85%	MIS	4 years	HHs survey	Planning and M&E/ DCD
1.5.2 % of children under 5 slept under LLIN the night before survey in targeted states	41.3%	MIS 2016	60%	75%	85%	85%	85%	MIS	4 years	HHs survey	Planning and M&E/ DCD
1.5.3 % of pregnant women who slept under LLIN the night before survey in targeted states	41.0%	MIS 2016	60%	75%	85%	85%	85%	MIS	4 years	HHs survey	Planning and M&E/ DCD
1.5.4 % of households accepted IRS	70%	IRS report	100%	100%	100%	100%	100%	IVM reports	Bi-annual	IRS report	

Objective 2: To ensure universal access of malaria patients to quality-assured malaria case management (testing, treatment) and to encourage seeking treatment within 24 hours of fever initiation											
Indicators	**Baseline**		**Target per year**					**Source**	**Frequency**	**Method/s**	**Responsible**
	Value	**Year**	**2021**	**2022**	**2023**	**2024**	**2025**				
Strategy 2.1: Quality assured RDT diagnosis available at all times for fever cases in all iCCM points-of-care, public and private health facilities at all levels and quality assured microscopy available for fever cases and other suspected malaria cases in family health centres and hospitals											
2.1.1 Proportion of suspected malaria cases tested at public facilities	7.8%	Malaria QoC survey 2019	50%	75%	80%	85%	90%	HMIS report	Quarterly	Routine	DCC
2.1.2 Proportion of suspected malaria cases tested at private facilities	4.5%	Malaria QoC survey 2019	30%	50%	75%	85%	100%	HMIS Reports	Quarterly	Routine	DCD
2.1.3 % of public health facilities covered by RDTs diagnostic services	78%	2019	83%	90%	93%	97%	100%	NMSF	Annual	Routine/	NMSF
2.1.3 % of hospitals with quality-assured microscopy	<40%	2019	60%	75%	85%	85%	85%	DCD Report/ HFS	Annual/ 3 – 4 Years	Routine/ survey	DCD Planning and M&E/ Lab unit
2.1.4 % of states with functioning malaria reference laboratory	20.00%	2019	30%	50%	60%	85%	100%	DCD Report/ HFS	Annual/ 3 – 4 Years	Routine/ survey	DCD Planning and M&E/ Lab unit
2.1.5 % of public health facilities involved in laboratory QA system	0.00%	2019	25%	50%	100%	100%	100%	DCD Report/ HFS	Annual/ 3 – 4 Years	Routine/ survey	DCD Planning and M&E/ Lab unit
2.1.6 % of private health care facilities involved in laboratory QC system	0.00%	2019	0	50%	75%	80%	85%	DCD Report	Annual	Routine	DCD Planning and M&E/ Lab unit
Strategy 2.2. Recommended ACTs available for all confirmed uncomplicated cases in all iCCM points-of-care, public and private health facilities, together with artesunate suppositories for pre-referral treatment of severe malaria at primary health care level and injectable (IV) artesunate available for all severe malaria cases where there is admission facilities											
2.2.1 Proportion of malaria cases (presumed and confirmed) received first line ACT at public facilities	81.6%	2019	85%	90%	100%	100%	100%	HFS	3 - 4 Years	Survey	Planning and M&E/ DCD
2.2.2 Proportion of confirmed malaria cases received first-	100%	2019	100%	100%	100%	100%	100%	DCD Reports	Annual	Routine	DCD

Objective 2: To ensure universal access of malaria patients to quality-assured malaria case management (testing, treatment) and to encourage seeking treatment within 24 hours of fever initiation											
Indicators	**Baseline**		**Target per year**					**Source**	**Frequency**	**Method/s**	**Responsible**
	Value	**Year**	**2021**	**2022**	**2023**	**2024**	**2025**				
line ACT in the targeted communities											
2.2.3 Percentage of persons who reported to have had fever 2- weeks prior the survey and received ACT according to treatment protocol	34.1%	2016	70%	-	-	100%	100%	MIS	3- 4 Years	Survey	DCD
2.2.4 % of malaria cases received ACT free of charge from the facility	<50%	2019	85%	100%	100%	100%	100%	HFS	3 - 4 years	Survey	Planning and M&E/ DCD
2.2.5 Proportion of those tested negative who received ACT (free of charge or paid)	30%	2019	<10%	<10%	<5%	<5%	0.00%	HFS	3 - 4 years	Survey	Planning and M&E/ DCD
2.2.6 Proportion of severe malaria cases who received Artesunate IV	?	2019	50%	75%	85%	100%	100%	DCD Report	Annual	Routine	DCD
2.2.7 Proportion of care providers who adhere to malaria treatment guideline	>90	2019	95%	95%	95%	95%	95%	QoC report	Quarterly	Supervisory visit	DCD
Strategy 2.3: Primaquine as one dose of 0.25 mg/kg body weight with ACT to patient with P. falciparum malaria to reduce transmission in low transmission areas (corresponding to stratum 1-4) and primaquine 0.25 mg/kg body weight daily for 14 days to prevent relapse of P. vivax without testing for G6PD but with warnings to patient and close supervision for potential primaquine induced haemolysis											
2.3.1 Proportion of falciparum malaria received single low dose PQ	0	2020	50%	75%	75%	85%	85%	DCD Report	Quarterly	Routine	DCD
2.3.2 Proportion of vivax malaria received 8 –weeks course PQ	0	2020	50%	75%	75%	85%	85%	DCD Report	Quarterly	Routine	DCD
Strategy 2.4: Malaria case management through iCCM where coverage with health facilities is low in stratum 2, 5 and 6.											
2.4.1 Proportion of malaria cases tested with RDT at iCCM	?	2019	50%	75%	75%	85%	85%	DCD Reports	Quarterly	Routine	MCH/DCD
2.4.2 Proportion of confirmed malaria cases received ACT at iCCM	?	2019	50%	75%	75%	85%	85%	DCD Reports	Quarterly	Routine	MCHDCD

Objective 2: To ensure universal access of malaria patients to quality-assured malaria case management (testing, treatment) and to encourage seeking treatment within 24 hours of fever initiation											
Indicators	**Baseline**		**Target per year**					**Source**	**Frequency**	**Method/s**	**Responsible**
	Value	**Year**	**2021**	**2022**	**2023**	**2024**	**2025**				
2.4.3 Proportion of communities received malaria case management services through iCCM from targeted communities.	0	2019	20%	45%	70%	95%	100%	DCD Report	Quarterly	Routine	MCH/DCD /Case management
2.4.4 Proportion of severe malaria cases received pre-referral AS suppositories in targeted communities	0	2019	50%	75%	75%	85%	85%	DCD Report	Quarterly	Routine	MCH/DCD /Case management
Strategy 2.5: Monitoring anti-malarial drugs efficacy and use											
2.5.1 No. of efficacy studies carried out	1	2019	1	1	1	1	1	DCD report	Annual	Study	DCD /Case management
2.5.2 No. of studies carried out to assess the healthcare providers adherence	0	2019	1	1	1	1	1	DCD Reports	Annual	Study	DCD /Case management
2.5.3 No. of studies carried out to assess patient adherence to treatment	0	2019	1	1	1	1	1	DCD report	Annual	Study	DCD /Case management
Strategy 2.6: Communication for timely seeking treatment for fever											
2.6.1 Proportion of febrile patients who seek care within 24-hours of initiation of fever	47.7%	MIS 2016	65%	-	-	85%	85%	MIS	3- 4 Years	Survey	DCD/HEALTH PROMOTION

Objective 3: To control malaria in pregnancy including its effects on low birth weight through case management (under objective 2), distribution of LLINs to all pregnant women in LLIN targeted areas as replacement (under strategy 1.3) and IPTp in stratum 5 and 6											
Indicators	**Baseline**		**Target per year**					**Source**	**Frequency**	**Method/s**	**Responsible**
	Value	**Year**	**2021**	**2022**	**2023**	**2024**	**2025**				
Strategy 3.1. IPTp through ANC for pregnant women in areas where the prevalence is higher than 10% (mainly in stratum 3, 5 and 6)											
3.1.1 Proportion of ANC clinics provided on regular basis IPTp in stratum 5, 6	**0**	**2019**	**20%**	**25%**	**50%**	**85%**	**100%**	**DCD report**	**Quarterly**	**Routine**	**RH/HMIS**
3.1.2 Proportion of pregnant women who received at least 3 doses of SP in stratum 5, 6	0	2019	10%	20%	35 50%	75%	85%	DCD Reports	Quarterly	Routine	RH/HMIS
Strategy 3.2: Distribution of LLINs thorough EPI and ANC clinics to all pregnant women and children under one year in LLIN areas (as replacement) and IRS targeted areas.											
3.2.1 % of pregnant women receiving LLINs through ANC out of ANC attendee in targeted areas	**55.6%**	**2019**	**60%**	**65%**	**70%**	**75%**	**80%**	**RH Reports**	**Quarterly**	**Routine**	**RH**
3.2.2 % of children 0 -5 years receiving LLINs through EPI out of EPI attendee	44.4%	2019	50%	60%	65%	70%	75%	EPI Reports	Quarterly	continuous distribution	EPI

Objective 4: To provide timely and reliable information to monitor the progress, trend in malaria cases and deaths and to early detect and contain epidemics											
Indicators	**Baseline**		**Target per year**					**Source**	**Frequency**	**Method/s**	**Responsible**
	Value	**Year**	**2021**	**2022**	**2023**	**2024**	**2025**				
Strategy 4.1 Utilizing IDSR, HMIS/ DHIS2, programme data and climate and population movement data to disseminate weekly, monthly and quarterly malaria reports											
4.1.1 Proportion of timely received surveillance reports from states	94.7% (17)	2019	100%	100%	100%	100%	100% (18)	IDSR	WEEKLY/Monthly/ Quarterly/Annual	Routine	IDSR
4.1.2 Proportion of compilation reports made by planning, M&E Department	100% (16)	2019	100%	100%	100%	100%	100% (16)	DCD report	Quarterly/Annual	Routine	Planning, M&E Dept
4.1.3 % of states provided timely quality monthly malaria control reports	50% (9)	2019	70%	90%	90%	100%	100% (18)	DCD report	Quarterly/Annual	Routine	Planning, M&E Deptt
Strategy 4.2. EPR for malaria integrated with Health Emergency and Epidemic Control RRT with emphasis of foci investigation in stratum 1 (pre-elimination areas)											
4.2.1. % of staff trained in malaria epidemic preparedness and response	<40% (60)	2019	50%	75%	85%	100%	100% (207)	DCD report	Annual	Routine	IDSR/ Planning and M&E Dept.
4.2.2 % of states and localities using malaria epidemic thresholds to weekly monitor trends of the disease	38% (79)	2019	60%	85%	100%	100%	100% (207)	IDSR.	Annual	Routine	IDSR.
4.2.3 Proportion of malaria outbreaks/ epidemics detected within one week from onset	72%	2019	%85	%85	%85	100%	%85	IDSR.	Annual	Routine	IDSR.
4.2.4 Proportion of outbreaks/ epidemics controlled within two weeks from detection	0.00%	2019	%85	%85	%85	%85	%85	IDSR.	Annual	Routine	IDSR.
4.2.5 % of foci reported to have malaria cases investigated	**0**	**2019**	**50%**	**80%**	**100%**	**100%**	**100%**	**SMCP**	**Periodic**	**Routine**	**Planning, M&E Dept.**
4.2.5 % of foci investigated and having a report including the response	0	2019	50%	80%	100%	100%	100%	SMCP	Periodic	Routine	Planning, M&E Dept.

Objective 5: To coordinate and sustain evidence-based and cost-effective malaria control activities at national, state and locality level											
Indicators	**Baseline**		**Target per year**					**Source**	**Frequency**	**Method/s**	**Responsible**
	Value	**Year**	**2021**	**2022**	**2023**	**2024**	**2025**				
Strategy 5.1: Capacity building through training in programme management, epidemiology and vector control/ entomology with regular supportive supervision from national level to state and locality level											
5.1.1 % of states with malaria control coordinator trained in programme management	<50% (<9)	2019	100%	100%	100%	100%	100% (18)	SMCP report	Annual	Routine	SMCP/ DCD
5.1.2 % of states with at least one person trained in malaria epidemiology	<25% (<4)	2019	50%	75%	100%	100%	100% (18)	SMCP report	Annual	Routine	SMCP/ DCD
5.1.3 % of states with at least one person trained in vector control/ entomology	66% (12)	2019	75%	85%	100%	100%	100% (18)	SMCP report	Annual	Routine	SMCP/ DCD
5.1.3 % of localities with at least one person trained in vector control/ entomology	48% (91)	2019	75%	85%	90%	95%	100% (189)	SMCP report	Annual	Routine	SMCP/ DCD
5.1.5 No. of states visited by the national supportive supervision team (2 visits/ state/ year)	?	2019	18	18	18	18	18	SMCP report	Annual	Routine	SMCP/ DCD
5.1.6 % of localities visited by the state supportive supervision team (2 visits/ locality/ year)	?	2019	25%	50%	75%	100%	100% (189)	SMCP report	Annual	Routine	SMCP/ DCD
Strategy 5.2: Avoid stock outs of RDT, ACTs and artesunate suppositories and IV through development of one-layer PSM system ie from state to facility											
5.2.1 % of states warehouses reporting no stock outs of ACTs or RDTs for more than one week in the last 3 months	75%	2019	100% (18)	100% (18)	100% (18)	100% (18)	100% (18)	SMCP report	Quarterly	Routine	SMCP/ DCD
5.2.2 % of health facilities reporting no stock outs of RDTs for more than one week in the last 3 months	<50%	2019	100%	100%	100%	100%	100%	SMCP report	Quarterly	Routine	SMCP/ DCD
5.2.3 Proportion of health facilities without stock-outs of anti-malaria drug for 7	61.7%	2019	95%	95%	95%	95%	95%	NMSF Report	Annual	Routine	NMSF

Objective 5: To coordinate and sustain evidence-based and cost-effective malaria control activities at national, state and locality level											
Indicators	**Baseline**		**Target per year**					**Source**	**Frequency**	**Method/s**	**Responsible**
	Value	**Year**	**2021**	**2022**	**2023**	**2024**	**2025**				
days within the past 3 months											
Strategy 5.3: Retention of trained malaria and vector control specialists at all level through better payment scheme, continuous professional development and job satisfaction											
5.3.1 % of personnel retained at national, state and localities (4 at state level and one at locality level)	?	2019	60% (133)	75% (166)	85% (188)	85% (188)	85% (188)	DCD report	Quarterly	Routine	DCD
Strategy 5.4: Strengthen political commitment and institutional support											
5.4.1 % of states allocated/ released budget for malaria	?	2019	60%	80%	100%	100%	100% (18)	SMCP report	Quarterly	Routine	SMCP/ DCD
5.4.2 % of localities allocated/ released budget for malaria	?	2019	60%	80%	100%	100%	100% (189)	SMCP report	Quarterly	Routine	SMCP/ DCD
5.4.3 % of potential local institutes (universities, colleges, private entities, civil societies) involved in malaria control at national and state level	?	2019	60%	80%	100%	100%	100% (120)	SMCP report	Quarterly	Routine	SMCP/ DCD
Strategy 5.5: Harmonization of the efforts of national, states, localities, relevant governmental sectors and partners for better malaria control and outcome											
5.5.1 % of coordinated plans developed	?	2019	60%	80%	100%	100%	100%	DCD report	Annual	Routine	DCD
5.5.2 no. of joint meetings arranged	?	2019	4	4	4	4	4	DCD report	Annual	Routine	DCD

Budget per objective and strategy

Table 4: Summary of the budget per objective and strategy

Objective 1: To ensure universal coverage of at risk population with integrated vector management as per operational stratification (with LLINs, IRS or LSM) and to maximize LLIN utilization rates from less than 53% (Community advocacy survey) to more than 85%						
Strategies	**2021**	**2022**	**2023**	**2024**	**2025**	**Total cost in USD**
1.1 LSM	14,124,696	13,074,272	13,543,273	10,487,274	10,020,275	**61,249,790**
1.2 LLINs	17,135,807	114,629,781	18,031,586	18,429,675	123,673,968	**291,900,817**
1.3 IRS	25,550,817	23,540,821	24,102,040	24,816,759	25,385,634	**123,396,071**
1.4 Entomological surveillance	1,175,915	757,416	794,917	996,418	786,919	**4,511,585**
1.5 Communication for vector control	435,550	285,550	285,550	315,550	285,550	**1,607,750**
Total objective 1	**58,422,785**	**152,287,840**	**56,757,366**	**55,045,676**	**160,152,346**	**482,666,013**
Objective 2: To ensure universal access of malaria patients to quality-assured malaria case management (testing, treatment) and to encourage seeking treatment within 24 hours of fever initiation						
2.1 Quality assured diagnosis	10,058,912	9,367,565	8,831,549	8,071,187	8,083,110	**44,412,322**
2.2 Treatment for UM and SM cases	17,038,333	12,346,883	11,822,322	10,401,784	10,207,458	**61,816,780**
2.3 Primaquine for both pf and pv	419,000	551,000	617,000	683,000	683,000	**2,953,000**
2.4 iCCM and iCCM+	918,000	1,057,500	1,039,500	1,192,000	1,344,500	**5,551,500**
2.5 Efficacy studies	200,000	160,000	200,000	160,000	200,000	**920,000**
2.6 Communication for early treatment	323,000	228,000	228,000	258,000	228,000	**1,265,000**
Total objective 2	**28,957,245**	**23,710,949**	**22,738,371**	**20,765,971**	**20,746,067**	**116,918,602**
Objective 3: To control malaria in pregnancy including its effects on low birth weight through case management (under objective 2), distribution of LLINs to all pregnant women in LLIN and IRS targeted areas (under strategy 1.3) and IPTp in stratum 5 and 6						
3.1 IPTp	356,748	275,332	373,370	415,300	497,966	**1,918,716**
3.2 Distribution of LLINs (ANC & EPI)	220,900	25,200	25,200	25,200	25,200	**321,700**
Total objective 3	**577,648**	**300,532**	**398,570**	**440,500**	**523,166**	**2,240,416**
Objective 4: To provide timely and reliable information to monitor the progress, trend in malaria cases and deaths and to early detect and contain epidemics						
4.1 Surveillance	1,895,166	1,652,438	836,897	697,961	735,879	**5,818,341**
4.2 EPR	683,860	431,465	165,987	122,694	132,817	**1,536,824**
Total objective 4	**2,579,025**	**2,083,904**	**1,002,884**	**820,655**	**868,696**	**7,355,164**
Objective 5: To coordinate and sustain evidence-based and cost-effective malaria control activities at national, state and locality level						
5.1 Capacity building	1,640,292	2,278,892	1,355,102	1,416,478	2,508,060	**9,198,823**
5.2 PSM	1,185,750	1,210,500	1,215,000	1,285,500	1,365,000	**6,261,750**
5.3 Retention of trained staff	912,180	898,100	871,100	871,100	871,100	**4,423,580**
5.4 Political and institutional support	218,800	208,800	208,800	208,800	208,800	**1,054,000**
5.5 Harmonization of partners efforts	451,761	51,762	451,763	51,764	451,765	**1,458,815**
Total objective 5	**4,408,783**	**4,648,054**	**4,101,765**	**3,833,642**	**5,404,725**	**22,396,968**
Overall total	**94,945,486**	**183,031,278**	**84,998,956**	**80,906,443**	**187,695,000**	**631,577,164**

Annex 1: Output targets per objective, strategy and activity.

Objective1: To ensure universal coverage of at risk population with integrated vector management as per operational stratification (with LLINs, IRS or LSM) and to maximize LLIN utilization rates from less than 53% (Community advocacy survey) to more than 85%								
Activity	**Responsible**	**Activity component**	**2021**	**2022**	**2023**	**2024**	**2025**	**Unit definition**
Strategy 1.1: LSM using chemical larviciding, environmental management and larvivorous fish in urban settings (including major towns/ cities at states and localities) corresponding to stratum 4 (urban areas)								
1.1.1 Updating of Geographic Reconnaissance (GR) for 110 towns/ cities targeted for LSM using GIS / GPS / remote sensing	IVM department	5-days Training/ refresher course for 40 state and national entomologists	20	20	-	20	20	Person trained
	State IVM dept.	Report on field survey of 110 towns/ cities	35	35	40			Updated GR report per each town/city
1.1.2 Procurement of hand compression pumps and larviciding for LSM in 110 towns/cities	IVM department and SMCP	Procure and deliver hand compression pumps to towns/ cities	5,000			2,500		Pump delivered
		Procureme and deliver of spare parts for spray pumps	1,000	1,000	1,000	1,000	1,000	1 set of spare parts delivered
		Procureme and deliver PPE to applicators	9,725	9,725	9,725	9,725	9,725	PPE set delivered
		Procure temephos EC50% and deliver to towns/cities	25,000	25,000	25,000	25,000	25,000	Litre of temephos EC 50% delivered
1.1.3 Recruitment of "applicators", training, and provision of PPE for 110 towns/cities	IVM department and states IVM and SMCP	Rcruitment of aplicators by state committee	3,485	-	-			Applicator recruited
		5-days training course (basic and refresher) for field supervisors (Public health officers and saniraty overseers)	400	400	400	400	400	Person trained
		3-days training course (basic and refresher) for applicators	9,725	9,725	9,725	9,725	9,725	Person trained
		3-days training of technicians for pumps maintainance	220	-	220		220	Person trained
1.1.4 Apply larviciding in potential breeding sites (chemical or environmental) on weekly basis	States IVM units and localities	Perdiem for field supervisors	800	800	800	800	800	Transport + Perdiem for 1 person-year
	IVM Depart.	Perdiem for applicators	9,725	9,725	9,725	9,725	9,725	Transport + Perdiem for 1 person year

Objective1: To ensure universal coverage of at risk population with integrated vector management as per operational stratification (with LLINs, IRS or LSM) and to maximize LLIN utilization rates from less than 53% (Community advocacy survey) to more than 85%

Activity	Responsible	Activity component	2021	2022	2023	2024	2025	Unit definition
	IVM Depart.	Procurement of trucks for transportation of workers	35	35	40	-	-	1 truck procured
	IVM Depart.	Rehabilitation of warehouse for vector control commodities	35	35	40	-	-	1 warehouse rehabilitated
1.1.5 Supervision of larviciding	IVM Depart.	Procurement of 220 Hilux pickup 4x4 for field supervision	35	35	40	-	-	1 car procured
	State entomologist and assistant	Field visits with field-work for 2 days in each city/town	220	220	220	220	220	Transport and perdiem for 1 person-year
	State entomologists	Report on larviciding activities on weekly basis	110	110	110	110	110	Report/ twon or city
Strategy 1.2. LLIN mass distribution every 3 years in the 12 targeted states and rural Khartoum corresponding to stratum 2, 5 and 6.								
1.2.1 Procurement of LLINs for mass and continuous distribution	IVM department	Procure of 45,552,249 LLINs for mass distribution	356,628	21,385,867	374,901	384,386	23,050,467	LLIN procured
	IVM Department	Procure of 19,310,449 LLINs for distribution through ANC/ EPI	3,671,549	3,764,440	3,859,680	3,957,330	4,057,450	LLIN procured (CIF Port Sudan)
1.2.2 Transfer and storage of LLINs at targeted state	PMU/IVM dept./UNICEF	Road transfer of LLINs from Port-Sudan to State	40,282	251,503	42,346	43,417	271,079	Bale of nets delivered (100 nets/ bale)
	State IVM dept, UNICEF	Safe storage of LLINs at state warehouse	168	168	168	168	168	Monthly rental of 1 storage space
1.2.3 Update national guidelines for mass and continuous distribution of LLINs	IVM department	Technical committee to update the LLINs distribution guideline including continuous distribution	1	1				Complete guideline developed by committee
		Printing of guidelines	10,000		10,000		10,000	1 booklet printed
1.2.4 Training of LLINs distributors using the guidelines	IVM department	5-days TOT at national level for 36 persons		36			36	Person-trained
	State IVM	2-days Training of volunteers for mass distribution	357	21,386	375	384	23,050	Person-trained
1.2.5 Distribution of LLINs through mass campaign for targeted states/ localities	State IVM	House-to-house registration of population	59,438	3,564,311	62,484	64,064	3,841,745	Cluster-registered
	State IVM	Advocacy/ education on net use	59,438	3,564,311	62,484	64,064	3,841,745	cluster-visited

Objective1: To ensure universal coverage of at risk population with integrated vector management as per operational stratification (with LLINs, IRS or LSM) and to maximize LLIN utilization rates from less than 53% (Community advocacy survey) to more than 85%								
Activity	**Responsible**	**Activity component**	**2021**	**2022**	**2023**	**2024**	**2025**	**Unit definition**
	State IVM	Transport of nets to end users (village/facility level)	40,282	251,503	42,346	43,417	271,079	Bale of nets delivered (100 nets/bale)
	State IVM	Mass campaign distribution	356,628	21,385,867	374,901	384,386	23,050,467	LLIN delivered
	National IVM/SMCP	Field visit to supervise the mass distribution at 13 states	52	2,000	52	52	2,250	Transport + perdiem for 1 person-campaign
1.2.6. Conduct LLINs tracking system surveys in target states/ localities	IVM department &State IVM	Data collection (300 HHs in 25 cluster in each region of the 4 targeted regions)	1	200	100	100	200	Cluster surveyed
	IVM department	Data analysis and tracking survey report (survey will be conducted at 3, 12, 24 and 36 months after each mass distribution)	1	2	1	1	2	Survey report
Strategy 1.3. IRS in irrigated developmental projects in Gezira, Sennar, Kassala, Gedarif, White Nile, River Nile and Northern States corresponding to stratum 3 and part of stratum 1 and 2								
1.3.1 Procurement of recommended insecticides for IRS, PPE, spraying pumps and spare parts	IVM department	Procurement of bendiocarb WP 80% (carbonate) to cover 2 rounds per year	134,614	-	-	-	-	Kilogram procured (State capital)
	IVM dept.	Procurement of Fludora® fusion WP to cover 2 rounds per year	-	109,932	112,714	115,565	118,489	Kilogram procured (State capital)
	IVM dept.	Procurement of compression pumps	1,600	800	800	1,600	1,600	1 compression pump procured
	IVM dept.	Procurement of spare parts for pumps	1,000	1,000	2,000	2,000	2,000	1 spare parts set procured
	IVM dept.	Procurement of PPE	7,000	7,000	7,000	7,000	7,000	1 PPE- person
1.3.2 Transfer and storage of insecticide, pumps, PPE and spare parts at targeted states warehouses	IVM dept.	Road transfer of insecticides from Port-Sudan to States	134,614	109,932	112,714	115,565	118,489	Kilogram transferred
		Road transfer of pumps. PPE and spare parts from Port-Sudan to State	7	7	7	7	7	Consignment of pumps, spare parts and PPEs delivered to 1 state
	PMU, IVM department and State IVM/SMCP	Safe storage at state warehouse	7	7	7	7	7	Monthly rental of 1 storage space
1.3.3 Recruitment and training of IRS supervisors and applicators	IVM dept.	Recruitment of national supervisors	33	33	33	33	33	Person recruited
	State IVM	Recruitment of state supervisors	33	33	33	33	33	Person recruited
	State IVM/SMCP	Recruitment of applicators	7,348	4,280	4,388	4,499	4,613	Person recruited

Objective1: To ensure universal coverage of at risk population with integrated vector management as per operational stratification (with LLINs, IRS or LSM) and to maximize LLIN utilization rates from less than 53% (Community advocacy survey) to more than 85%

Activity	Responsible	Activity component	2021	2022	2023	2024	2025	Unit definition
	IVM dept.	3-days training of national supervisors	86	86	86	86	86	Person trained
	IVM dept.	3-days training of state supervisors	33	33	33	33	33	Person trained
	State IVM/SMCP	5-days training of IRS applicators	7,348	4,280	4,388	4,499	4,613	Person trained
	State IVM/SMCP	3-days training of data entry and management	158	79	79	79	79	Person trained
	State IVM/SMCP	One-day training of store keepers	222	111	111	111	111	person trained
	State IVM/SMCP	2-days training of Health promoters	500	250	250	250	250	Person trained
	State IVM/SMCP	Printing of IEC materials for community advocacy during IRS camapign	2,504,441	1,283,902	1,316,384	1,349,689	1,383,836	Leaflet printed
	State IVM/SMCP	Advocacy/ education campaign	216	108	108	108	108	Cluster covered
	State IVM/SMCP	Transfer of insecticides to localities, admin units and target village	134,614	109,932	112,714	115,565	118,489	Kilogram delivered
	State IVM/SMCP	Spraying of targeted households and safe disposal of containers	2,504,441	1,283,902	1,316,384	1,349,689	1,383,836	House sprayed (operation cost: perdiem + transport)
	State IVM/SMCP	Conduct cone bioassay test in the sentinel sites for IRS (4 rounds for each campaign)	268	134	134	134	134	Report submitted
	IVM/SMCP	Daily field visit from state supervisors to village level	33	33	33	33	33	Transport + perdiem for 1 person week
	IVM depart./SMCP	Field visit from national supervisors to state and village (5 days/ state)	33	33	33	33	33	Transport + perdiem for 1 person week
	State IVM/SMCP	Daily reporting about coverage and quality of application	33	33	33	33	33	Report submitted
	State IVM/SMCP	Final campaign report	1	1	1	1	1	Cans/ bags collected/ state

Strategy 1.4. Entomological surveillance, monitoring of insecticide resistance in sentinel sites, bio-assay following IRS and for monitoring quality of LLINs

Objective1: To ensure universal coverage of at risk population with integrated vector management as per operational stratification (with LLINs, IRS or LSM) and to maximize LLIN utilization rates from less than 53% (Community advocacy survey) to more than 85%								
Activity	**Responsible**	**Activity component**	**2021**	**2022**	**2023**	**2024**	**2025**	**Unit definition**
1.4.1 Development of national vectorial identification keys for major disease vectors in Sudan entomological surveillance	IVM depart, SMART& FSKU.	Desk analysis of available data	1					Desk report completed
	IVM depart& SMART	field-visit to fill gap in data identified by desk analysis	1					Field visit report submitted
	IVM depart, SMART&FSKU	Consensus workshop	1	1	1	1	1	Workshop conducted
	IVM depart	Printing of the document (Identification keys for major disease vector)	1500			1000		Copies printed
	IVM depart.	Distribution of the document	500	500	500	500	500	Copies distributed
1.4.2 Update/ develop national guidelines, manuals and SOPs for entomological surveillance	IVM depart.	Update entomological surveillance manual	1					Manual updated
	IVM depart.	Update of SOPs for vector surveillance	1					SOPs prepared and endorsed
	IVM depart.	Update of guideline for vector surveillance	1					Guideline endorsed
	IVM depart.	Printing of updated/ developed materials	1000	1000	1000			Guideline endorsed
1.4.3 Completeness and strengthening of entomological laboratories in states	IVM depart.	Assess the current situation at state level	9	9				State report submitted
	IVM depart.	Training of staff at state entomological lab	25	25	25	25	25	Person trained
		Develop curriculum and train teams in MSc courses in Medical / Public health Entomology and Vector Control to support VBDs control in different levels of health.	30	0	0	30	0	Person trained
1.4.4 Conduct vector surveillance in 106 sites on regular basis	IVM depart.	Provide supplies on regular basis to states	18	18	18	18	18	Kit of Lab supplies delivered to state
	State IVM/SMCP	Conduct monthly/ weekly vector surveillance for targeted vectors	18	18	18	18	18	State vector surveillance report submitted
	State IVM/SMCP	Provide entomology support during epidemics of vector-borne diseases	5	5	5	5	5	Entomology report (related to epidemic) submitted
	IVM depart.	Compile state reports in one national report	12	12	12	12	12	National report issued
	IVM DEPT, state IVM/SMCP	Conduction of susceptability test at 49 sites annually and in 24 sites every two years	73	24	73	24	73	Report (site) submitted

Objective1: To ensure universal coverage of at risk population with integrated vector management as per operational stratification (with LLINs, IRS or LSM) and to maximize LLIN utilization rates from less than 53% (Community advocacy survey) to more than 85%									
Activity	**Responsible**	**Activity component**	**2021**	**2022**	**2023**	**2024**	**2025**	**Unit definition**
1.4.5 Conduct susceptibility test for malaria vectors to insecticides		functioning Entomological sentinel sites in surveillance system	106	106	106	106	106	Report submitted
	IVM depart.	Develop distribution maps of insecticide resistance	18	18	0	0	18	Map developed
	IVM depart.	Evaluation of potential alternative insecticides	5	5	5	0	0	Insecticide tested
Strategy 1.5. Communication for high utilization rate of LLINs, IRS and LSM								
1.5.1 Development of vector control communication strategy	IVM depart.	Desk analysis of available data regarding utilization of various VC interventions	1					Report drafted, discussed and finalized
	IVM depart.	Develop communication startegy (behavioural objectives, communication strategies and targets, indicators and budget)	1					Complete strategy developed by committee
	IVM depart.	Endorsement of the strategy by national and state levels	1					Strategy endorsed
1.5.2 Design and produce communication messages	IVM depart.	Design message/s	30			30		Message designed
	IVM depart.	Test the message through different channels	30			30		Message tested
	IVM depart.	Produce the approved messages using suitable format (audio, vidio, printed, ..etc)	5					package of messages produced
1.5.3 Conduct communication and education campaign	IVM depart.	Meetings with partners (radio, TV, …etc.)	2	2	2	2	2	One meeting arranged
	IVM depart.	Approval of activities time-frame and scope with partners	1	1	1	1	1	Detailed plan developed
	IVM depart.	Conduction of the educational activities (operational cost)	18	18	18	18	18	Package of message delivered per state
	IVM depart.	Evaluation of the campaign/ continuous IEC programme	1	1	1	1	1	Completed report based on desk analysis
	Health promotion	5-days training of Trainers (interpersonal skills, SBCC & C4D)	25	25	25	25	25	Person trained
	Health promotion	3-days training of community mobilization agents on (Malaria, Net use, SBCC)	325	325	325	325	325	Person trained
	Health promotion	3-days training of media personnel (key messages on Malaria and Net use, SBCC, and plan for coverage)	17	17	17	17	17	Person trained

Objective 2: To ensure universal access of malaria patients to quality-assured malaria case management (testing, treatment) and to encourage seeking treatment within 24 hours of fever initiation								
Activity	**Responsible**	**Activity component**	**2021**	**2022**	**2023**	**2024**	**2025**	**Unit definition**
Strategy 2.1. Quality assured RDT diagnosis available at all times for fever cases in all iCCM points-of-care, public and private health facilities at all levels and quality assured microscopy available for fever cases and other suspected malaria cases in family health centres and hospitals								
2.1.1.Procurement of RDTs, microscopes, slides and reagents	UNICEF	Procurement of RDTs	11,193,141	10,240,786	9,774,085	9,366,298	9,277,703	RDT procured
	UNICEF	Procurement of microscopes	500	500	500			Microscope procured
	UNICEF	Procurement of slides	40,000	40,000	40,000	40,000	40,000	Box of slides procured (50 slides/ box)
	UNICEF	Procurement of giemsa stain	10000	10000	10000	10000	10000	litre of stain procured
	UNICEF	Procurement of oil immersion	1000	1000		1000	1000	Litre of oil procured
2.1.2. Training of laboratory personnel/ medical assistants/ volunteers in RDTs and microscopy	National reference lab	5-days TOT training of state senior lab personnel (2/ state)	40		40		40	Person-trained
	State reference lab	5-days training of 6,300 lab personnel on RDT and microscopy	1800	1800	900	900	900	Person-trained
	State reference lab	2-days training of 3,000 medical assistant on RDT	450	450	750	686	450	Person-trained
	State reference lab	3-days training of 8,500 volunteers at iCCM on RDT	1000	1500	1500	2000	2500	Person-trained
	State reference lab	2-months basic training for 500 persons in malaria microscopy	60	60	60	60	60	Person-trained
2.1.3.Maintaining supply of RDTs, microscopy to all public health facilities and iCCM points	SMRL	Regular supply of RDTs to all health facilities	4,263	5,463	6,063	6,163	6,263	Facility supplied
	SMRL	Regular supply of slides and reagent to hospitals and family health centres	3063	3063	3063	3063	3063	Facility supplied
	SMRL	Regular supply of RDTs to iCCM points	1750	3500	5250	7000	8750	iCCM point supplied
2.1.4.Establishment of national malaria Reference laboratory (NMRL) and states malaria reference laboratory (SMRL)	DCD	Review the existing status of reference lab at states level	9	9				Lab-reviewed
	NMRL	Provision of reference lab set of S&E (microscopes, teaching microscopes, slides, …etc)	6	6	6			Set of S&E delivered
	NMRL	Development of teaching slides banks	8000	3000	3000	3000	3000	Slide bank established
	SMRL	Establish re-checking of slides system at state level	6	6	6			Re-checking system endorsed
	NMRL	Preparatory workshop for ECAMM	20	20	20	20	20	Person-attended

Objective 2: To ensure universal access of malaria patients to quality-assured malaria case management (testing, treatment) and to encourage seeking treatment within 24 hours of fever initiation								
Activity	**Responsible**	**Activity component**	**2021**	**2022**	**2023**	**2024**	**2025**	**Unit definition**
	NMRL	Follow-up workshop to Introduce malaria diagnosis curriculum into the pre-service training of medical lab. technologists	25	25	25	25	25	Person-attended
2.1.5. Regular supportive supervision from NMRL to states and from SMRL to HFs and iCCM	NMRL	Field visits with field-work lasting 5 days in one state (2 visits/ state/ year)	36	36	36	36	36	Transport + perdiem for 1 person-week
	SMRL	Field visits with field-work lasting 2 days in one locality (2 visits/ locality/ year)	567	567	567	567	567	Transport + perdiem for 1 person-week
2.1.6.Establish an operational research system for malaria diagnosis	NMRL	Monitoring the appearance of Pf/HRP2,3 in 3 states (Collection of blood samples and testing for gene deletion)	3	3	3	3	3	Site monitored
	NMRL	Assessment of national competency for Malaria microscopy (NCAMM)	1		1		1	Report submitted
	NMRL	Assessing compliance of care providers with the results of microscopy and RDTs		1		1		Report submitted
Strategy 2.2: Recommended ACTs available for all confirmed uncomplicated cases in all iCCM points-of-care, public and private health facilities, together with artesunate suppositories for pre-referral treatment of severe malaria at primary health care level and injectable (IV) artesunate available for all severe malaria cases where there is admission facilities								
2.2.1. Updating of malaria treatment protocol, 2017 to align with the WHO recommendations and disseminating to care providers	DCD	Arrange meetings for Technical Advisory Committee (TAC) members to update the protocol and to follow its implementation	1	1	1	1	1	Meeting conducted
	DCD/TAC	Contracting TA to development /update of the training package recording reporting tools and SOPs for prevention and managment of malaria for care providers at different level(specialist,doctors,MA,MW and health promoters)	1	0	0	0	1	Traing package updated
	DCD	Malaria treatment protocol poster Outcome :6 per 521 hospital(100%) coverage , 2 per Health center (100% coverage)	15354	0	15354	0	15354	poster
	DCD	Malaria treatment protocol pamphlet: Uncomplicated Malaria management.(English and Arabic). Outcome :20 per 521 hospital(100%) coverage , 4 per Health center (100% coverage)	35293	0	35293	0	35293	pamphlet printed
	DCD	Malaria treatment protocol bench Aid : Uncomplicated Malaria management(English and Arabic). Outcome :6 per 521 hospital , 2 per Health center (100% coverage)	15354	0	15354	0	15354	Bench Aid printed
	DCD	Learners Guides book(English and arabic)	10945	0	0	0	10945	Book printed
	DCD	Tutor Guides book	530	0	0	0	530	Book printed

Objective 2: To ensure universal access of malaria patients to quality-assured malaria case management (testing, treatment) and to encourage seeking treatment within 24 hours of fever initiation								
Activity	**Responsible**	**Activity component**	**2021**	**2022**	**2023**	**2024**	**2025**	**Unit definition**
	DCD	Artesunate injection poster (English and arabic) outcome: 4 per 521 hospitals (100% coverage)	15354	0	15354	0	15354	poster printed
	DCD	Malaria diagnostic algorithm poster (English and arabic) Outcome :6 per 521 hospital(100%) coverage , 2 per Health center (100% coverage)	2292	0	2292	0	2292	poster printed
	DCD	Malaria Protocol Booklet (English+ arabic)	11462	0	0	0	11462	Booklet printed
	DCD	Servere malaria management pamphlet 20 per 521 hospitals (100% coverage)	20512	0	20512	0	20512	pamphlet printed
	DCD	DHAP guided prescription book(1 book =1000 prescription)	880	880	880	880	880	Guided prescription book printed
	DCD	National dissemination workshop for the treatment protocol	50	0	0	0	50	Person oriented
	DCD	Orientation session on update of national treatment guidelines for internal medicine, Paediatric,Obstetrics and gynaecology , afamily medicine and community medicine registrars at Sudan Medical Specialization Board Outcome:100% coverage for SMSB registrars for above speaciltities/Year	1200	1200	1200	1200	1200	Person oriented
	DCD	Orientation session on update of national treatment guidelines for house officer at Sudan Medical Council Outcome:100% coverage for SMC houseofficers/Year	3000	3000	3000	3000	3000	Person oriented
	DCD	Orientation session on update of national treatment guidelines for new pharmasist at GDP Outcome:100% coverage for new pharmasist at GDP/Year	1200	1200	1200	1200	1200	person orinted
	DCD	Dissemination workshop for the treatment protocol in 17 states	425	0	0	0	425	Person orinted
2.2.2. Training of care providers on the updated malaria treatment protocol	DCD/SMSB	Online malaria case management course for SMSB registrars/SMC houseofficers to be linked to their portofolio	1	0	0	0	1	Course established
	DCD	National TOT on malaria case management . Outcome: 2 qualified Malaria case management trainers at each state ,one is the designated state case management officer and one will lead the state mentor team. -One day orination session will be at the end of ToT to share deliverables and setting state plan for state mentor team with state case management officers and leader of state mentor team .	50	0	0	0	50	Malaria case management trainer trained

Objective 2: To ensure universal access of malaria patients to quality-assured malaria case management (testing, treatment) and to encourage seeking treatment within 24 hours of fever initiation								
Activity	**Responsible**	**Activity component**	**2021**	**2022**	**2023**	**2024**	**2025**	**Unit definition**
	DCD	Training of trainers on Malaria case management protcol at states level Outcome: -25 malaria case management Trainers at each state(From public , Police ,military and health insurance facilitie) -2 Trainers to be selected to as state mentor team memebers.	450	0	0	0	450	Malaria case management trainer trained
	SMOH	Establishment meeting for States Mentor team at n18 states	18	18	18	18	18	Meeting conducted
	SMOH(state mentor team)/NHIF	Care provider Training at locality level Target : care providers per Health facility per locality. Outcome : Two Trained care provider per each health facility per each locality	4282	4282	4282	4282	4282	person trained
	State mentor team/Police/militery/partners	Orientation sessions at general hospital level for consultants, medical doctors on Malaria case management protocol at 18 states (by state case mangement offcier and states trainers (4 doctors +4 nurses)	450	450	450	450	450	person orinted
	DCD	"National Training of nurse trainers of Sever malaria case management Target: 2 Nurse per state . Outcome :- 2 qualified Nurse trainer of Sever malaria case management at each state -One nurse to be selected to join state mentor team.	50	0	0	0	50	Malaria case management nurse trainer trained
	DCD	Training of nurse trainers of Sever malaria case management at 18 states Target :25 Nurses working at public , Police and military hospitals per each state . Outcome: 25 trained Nurses on sever malaria case management at each state.	450	0	0	0	25	Malaria case management nurse trainer trained
	SMOH(State mentor team)/Police/militery/partners	Orientation sessions at general hospital level for nurses on severe Malaria case management protocol at 515 hospital	515	515	515	515	515	Session conducted
	SMOH	Follow up meeting for States Mentor team per 18 states	18	36	36	36	36	Meeting conducted
	DCD	Biannual technical advisory meeting	2	2	2	2	2	Meeting conducted
	DCD/UNHCR?	Training of care providers on the treatment protocol at south kordofan , West kordufan,Whilte Nile,east Darfur and south Darfur refugee camps	300	300	300	300	300	person trained
	Police/militery	Training of care providers on the treatment protocol at prisons in khartoum state	40	40	40	40	40	person trained

Objective 2: To ensure universal access of malaria patients to quality-assured malaria case management (testing, treatment) and to encourage seeking treatment within 24 hours of fever initiation								
Activity	**Responsible**	**Activity component**	**2021**	**2022**	**2023**	**2024**	**2025**	**Unit definition**
	Police/militery	Training of care providers on the treatment protocol at prisons in 11 states/ uniform	275	275	275	275	275	Person trained
	Private sector	meeting to discuss with private sector organization ways to engage private providers in malaria diagnosis and treatment	1	1	1	1	1	Meeting conducted
	Private sector	follow up with private sector organization ways to engage private providers in malaria diagnosis and treatment(follow up meetings)	4	4	4	4	4	Meeting conducted
	Private sector	Training of care providers at private hospitals the management of SM	28	28	28	28	28	Session conducted
	Private sector	Training of care providers at private clinics on malaria treatment protocol - Training of care providers at private hospitals the management of SM	540	540	540	540	540	person trained
	Private sector	Conduct supportive supervision to hospitals in the 18 states	72	72	72	72	72	Visit conducted
	NMSF	Artemether 20mg + Lumefantrine 120 mg Tablet (1 X 6 tabs)	2182160	1374476	1310590	1158604	1081364	Treatment course
	NMSF	Artemether 20mg + Lumefantrine 120 mg Tablet (2 X 6 tabs)	4509797	2840583	2708553	2394449	2234819	Treatment course
	NMSF	Artemether 20mg + Lumefantrine 120 mg Tablet (3 X 6 tabs)	2036683	1282844	1223217	1081364	1009273	Treatment course
	NMSF	Artemether 80mg + Lumefantrine 480 mg Tablet (1 X 6 tabs)	5819093	3665268	3494907	3089612	2883638	Treatment course
	NMSF	Dihydroartemisinin + Pipraquine 20/160 mg (3)	109921	55613	52523	46344.2	43255	Treatment course
	NMSF	Dihydroartemisinin + Pipraquine 40/320 mg (3)	227169	114934	108548	95778.0	89393	Treatment course
	NMSF	Dihydroartemisinin + Pipraquine 40/320 mg (6)	102593	51905	49022	43254.6	40371	Treatment course
	NMSF	Dihydroartemisinin + Pipraquine 40/320 mg (9)	293122	148301	140062	123584.5	115346	Treatment course
	NMSF	Artesunate injection 30 mg (4 vial per patient)	626,161	593205	560250	494338	461382	Treatment course
	NMSF	Artesunate injection 60 mg (4 vial per patient)	410,918	389291	367664	324409	302782	Treatment course
	NMSF	Artesunate injection 120mg (4 vial per patient)	645,729	611743	577757	509786	475800	Treatment course
	NMSF	Artesunate injection 120 mg (6 vial per patient)	410,918	389291	367664	324409	302782	Treatment course
	NMSF	Procurement of artesunate suppositories	48,919	46,344	43,770	38,620	36,045	Treatment course
	NMSF	Procurement of quinine sulphate tabs	2,400,000	1,920,000	1,152,000	633,600	316,800	Tab of 300 mg
	NMSF	Procurement of quinine inj	480,000	384,000	230,400	126,720	63,360	Vial of 600 mg in 2 ml
	NMSF	Procurement of IV fluids (normal saline/ 5% glucose)	480,000	384,000	230,400	126,720	63,360	Bottle of fluid

Objective 2: To ensure universal access of malaria patients to quality-assured malaria case management (testing, treatment) and to encourage seeking treatment within 24 hours of fever initiation								
Activity	**Responsible**	**Activity component**	**2021**	**2022**	**2023**	**2024**	**2025**	**Unit definition**
2.2.4. Distribution of the anti-malaria to PHC facilities, hospitals and iCCM		Distribution to FHUs	3,030	3,030	3,030	3,030	3,030	FHU covered
		Distribution to FHCs	2,602	2,602	2,602	2,602	2,602	FHC covered
		Distribution to Hospitals	438	438	438	438	438	Hosp. covered
		Distribution to iCCM points	1,000	1,500	1,500	2,000	2,500	iCCM covered
2.2.5. Engagement of private providers in malaria diagnosis and treatment		Arrange a workshop to engage private sector	180	180	180	180	180	Person attended
		Provide RDTs, ACTs and Inj. As on regular basis	500	500	500	500	500	Private site covered
		Establish reporting system from private sector	1	1	1	1	1	Report received
2.2.6. Conduct supportive supervision to care providers at facility level	DCD	Field visits with field-work lasting 5 days in one state (2 visits/ state/ year)	36	36	36	36	36	Person week
	SMCP	Field visits with field-work lasting 2 days in one locality (2 visits/ locality/ year)	360	360	360	360	360	Transport + perdiem for 1 person-week
Strategy 2.3: Primaquine as one dose of 0.25 mg/kg body weight with ACT to patient with P. falciparum malaria to reduce transmission in low transmission areas (corresponding to stratum 1-4) and primaquine 0.25 mg/kg body weight daily for 14 days to prevent relapse of P. vivax without testing for G6PD but with warnings to patient and close supervision for potential primaquine induced haemolysis								
2.3.1.Procurement and distribution of primaquine	NMSF	Procurement of PQ	3000000	4000000	4500000	5000000	5000000	Tablet-7.5 mg
	NMSF	Distribution of PQ to FHUs	3030	3030	3030	3030	3030	FHU covered
	NMSF	Distribution of PQ to FHCs	2602	2602	2602	2602	2602	FHC covered
	NMSF	Distribution of PQ to Hosp.	438	438	438	438	438	Hosp. covered
2.3.2. Monitoring the use of primaquine at different setting	DCD	Sites to monitor the PQ use	18	18	18	18	18	Site monitored
	Pharmacy DG	Monitoring adverse effect events	50	50	50	50	50	Event investigated (Transport + perdiem)
Strategy 2.4: Malaria case management through iCCM and iCCM+ (i.e. including older children and adults) where coverage with health facilities is low in stratum 2, 5 and 6.								
	DCD/ IMCI	Team to finalized the guidelines for iCCM	1					Complete guideline submitted
	DCD/ IMCI	Team to develop a training curriculum for iCCM training	1					Complete curriculum submitted
	DCD/ IMCI	Printing of the curriculum	2,000	2,000	2,000	2,000	2,000	1 booklet printed

Objective 2: To ensure universal access of malaria patients to quality-assured malaria case management (testing, treatment) and to encourage seeking treatment within 24 hours of fever initiation								
Activity	**Responsible**	**Activity component**	**2021**	**2022**	**2023**	**2024**	**2025**	**Unit definition**
	DCD/ IMCI	Printing of guidelines for supply, referral and reporting	2,000	2,000	2,000	2,000	2,000	Guideline prepared
2.4.2 Selection and training of volunteers	National ICCM	Orientation of target states programs about the updated iCCM intervention and share implementation plan with states programs	9	9				Seesion conducted
	National ICCM	Official communication with SMOHs regarding the plan for implementation of the iCCM intervention and facilitation needed from SMOHs	9	9				letter sended
	National ICCM	Establish the states iCCM coordination committees according to guidelines	9	9				Committee established
	State MCP/IMCI	Recruitment of volunteers	1,000	1,500	1,500	2,000	2,500	Person recruited
	Mentors/ IMCI	15-days training of volunteers	1,000	1,500	1,500	2,000	2,500	Person trained
2.4.3 Supply iCCM points-of-care with RDTs, ACTs, artesunate supp. and PQ and monitor progress	State MCP/IMCI	Quantify supplies for iCCM implementing areas including non malaria commodities	1					Report on quantification received
	NMSF	Supply with RDTs	500,000	500,000	750,000	750,000	1,500,000	RDT kit supplied
	NMSF	Supply with AL (adult and Pediatrics)	300,000	300,000	500,000	600,000	1,000,000	AL course supplied
	NMSF	Supply with artesunate sup.	3,000	3,000	3,000	3,000	5,000	Artesunate sup. Supplied
	NMSF	Supply with PQ	150,000	150,000	250,000	300,000	500,000	PQ supplied
	State MCP/IMCI	Field visit from state supervisors to iCCM point-of-care level	216	216	216	216	216	Perdium + transport for 1 team per month
	National ICCM	Field visit from national supervisors to state and village (10 days/ state)	18	18	18	18	18	Perdium + transport for 1 visit

Objective 2: To ensure universal access of malaria patients to quality-assured malaria case management (testing, treatment) and to encourage seeking treatment within 24 hours of fever initiation								
Activity	**Responsible**	**Activity component**	**2021**	**2022**	**2023**	**2024**	**2025**	**Unit definition**
	State MCP/IMCI	Conduct bi-annual review meetings with focal locality departments at state level for monitoring implementation of the iCCM	36	36	36	36	36	Meeting conducted
	National ICCM	Communication cost for states and locality iCCM focal persons to follow up implementation of the intervention and communicate with iCCM care providers	18	18	18	18	18	Cost per state
Strategy 2.5: Monitoring anti-malarial drugs, efficacy								
2.5.1.Conduct on regular basis efficacy studies and operational researches	DCD	Study the efficacy of AL, DHAP and potential alternative drugs in selected sites	5	5	5	5	5	Site studied
	DCD	Conduct OR related to care providers adherence to treatment protocol	2		2		2	Research conducted
	DCD	Support research institutes and researchers to conduct studies relevant to malaria case management	5	5	5	5	5	Study supported
2.5.2. Share and publish findings of efficacy studies and OR with relevant networks and groups at conferences and meetings		Published the findings of efficacy studies and OR in peer-reviewed journals	5	5	5	5	5	Study published
	DCD	Present the findings of efficacy studies and OR with relevant networks and groups at conferences and meetings	2	2	2	2	2	Study presented
	DCD	Promote dissemination of malaria research findings through arrangement of an annual 2-days conference (Malaria research conference)	1	1	1	1	1	Conference arranged
Strategy 2.6. Communication for timely seeking treatment for fever								
2.6.1.Development of case management communication strategy	CDC/ Health promotion	Desk analysis of available data regarding treatment-seeking behaviour	1					Report discussed
	CDC/		1					Person week

Objective 2: To ensure universal access of malaria patients to quality-assured malaria case management (testing, treatment) and to encourage seeking treatment within 24 hours of fever initiation								
Activity	**Responsible**	**Activity component**	**2021**	**2022**	**2023**	**2024**	**2025**	**Unit definition**
	Health promotion	Develop communication strategy (behavioural objectives, communication strategies, targets, M&E frame and budget)						
	DCD/ Health promotion	Endorsement of the strategy by national and state levels	1					Strategy endorsed
2.6.2. Develop/ Design communication messages to promoter treatment-seeking behaviour	DCD/ Health promotion	Design message/s	30			30		Message designed
	DCD/ Health promotion	Test the message through different channels	30			30		Message tested
	DCD/ Health promotion	Produce the approved message using suitable format	5					Message produced
2.6.3. Conduct communication and education treatment-seeking behaviour campaign	DCD/ Health promotion	Meetings with partners (radio, TV, …etc.)	2	2	2	2	2	Person days
	DCD/ Health promotion	Approval of campaign(s)/ IEC routine activities time-frame and scope	1	1	1	1	1	Campaign/ IEC delivery map
	DCD/ Health promotion	Conduction of the educational activities (operational cost)	18	18	18	18	18	Message delivered
	DCD/ Health promotion	Evaluation of the campaign/ continuous IEC programme	1	1	1	1	1	Completed report based submitted

Objective 3: To control malaria in pregnancy including its effects on low birth weight through case management (under objective 2), distribution of LLINs to all pregnant women in LLIN and IRS targeted areas (under strategy 1.3) and IPTp in stratum 5 and 6								
Activity	**Responsible**	**Activity component**	**2021**	**2022**	**2023**	**2024**	**2025**	**Unit definition**
Strategy 3.1. IPTp through ANC for pregnant women in areas where the prevalence is higher than 10% (mainly in stratum 3, 5 and 6)								
3.1.1. Quantify the need in the targeted areas, and develop implementation guidelines	DCD/ MCH/UNICEF/UNFPA	Team to identify in each target area sites for implementation and to quantify their needs	1					stackeholders meeting conducted
	DCD/ MCH/UNICEF/UNFPA	Team to develop IPTp implementation guideline including registration and reporting	1					Completed guideline submitted
	DCD/ MCH	Printing of guideline and SOPs for IPTp	2,000	1,000	1,000	1,000	1,000	Guidline printed
3.1.2. Training of midwives and other ANC staff	DCD/ MCH/UNICEF/UNFPA	5-days TOT for state focal person (MCH director) at national level	21					Person trained
	State MCP/ MCH	5-days training of health visitors in targeted states	79		79		79	Person trained
	State MCP/ MCH	3-days training of midwives	1,470	1,000	1,000			Person trained
	DCD/MCH	Orientation of obstetricians and medical doctors at state level	7					orientation session conducted
3.1.3. Provide regular supply with SP and monitor the use and quality of care	NMSF	procurement and delivering of SP to point of services	572	1,173	2,105	4,625	5,374	Tin of one thousand tab delivered
	HMIS	Reporting of users per state	7	7	7	7	7	State reported
	DCD/ MCH/UNICEF/UNFPA	Supervise the implementation at community level	7	7	7	7	7	Site visited
Strategy 3.2: Distribution of LLINs thorough EPI and ANC clinics to all pregnant women and children under one year in LLIN areas (as replacement) and IRS targeted areas								
3.2.1. Routine distribution of LLINs through ANC and EPI channels	MCH/DCD	2-days training of ANC and EPI staff for continuous distribution	1,757	-	-	-	-	peron trained

Objective 3: To control malaria in pregnancy including its effects on low birth weight through case management (under objective 2), distribution of LLINs to all pregnant women in LLIN and IRS targeted areas (under strategy 1.3) and IPTp in stratum 5 and 6								
Activity	**Responsible**	**Activity component**	**2021**	**2022**	**2023**	**2024**	**2025**	**Unit definition**
	MCH/ DCD	Distribution of LLINs to pregnant women and children under one year	3,671,549	3,764,440	3,859,680	3,957,330	4,057,450	LLIN delivered
	ANC	Promote the use of LLINs among pregnant women through written message	3,671,549	3,764,440	3,859,680	3,957,330	4,057,450	Message delivered
3.2.2. Incorporate registration and reporting into EPI and ANC ongoing system	DCD/ MCH/ ANC	Team to work with consultant to incorporate registration and reporting into ANC system	1					Person day
	DCD/ MCH/ EPI	Team to incorporate registration and reporting into EPI system	1					Person day
	State ANC	Reporting from state about ANC sites contribution in MIP on regular basis	8	8	8	8	8	State reported
	State EPI	Reporting from state about EPI contribution in LLIN distribution on regular basis	13	13	13	13	13	State reported

Objective 4: To provide timely and reliable information to monitor the progress, trend in malaria cases and deaths and to early detect and contain epidemics								
Activity	**Responsible**	**Activity component**	**2021**	**2022**	**2023**	**2024**	**2025**	**Unit definition**
Strategy 4.1: Utilizing IDSR, HMIS/ DHIS2, programme data and climate and population movement data to disseminate weekly, monthly and quarterly malaria reports								
4.1.1. Revise the existing facility-based and community-based registers and reporting format to ensure provision of data needed for monitoring and evaluation of the malaria control programme	DCD - Planning, M&E/ HMIS	Team to revise facility- and community-based registration and reporting format including lab and pharmacy to include data needed by the NMC	1					Work completed and submitted
	DCD - Planning, M&E/ HMIS	Endorsement of the new revised format	1					New format endorsed
	DCD - Planning, M&E/ HMIS	Printing of the new registers and format	6070	6070	6070	6070	6070	Register/ report printed
	DCD - Planning, M&E	Dissemination of the new register and report format to state	18	18	18	18	18	Register/ report delivered
4.1.2. Provide comprehensive malaria report on weekly, monthly and quarterly basis including case-based data, vector surveillance data, climate-based data (temperature and rainfall), population movement and malaria control interventions	DCD - Planning, M&E/ HMIS	Obtain on weekly basis case-based data from IDSR/ DHIS2/ HMIS	52	52	52	52	52	Report obtained
	DCD - Planning, M&E/ HMIS	Obtain on weekly basis vector surveillance data	52	52	52	52	52	Report obtained
	DCD - Planning, M&E	Obtain on monthly/ quarterly basis climate-based data (temperature, relative humidity and rainfall)	12	12	12	12	12	Report obtained
	DCD - Planning, M&E/ HMIS	Obtain on quarterly basis population movement data	4	4	4	4	4	Report obtained
	DCD - Planning, M&E/ HMIS	Obtain on monthly basis malaria control intervention data	12	12	12	12	12	Report obtained
	DCD - Planning, M&E/ HMIS	Obtain on weekly/ monthly basis case-based data from private providers	12	12	12	12	12	Site reported
	DCD - Planning, M&E/ HMIS	Provide malaria weekly report	52	52	52	52	52	Report released
	DCD - Planning, M&E	Provide malaria monthly report	12	12	12	12	12	Report released
	DCD - Planning, M&E/ HMIS	Provide malaria quarterly report	4	4	4	4	4	Report released
	DCD - Planning, M&E/ HMIS	Provide malaria annual report	1	1	1	1	1	Report released
4.1.3. Conduct malaria surveillance dashboard training at national, state and locality level		Conduct malaria dashboard 3-days training at national , state and locality level	387	387	0	0	0	Person trained
	DCD/ Planning, M&E	3-days TOT training of malaria surveillance at state level	54	0	54	0	54	Person trained

Objective 4: To provide timely and reliable information to monitor the progress, trend in malaria cases and deaths and to early detect and contain epidemics								
Activity	**Responsible**	**Activity component**	**2021**	**2022**	**2023**	**2024**	**2025**	**Unit definition**
	DCD/ Planning, M&E	3-days training of locality surveillance officers	189	0	0	0	0	Person trained
	DCD - Planning, M&E	2-days training of HMIS officer at facility level	1775	1395	0	0	0	Person trained
	HMIS	Provision of Tablets for community HIS	0	500	463	0	0	Tablets procured delivered
	HMIS	Support operation cost for the already running system	12	12	12	12	12	Site supported
	HMIS	Annual maintaining of internet services for the DHIS at national, states, and localities levels (in 279 old sites and 400 new sites)	679	679	679	679	679	Internet services maintained
	HMIS	follow up reporting completeness and timeliness by supporting and distributing SIM cards fees at federal , States and locality level	502	502	502	502	502	Person supported
	HMIS	Provision of High quality Storage and Backup Server	1	0	0	0	0	Server provided
	HMIS	Provision of computers for sentinel sites	1000	800	0	0	0	Computer delivered
		Provision of connectivity at sentinel site level	1000	800				
4.1.5. Supportive supervision for surveillance and HMIS officers at state, locality and facility levels	DCD- Planning, M&E	Field visits lasting 5 days in each state for OSDV (On Site Data Verification) and DQA (Data Quality Audit) (2 visits/ state/ year)	36	36	36	36	36	Transport + perdiem for 1 visit
	SMCP/HMIS	Field visits lasting 2 days in each locality for OSDV and DQA (2 visits/ locality/ year)	378	378	378	378	378	Transport + periderm for 1 visit
	DCD- Planning, M&E	Conduct monthly meeting by malaria surveillance TWG	12	12	12	12	12	Meeting cost
Strategy 4.2: EPR for malaria integrated with Health Emergency and Epidemic Control (HEEC) RRT with emphasis of foci investigation in stratum 1 (pre-elimination areas)								
4.2.1. Establish –in line with HEEC- malaria contingency plan, early warning/ early detection system and epidemic threshold	DCD - Planning, M&E/ HEEC	Develop in-line with HEEC strategic plan a contingency plan for malaria epidemic	1	1	1	1	1	National malaria contingency plan developed
	DCD - Planning, M&E/ HEEC	Establish and maintain in line with IDSR a malaria epidemic early warning/ early detection system per state	18	0	0	0	0	State EWS/EDS established
	DCD - Planning, M&E/ HEEC	TOT at national level on early detection and containment of epidemics	25	0	25	0	25	

Objective 4: To provide timely and reliable information to monitor the progress, trend in malaria cases and deaths and to early detect and contain epidemics								
Activity	**Responsible**	**Activity component**	**2021**	**2022**	**2023**	**2024**	**2025**	**Unit definition**
	DCD - Planning, M&E/ HEEC	Training states and locality coordinators on early detection and containment of epidemics	1079	800	0	0	0	
	DCD - Planning, M&E/ HEEC	Updating the epidemic threshold for all states (facility/ locality)	189	189	189	189	189	State threshold updated
	DCD - Planning, M&E/ HEEC	Training of national and state RRT on malaria surveillance and epidemic	20		20		20	Team trained
	DCD - Planning, M&E/ HEEC	Training course of Rapid Response team at State and locality level	567	304	81	142	0	
4.2.2. Assess feasibility for moving towards malaria elimination in very low malaria transmission states.	DCD	Recruitment of elimination consultant for 3 months	1	1	0	0	0	Person month
	Consultant/ DCD	Assess feasibility of malaria elimination at states in low transmission zone	1	0	0	0	0	State feasibility report
	Consultant/ DCD	Development of road map for elimination	1	0	0	0	0	Road map endorsed
4.2.3. Re-orient malaria control interventions towards elimination in low malaria transmission states	Consultant/ DCD	2-weeks training of malaria control staff at state and locality level on malaria elimination	30	46	0	0	0	Person trained
	Consultant/ DCD	Meetings to re-orient surveillance system to capture and classify any confirmed malaria cases	10	10	10	10	10	Person meeting
	SMCP/ DCD	Investigate any clusters of cases in order to understand risk factors and recommend suitable interventions	12	12	12	12	12	Cluster investigated

Objective 5: To coordinate and sustain evidence-based and cost-effective malaria control activities at national, state and locality level								
Activity	**Responsible**	**Activity component**	**2021**	**2022**	**2023**	**2024**	**2025**	**Unit definition**
Strategy 5.1: Capacity building through training in programme management, epidemiology and vector control/ entomology with regular supportive supervision from national level to state and locality level								
5.1.1. Training of malaria control staff at national, state and locality level in epidemiology, parasitology and entomology	DCD-Planning, M&E	Support high level training in epidemiology	50	150	100	50	250	Person trained
	DCD-Planning, M&E	Support high level training in parasitology	5	5	5	5	5	Person trained
	IVM	Support high level training in entomology and Vector control	36	0	0	36	0	Person trained
	DCD-Planning, M&E	Conduct of a 2-months training course on planning malaria programmes for states and locality coordinators	20	20	20	20	20	Person trained
	DCD-Planning, M&E	Conduct short training course on Malaria Surveillance, M&E and data management	25	0	25	0	25	Person trained
	DCD-Planning, M&E	Training states malaria coordinators on combating malaria during emergencies	207	0	50	0	50	Person trained
5.1.2. Provide structured support to staff at state and locality level through mentoring, supervision and at meetings	DCD-Planning, M&E	Mentoring states and locality malaria coordinators	12	12	12	12	12	Mentor month (Honorarium)
	DCD-Planning, M&E	Exchange experience between state coordinators through peer-review	4	4	4	4	4	Peer-review conducted
	DCD-Planning, M&E	regular meetings of locality and state coordinators and senior staff	91	91	91	91	91	Person day
	DCD-Planning, M&E	Field visit from national to state and localities (5 days/ state)	36	36	36	36	36	Transport + perdiem for 1 person-week
5.1.3. Promote intelligent use of data and actively use information to re-orient control interventions	HMIS	Geo-coding of health facilities and clusters using available data	1	0	1	0	1	Facility geo-coded
	DCD-Planning, M&E	Team to analyze, interpret and triangulate the reported incidence and mortality data from different sources (IDRS/ DHIS2/ HMIS) on quarterly and annual basis and incorporate the analysis in annual malaria report.	4	4	4	4	4	Quarterly report submitted
	DCD-Planning, M&E	Establish indicator sites to assess malaria prevalence among febrile patients attending to health facilities on regular basis	189	189	189	189	189	Site reported
	DCD/ DCD-Planning, M&E	Carry out community-based MIS to assess malaria prevalence and other indicators at community level	0	1	0	0	1	MIS report
	DCD/ DCD-Planning, M&E	Conduct mid-term (MTR) for the MSP 2021 – 2025	0	0	1	0	0	MTR report
Strategy 5.2: Avoid stock outs of RDT, ACTs and artesunate suppositories and IV through development of one-layer PSM system ie from state to facility								

Objective 5: To coordinate and sustain evidence-based and cost-effective malaria control activities at national, state and locality level								
Activity	**Responsible**	**Activity component**	**2021**	**2022**	**2023**	**2024**	**2025**	**Unit definition**
5.2.1. Secure adequate and maintained stocks of RDTs and anti-malaria medicines at state level	DCD/ NMSF	Team to analyze (desk analysis) enabling and constraining factors related to maintaining adequate stock at state and facility level	1					Desk analysis report submitted
	DCD/ NMSF	Team to update the supply and distribution strategy for each state based on the above analysis	1					Person week
	DCD/ NMSF	5-days training of state NMSF focal points	18		18		18	Person trained
5.2.2.Develop a system to supply health facilities, ANC clinics and iCCM point from state store directly including the monitoring system	NMSF/ DCD	Committee to develop a one-layer system of supply (from store to point of service)	1	0	0	0	0	Person week
	NMSF/ DCD	Committee to calculate the monthly/ quarterly need for each point of care	1					Person week
	NMSF/ DCD	3-days training of point of care focal point on the supply system	7575	8070	8070	8570	9070	Person trained
	NMSF/ DCD	Secure transport of supplies to point of care	7575	8070	8070	8570	9070	Site supplied
Strategy 5.3: Retention of trained malaria and vector control specialists at all level through better payment scheme, continuous professional development and job satisfaction								
5.3.1. Utilization of the existing system at FMOH and SMOH to retain trained staff	DCD	Include malaria coordinators at all levels in the current FMOH incentive system	207	207	207	207	207	Person year
	DCD	HR for DCD and HMIS strengthening	15	15	15	15	15	Person year
	DCD	Establish carrier development for technical staff working at all levels	130	90	0	0	0	Person promoted
	DCD	Establish accredited system for CPD for all staff at all level	108	100	100	100	100	Person trained
	IDSR nd HMIS	Work with WHO/ partners to secure training opportunities outside the country	9	9	9	9	9	Person trained
	DCD - Planning, M&E	Work with WHO/ partners to attend meetings outside the country	3	3	3	3	3	Person participated
Strategy 5.4: Strengthen political commitment and institutional support								
5.4.1. Work with line-ministries to implement Presidential Decrees related to tax and tariff deletion	DCD – Partnership/ MOF	Deletion of tax and tariff related to malaria commodities	2	2	2	2	2	Tax and tariff deleted
	DCD – Partnership/ MOF	Meet the local component of various projects	1	1	1	1	1	Local component met

Objective 5: To coordinate and sustain evidence-based and cost-effective malaria control activities at national, state and locality level								
Activity	**Responsible**	**Activity component**	**2021**	**2022**	**2023**	**2024**	**2025**	**Unit definition**
	DCD – Partnership/ Ministry of Agriculture and irrigation	Workshop on application of intermittent irrigation and use of modified irrigation system	1					Schemes committed
	DCD – Partnership/ localities and water sector	Involvemeny of water sector at state and locality in LSM at towns and cities	110	110	110	110	110	Town/ city complied
5.4.2. Involvement of political and community leaders in malaria control campaigns, workshops and meetings	DCD - Partnership	Launching of major malaria control campaigns by senior leaders	2	2	2	2	2	Leaders involved
	DCD - Partnership	Workshops to facilitate the implementation of malaria interventions at local level by community leaders	18	18	18	18	18	Leaders involved
	DCD – Partnership/ SMCP	Discussion of malaria situation report in official meetings at state level (particularly during the season)	18	18	18	18	18	State report discussed
Strategy 5.5: Harmonization of the efforts of national, states, localities, relevant governmental sectors and partners for better malaria control and outcome								
5.5.1. Align the NGOs plan with NMSP plan	DCD - Partnership & Planning, M&E	Arrange meeting to align plans of NGOs with malaria plan	1	1	1	1	1	NGO aligned with
	DCD - Partnership & Case Management	Involve providers at NGOs clinics and community-based activities in training workshop for malaria treatment protocol	240	240	240	240	240	Person trained
	DCD - Partnership & Planning, M&E	Arrange on regular basis meetings with NGOs forum	2	2	2	2	2	Meeting arranged
5.5.2. Involve research institution and academia in malaria control	DCD - Partnership & Planning, M&E	Support the Lab Science colleges with teaching aids	5	5	5	5	5	College supported
	DCD - Partnership & Planning, M&E	Continue the degree training course with BNICDC and ofK (Entomology and VC)	40		40		40	Person trained
	DCD - Partnership & Planning, M&E	Continue collaboration with Sennar malaria training centre in training and monitoring of insecticide resistance	1	1	1	1	1	Support provided
	DCD - Partnership & Planning, M&E	Continue collaboration with research institutes for evidence generation	5	5	5	5	5	Study published