THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF HEALTH, COMMUNITY DEVELOPMENT, GENDER, ELDERLY AND CHILDREN

Malaria Surveillance, Monitoring and Evaluation Plan 2015 – 2020

NATIONAL

MALARIA

CONTROL

PROGRAMME

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FIGURES

TABLES

ACRONYMS

ACT	Artemisinin Combination Therapy
ADDO	Accredited Drug Dispensing Outlet
ADR	Adverse Drug Reaction
BCC	Behavioral Change Communication
CHMT	Council Health Management Team
DFID	Department for International Development
DHMT	District Health Management Team
DHS	Tanzania Demographic Health Survey
DMIFP	District Malaria IMCI Focal Person
EHMM	Environmental Health Malaria Monitoring
eILS	Electronic Integrated Logistics System
EIR	Entomological Inoculation Rate
GFATM	Global Fund to Fight Aids, Tuberculosis, and Malaria
HC	Health Centre
HF	Health Facility
IDSR	Integrated Disease Surveillance and Response
ILS	Integrated Logistic System
IMCI	Integrated Management of Child Illness
IPTp	Intermittent Preventive Treatment in Pregnancy
IRS	Insecticide Resistance Spraying
IRT	Insecticide Resistance Testing
ITN	Insecticide Treated Net
KCMC	Kilimanjaro Christian Medical Centre
LGA	Local Government Authority
LMIS	Logistics Management Information System
MDG	Millennium Development Goal
MEEDS	Malaria Epidemic Early Detection System
MEEWS	Malaria Epidemic Early Warning system

TMIS	Tanzania Malaria Indicator Survey
MIS	Malaria Indicator Survey
MoHCDGEC	Ministry of Health, Community Development, Gender, Elderly and Children
MPR	Malaria Programme Review
mRDT	Malaria Rapid Diagnostic Test
MVCMIS	Malaria Vector Control Information System
MVS	Malaria Vector Surveillance
NBS	National Bureau of Statistics
NIMR	National Institute for Medical Research
NMCP	National Malaria Control Programme
NMSP	National Malaria Strategic Plan
PMI	President's Malaria Initiative
PSU	Pharmaceutical Services Unit
RHMT	Regional Health Management Team
SARA	Service Availability and Readiness Assessment
SME	Surveillance, Monitoring and Evaluation
SMPS	School Malaria Parasitaemia Survey
SOP	Standard Operating Procedure
SPAM	Service Provision Assessment for Malaria
SPS	Sentinel Population Surveillance
TES	Therapeutic Efficacy Study
THMIS	Tanzania Health Management Information System
TRPI	Tropical Pesticides Research Institute
TSPA	Tanzania Service Provision Assessment
TWG	Technical Working Group
WHO	World Health Organization

FOREWORD

The Surveillance, Monitoring and Evaluation (SME) Plan has been developed in line with the current National Malaria Strategic Plan (MSP) covering the period 2015 – 2020. The MSP outlines the key technical and supportive strategies in the fight against malaria for the period 2015 - 2020.

As Tanzania gradually will move from a malaria control phase to a malaria pre-elimination phase, monitoring, evaluation and surveillance will be more important than ever.
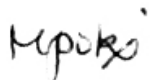
This SME plan is a product of extensive consultation and collaboration between all stakeholders and establishes a strategic framework for the collection, transmission, analysis, interpretation, dissemination and, ultimately, use of information for optimizing malaria control interventions.

This Malaria Surveillance, Monitoring and Evaluation plan is forming the ideal platform to measure performances and evaluating achievements of the MSP targets.

The plan describes the comprehensive SME platform with its goal and objectives (chapter 1), the core malaria indicators and the available information system in place to collect them (chapter 2), the necessary data management framework (chapter 3) and the implementation arrangements (chapter 4).

The plan is part of the implementation of the principle of the "Three Ones"; one Strategic Plan, one Coordinating Mechanism and one Surveillance, Monitoring and Evaluation plan for malaria control including costed work plan, agreed by Malaria Control Programme and its partners in effective monitoring of performance and outcomes.

I am confident that this plan provides the necessary framework for monitoring and evaluation of malaria control interventions and I urge all stakeholders to put all efforts into its implementation to enable the country move towards the vision of "MALARIA-FREE TANZANIA".

Dr. Mpoki M. Ulisubisya
PERMANENT SECRETARY

ACKNOWLEDGEMENT

EXECUTIVE SUMMARY

The surveillance, monitoring and evaluation (SME) plan for the National Malaria Control Program (NMCP) in Mainland Tanzania for the period 2015 – 2020 is based on and complements the NMCP's Malaria Strategic Plan (MSP) 2015 – 2020. Tanzania's progress in malaria control is shifting the epidemiology of malaria from control phase towards sustained control and, eventually, to pre-elimination. As Tanzania moves towards new phases of control, it becomes increasingly imperative that cases are properly reported and followed-up and that programmatic and service provision indicators are continuously collected. This enables NMCP to assess its progress towards international and national targets, and to ensure resources are being used in the most cost-effective manner. The SME plan focuses on NMCP's strategy to move towards a) passive surveillance through health facilities and b) proactive, regular monitoring of parasite prevalence, vector distribution, and interventions coverage. The planned SME activities will contribute to an improved understanding of the malaria burden carried by specific geographies and communities within Tanzania, and push the country forwards towards elimination.

The overarching objective of SME activities for the next five years includes:

- To provide timely and reliable information to assess progress towards the set global and national targets,
- To ensure resources are used in the most cost-effective manner, and
- To account for investments made in malaria control

The objectives of the NMCP's strategic plan will be supported by extensive routine and periodic SME systems and surveys with various processes and tools used for data management and analysis. The tools that have been used in the past - basic health facilities indicators and national representative surveys - have been both cost-effective and efficient in capturing useful data, but may not provide a clear picture of the gains made in malaria in the near future. Three major impact and four major outcome indicators have been identified as the core national indicators to evaluate the progress towards the achievements of the 2015-2020 national malaria strategic plan. These indicators are collected through national and regional representative surveys and include four key sources of information based on population, health facility, malaria vector, and programmatic level. Assessment of intervention coverage and impact is a fundamental element for monitoring disease trends. Health facility based surveillance indicators are able to capture key coverage and impact indicators up to district and sub-district level.

Due to the complex malaria transmission framework, there is a wide variety of SME systems and tools in place to collect data for monitoring malaria transmission and malaria control interventions across Tanzania. These multiple systems reflect the interaction between the different elements of malaria transmission: vector, parasite, host, environment and, eventually, malaria control interventions. The comprehensive malaria surveillance framework includes three major elements. Each element of the surveillance framework is strongly linked with a response system and will generate an alert if an abnormal situation or rupture of equilibrium occurs.

- Malaria disease surveillance including passive monthly HMIS and weekly eIDSR reporting and active case detection, if applicable.
- Malaria control programmatic surveillance including malaria commodities logistic management reporting, preventive initiatives reporting and, parasite and vector resistance monitoring.
- Malaria transmission surveillance: including Sentinel Population Surveillance, Malaria Vector Surveillance and climate monitoring.

All data that originates from one of the above systems or surveys is submitted to a more senior level for approval. Data can originate from a variety of levels, including Health Facilities, District Malaria Focal Persons, and Regional or National representatives and institutions. The preferential flow of information from HFs is via DHIS. Ideally, once reviewed, data should be sent to the SME unit of the NMCP and, eventually, entered into a comprehensive composite Malaria Database. The NMCP SME unit will aggregate the data and produce reports and publications for dissemination and utilization at various levels, such as the Ministry of Health and Social Welfare, CHMTs and RHMTs, other Ministries, Government Departments, Development partners, Implementing Partners, Research Institute and Community level.

In order to manage the massive input of information appropriately it is of paramount importance to set up a centralized data repository system (DRS) that is able to store records from different systems, organize them and provide standardized outputs for easy interpretations. The DRS should be flexible and provide a platform for analysis of data at different administrative and functional levels. This framework of a planned surveillance, monitoring, and evaluation activities will contribute to an improved understanding of the malaria burden carried by specific geographies and communities within Tanzania.

1 INTRODUCTION AND BACKGROUND

1.1 Introduction

The Surveillance, Monitoring and Evaluation (SME) plan for the National Malaria Control Programme (NMCP) of Mainland Tanzania, covers the period 2015 – 2020. It is based and is complementing the NMCP's Malaria Strategic Plan (MSP) 2015 – 2020.

Malaria is one of the major public health threats in Tanzania and is transmitted in the country by two major mosquito species, the *An.gambiae sl* and *An funestus*. *P.falciparum* is the most predominant malaria parasite species in Tanzania and causes severe forms of the disease, while other *non-falciparum* species (*P.malariae* and *P.ovale*) are encountered with different distributions across the country and are less virulent[1]. In the recent years, there has been a dramatic decrease in malaria with parasite prevalence reducing by half between 2007/2008 and 2011/2012[2] . This decrease is largely due to increases in government and donor funding to support the scale up of malaria control interventions including:

- Preventive vector control interventions: universal coverage with long lasting insecticide treated nets (LLINs), indoor residual spraying (IRS) and larval source management (LSM) in selected areas
- Treatment with artemisinin-combination therapies (ACTs)
- Diagnostic testing with malaria rapid diagnostic tests (mRDTs)
- Intermittent preventive treatment during pregnancy (IPTp)
- Behaviour change communication (BCC) campaigns
- Surveillance, monitoring and evaluation activities
- Programme management, partnership development and resource mobilization.

The results in terms of intervention coverage, reductions of malaria-associated morbidity and impact on mortality—especially in children under five years of age—will allow mainland Tanzania to reach many of its international commitments - Abuja Declaration and Millennium Development Goals (MDGs) - as well as its own development goals as expressed in the National Health Policy, Vision 2025 and the National Strategy for Growth and Reduction of Poverty.

Until now, monitoring and evaluation of malaria control has been mainly based on:

- Periodic national representative malaria indicator surveys (Demographic and health surveys - DHS - and malaria indicator surveys - MIS), approximately every five years for key mortality estimates, malaria services outcomes, malaria parasitaemia and anemia indicators
- Routine health facility-generated data through health information systems
- Programmatic surveys to monitor insecticide susceptibility and drug efficacy
- Health facility supervision and verification
- Operational research

Tanzania's progress in malaria control is shifting the epidemiology of malaria from control phase towards sustained control and, eventually, to a pre-elimination phase. As Tanzania moves towards new phases of control it becomes increasingly imperative that cases are properly reported and followed-up and that

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[1] (National Malaria Control Programme, 2014)
[2] (National Malaria Control Programme n.d.)

programmatic and service provision indicators are continuously collected. The tools that have been used in the past - basic health facilities indicators and national representative surveys - have been both cost-effective and efficient in capturing useful data, but may not provide a clear picture of the gains made in malaria in the future. This document highlights NMCP's strategy to move towards a) passive surveillance through health facilities and b) proactive, regular monitoring of parasite prevalence, vector distribution, and interventions coverage.

1.2   Epidemiology of Malaria and its Control in Tanzania

The situation and epidemiology of malaria in Tanzania is extensively described in recent NMCP documents; National Malaria Strategic Plan 2015 - 2020; Epidemiological profile of malaria and its control in Mainland Tanzania (2013) and the Malaria Programme Performance Review of Tanzania Mainland (2011/2012), it will be described here in the context of SME.

Tanzania is currently undergoing a malaria epidemiological transition, with approximately 60% of the population now living in hypo-endemic areas - regions where parasitaemia is between 0 and 10 % -, compared to 30% in 2000[3]. The map in Figure 1 created by NMCP in partnership with INFORM, highlights the distribution of malaria parasite prevalence across the country in 2010[4]. This map displays the regions where high malaria transmission remains most entrenched (darker green) in the lake regions, and West and South Eastern Tanzania.

Figure 1: Tanzania 2000 (left) and 2010 (right) Predicted **PfPR$_{2-10}$**
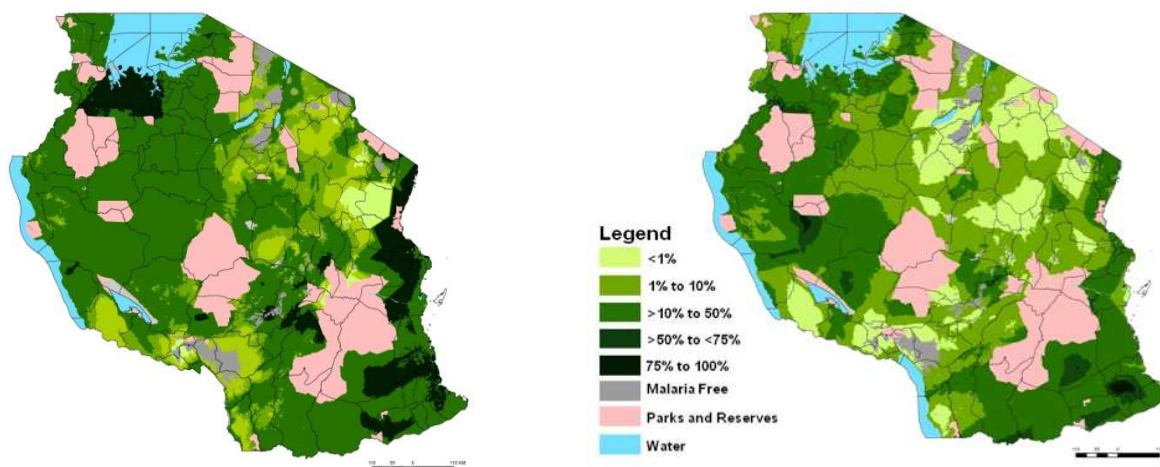
Source: Epidemiological Profile of Malaria and its Control in Tanzania. NMCP 2013

Through existing monitoring and surveillance systems, the NMCP has been able to identify the following key factors that influence malaria control in Tanzania.

● **Geography and Climate**
  Tanzania is divided into 25 regions and has extremely varied geography and climate, ranging from tropical coastal lowlands to arid and mountainous highlands. The basins around lakes Victoria,

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[3] (National Malaria Control Programme 2014)

[4] (The INFORM Project: Department of Public Health Research Kenya Medical Research Institute - Wellcome Trust Progamme, Nairobi, Kenya 2013)

Tanganyika and Nyasa have relatively high temperatures, humidity and heavier rainfall[5]. The greater part of Tanzania consists of the Central Plateau, Southern and northern Highlands around 900–1,800m, which is punctuated by mountain ranges[6]. Climatic conditions remain favorable for transmission throughout almost the entire country, with close to 96% of Mainland Tanzania at risk[7].

- **Urban *vs* Rural**

  The proportion of the population living in urban areas has increased with each census from 5% in 1967, 13% in 1978, 21% in 1988, 27% in 2002 and 30% in 2011/2012. Dar es Salaam city accounts for approximately 10% of mainland Tanzania's population[8]. This trend places an increasing burden on already over-whelmed public services and social infrastructure in urban settings.

- **Health System Decentralization**

  There are two formal administrative levels in Tanzania's health system: regions and councils. Councils are categorized according to population settings: district councils (mainly in rural settings), township, municipal and city (mainly urban settings)[9]. There are currently over 6,500 healthcare facilities in the country. 79% of these facilities are government run, 13% are faith-based and voluntary, and 9% are privately owned[10].

- **Socioeconomic Status**

  Poverty in Tanzania is a key concern for the Government, and has significant impacts on the accessibility of health care. Income growth in Tanzania is highly correlated to an individual's urban or rural location growth, driven predominantly through the agricultural sector, was about 4.5% on average between 2000 and 2007. When contrasted with the national population growth rate of 2.9% over the same time period, the change in rural per capita income becomes small, thus perpetuating poverty in rural areas[11]. The Household Budget Survey, conducted in 2011/2012, indicated that out of every 100 Tanzanians, 36 were poor in 2000 - 2001 compared to 34 in 2007 and 22.8 in 2011/2012.

1.2.1 Malaria Prevalence

Tanzania has the third largest population at risk of stable malaria in Africa, following Nigeria and the Democratic Republic of Congo, with 96% of Tanzania mainland population at risk for contracting the illness[12]. Comparing the THMIS surveys conducted in both 2007/2008 and 2011/2012 it is evident that the prevalence of malaria has decreased significantly across all regions. Overall, malaria prevalence declined from 18.1% in 2007/2008 to 9.5% in 2011/2012[13].

Table 1 highlights the distribution of Tanzania's population according to malaria stratification. Approximately 59% of the population lives in malaria hypo-endemic areas while the remaining 41% lives in meso-, holo-, and hyper-endemic areas.

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[5] (National Malaria Control Programme 2014)

[6] (National Malaria Control Programme 2014)

[7] (National Malaria Control Programme 2014)

[8] (The INFORM Project: Department of Public Health Research Kenya Medical Research Institute - Wellcome Trust Progamme, Nairobi, Kenya 2013)

[9] (National Malaria Control Programme 2014)

[10] (National Malaria Control Programme 2014)

[11] (National Malaria Control Programme 2014)

[12] (National Malaria Control Programme 2014)

[13] (National Malaria Control Programme 2014)

Table 1: Epidemiological classes and population at risk

Epidemiological Class	Population at Risk		
	Population	Proportion %	Cumulative %
Pop Malaria free	1,573,594	3.63%	3.63%
Pop unstable	12,161	0.03%	3.66%
Pop < 1%	9,462,802	21.83%	25.48%
Pop 1-4.5%	8,850,001	20.41%	45.90%
Pop 5-9.9%	5,785,627	13.35%	59.24%
Pop 10-49.9%	16,675,631	38.46%	97.71%
Pop 50% PLUS	993,639	2.29%	100.00%

As mosquito breeds in still water; the volume of rainfall is strongly correlated to the prevalence of malaria. Seasonal malaria peaks occur at the end of the rainy season. The Central and Southern parts of the country have one rainy season (that peaks in March-April), with more than 60% of rainfall concentrated in less than three months. The Eastern, Northern, and Western zones experiences bimodal rainfall (with peaks in November and April), with rainfall spread over a longer period[14].

It is apparent that tools and procedures for SME that have served well in the past may not be sufficient to conduct effective and efficient SME in an environment of lower prevalence of malaria as is now being encountered in parts of Tanzania. For example, sample sizes of typical surveys used to do SME may not provide point estimates with small enough confidence intervals to enable comparisons across places and time. The uneven progress of malaria control across the country also poses challenges to typical SME procedures. While national coverage estimates may still be useful, additional emphasis will need to be placed on sub-national indicators to more efficiently target malaria interventions.

1.2.2 Malaria Transmission

The effectiveness of preventive malaria interventions such as LLINs, IRS, LSM and others depends on the intensity of parasite transmission and types of mosquitoes that are present in the environment. The following factors make mosquitoes efficient carriers of the malaria parasites:

- **Vector biology and dynamics**
  Different species of mosquitoes have their own preferences in terms of resting and feeding habits with implication on type of vector control interventions deployed
- **Vectoral Capacity**
  Mosquitoes that transmit malaria have high vectoral capacity and are very efficient carriers of the disease and therefore able to maintain malaria transmission
- **Adaptation to Environment**
  Mosquito populations are able to shift feeding, resting, and breeding behaviours to adapt to environmental challenges and human malaria interventions
- **Resistance**
  Mosquitoes develop resistance to a variety of insecticides

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[14] (National Malaria Control Programme 2014)

For the purposes of SME it is also important to understand mosquitoes' geographic distribution in the country as they impact the tools employed to contain them from infecting humans (*Table 2)*. In-country entomological monitoring as well as continuous review of international databases that report on vector prevalence and resistance should be key components of a well-designed SME plan.

Mosquito resistance to insecticides used in LLINs and IRS is an important concern for SME. Tests in several regions of Tanzania reveal that mosquito resistance to several insecticides is emerging and in a few places rapidly spreading. The recent change (2013) of World Health Organization (WHO) guidance with its more stringent criteria for assessing sensitivity reveals a worsening resistance picture and will demand more aggressive routine surveillance.

Finally, changes in mosquito resting and biting behavior, although not well studied until now in Tanzania, have important programmatic implications.

Should malaria transmission continue to decline within the duration of this strategic plan's timeframe, additional SME, improved, more precise prevalence monitoring and case detection tools will need to be introduced. This will include larger use of quality health facility generated data, serology and, more sensitive diagnostic testing.

Table 2: Anopheline Mosquitoes Transmitting Malaria in Tanzania

Species	Behaviour	Distribution/Predominance	Habitat
A. gambiae s.s.	Endophilic Anthropophilic Endophagic	Throughout Tanzania but declining numbers in several areas. Predominant in the north west and south east of the country.	Shallow, sunlit, temporary bodies of water.
A. arabiensis	Exophilic Anthropophilic Zoophilic (cattle) Exophagic	Widespread, but lower densities in Kagera, Kigoma, Katavi, Geita, Western parts of Mwanza and Mara regions. Currently considered the most predominant vector in Tanzania.	Wide variety of natural and artificial habitats
A. funestus	Endophilic Anthropophilic	Widespread, South eastern Tanzania	Permanent or semi-permanent bodies of fresh water with emergent vegetation.
A. merus		Minor vector present along coastal regions	

1.3   Achievements in Malaria Control in Tanzania

1.3.1 Malaria Prevention

The 2007/2008 and 2011/2012 THMIS shows a dramatic increase in LLIN ownership (from 38.3% to 91.5%) and use (from 20% to 69%). The rural areas had a three-fold increase in ownership. Use amongst biologically vulnerable groups remains higher than amongst rest of the population. Populations living in households of the lowest wealth quintile had a four-fold increase in ownership of nets, from 22% to 90%. The net source pattern changed between 2007/2008 and 2011/2012 due to different distribution mechanisms, with 55% of nets in the households provided through free campaigns in 2011/2012, while in 2007/2008 the bulk of the nets (59%) came from a shop, mobile vendor, or market.

The overall proportion of households covered by IRS in the previous 12 months rose seven-fold between 2007/2008 and 2011/2012. IRS has been implemented in selected areas of the country and was scaled up in 18 out of 22 councils in three regions of the lake zone between 2007/2008 and 2011/2012.

The proportion of women with a history of pregnancy in the previous two years accessing two or more doses of SP for IPTp did not change over the two surveys—30% and 33%, respectively.

1.3.2 Management of Fever in Children

Despite the drop in malaria prevalence, the proportion of children with a history of recent febrile illness did not change—19% and 20.5% in 2007/2008 and 2011/2012, respectively. Urban settings have a relatively higher rate of febrile illness compared to rural areas—23% and 20%, respectively. The 2011/2012 THMIS showed increased consumption of ACT (35%) compared to the 2007/2008 survey (20%), especially in rural areas. ACT was the leading antimalarial taken during the illness in both surveys, but its share went up from 37% in 2007/2008 to 61% in 2011/2012. Two out of three children treated with antimalarials in rural areas were given an ACT.

1.3.3 Malaria Knowledge and Communication

In THMIS 2011/2012, the media most commonly used by far to convey malaria messages to women ages 15 - 49 years was radio, with a share of 49%. A similar proportion of radio diffusion has been observed in rural and urban communities, while printed materials and television were used mostly by the population living in urban areas. Women living in households in the lowest wealth quintile and with no education have significantly lower access to malaria messages compared to women who were in the highest wealth quintile and with more education; specifically, 48% of women in the lowest wealth quintile accessed malaria messages compared to 82% of those in the highest quintile, and 37% of women with no education accessed malaria messages compared to 84% of the women with secondary education or above. Women living in households in the lowest wealth quintile and with no education were more likely to receive the messages from healthcare workers compared to women in the respective highest wealth quintile and with more education.

1.4 National Malaria Strategic Plan

1.4.1 Vision, mission, goals and objectives

The **vision** for NMCP's Strategic Plan 2014 to 2020 is for Tanzania to become a society free of malaria. This vision is driven through the **mission** to ensure all Tanzanians have access to quality, effective, safe, and affordable preventive and curative malaria interventions through timely and sustainable collaborative efforts with partners and stakeholders at all levels.

To ensure that Tanzania's vision and mission are achieved, the NMCP has identified a more specific **goal** of reducing the average country malaria prevalence from 10% in 2011/2012 to 5% in 2016 and further down to less than 1% in 2020. All decisions made at NMCP and the MOHCDGEC are driven by this strategic goal.

NMCP's strategic plan outlines the key strategic objectives and action plan during the period 2014 to 2020. The document discusses the key technical and supporting strategies necessary for the ongoing fight against malaria. Furthermore, the plan provides a high level guide for the implementation, coordination, and monitoring of malaria activities of the Government of Tanzania, regional and local government authorities, development partners, implementing organizations, academic institutions and the private sector.

There are five key strategic objectives, outlined below, that are included in NMCP's strategic plan:

- Reduce malaria transmission by scaling up and maintaining effective and efficient vector control interventions

- Prevent the occurrence of severe morbidity and mortality related to malaria infection through the promotion of universal access to appropriate early diagnosis, prompt treatment and provision of preventive therapies and vaccines to vulnerable groups
- Create an enabling environment in which individuals and household members are empowered to minimize their own malaria risk and seek proper and timely malaria treatment, if and when needed
- Provide timely and reliable information to assess progress in achieving established global and national targets, to ensure that resources are used in the most cost-effective manner and to account for investments made in malaria control
- Ensure effective programmatic and financial management of malaria control interventions at all levels, implemented through effective and accountable partnerships, with adequate funding

The above goals of the MSP reflect the overall direction of malaria strategic planning activities for the coming five years. However, each objective is broken down further and includes a series of quantifiable indicators that allow NMCP and its partners to measure progress against these objectives (see APPENDIX 1: STRATEGIC PLAN 2015-2020 LOGICAL FRAMEWORK).

Figure 2: Overview of Malaria Strategies
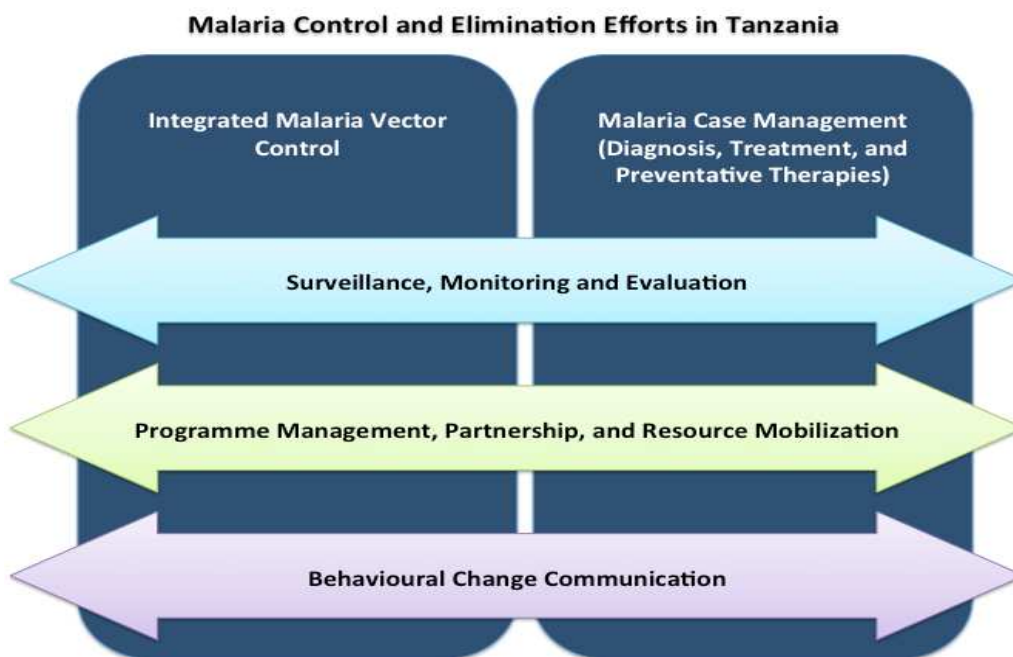
These indicators are driven by data that is collected and analysed by NMCP's SME activities. In this way, SME activities impact all other activities of the programme. Behavioural change communication and programme management are two functions that also span preventive and curative interventions. This concept is displayed in the *Figure 2*.

1.4.2 Identified SME Challenges

NMCP and their strategic partners have made significant progress in malaria monitoring, evaluation and surveillance. As new surveillance tools are implemented and the scale of existing systems is expanded, challenges become more apparent. The following challenges have been identified in the preparation and creation of this document, and will be answered in this strategic plan:

- Complex and multiple reporting tools from various partners: as the existing number of reporting systems increases, so does the complexity of reporting and data analysis; data analysis and back end data aggregation is an issue that NMCP is currently working on
- Weak implementing partners' coordination: NMCP implementing partners are usually generating conspicuous amount of information; there are a few established mechanisms or occasions for information sharing
- Datasets managed by implementing partners are not synchronized with a central database; the existing, though fragmented, national malaria datasets requires improvement in data quality, timeliness, completeness and regular updating to generate reports; the databases used by implementing partners have different formats for data management, thus making importation and management of data from partners' databases tedious and time consuming
- Inadequate numbers of human resources with the required skills mix at the NMCP SME unit.
- Delayed sharing of operational research findings, for decision making: a current challenge experienced by NMCP is the ability to gather and analyze data in a timely fashion such that it can be used to make evidence based decisions;
- Access to data: data accessibility and dissemination is a key challenge that currently exists in malaria monitoring and evaluation; this challenge is partly driven by the limited access to data at multiple levels of the government organizations

These challenges have been discussed in a group setting between NMCP and the partners and the SME plan was developed with them in mind.

1.5   Goal of National Surveillance, Monitoring and Evaluation Plan

As stated in the NMSP, the overarching objective of surveillance, monitoring and evaluation activities for the next five years is three fold, and is:

- provide timely and reliable information for assessing progress towards the set global and national targets,
- ensure resources are used in the most cost-effective manner, and
- account for investments made in malaria control in the country

Strategic decisions made at the programme level are informed by this overarching objective.

1.6   Malaria Surveillance, Monitoring and Evaluation Objectives

NMCP's strategic plan identified the following four specific objectives, which will serve to address the interventions during the implementation period. These objectives are specific, and each is supported with individual activities and indicators of progress towards their achievement.

Objective 1: Improve quality, completeness, and timeliness of malaria indicators within the routine health information system to reach 90% of health facilities reporting monthly through the HMIS by 2020

Objective 2: Establish a comprehensive framework for collecting, processing and storing essential malaria indicators from periodic service delivery and programmatic surveys

Objective 3: Establish and maintain a comprehensive and effective malaria knowledge management system to collate, interpret, disseminate, and promote the use of quality malaria data for evidence-based decision making at national and district level

The above specific objectives are supported by extensive routine and periodic SME systems and surveys. The processes and tools used for data management and analysis are described in the next sections.

1.7   Scope of Malaria Surveillance, Monitoring and Evaluation

The collected **data** should be analysed and transformed into **information** that is able to generate **knowledge** and eventually **evidence** to help mangers to make and implement **decisions** that will result in the desired **impact**. The scope of SME is to influence plans and decision through a continuous process that aims to integrate, interpret and evaluate indicators that are monitored, compiled, arranged, analyzed and presented to stakeholders and policy makers (Figure 3).

Figure 3: The scope of malaria surveillance monitoring and evaluation
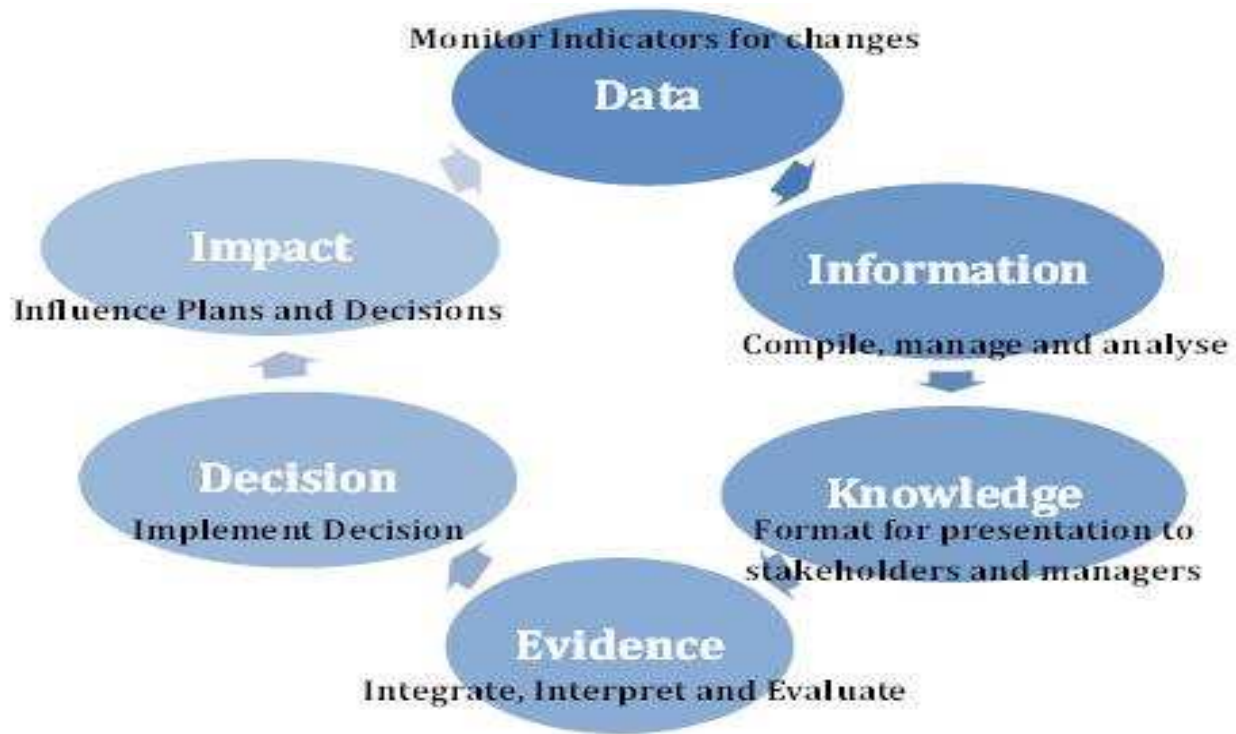
2 INDICATORS AND COMPREHENSIVE INFORMATION SYSTEM

2.1 Data Measurement and Indicators

2.1.1 Type of indicators

In order for NMCP's strategic interventions to be executed successfully, it is essential to monitor and evaluate all malaria control programme activities. This enables NMCP to assess its progress towards international and national targets, and to ensure resources are being used in the most cost-effective manner.

The following SME model by RBM illustrates the various types of indicators which are collected, and which evaluate and track the success of a programme (*figure 4*).

Figure 4: RBM SME Model

	Indicators that Monitor Malaria Prevention and Control			Impact Indicators (Measuring Pop. Coverage and Reductions in Malaria)	
	Inputs	Process Indicators	Output Indicators	Outcome Indicators	Impact Indicators
Sample Data Sources	• HR • Finance • Drugs and supplies • Logistics • Tech. assistance • Research • Information • Physical Structures	Use of financial resources for: • Planning • Training • Meetings • Tech. Assistance • Advocacy and Communication	• Policies & guidelines • People employed / trained • Commodities distributed • Co-ordination mechanisms • Partnership development • Supervision carried out • Services provided	• Sector performance • Increased coverage • Increased access • Increased utilization of services	• Sustained improved health and socio economic status • Sustained morbidity and mortality reductions
	Measured at the program level			Measured at the population level	

The previous figure, highlights the different indicators that affect malaria prevention and control and that can be used by NMCP and partners. Each indicator type is explained below.

Input indicators track human and financial resources that are involved with programme operations. These may involve programme facilities, finances, and supplies - medication, medical and office supplies among others - .

Process indicators indicate the effectiveness and success of a programme's operations. They demonstrate whether the programme is being carried out according to budget and schedule. Process indicators typically involve the monitoring of financial resources.

Output indicators measure immediate individual programme results. They inform the audience of the direct effect of the programme's activities.

Outcome indicators measure the intermediate changes (on a population level) as a result of the programme. These indicators are typically represented as a percentage or rate. Data for outcome indicators is typically found in census data, population surveys, or surveillance system.

Impact indicators measure the long term, cumulative improvement in a broad population's health and wellbeing. These indicators often measure morbidity or mortality rates, disease prevalence, etc. It is generally difficult to attribute the performance of a single programme activity to an impact indicator as it measures long term goals which multiple programmes or activities share

2.1.2 Core malaria Indicators

Three major impact and four major outcome indicators have been identified as the core national indicators to evaluate the progress towards the achievements of the malaria strategic plan. These indicators are basically collected in national and regional representative surveys (*table 3*). Assessment of intervention coverage and impact is a fundamental element for monitoring disease trends. Health facility based surveillance indicators (summarized in *table 4*) are able to capture key coverage and impact indicators up to district and sub-district level. A more comprehensive list of indicators together with the description of numerators and denominators is included in *APPENDIX 2: KEY INDICATORS FOR MONITORING MALARIA CONTROL AND PREVENTION ACTIVITIES*.

Table 3: Strategic malaria monitoring and evaluation indicators (community-household based)

See *appendix 2* for complete description of the indicators

Indicator	Definition	Type of indicator	Data Source
Parasite prevalence: proportion in age standardized (children aged 6–59 months, school age children 5-16 years old) with malaria infection [15]	The prevalence of parasitemia is a precise indicator of malaria exposure. With intervention coverage data and repeated estimation, understanding of the epidemiology of malaria can be improved and progress of control efforts can be tracked more effectively if estimates of parasitemia prevalence are available.	Impact	Household and school survey
All-cause <5 Mortality Rate [16]	The all-cause mortality of children younger than 5 years is assessed in the current malaria endemicity to evaluate the impact of interventions. Very young children bear the major burden of malaria because they have not yet developed adequate clinical immunity and have the highest risk of severe illness and death.	Impact	Household surveys, complete or sample vital registration system
Prevalence of anaemia in children	Anaemia in early childhood is related with malaria infection intensity. Factors other than malaria might affect this indicator (nutrition, helminthiasis)	Impact	Household

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[15] HSSP IV indicator and GF periodic review indicator in high transmission areas
[16] GF periodic review indicator

Indicator	Definition	Type of indicator	Data Source
aged 6–59 months			surveys
Proportion of population at risk targeted for LLIN that slept under an ITN the previous night [17]	This indicator measures the level of LLIN use of all age groups at the time of the survey. It is useful to track usage among all age groups since coverage of the entire population will be required to accomplish large reductions in the malaria burden. While vulnerable groups, such as children under 5 years old and pregnant women, should still be prioritized, the equitable and communal benefits of wide-scale LLIN use by older children and adults should be promoted and evaluated by national malaria control programs.	Outcome	Household survey
Proportion of population at risk and protected by IRS within the last 12 months [18]	This indicator allows overall national coverage of indoor residual spraying to be assessed. It is used to measure the proportion of households covered by IRS	Outcome	Household survey
Proportion of women` who received at least three or more doses of IPTp during ANC visits during their last pregnancy [19]	NMCP guidelines recommend that all pregnant women receive two or more doses of IPTp during regularly scheduled antenatal visits under direct observation of a health worker. This indicator is used to measure the national-level use of IPTp to prevent malaria during pregnancy among women. Because of the limited number of women who delivered a live baby within the previous 2 years, care should be taken to ensure that surveys are conducted with a sufficient sample size and designed to allow comparison among regions and urban/rural strata.	Outcome	Household Survey
Proportion of children aged 6-59 months suspected malaria cases that received a parasitological test [20]	The replacement of conventional antimalarial drugs with high-cost artemisinin-based alternatives has created an increased need for accurate disease diagnosis. In addition to avoiding unnecessary treatment with these expensive drug combinations, diagnostics allow a more rational use of drugs that might effectively reduce drug pressure, thereby delaying the onset of drug resistance. This indicator is intended to capture baseline-level coverage and subsequent scale-up of diagnostic programs.	Outcome	Household survey

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[17] HSSP IV indicator
[18] GF periodic review indicator
[19] HSSP IV indicator and GF periodic review indicator
[20] GF top 10 and periodic review indicator

Table 4: Core national and sub-national surveillance and performance indicators (health facility based)

See *appendix 2* for a complete description of the indicators

Indicator	Definition	Type	Data Source
Malaria case Incidence [21]	This indicator assesses the burden of malaria infection in the general population.	Impact	Routine surveillance system HMIS/DHIS2
Inpatients malaria cases [22]	This indicator assesses the burden of malaria through the health system and provides trends of the burden of malaria in the general population in a stable malaria endemicity and stable reporting system.	Impact	Routine surveillance system HMIS/DHIS2
Inpatient malaria deaths [23]	Mortality is a major component of the burden caused by malaria. Data for this indicator should be collected routinely through facility records including the results of malaria testing and diagnosis	Impact	Routine surveillance system HMIS/DHIS2
Case fatality rate	Case fatality rate (CFR) intends to monitor the treatment outcomes for severe malaria patients admitted in health facilities. Timely referral of severe diseases, prompt and appropriate treatment and competence of the staff are the major factors affecting the rate, NMCP intends to monitor CFR as proxy indicator of quality of health care for severe malaria paients.	Output	Routine surveillance system HMIS/DHIS2
Proportion of confirmed malaria diagnosis [24]	Malaria treatment should be administered to patients with parasitological confirmation. The treatment on clinical ground should be reserved in exceptional cases. This indicator assesses the clinical performances of the healthcare workers.	Output	Routine surveillance system HMIS/DHIS2
Proportion of confirmed malaria cases that receive first-line antimalarial treatment according to national policy	Prompt treatment with an effective antimalarial drug regimen is a key component of the technical strategy for controlling and preventing malaria.	Output	Routine surveillance system HMIS/DHIS2
Malaria test positivity rate [25]	The test positivity rate or slide positivity rate (SPR) assesses the proportion of tests (microscopy and/or RDT) that are positive for malaria among the fever patients tested. The test positivity rate is usually computed for a specified period of case detection activities. In areas with unstable malaria, an increasing test positivity rate among fever patients is one of the warning signs of a possible epidemic. WHO recommends a SPR <5% as transitional state towards malaria pre-elimination phase.	Outcome	Routine surveillance system HMIS/DHIS2
Percentage of all suspected malaria cases that received a parasitological test	This indicator assesses the diagnostic performances of the healthcare workers. According to the national guidelines all suspect malaria cases should be tested for parasitological confirmation. The replacement of conventional antimalarial drugs with high-cost artemisinin-based alternatives and decreasing prevalence of malaria among fever cases has created an increased need for accurate malaria diagnosis. Accurate malaria diagnosis avoids unnecessary treatment with expensive drug combinations and ensures appropriate treatment for febrile patients. Diagnosis allows for more reliable tracking of malaria burden and the impact of control interventions. Accurate diagnosis allows a more rational use of drugs that might effectively reduce drug pressure, thereby delaying the onset of drug resistance. This indicator captures the baseline levels and subsequent	Output	Routine surveillance system HMIS/DHIS2

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[21] GF periodic review indicator

[22] GF periodic review indicator

[23] GF periodic review indicator

[24] HSSP IV indicator

[25] GF periodic review indicator

Indicator	Definition	Type	Data Source
	scaling up of diagnostic programs within malaria-endemic areas.		
Annual malaria blood examination rate	It is useful to measure the annual blood examination rate to ensure that potential differences in diagnostic efforts or completeness of reporting are taken into account. The annual blood examination rate is usually measured against the population. Alternatively, a very practical blood examination indicator is measured against the total number of people attending the OPD.	Output	Routine surveillance system HMIS/DHIS2
Proportion of pregnant women who received three or more doses of IPTp during ANC visits [26]	In high burden areas with stable malaria transmission, intermittent preventive treatment with at least two doses of recommended antimalarial medication (sulfadoxine-pyrimethamine) during pregnancy has been shown to significantly reduce the risk for severe maternal anemia, placental parasitaemia and low birth weight. All pregnant women in areas with stable malaria transmission receive at two or more doses of intermittent preventive treatment during regularly scheduled antenatal care visits.	Output	Routine surveillance system HMIS/DHIS2
Proportion of children born with low birth weight (<2.5 kg)	Malaria in pregnancy is related with LBW. A decrease in proportion of newborns with LBW is a useful phenotype indicator related to malaria infection during pregnancy.		Routine surveillance system HMIS/DHIS2
Proportion of expected health facility reports received [27]	National programs managing the national response to malaria require timely and complete program information from all facilities. By tracking this indicator, national programs will be able to identify health facilities that may need support to improve their reporting performance.	Output	Routine surveillance system HMIS/DHIS2

2.2   Malaria related data collection systems and sources of information

Due to the complexity of malaria epidemiology and its control, there is a wide variety of SME systems and tools to collect data for monitoring malaria transmission and malaria control interventions across Tanzania. These multiple systems reflect basically the interaction between the different elements of malaria transmission: vector, parasite, host, environment and, eventually, malaria control interventions (see Figure 5).

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[26] HSSP IV indicator
[27] HSSP IV indicator

Figure 5: Basic malaria transmission framework
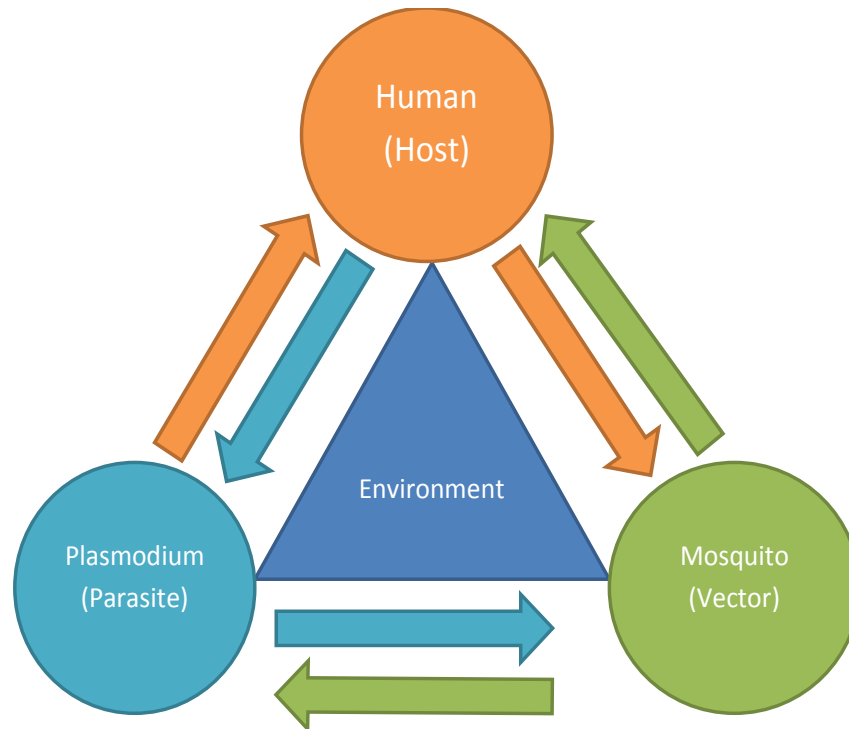
Therefore, malaria transmission is determined by several factors within the above frameworks. Just a few examples:

- Mosquitoes distribution and bionomics: some mosquito species have higher capacities for transmission than others, or have different rest and feeding habits
- Climatic parameters: rainfall, temperature and humidity, influences malaria parasite development in the mosquito
- Parasite associated factors: *P.falciparum* are more virulent and cause more morbidity and mortality compared to other malaria species
- Immunological background of the human host: people living in stable malaria transmission areas have higher immunity against malaria while children under five years, pregnant women and overseas travelers have lower or no immunity against malaria
- Socio economic factors: better housing, access to health services, level of education influence malaria transmission

2.3 Malaria Information System

As a result of the multiple elements of malaria transmission there are many different systems that are interrelated.

This SME plan describes four key sources of information based on population, health facility, malaria vector, and programmatic respectively.

The diagrams presented in the synopsis shown in *Figure 5* highlight how each of the system is related and interact with each other. The different systems and data sources are described in the following sections 2.5.1 to 2.5.4.

Figure 6: Synopsis of malaria information system

Health Facility Information

ADR

LMIS☼

HMIS

DOIS

MSD Epi9

IDSR

MEEDS

Malaria Vector Information

MVS

HDSS

SPS

Population Information

TDHS

Census

CMM

MVCIS

THBS

SMPS

MEEWS

IRT

SPAm

TES

MPR

MAPROOM

EUV

ISS

DQA

TSPA/ SARA

QA

Programmatic Information

Legend	
Core malaria surveillance (green)	*Included in DHIS2* (yellow solid box)
Periodic Survey (orange)	*Potential to be included in DHIS2* (yellow dashed box)
Routine information system (blue)	

Health Facility:

HMIS: Health Management Information System; IDSR: Integrated Disease Surveillance System; LMIS: Logistic Management Information System ; MSD_E9: supplies stock movement; MEEDS: Malaria Early Epidemic Detection System; ADR: Adverse Drug Reaction;

Vector:

MVS: Malaria Vector Surveillance; IRT: Insecticide Resistance Testing: MVCIS: Malaria Vector Control Information System

Population:

 SMPS: School Malaria Parasitological Survey; SPS: Sentinel Population Surveillance; TDHS: Tanzania Demographic Health Survey; TMIS: Tanzania Malaria Indicator Survey; CMM: Community Malaria Monitoring; HDSS: Health and Demographic Sentinel Surveillance; THBS: Household Budget Survey;

Programmatic

MEEWS: Malaria epidemic early detection system; MPR: Malaria Program Review; MAPROOM: climate monitoring; ISS: Integrated Supportive Supervision; TES: Therapeutic Efficacy Studies; SARA: Service Availability and Readiness Assessment; SPAm: Service Provision Assessment for malaria; TSPA: Tanzania Service ; QA: Diagnostic and antimalarials quality assurance; EUV: End User Verification Provision Assessment; DQA: Data quality audit

2.3.1 Population Based Information

Population based data allows the Government of Tanzania and NMCP to understand the intensity of malaria transmission among the population and the different geographical areas, impact of control measures, trends in malaria care and preventive services access as well as information on quality healthcare and malaria preventive services. (Figure 6 and *Table 5*)

Population-Based Data

- National Population Census (NPC)
- Demographic and health Survey (DHS)
- Community Malaria Monitoring (CMM)
- Demographic Sentinel Surveilance (DSS)
- School Malaria Parasitological Survey (SMPS)
- Sample Vital events Registration Verbal autopsy (SAVVY)
- Malaria Indicator Survey (MIS)
- Sentinel Population Surveillance (SPS)
- Household Budget Survey (HBS)

Health Facility-Based Data

Vector Control Data

Population-Based Data

Programmatic Data Sources

| Periodic Survey | Routine Data | Core malaria surveillance |

Included in DHIS

To be included in DHIS

Table 5: Key sources of population based data that NMCP uses.

System	Indicators	Sites	Representation	Frequency	Funding Source	Responsible
National Population Census	Demographic	All Households	All administrative settings	10 years	GOT	NBS
Demographic Sentinel System and Sample Vital events Registration with Verbal autopsy (SAVVY)	Demographic	4 districts (DSS) SPD (SAVVY)	District (DSS) National (SAVVY)	Continuous	Development partners	IHI
Malaria Indicator Survey,	Malaria Prevalence 6-59 months Intervention Outcomes	Selected Households	National and Regional Representative Surveys	5 years	GOT, Development partners	NBS
Demographic and Health Survey	Infant and child mortality Malaria and Anaemia Prevalence Intervention Outcomes	Selected Households	National and Regional Representative Surveys	5 years	GOT, Development partners	NBS
Household Budget Survey (HBS)	Socio economic, poverty	Selected Households	National Representative	Every 5 years	NA	NBS
School Malaria Parasitological Surveys (SMPS)	Prevalence 5-16 yr	2-4 schools per council All councils	Council, subcouncil	2 years	Global Fund	NMCP
RCH sentinel population surveillance	Malaria Positivity Rate: pregnancy and infancy	2-4 HC per council (<5), all HF (PW) All councils	Sub council	Continuous / monthly	GOT	NMCP
Community Malaria Monitoring	Community malaria preventive services coverage	All wards	Council sub council	Quarterly	GOT, Global Fund	NMCP

National Population Census (NPC)

Data collected from the National Bureau of Statistics are used in support of SME activities to calculate population projections to be used as denominator for select indicators. Apart from demographic information the NPC provides also basic socio-economic data such as housing and access to water and power services.

Demographic Surveillance System (DSS)

The DSS approach involves periodic monitoring of households and members within households in cycles or intervals every four months. The DSS collects information on demographic, socio-economic, and environmental characteristics of a population. The DSS in Tanzania is currently carried out in three districts (Kilombero, Ulanga and Rufiji) and is managed by research institutions (IHI).

Sample Vital events Registration with Verbal autopsy (SAVVY)

Sample Vital events Registration with Verbal autopsy (SAVVY) is a demographic surveillance system within Sentinel Panel of District (SPD) platform that collects and analyzes health community-based information data

with intent to determine community birth trends and cause-specific mortality fractions in a population that has no complete or incomplete vital registration system. SAVVY provides nationally representative estimates of mortalities based on age, sex, residence and zone, and it covers about 2% of Tanzania mainland population. The cause-specific mortality fraction, including malaria, is determined based on verbal autopsy interviews with next of kin or other caregivers. The SAVVY is managed by research institutions (IHI).

Demographic and Health Survey (DHS)

The DHS collects population-based data on reproductive, maternal and child health as well as mortality indicators. The sample is usually designed to produce separate estimates on key indicators at the national level for urban and rural areas, SES and other important strata. It is conducted by National Bureau of Statistics (NBS) every 5 years. For purposes of the NMCP national SME plan, the objectives of the DHS are to provide data for measuring the following key indicators over time:

- All-cause mortality in children under 5 years old and infants
- Proportion of households/children/pregnant women with at least one LLIN / have slept under an LLIN the previous night
- Proportion of children with fever in last 2 weeks who received appropriate antimalarial treatment within 24 hours from onset
- Treatment seeking behaviour
- Prevalence of anemia in children 6-59 months
- Malaria prevalence in children 6-59 months (added to the 2015 survey and previously done through Tanzania HIV and Malaria Indicator Survey - THMIS)

The last DHS was conducted in 2010. The next survey will be conducted in July 2015, followed by a survey in 2020.

Malaria Indicator Survey (MIS)

The Malaria Indicator Survey (MIS) is a cornerstone of NMCP's SME strategy. The survey has previously been administered every five years in conjunction with the HIV survey (THMIS). The last survey was conducted in 2011/2012.

NMCP believes strongly in the need for additional MIS surveys to be conducted, as a large (over 20 million) LLIN distribution campaign will be conducted in 2015 and 2016. An MIS survey in 2017 would provide an opportunity to measure the success and outcomes of this distribution, which would not otherwise be possible until 2020 when the next DHIS survey is done. At the same time the MIS (together with the MPR) will be able to provide essential indicators for the evaluation of the first phase of the MSP 2015-2020.

Although stand-alone MIS (as well as DHS) are usually conducted during the dry season, therefore consideration must be made when comparing data taken in rainy and non-rainy seasons due to possible seasonal malaria transmission variations.

Finally, as Tanzania brings malaria under control and malaria prevalence declines, it will be increasingly difficult to estimate prevalence in extremely low transmission areas with precision. This will make broad surveys like MIS less and less appropriate. It is also likely that Tanzania will make uneven progress in malaria control – prevalence in some regions will decline faster than others. This trend has already been witnessed in the South and Northwest of Tanzania. This uneven progress may necessitate oversampling in some areas with lower prevalence.

Household Budget Survey

It is widely accepted that socio-economic indicators such as wealth and education are strongly correlated to disease prevalence. NMCP relies on a variety of data sources to capture socioeconomic information on various populations within Tanzania. One key source is the Household Budget Survey[28]. The survey's sample size was designed to cover Dar es Salaam, other urban areas and rural domains[29]. The most recent Household Budget Survey was conducted in 2014.

Additional socioeconomic indicators such as: education, income, urban and rural distribution, and house structures are sourced from nationally representative surveys conducted by the National Bureau of Statistics and other Tanzanian Ministries as well as the MIS survey. NMCP has witnessed the trend that higher socio-economic strata of the Tanzanian population have a much lower prevalence of malaria when compared to poorer strata.

School Malaria Parasitological Survey (SMPS)

The Tanzanian malaria strategic plan milestones are assessed by using parasitemia prevalence as the overarching impact indicator. To monitor this parameter the SME plan includes two types of surveys: a) DHS/MIS, and b) SMPS. The DHS/MIS sample size is powered to provide national and regional prevalence data, together with other important service coverage indicators. These surveys are performed at an interval of 3-5 years and include only children aged 6-59 months (see above sections).

The SMPS represents a specific platform that is powered to provide district and sub-district level information on malaria parasitemia and are conducted more continuously within a 2 years cycle. Even with a very large sample size, SMPS is relatively inexpensive (compared to DHS/MIS) and easily conducted within the routine district health system. For the above reasons, NMCP introduced SMPS in 2004, with DFID financial support and continued with GFATM support. Tanzania is the first African country to have nationwide district representative malaria prevalence information. The SMPS collects parasitaemia data from children aged 5 - 16 years across a sample of public primary schools. School age children represent a fair sentinel population due to relatively high net enrolment rate (90%, BEST 2013). The survey is conducted in 2 to 4 schools per district, depending on the population size, and is performed by NMCP in collaboration with regional and district staff. Data collection quality assurance is done in collaboration with two research partner institutions (NIMR and IHI).

The district - and sub-district - representativeness is of paramount importance in the current epidemiological transition in order to assess malaria intensity in transmission foci. This kind of assessment will make NMCP and district councils able to stratify the territory in term of malaria prevalence and to develop suitable and diversified strategies for its control according to the transmission intensity. Collateral information about LLIN usage and school absenteeism due to illness is collected during the survey.

Sentinel Population surveillance at Antenatal Clinic (ANC)

At present, the ANC Sentinel Population surveillance (SPS) is used in all health facilities that report monthly malaria tests results - mainly by using mRDT - for pregnant women attending the clinic for the first time. Pregnant women are an ideal sentinel population due to high coverage of ANC attendances (98%, DHS 2010). NMCP is planning to expand the service to infants attending measles vaccination (approximately at 9 months of age) in selected health facilities - ideally all health centers in the country (approximately 400). Although the data are generated in HFs, the system intends to monitor the temporal and spatial malaria transmission intensity in the population up to sub-district level. SPS used to monitor trends in malaria morbidity and geographical distribution with the following supportive objectives:

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[28] (Tanzanian National Bureau of Statistics 2011/2012)
[29] (Tanzanian National Bureau of Statistics 2011/2012)

- Mapping subdistrict level malaria transmission intensity
- Inform programmatic decision-making
- Predict demand for services and service provision needs
- Advocate for malaria control resources
- Contribute to the development of a standard set of indicators for malaria surveillance

The pregnant women arm of RHS Sentinel population system is already included in HMIS and in the DHIS2 platforms. The SPS produces data outputs that are particularly valuable for risk mapping and identifying seasonal transition. This type of data will become increasingly important as prevalence decreases country-wide, necessitating targeted interventions and monitoring and surveillance efforts.

Community Malaria Monitoring (CMM)

The MOHCDGEC has posted an Environmental Health Officer for each ward in Tanzania Mainland. The NMCP intends to use this formal council healthcare cadre to gather information on malaria preventive services usage in the population through home visits that would be fed, eventually, into the DHIS system.

The Ward Environmental Health Officer (WEHO) is responsible for dealing with environmental health issues, water and sanitation, and annual home visits. The WEHO would report to the Ward Executive Officers (WEO) and to District Health Officers (DHO) on a quarterly basis. In an average sized ward, it would be possible for each home to be visited annually using both WEHO and Community Health Workers.

Expected Timeline for collection of population based information

Figure 8 highlights the expected timeline for the periodic population based information sources discussed above:

Figure 8: Population-Based Survey Timeline
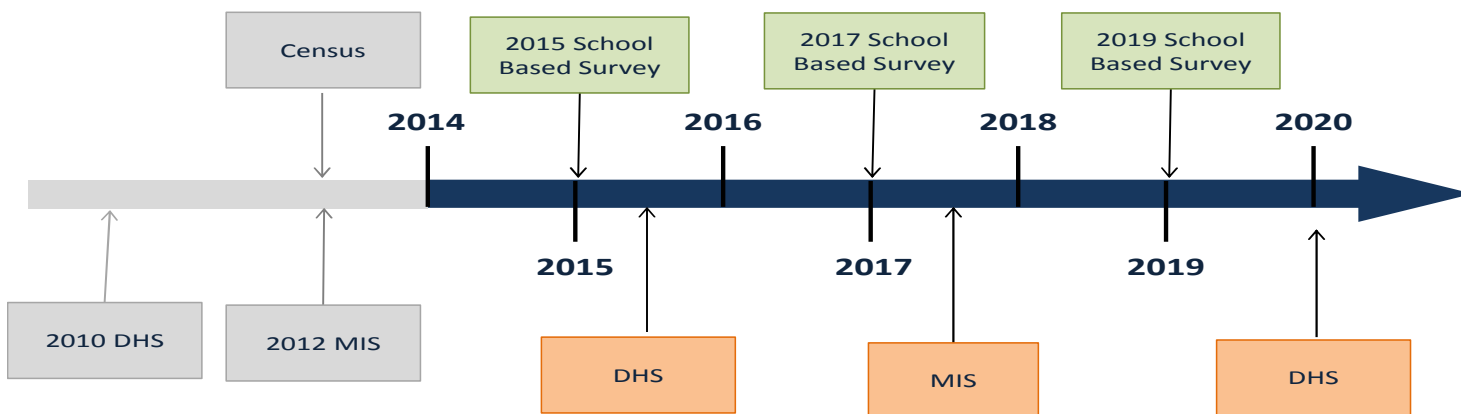
2.3.2 Health Facility Based Information

Health facilities are generating essential information through the routine data collection and reporting systems, basically HMIS and IDSR. Data are generated in all health facilities, public and private, and reported with a mixed system paper and electronically based. and Table 6 outlines the various health facility-based monitoring and evaluation systems that are currently used by NMCP and the Tanzanian MOHCDGEC.

Figure 9: Health Facility Tools as Part of All SME Systems
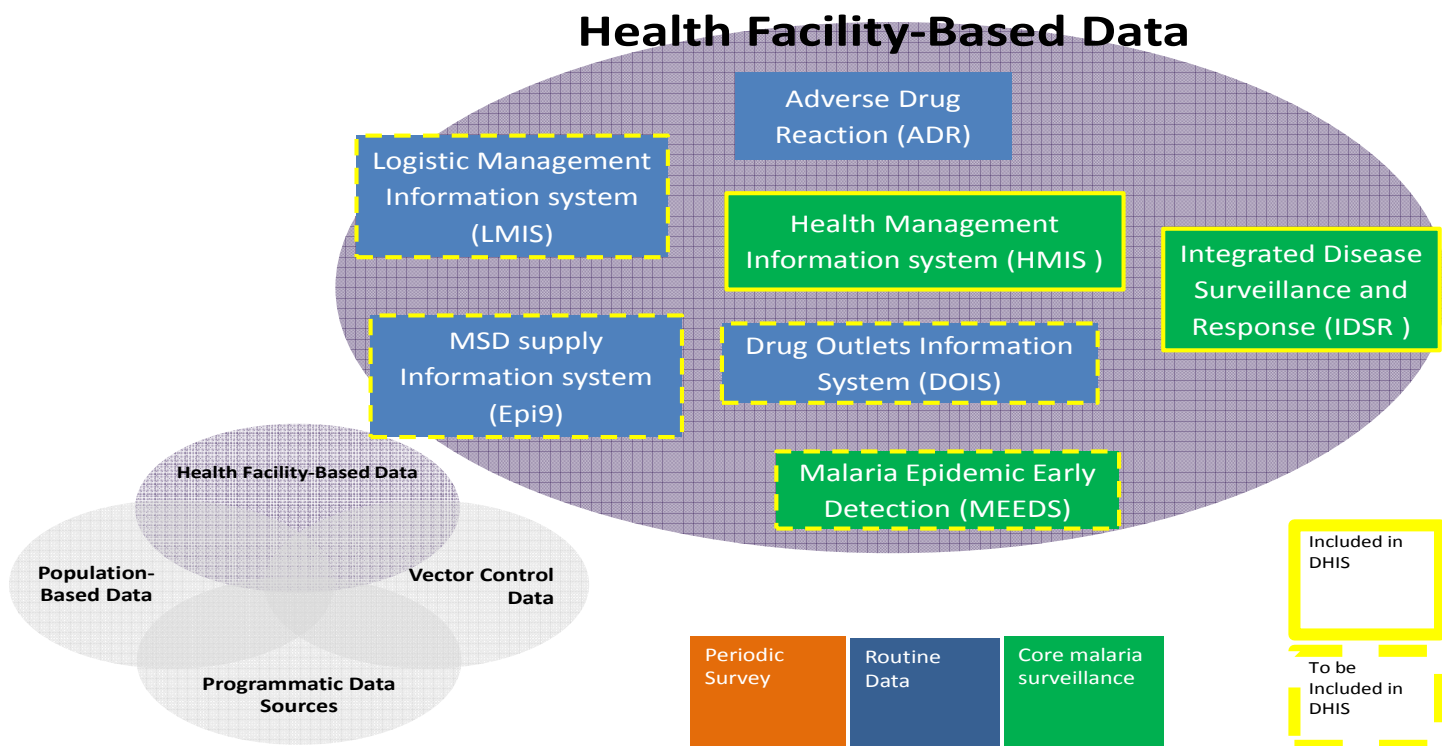
Table 6: Health Facility-Based Information Sources

System	Indicators	Sites	Representation	Frequency	Funding Source	Responsible
Health Management Information (HMIS)	Malaria cases, tests, attendances, services, admissions and deaths	All HF	All levels	Monthly	GOT and development partners	MOHCDGEC (M&E)
Integrated Disease Surveillance and Response (IDSR)	Cases	Selected areas	Council and HF	Weekly	PMI, others	MOHCDGEC (Epidemiology)
Malaria Epidemic Early Detection (MEEDS)	Epidemic alert and actions	Selected areas (epidemic prone)	Council and HF	Weekly	PMI, others	IDSR MOHCDGEC
Adverse Drug Reaction Reporting (ADR)	Passive Reactions	All HF	NA	Expected event	GOT	TFDA
LMIS	Supply Chain Indicators	All HF	All levels	Quarterly	GOT and development partners	PSS MSD
ILS gateway	Tracer Medicine Stock and Adjustment	All HF	All levels	Monthly	PMI	PSS
Private Drug Outlets Information	Supply Chain Indicators	Private HF	All levels	Monthly	GOT and development partners	Pharmacy Council and TFDA

30

Health Management Information System (HMIS)

HMIS is a routine system that collects data at both public and private health facilities. The HMIS provides a continuous flow of data, and relatively high reporting rate (around 90% in public sector). Due to the large number of institutions and individuals that contribute to this system, it is challenging for the MOHCDGEC to ensure a high standards of data quality. However, the large number of contributors from both public and private sectors, provide an important insight into malaria testing and treatment services in Tanzanian communities. At a very high level, the HMIS highlights malaria "hot spots" where disease burden is high.

NMCP has recently spearheaded the introduction in HMIS of a malaria testing and tracer medicines reporting systems. NMCP in collaboration with partners intends to improve the rate and quality of parasitological testing and reporting in the public and private sectors. During all NMCP promoted trainings, the newly revised HMIS system will be showcased and explained. The goal of this intervention is to improve the overall performances for malaria testing, treatment and the related informat ion (Test Treat and Track - 3Ts).

HMIS and DHIS standard malaria indicators are summarized in APPENDIX 3 HMIS/DHIS2 INDICATORS.

In the Malaria Strategic Plan 2014-2020, NMCP introduced malaria case fatality (CFR) rate as a strategic indicator for malaria case management. This indicator is monitored within the HMIS and is reported through DHIS2. Annual and seasonal CFR, especially in district hospitals, is a good barometer of changing epidemiology and disease severity.

Current HMIS strengthening should focus on improving human resource capacity, complete, timely and accurate reporting to accommodate data demands of specific programmes and improve the quality of data recording and reporting. Specific recommendations for strengthening coordination of programmes and improving the quality of data include: training focal people at the health facility and district level to ensure complete/accurate reporting and improvement to existing data collection tools as needed to ensure accurate and standardized reporting of data for ascertaining data for impact indicators. Further review of the system is currently underway with the goal of finding ways to respond to the data demands of specific programmes in a timely fashion. As well, implementation of a new integrated diagnostic services information system within HMIS is currently underway.

Integrated Disease Surveillance and Response (IDSR) and Malaria Epidemic Early Detection (MEEDS)

IDSR was established by the MoHCDGEC to collect routine weekly epidemiological data – cases and deaths - of notifiable diseases to be used mainly for early detection and management of epidemics. The IDSR and HMIS use the same data collection tools in parallel but with different reporting tools and frequency. Electronic IDSR (eIDSR) reporting has been recently introduced in part of the country by using mobile phone technology.

The NMCP intends to use the eIDSR platform to generate weekly epidemiological (malaria cases) and programmatic (antimalarial stock status) information for the establishment of malaria epidemics early detection system (MEEDS). The eIDSR is interfaced within DHIS. The system is expected to generate alerts and actions notifications based on the abnormal occurrence of malaria cases based on the provided thresholds or low antimalarial stock levels. This will constitute the basis for appropriate malaria outbreak and stock-out response.[30]

The ultimate goal for NMCP is to introduce IDSR/MEEDS to all the malaria unstable transmission areas across Tanzania. These areas are considered to be epidemic prone due to climatic – malaria transmission less likely to occur - and consequent immunological – human population more susceptible - reasons. The use and scale of

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[30] NMCP, Malaria Surveillance and Response Guidelines 2015

IDSR/MEEDS should be based on the volume and type of data that are needed in order not to duplicate and overlap the existing HMIS. These factors will be considered in ongoing IDSR system development.

Logistic Management Information System and MSD supply chain information system (Epi9)

There are two major initiatives to report malaria commodities logistic management: Logistic Management Information System (LMIS) overseen by the Pharmaceutical Service Section (PSS) of the MoHCDGEC, and Supply Chain Information System run by MSD. These systems include a combination of paper based and electronic records and reports.

LMIS has an electronic web based interface (eLMIS) that includes health facility quarterly requisition and request while MSD information system is run with Epicore9 platform and generates stock and commodities movement information including issuing records of all malaria commodities to public health facilities including batch numbers.

NMCP is actively involved in the delivery and utilization of the services provided by the two initiatives and is committed to promote and sustain a more integrated and efficient platforms by a) improving the currently adopted technical solutions; b) establish an effective commodities surveillance linked with rapid stockouts response; and c) establishing an interface with the DHIS.

Adverse Drug Reaction Reporting Reporting (ADR)

The ADR observed by clinicians in the routine practice are reported to the Tanzania Food and Drug Authority (TFDA) and recorded in a national registry. NMCP intends to work closely with TFDA to monitor the undesired effects of antimalarials.

Private Drug Dispensing Outlets Information

NMCP in collaboration with Pharmacy Council, TFDA and implementing partners will promote a novel routine information system to track stock movements of quality assured antimalarials and mRDT in the private sector, from first line buyer to dispensing level.

Pharmacy Council and partners recently developed a web-based information system with interoperable mobile applications and piloted it in a few regions. The system manages information on facility registration, personnel qualifications and certifications, inspections, and licensing fee payment status for retail outlets. NMCP will assist the Pharmacy Council to develop further, integrate and, eventually, scale up the system to all private dispensing outlets.

2.3.3 Vector Control Data Sources

The IMVC component of the Malaria Strategic Plan 2015-2020 requires continuous monitoring of malaria transmission entomological indicators including the entomological inoculation rate (EIR), malaria vector population dynamics including speciation, density and bionomic. Monitoring entomological variables, especially EIR, is a challenging activity and might be logistically and technically difficult when transmission is decreasing to very low level. Currently, there are no national representative figures for these indicators. To overcome these challenges, NMCP has planned for the first time to establish a countrywide entomological surveillance in 62 sentinel districts. The system is district-based and encompasses a broad partnership between, NMCP, research institutions, local government authorities and communities. Entomological surveillance is an integral part of the comprehensive malaria surveillance framework. (*Figure 9* and *Table 7*).

Figure 10: Vector Control Tools as Part of All SME Systems

Vector Control Data Sources
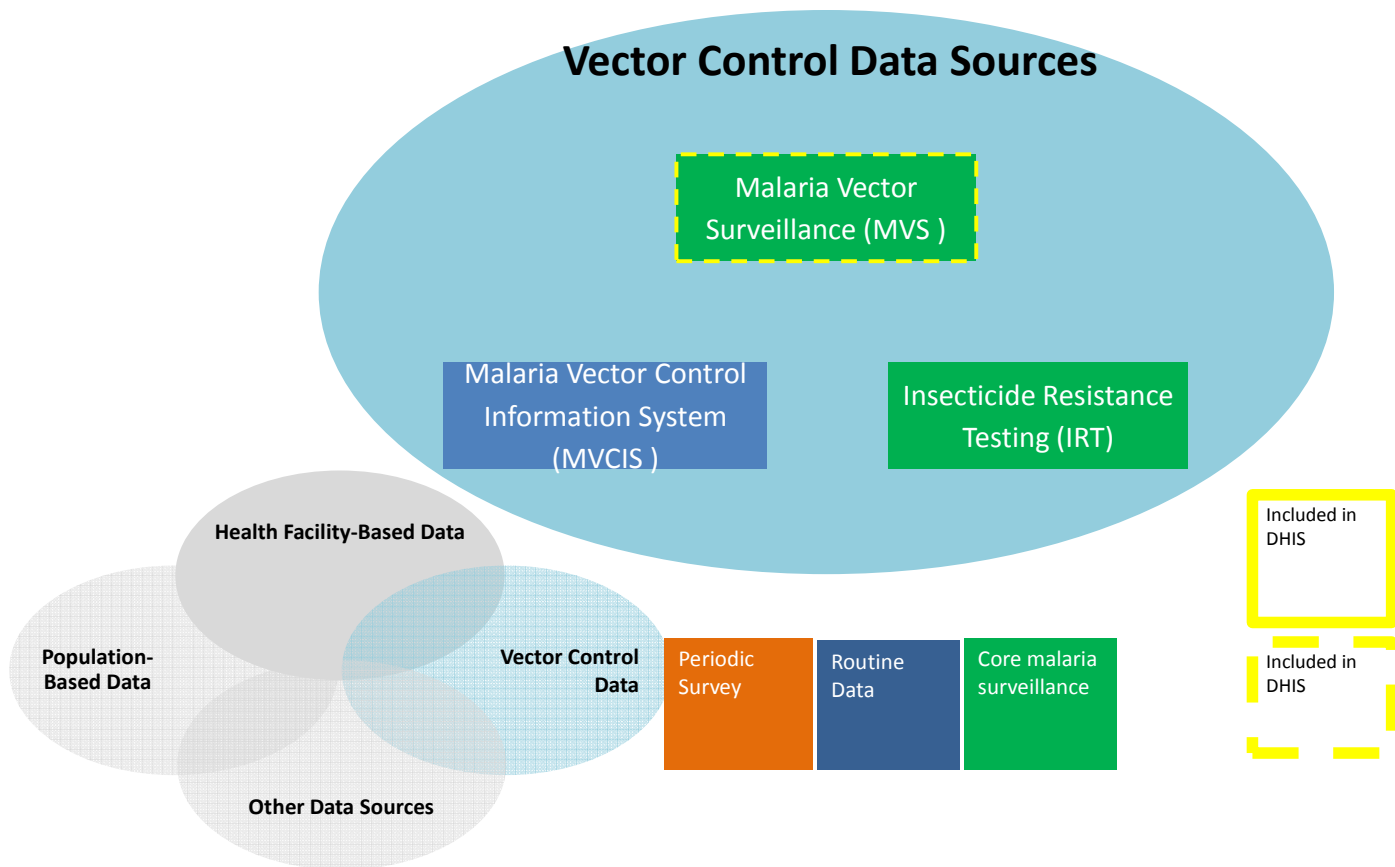
Table 7: Entomological Based Information Sources

System	Indicators	Sites	Representation	Frequency	Funding Source	Responsible
National malaria vector surveillance (MVS)	Entomological inoculation rate, vector species and density, blood index	2-4 sites per council 62 councils	Regional, Council,	Monthly Quarterly	GF	NMCP
Insecticide resistance test (IRT)	Insecticide susceptibility	28 sites	National	Annual	PMI	Research institutes
Malaria Vector Control Interventions Monitoring (MVCIM)	LLIN distribution IRS and LSM performances	MVCI sites	National District Sub-district	Depend on initiative	GOT and development partners	NMCP

National Malaria Vector Surveillance

A National Entomological Surveillance system will equip NMCP with a better biological understanding and timeline of the anopheles mosquitoes that spread malaria. This knowledge would provide important information allowing NMCP and the MOHCDGEC to target interventions and assistance to areas where transmission and prevalence are worst.

The National Entomological Surveillance is planned to being rolled out initially in 62 select councils within Tanzania, at between 2 and 4 sites per council. The sites used within each council are the same sites as the schools malaria parasitaemia survey where other surveillance efforts are currently ongoing. This will allow NMCP to gather surveillance and parasitological data from each site. In the first year, monthly monitoring information will be collected. Starting in the second year, NMCP will implement quarterly monitoring. NMCP

is currently finalizing the protocol and the preliminary activities for the establishment of national malaria vector surveillance.

The malaria vectors basic indicators, including annual entomological inoculation rate, species density and composition, will be initially monitored. Additional bionomics parameters such as indoor vs outdoor biting, early vs late biting and human blood index will be added.

For National Malaria Vector Surveillance to be successful, a partnership between NMCP and the research institutions (Ifakara Health Institute, NIMR, TPRI and KCMC) should be consolidated. For this endeavor to be successful, additional partner support is required.

Insecticide Resistance Testing (IRT)

Systematic national representative insecticide resistance testing (IRT) was introduced in 2009 in 12 sentinel sites and is currently conducted in 28 sentinel sites. Tests are conducted by NMCP partner research institutions, coordinated by NIMR, in each sentinel site every alternate year. All IRT follows standard WHO testing protocol. PMI is currently funding the systematic national IRT initiative.

Routine Vector Control Monitoring Information System

The major vector control initiatives need specific information systems to monitor the progress of the activities. Inputs, process and outputs indicators are included in the respective systems. For LLIN two different systems are in place to monitor a) national mass distribution campaign and b) continuous distribution through RCH clinics and schools. The major indicators are: census of households, number of net distributed, distribution points. For IRS the monitoring system includes the following main indicators: location of house structures, structures sprayed, staff trained, population protected. For LSM in relation to larviciding the main monitoring indicators are: number of targeted vector breeding sites, number and frequency of breeding sites treated with larviciding.

2.3.4 Programmatic Data Sources

A set of measurement are available to assess that all Tanzanians have access to quality, effective, safe, and affordable malaria preventive and curative interventions through timely and sustainable collaborative efforts with partners and stakeholders at all levels (MSP 2014-2020 mission). The strategic plan achievements are expected to be evaluated through periodic malaria programme reviews at the mid-term and at the end of the implementation period.

Monitoring and evaluation of timely and quality malaria diagnostics and treatment services in both private and public health sectors is an important programmatic matter to assess the progress towards the achievement of the malaria strategic plan. In this SME plan continuous service provision assessment will be carried out in health facilities. Efficacy of antimalarial medicines is also a major programmatic measure to maintain appropriate treatment services.

Vector control intervention assessment, including insecticide resistance, is another programmatic aspect to be monitored and it has been discussed in the previous section. Other programmatic measurements related to weather condition are also included in this section (see and Table 8).

Figure 11: Programmatic Data Sources

Programmatic Data Sources
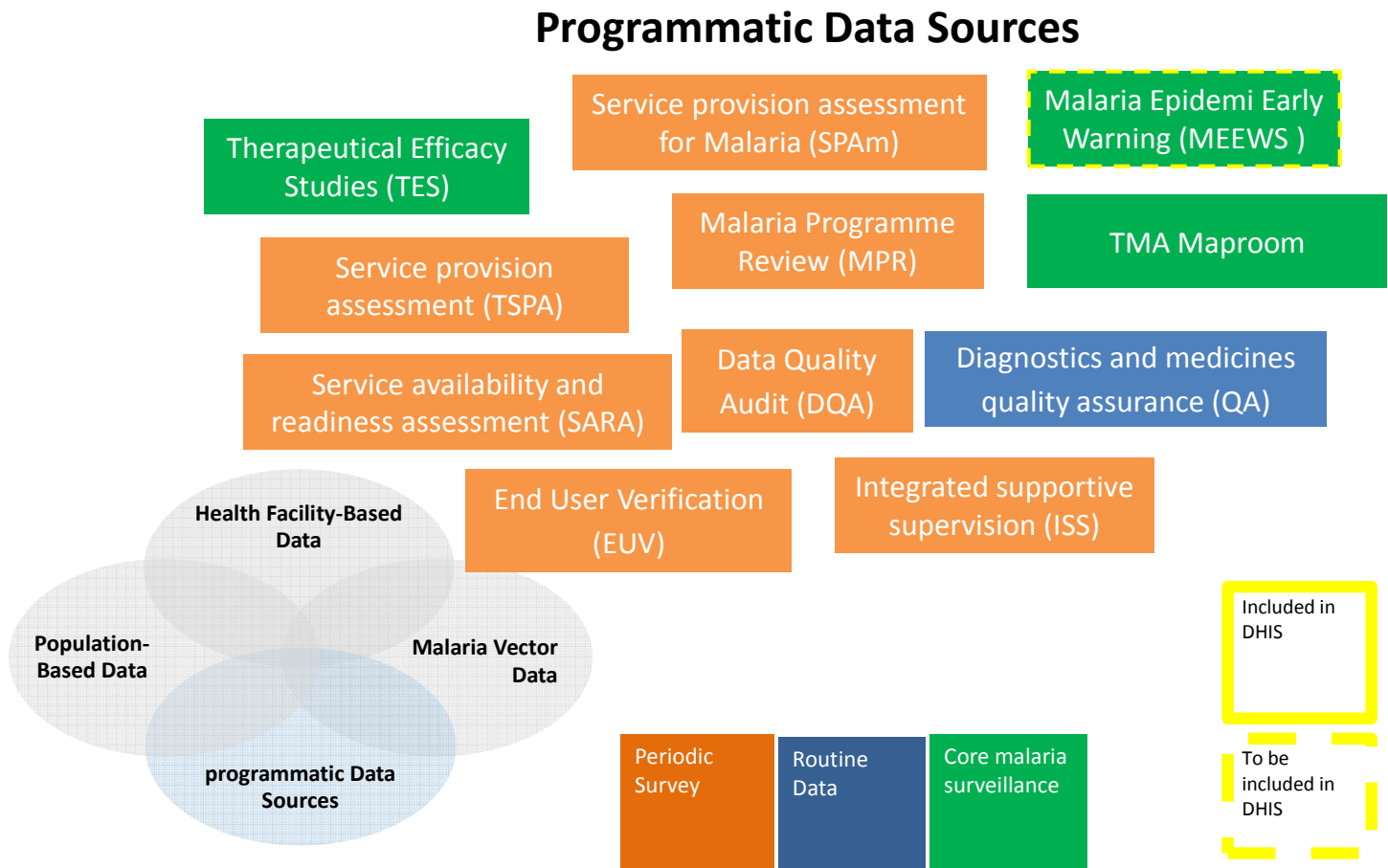
Table 8: Programmatic data source synopsis

System	Indicators	Sites	Representation	Frequency	Funding Source	Responsible
Service Provision Assessment for Malaria (SPAM)	Quality of care for malaria services QA ACT availability	16 HF per council (6 HF +12 ADDO) 25 councils	National	Once per year	Global Fund	NMCP
Tanzania Service provision Assessment (TSPA)	Health care provision	Selected HF	National Representative	Every 5 years	Development partners	NBS
Service Availability and Readiness Assessment (SARA)	Health care provision	Selected HF	National Representative	NA	Development partners	Research institutes
Therapeutic efficacy Studies (TES)	Clinical and parasitological cure	8 Sites	National	Biannual	Global Fund, PMI	NMCP
Integrated Supportive Supervision (ISS) and data quality	Programmatic indicators	Selected district and HF	National	Quarterly	Global Fund, PMI	NMCP

audit (DQA)						
Malaria Programme Review (MPR)	Programmatic indicators	Selected district and HF	National	Strategic plan Mid term	Global Fund, PMI	NMCP
Meteorological Information Monitoring (MIM)	Precipitation temperature	TMA weather stations	Zonal	Daily, weekly, monthly	NA	TMA
Malaria Epidemic Early Warning System (MEEWS)	Weather Programmatic Socio-economic	Epidemic prone areas	Zonal, District, sub-district	TBD	NA	NMCP
Diagnostics and medicine quality assurance (DMQA)	Antimalarials quality	Port of entry, selected HF	NA	NA	GOT	TFDA
End user Verification (EUV) and ACT tracking	Pharmaceutical Management	Selected Facilities	All levels	Quarterly	PMI, Global Fund	NMCP

Climate Data

Currently, rainfall and temperature data are collected at the regional and council level. The level of rainfall and temperature are large factors affecting mosquito breeding. As a result, it is important that NMCP continues to monitor trends in rainfall and temperature across the country. The Tanzania Meteorological Agency (TMA) will be used to ascertain the propensity of study areas to harbor mosquito populations, allowing for NMCP's analyses to control for periods of unusual dryness or wetness.

TMA is responsible for collection and dissemination of weather information from all regions in Tanzania. The parameters related to malaria transmission are rainfall (determinant of magnitude and duration of mosquitoes' breeding sites) and minimum temperature (limiting factor for effective sporogony in the vector). TMA, in collaboration with partners (IRI) is managing a web site that includes climatic parameters that are useful for interpretation of malaria transmission up to sub-district level: http://maproom.meteo.go.tz/maproom/ . Usually extreme weather conditions, drought or flooding, might affect malaria transmission as well as abnormal increase in minimum temperatures especially in highlands.

Malaria Epidemic Early Warning System (MEEWS)

Long-term weather forecasting is expected to provide enough lead time for preparedness activities to mitigate incumbent malaria outbreaks or eventual rise in the number of cases. Actual rainfall and temperature data are also useful to predict the start of malaria transmission and to anticipate abnormal malaria transmission in case of excessive precipitations and temperatures.

The interruption of malaria control activities has been described as a triggering factor for malaria outbreaks. Sudden interruption of IRS and decay of LLIN might diminish the protection level within the communities. Interrupted supply of antimalarials might affect timely and effective treatment of malaria cases with potential progress of uncomplicated to severe cases.

Information about interruption of malaria control interventions such as minimum antimalarial stock levels, ageing LLIN, scaling down of IRS interventions, should be monitored and linked to an early warning system.

The comprehensive malaria surveillance framework proposed in this SME plan, that is contemplating programmatic and logistic elements alongside with epidemiological data, will guide NMCP in gathering the necessary information and to provide alert and response to critical situations (see Comprehensive malaria surveillance and response framework on page 39).

Service Availability and Readiness Assessment (SARA) and Tanzania Service Provision Assessment (TSPA)

The NMCP recognizes the need for additional data on service readiness in government, parastatal, private non-profit and private for-profit health facilities beyond the routine information on service delivery. NMCP will support health facility assessments carried out in coordination with other programmes such as Service Availability and Readiness Assessment (SARA) and Tanzania Service Provision Assessment (TSPA). These national representative surveys provide additional information on the facility infrastructure, equipment, drugs, pharmacy and laboratory services, recordkeeping, management, and counseling. Of critical importance for NMCP is the verification of health worker compliance with case management protocols through direct observation of clinical practices in health facilities, checking of caretakers understanding through post consultation interviews and, finally, monitoring health worker training and understanding of malaria case management.

Service Provision Assessment for Malaria (SPAm)

The Service Provision Assessment for malaria (SPAm) was started January 2015 and is a tool used by NMCP to monitor quality of care. Indicators originate from sentinel districts and are analyzed on an annual basis. SPAM is fully funded by Global Fund, but is administered and run by NMCP. Currently, 25 districts participate in SPAM data collection with the assistance of regional administration and district council teams.

In the framework of SPAM, a sample of private drug outlets selling malaria commodities are visited twice per year to monitor availability the composition and market share of different antimalarials and diagnostics. The aim of the private arm of the SPAM is to track the availability of the pre-qualified recommended antimalarials, especially the ones procured under the GF co-payment mechanism. Retail price monitoring is also monitored.

Diagnostics and antimalarials quality assurance test

Tanzania Food and Drug Authority (TFDA) is monitoring the quality of malaria commodities at the port of entry and in the market. NMCP will liaise with TFDA to keep track of the quality of antimalarials available in the private market.

Commodity Logistic Surveys (End user verification, ACT tracking)

NMCP in collaboration with PMI implementing partners initiated in 2007/2008 a regular end user verification survey in selected health facilities at quarterly interval. The aim of the survey is to verify the quality of pharmaceuticals and supply management at zonal MSD and health facility level.

Regular commodities tracking surveys, e.g. ACT tracking, are conducted by NMCP as requirements of the GF grants management. Other implementing partners developed their own peculiar malaria commodities information system and related surveys. NMCP will work with partners to integrate and eventually merge the several initiatives to improve the cost-effectiveness of the surveys.

Therapeutic Efficacy Studies

Therapeutic Efficacy Studies (TES) are coordinated by NMCP under a dedicated task force and conducted by partner research institutions. Currently, TES covers 8 sites, 4 of which are surveyed each year. As a result, each site is monitored every other year. The TES sites were established in the late 1990s as it was crucial to have a system that could monitor antimalarial efficacy. Furthermore, TES were implemented to inform the selection of appropriate antimalarials to be used as a recommended treatment option in the country.

Integrated Supportive Supervision

Currently there are very fragmented initiatives to monitor and supervise malaria control activities especially in health care delivery facilities. Various implementing partners, including NMCP, developed different systems to

monitor specific interventions each one with its own tool or checklist. To mention a few: data collection and supervision tool (NMCP), data quality audit (NMCP), service provision assessment for malaria (NMCP), ACT/mRDT tracking (NMCP), end-user verification (PMI/JSI), health commodities assessment (PMI/JSI/LMU), private-provider assessment checklist (PSI), outreach training and supportive supervision (PMI/Malariacare), health facility supervision checklist for IDSR implementation (PMI/RTI/IDSR).

During the implementation of this SME plan, NMCP will work with implementing partners to harmonize and integrate the above mentioned systems and tools. The output of the harmonization/integration initiative will produce a modular framework where all the needs of monitoring implementation will be accommodated and used by different partners.

Data Quality Audit

Data quality audit (DQA) has been recently introduced to validate the data that has been reported in DHIS2 at the level of the council and health facility. The DQA system in place is able to identify the key weaknesses and proposing actionable recommendations with the aim of improving patient care, to ensure professional standard and creating culture of quality improvement in clinical setting, but also being up to date with the evidence based good practice.

NMCP aims to scale up the intervention in phases to all region and councils to make sure that all health facilities are audited at least once per year by the respective CHMT.

Malaria Programme Review

The Malaria Programme Review (MPR) is a periodic, collaborative evaluation for the NMCP. It aims at improving operational performance and delivery of malaria control interventions in order to reduce morbidity and mortality. The purpose of this review is to identify the programme's achievements in outcomes and impact, best practices, and lessons learnt during critical issues. Usually solutions are provided for more effective delivery, resulting in revision of programmes and strengthening of structures, system and capacity to achieve great equity, better coverage, higher quality and more effective delivery of anti-malaria interventions. The review is conducted in collaboration with the malaria programme, government institutions and all implementing partners and stakeholders in relation to malaria control at all levels of health care delivery namely; national, sub-national and community levels.

Timeline

The Figure 12 summarizes the major programmatic surveys implementation timeline.

Figure 12: Programmatic surveys timeline
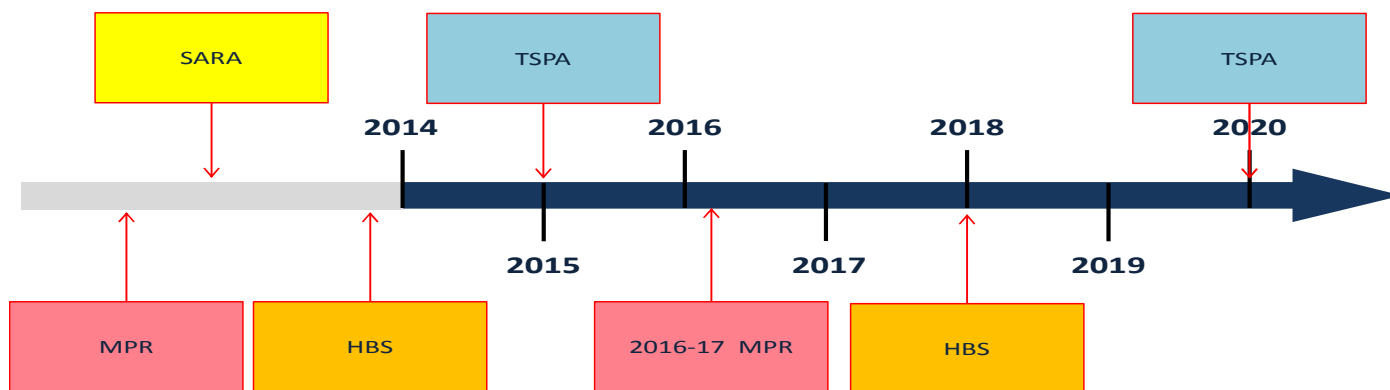
2.4 Comprehensive malaria surveillance and response framework

The SME indicators and information systems described in the sections 2.4 and 2.5 include a set of core malaria surveillance indicators and the systems that are in place to generate them (see the green boxes in

Due to the complex malaria transmission framework – including vector, parasite, human host and environment - several factors should be constantly monitored such as disease occurrence, human, vector and parasite dynamics and, ultimately, coverage of control measures. Comprehensive malaria surveillance needs to include key information that influence the occurrence of the disease and, eventually, to activate more investigations and the response.

The information is especially important for:

- Identifying areas and populations most affected by malaria and directing resources to populations most in need
- Identifying trends in cases and deaths that require additional specific control interventions
- Assessing if the interventions directed to control malaria have achieved the desired impact (evaluation of the program)
- Determine occurrence of a malaria epidemic and to monitor its evolution

The comprehensive malaria surveillance framework includes three major elements (Malaria **disease surveillance** including passive monthly HMIS and weekly eIDSR reporting and active case detection, if applicable (see Health Facility Based Information page 29)

- Malaria control **programmatic surveillance** including weekly antimalarial stock reporting, vector control initiatives reporting, malaria service provision assessment, malaria community monitoring and parasite and vector resistance monitoring (page 37 and page 34).
- Malaria **transmission surveillance**: including Sentinel Population Surveillance (SMPS and ANC page 28); Malaria Vector Surveillance (page 33) and meteorological monitoring (see Vector Control Data Sources page 32 and Programmatic Data Sources page 34).

Surveillance is strictly linked with response. Each element of the surveillance framework will generate an alert if an abnormal situation or rupture of equilibrium occurs, or it is likely to occur. In case of disease surveillance the abnormal situation could be an incipient malaria outbreak and the immediate response will be investigation and containment of the epidemic. For programmatic surveillance the abnormal situation is critical low stock of antimalarials and the immediate response will be the mobilization of contingency stocks or redistribution of existing stock. The parasite and vector surveillance are supposed to detect critical level of resistance to medicines or insecticide respectively. The response will be guided by change in therapeutically regimen or resistance mitigation interventions as shown in figure 13.

Figure 13: Comprehensive malaria surveillance framework
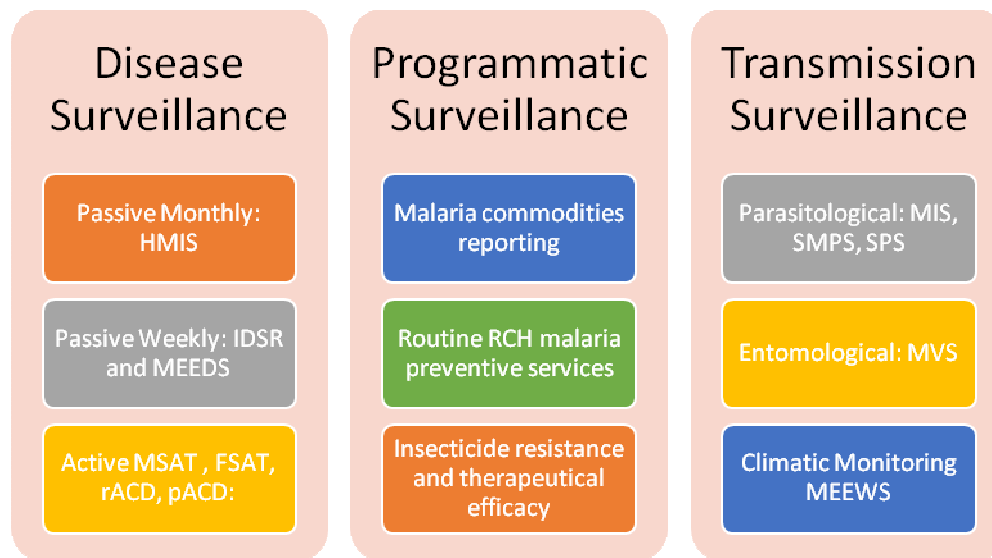
2.5 Operational Research

NMCP's supports and leads numerous research studies across Tanzania, some of which are led by partner organizations or research bodies, and others designed and managed in house. SME plan is a key platform to develop the malaria operational research agenda as there is almost always a monitoring, evaluation, and surveillance component to the studies. Furthermore, the metrics measured by operational research studies will often inform or support other SME plan efforts. NMCP's role in operational studies is largely to:

- Establish the research agenda for all studies such that it aligns with the 2014-2020 strategic plan
- Translate research findings into practice (policy and guidance) and
- Disseminate information and conclusions from the research study

The following research agenda (Table 9: Operational Research Areas) is updated on an ongoing basis, but represents the studies that are currently prioritized for the current phase of the NMSP implementation (2014-2017).

Table 9: Operational Research Areas

Epidemiology

Study Area	Description of Research Study
Dynamic epidemiological profile	Tanzania has a high level of heterogeneity in term of malaria transmission. Geo-located malaria prevalence data and malaria interventions are linked to several variables such as altitude, rainfall, vegetation index, demography to provide geographical description of malaria risk at national, regional, district and sub district level. Updated epidemiological profile is needed to select appropriate operational strata to target effective malaria control interventions
Transmission dynamics, stratification and operational implications	In Tanzania there are different transmission intensity areas with different response to control initiatives. Persistent hyperendemic and holoendemic areas should be deeply investigated to describe the determinants of malaria transmission and provide information for the formulation of appropriate-effective-evidence based control initiatives
Socio-economic determinants of	Housing, wealth and education are related to malaria prevalence in the communities.

Study Area	Description of Research Study
malaria transmission	Usually there is a direct relation with high prevalence and low education and wealth levels of the communities. A better description of the relation between socio-economic status and malaria transmission are necessary to design appropriate control initiatives
Climate determinants of malaria transmission in relation to outbreaks	Actual rainfall and temperature data are also useful to predict the start of malaria transmission and to anticipate abnormal malaria transmission in case of excessive precipitations and temperatures. Operationalization of MEEWS should be explored and eventually disseminated
Malaria epidemiology and its control in urban setting	Urbanize areas in Tanzania stand alone in relation to malaria transmission dynamics and malaria control interventions. Apart from some knowledge of vector bionomics in high anthropized settings and different socio-economic background of populations living in urban areas, little is known about malaria transmission and effective control in those areas. Since increased urbanization is a consolidated trend in Tanzania, more operational elements of malaria transmission and related control interventions need to be explored.

Health System

Study Area	Description of Research Study
Availability, Accessibility, Acceptability, Affordability, Delivery, Readiness, and Utilization of Malaria Services	Effective delivery of malaria test and treatment depends on a number of factors that might affect the timely and quality services. The factors related to health care service delivery should be described and mapped to select appropriate interventions. The stratification for providing quality care for uncomplicated and severe malaria is needed through improvement of the entire health system and to provide an answer to the underserved and out of reach sections of the population.

Multi-Sectoral Collaboration

Study Area	Description of Research Study
Evidence of Non-Traditional Interventions for Malaria Control	Housing improvement and environment management are unexploited areas that need to be taken on board for addressing sustainable malaria control initiatives. Innovative interventions are needed to be explored and best practices to be disseminated.

Vectoral Control

Study Title	Description of Research Study
Insecticide Resistance Testing	See Section Vector Control Data Sources page 32
New technologies	NMCP will partner with research institutions to research on the efficacy of new vector control tools and share evidence at relevant fora. Current ongoing researches include field trials of durable wall linings and LLINs with synergists. When and if applicable, new vector control tools will be piloted and assessed for scale-up.
Outdoor biting control	The current implemented vector control initiatives, mainly based on indoor measures, might not be enough to shrink further malaria transmission due to potential threat of outdoor biting. New technologies to control outdoor biting need to be introduced and are expected to be critical in controlling residual transmission, especially in low endemicity areas
Monitoring vector dynamics in relation to intervention	Collateral and complementary studies to the national malaria vector control surveillance (see Routine Vector Control Monitoring Information System page 34)
Useful life of LLIN products	An eight district study implemented by a consortium of research partners in collaboration with NMCP is currently being implemented to determine the effective life of three leading Long Lasting Insecticidal Nets (LLINs) products in Tanzania. The ABCDR study measures 1) attrition of the nets in households

	(presence/absence), 2) the physical integrity of the nets that are still present (number and size of holes), 3) the biological efficacy of the nets against mosquitoes (mosquito knock-down and mortality measured with WHO-approved assays), 4) the chemical insecticide residue in the net fibres (measured with high performance liquid chromatography in the laboratory) and 5) Determine insecticide Resistance in main malaria vectors

Malaria Case Management

Study Area	Description of Research Study
Therapeutic efficacy studies	See section Therapeutic Efficacy Studies page 37
Preventive therapies for risk groups	Seasonal malaria chemoprevention (SMC), infant and child preventive therapies (IPTi, IPTc), mass screening and testing (MSAT), mass drug administration (MDA) are major areas that need more evidence for an eventual inclusion into the recommended malaria strategies in the country.
Development and introduction of a malaria vaccine	RTS,S vaccine is expected to be introduced during the next strategic plan implementation period. Evidence based approaches including operationalization in suitable transmission areas need to be explored. Operational researches for other potential vaccines trials are also recommended.
Quality of care for malaria case management and appropriate management of fever	In the current epidemiological transition quality management of malaria cases is of paramount importance as well as a critical process on diagnosis and treatment of non-malarial febrile conditions. Professional skills and practices should be improved.
Monitoring quality of malaria diagnostics and introduction of new diagnostic tools	Alternative diagnostics tools and algorithms – for malaria and other febrile conditions - need to be introduced and tested in different transmission areas. Quality of malaria diagnosis remains central in the management of malaria. Several challenges have been observed such standardization of procedures and performances, quality assurance of test devices and laboratory reagents should be addressed.
Monitoring SP resistance markers	SP is still the recommended medicine for IPTp but concerns about its efficacy is hampering the potential benefits. The molecular markers of SP resistance need to be monitored in the community.
Efficacy of ITPp-SP in low transmission settings	WHO recommend the use of IPTp mainly in mesoendemic areas. Its efficacy in hypoendemic areas is not well described. More evidence is needed to inform the NMCP on where the intervention is needed and when the intervention might be safely scaled down.
Introduction of PQ-Alu combination in low transmission settings	Malaria epidemiological profile is showing areas where transmission is at a level that Primaquine (PQ) might be effectively introduced to reduce further malaria transmission by using its gametocydal effect.
Alternative community based case management	Operationalization of iCCM needs more evidence based interventions in identified hard to reach areas. Appropriate quality control of procedures and logistic management options should be tested.

3 DATA MANAGEMENT

Each of the detailed data collection systems described in the previous sections, produces a unique output with indicators specific to that source. All data that originates from one of the above systems or surveys is submitted to a more senior level for approval. Data can originate from a variety of levels, including Health Facilities, District Malaria Focal Persons, and Regional or National representatives and institutions. The preferential flow of information from HFs is via DHIS.

Ideally, once reviewed, data should be sent to the SME unit of the NMCP and, eventually, entered into a comprehensive composite Malaria Database. The NMCP SME unit is supposed to aggregate the data and produce reports and publications for dissemination and utilization at various levels, such as the MoHCDGEC, CHMTs and RHMTs, other Ministries, Government Departments, Development partners, Implementing Partners, Research Institute and Community level.

Figure 14 highlights the overall information flow from data collection to finding dissemination.

The ideal situation described above is still a wishful thinking due to several bottlenecks including: a) fragmentation of data sources; b) sub-optimal reporting from partners; c) limited human resource allocation and capacity of the SME unit; d) unsatisfactory implementing partner's commitment and conflicting priorities; and d) inadequate technical solutions.

3.1 The role and scope of DHIS2

The second generation of the District Health Information Software (DHIS2) is a web-based system that was introduce in the country in 2013. The majority of data are collected in the health facility in standardized HMIS books and registers, and reported monthly to the respective districts on a paper based format.

Data are entered into dedicated web based software at district level and stored and elaborated into a central database. Outputs are provided in form of tables, charts and maps. The system is also able to receive information directly from the health facilities through electronic devices (cellular phones or tablets).

The MOHCDGEC, under the Big Result Now (BRN) initiative, is planning to introduce tablet devices to health facilities to facilitate the transmission of data. Access to login is provided at different levels within NMCP and Government Ministries. Access to date is limited to a selected group of people. As a result, use of the data is still very limited. Within the DHIS there are multiple forms that capture different health facilities' data reported at different intervals depending on user's preferences.

Currently (2015) the overall reporting rate is 78% and 88% in private and public health facilities respectively.

DHIS2 currently hosts all HMIS generated data and e-IDSR but it is able to accommodate more information generated at health facility and community level including

- Logistic Information System
- Diagnostic Information System
- ILS gateway
- Community Malaria Monitoring
- Sentinel Population Surveillance
- Malaria Vector Surveillance

NMCP will work with stakeholders to improve and develop further malaria information linked with DHIS2.

3.2 Routine malaria data quality assurance

Routine malaria data is very important aspect for the National Malaria Control Program (NMCP) for monitoring malaria burden and intervention coverage at national and sub-national levels so as to make evidence-based programmatic decisions. Tanzania like other countries uses Health Management Information System (HMIS) for reporting routine health facility data. This HMIS is a paper-based system at the facility level. District Health Information Software (DHIS2) is the electronic platform for HMIS which was rolled-out in 2013. Currently, national average for health facility reporting is 93% with regional variance from 86% - 97% while timely report is 80% (67% - 95%). Since the national roll-out of the DHIS2, NMCP and the MoHCDGEC's focus was to ensure maximum flow of report within the platform.

According to Malaria Programme Review (MPR) and Impact Evaluation report conducted in 2011/2012 and Routine System Strengthening (RSS) revealed lack of/inadequate skills among health care workers, poor data/register keeping, inadequate tally sheets, lack of routine discussion of data with its limited use, inconsistencies in data across sources and incomplete reporting/use of HMIS tools. Due to the observed

stumbling blocks it has been difficult to analyze, interpret and eventually share these data; thus the use become limited. Since malaria data are typically part of the health system, a stable routine health system that produce complete, timely, reliable and valid data is needed in order to monitor malaria burden and intervention coverage.

Existing national guidelines, HMIS manuals, and other related standard operating procedures (SOPs), recommend every case attending each Health Facility (HFs) to be recorded and eventually to be reported to the higher level and use of that information for planning. In each HF, source of information for malaria data include Outpatient department (OPD, Inpatient department (IPD), Antenatal Care (ANC), laboratory, pharmacy and drug dispensing unit. In any of the section mentioned above, there are set of tools (register, tally sheets and summary sheets). A client/patient is recorded into respective register (depending on the type of care he/she is receiving) in line with tally sheets, so as to facilitate monthly aggregation of key indicators for the corresponding monthly summary report. Monthly summary reports are prepared using the data recorded on the tally sheets, one copy of each report is sent to the district medical office and one copy is maintained at the health facility. At the district level, data from the monthly summary reports are entered into the electronic DHIS2 system, which can be accessed by officials at the district, regional and national levels. Bigger HFs like hospitals which have computer facilities and DHIS2 oriented focal point do enters their report directly into DHIS2.

Thus data quality can be altered at any point in the process of transferring data. Alteration can occur at health facility level (during recording of patient information/during preparing monthly summary), but can be at District level during compiling the report in District health information system (DHIS2) and this may lead to poor malaria data.

NMCP will provide guidance to establish a comprehensive data quality audit (DQA) (see also page 34 in paragraph 2.3.4). The broad objective of DQA is to assess malaria data quality in health facilities in the public and private sector. The specific objectives of the interventions are: a) to verify components of malaria data quality (completeness, timeliness, representativeness, stability etc.) in districts and health facilities; b) to identify underlying technical and organization determinants of routine health information system in which malaria data are being reported and to address the eventual faults; c) to identify and correct behavioral determinant of health care workers on malaria data management.

The DQA will be carried out by NMCP, RMIFP and CMIFP in collaboration with HMIS focal persons and other key staff at the respective levels. Full involvement of RHMTs and CHMTs is of paramount importance to implement appropriately the activity and to address the identified problems.

3.3 The NMCP central data repository system

According to the proposed malaria SME plan architecture, NMCP foresees a massive input of information. To be able to manage the data appropriately it is of paramount importance to set up a centralized data repository system (DRS) able to store records from different systems, organize them and provide standardized outputs for easy interpretations. The DRS should be flexible and provide a platform for analysis of data at different administrative and functional levels.

The NMCP needs to get ready to administer the system through competent allocated human resources in addition to implementing the appropriate technical solution and related hard and software. The DRS will be designed to gather information from malaria stakeholders and implementing partners.

3.4 Dissemination Plan

The ultimate goal of any information generated is to be disseminated to improve the knowledge about malaria and its control in the country at all levels. NMCP plans to do it through a series of initiatives within and outside the country to improve knowledge and skills on data use and analysis. It is imperative for NMCP to increase its current capacity in term of staffing, competencies and adequate information technology solutions. Implementing partners, especially those from Local Government Authority, will be involved in the process through specific initiatives in the respective administrative areas. Communities also will be informed and involved in the planning through using appropriate channels. Table 10 is summarizing the information dissemination plan.

Figure 14: Schematic Framework for Coordination of SME within NMCP
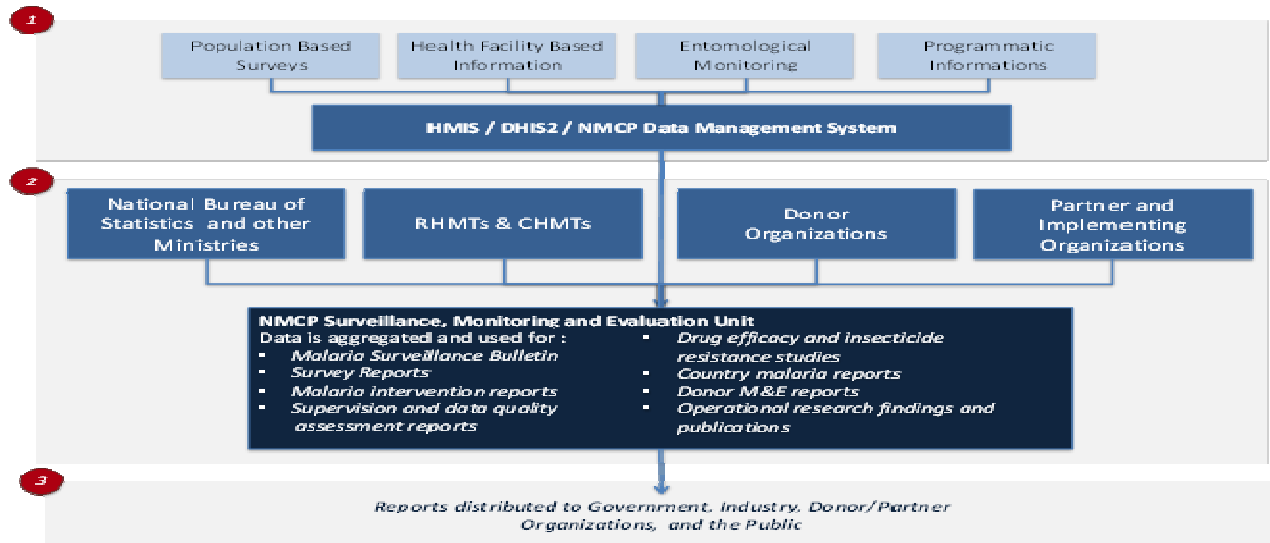
Table 10: Detailed Dissemination Plan for more information on data dissemination

Product	Frequency	Responsible	Contents	Audience
Epidemiological Bulletin	Semi-annual	NMCP SME unit SME TWG	Service provision; policy and surveys updates	Malaria partners, health workers,
Mass Media update, press release	Semi-annual	NMCP BCC and SME units	Policy and services update	Mass media, public
Fact sheets	Annual	NMCP BCC and SME units	Policy and services update	General Public
Malaria epidemiological profile	Semi-annual	NMCP and research partners	Updated malaria risk maps	MOHCDGEC, Malaria stakeholders
Summary DHIS2 updates	Quarterly	NMCP SME unit	Table, charts and maps	MOHCDGEC, Malaria stakeholders
Malaria Programme Review	Mid and end of MSP	NMCP and partners	Report	MOHCDGEC, Malaria stakeholders
Operational research abstract book	Annual	SME-TWG/SME-N	Abstract book / presentation	MOHCDGEC, Malaria stakeholders
Malaria SME network	Semiannual	SME-TWG	Meeting minutes / presentations	NMCP, Implementing Research partners
Annual Malaria Review Meeting	Annual	NMCP	Meeting minutes / presentations	LGA, RHMT, DHMT
RMO/DMO annual conference	Annual	MOHCDGEC	Conference proceedings	LGA
Global and regional meeting	Annual	NMCP	Meeting presentations	NMCP staff
National Scientific conferences	Annual	Research Partners	Abstract book	Researchers and public health professionals
International Scientific Conference (MIM, ASTPH)	Annual	Research and Acadaemia Partners	Abstract book	Researchers and public health professionals
Web site		NMCP	Web site	Health professionals, general public

4 IMPLEMENTATION ARRANGEMENTS AND OPERATIONAL PLAN

4.1 The scope and roles of NMCP and implementing partners involved in malaria SME

4.1.1 The role and scope of NMCP

The NMCP is committed to provide quality, affordable, effective and efficient malaria health services to all Tanzanian citizens. In order to track these benefits a strong surveillance, monitoring and evaluation unit within the program is needed to enable more evidence based decision-making and to provide implementation accountability.

NMCP believes that an effective SME organizational structure can drastically improve the quality of data analysis and utilization. The following organizational hierarchy was designed for NMCP's SME group, reflecting additional resources needed to support the many surveys and systems in place.

Adherence to the unit structure highlighted in *Figure* 15 would necessitate recruiting and hiring additional staff with appropriate skills mix. It is NMCP's belief that these additional staff members would enhance the SME Unit's ability to extract data and use it to make evidence-based decisions. It should also be noted that the new role of DHIS Focal Person would work for NMCP but would be based at the DHIS headquarters.

Figure 15: Optimal SME Unit Structure within NMCP
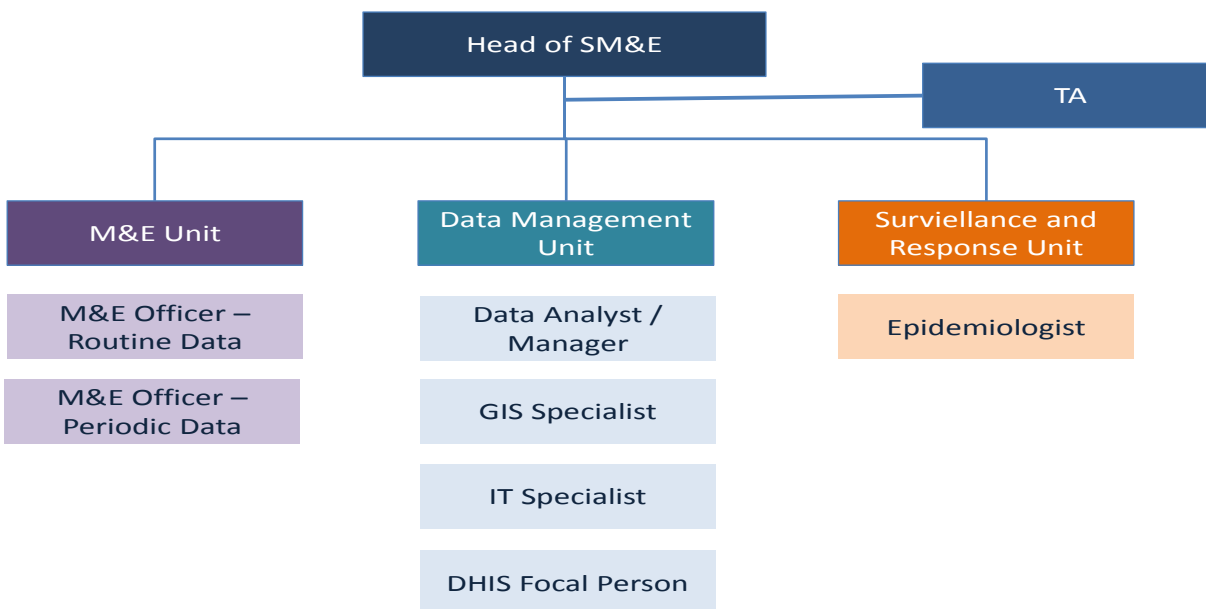
4.1.2 The role and scope other MoHCDGEC sections

NMCP will work closely with the relevant MoHCDGEC sections delegated to collect, manage and analyze information:

- The backbone of the malaria information system is the routine collection of data in the health facilities, reporting and subsequent analysis performed by HMIS especially through the DHIS
- mHealth initiatives are to be strengthen and expanded in collaboration with the delegated MoHCDGEC section
- IDSR will be leading the implementation of core malaria surveillance (MEEDS and commodities) under NMCP oversight

Other important malaria related data are managed by other MoHCDGEC sections:

- Pharmaceutical and supply information will be collected through the initiative of the Logistic Management Unit (LMU) of the PSS, Pharmacy Council, TFDA and MSD
- Comprehensive diagnostics information, currently managed by the DSS, will be linked to DHIS platform

4.1.3 The role and scope other ministries

NMCP will facilitate other ministries to perform initiatives related to collection and interpretation of malaria data:

- National Bureau of Statistics (NBS) will lead the implementation of national representative survey such as DHS, MIS, SPA, HBS and National census. NMCP will support NBS in the preparatory phase and in the dissemination findings
- Tanzania Meteorological Agency will lead the collection, analysis and dissemination of weather information related to malaria transmission, especially on producing a platform able to inform the malaria community on early warning for abnormal transmission.

4.1.4 The role and scopes of research institutions

The country has reputable and capable research institutions. This is a valuable asset to produce continuous information needed for creating evidence on malaria control interventions.

- Entomological monitoring including IRT (TPRI, IHI, NIMR, KCMC)
- Parasitological monitoring including TES (IHI, NIMR, KCMC, CUHAS)
- Quality assurance of NMCP led initiatives (SMPS, MVS etc)
- Implementation of the priority malaria research agenda (see Operational Research section)

Several international research institutions have been active for decades in Tanzania to conduct high-level operational research. NMCP will encourage these institutions to continue their activities in the country and to technically support the national research institutions.

4.1.5 The role and scopes of development and implementing partners

All development and implementing partners are committed to support NMCP in both implementing control initiatives and collecting data to monitor and evaluate the progress towards achieving the goal and objectives set out in the strategic plan.

Development partners have an enormous role in funding the implementation of the major SME initiatives through the support to HMIS/DHIS and implementation of national representative surveys through the NBS. Implementing partners usually give special attention to M&E in their initiatives through dedicated information management initiatives and are paying attention to innovative and creative approaches. NMCP will encourage a full integration of their implementing modalities within the comprehensive SME design presented in this plan.

4.1.6 The role and scopes of the private sector

Private sector plays a crucial role in delivery of both preventive and curative malaria services. Dedicated information system should be adopted to monitor the delivery of these services. Currently there is a gap of knowledge in the services rendered in some of the informal sector outlets. Particular attention will be paid to collecting accurate and timely information from:

- Manufacturers and first line buyers of diagnostics and medicines
- ADDO and other private outlets
- Commercial net manufacturers and distributors and
- Net retailers

4.1.7 SME governance: Technical working group and networking

The Surveillance, Monitoring and Evaluation Technical Working Group (SME-TWG) will oversee all technical activities and facilitate-decision making based on the available evidence. The SME Technical Working Group will be a small, yet pro-active, group of individuals with expertise in epidemiology, biostatistics, health information systems and entomology. The NMCP SME unit will be the delegated secretariat of the SME-TWG. The SME-TWG:

- Will be comprised of approximately 6-8 individuals from partner organizations with relevant technical skills who are nominated by the SME Network (and confirmed by the NMCP Secretariat). All members of the TWG must agree to prioritize their attendance at all meetings that will be held at least quarterly
- The TWG will work closely with the NMCP to oversee the implementation of the SME Plan 2015-2020

Other Activities of the TWG include:

- Advising the NMCP as to optimal structure of the SME cell within the NMCP
- Develop standards and guidance for reporting of malaria SME data by partners
- Review of SME data on a regular basis to assess trends in malaria intervention coverage, malaria morbidity and mortality and coverage of other child survival programs
- Provide guidance for malaria surveillance
- Set operations research priorities
- Review of relevant information needed by the NMCP management to inform decision-making
- Provide advice and guidance to the SME cell of NMCP for programme-based evaluation processes
- Provide advice and guidance to the SME cell on routine data collection and periodic surveys for evidence-based decision making

The SME TWG will ensure the following main areas of work are done.

- Involvement in planning, monitoring and reporting of SME activities
- Discussion of the annual work plans during the NMCP strategic planning process
- Keeping abreast of the progress of the planned SME interventions
- Assessment of the need for corrective measures to achieve targets set in annual plans.
- Strengthening of an integrated system for malaria surveillance
- Enhancement of surveys and operational research

The Surveillance, Monitoring and Evaluation Network is the broad umbrella group comprised of representatives of all partners. The SME Network will:

- Meet biannually to discuss SME activities and report about the SME plan implementation

- Nominate individuals to serve on the Technical Working Group
- Support NMCP to use SME information for evidence based planning and to promote advocacy for resource mobilization

4.1.8 The role and scope of Regional and Councils Health Management

The RHMT and CHMT are playing an enormous role in this SME plan as both the originator of large amount of data and the ultimate users of the information. Regional and district teams are accessing the DHIS2 and other web based outputs (e.g. eIDSR, eLMIS, ILS and gateway) for simplified analysis and interpretation of data.

4.2 SME Activities 2014 - 2020

The key objectives of NMCP's SME strategy for the next 5 years were outlined at a high level in the section on Malaria Surveillance, Monitoring and Evaluation Objectives page 16. Outlined below are the supporting activities that will allow NMCP to achieve each of their four SME objectives.

Objective 4.1 – Routine Reporting

4.1 Improve quality, completeness, and timeliness of malaria indicators within the routine health information system to reach 90% of health facilities reporting monthly through the HMIS by 2020

Supporting Activity: Support HMIS/DHIS units in the MoHCDGEC to improve quality of reporting malaria indicators and roll out of the electronic DHIS platform at all levels

The HMIS and the IDSR system are the two data systems established by the MoHCDGEC to collect routine SME data from healthcare facilities. The key malaria indicators are included in the existing HMIS and IDSR framework. NMCP will continue to collaborate and support the HMIS and IDSR units to improve the quality and timeliness of routine data collection. Electronic platforms will be expanded through DHIS2 to improve data management and to provide real-time outputs, including charts and maps, for data analysis, interpretation and use. Private health sector reporting will be strengthened through complete involvement in the routine reporting systems. The integrated platform for malaria SME through DHIS will include all malaria-related data collected and indicators generated. Weekly and monthly epidemiological, service delivery and logistic data will be linked through DHIS at various levels of healthcare delivery. Web- and desktop-based outputs will be provided for all levels from healthcare facilities to the national level.

NMCP and partners will be involved in providing training and support to healthcare workers in information management at different levels. DHIS utilization will be promoted from the national to the district level. All regional and district malaria focal points will be enabled to regularly access the DHIS and make use of the information for improving malaria service delivery. NMCP will appoint a dedicated person to liaise daily with HMIS/IDSR/DHIS[31].

Supporting Activity: Develop quality assurance / control system for data auditing and verification

The data, received weekly and monthly, will be sampled for auditing and verification during routine and *ad hoc* supervision visits.

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[31] (National Malaria Control Programme 2014)

Objective 4.2 – Periodic Surveys

4.2 Establish a comprehensive framework for collecting, processing and storing essential malaria indicators from periodic service delivery and programme surveys

Supporting Activity: Establish selected sentinel districts/sites to capture non-routine malaria data on quality of care

Sentinel districts will be selected to perform regular surveys (e.g. SPAM) on quality-of-care indicators for malaria diagnosis and treatment. These sites will collect data on appropriate case management according to guidelines as well as indicators not included in the routine HMIS (e.g., adherence to testing results, prescription habits, commodities storage and distribution practices, data validation). The private sector will be included in the surveys, and NMCP will assess these data biannually. In addition, NMCP together with partners will conduct regular end user verification and commodities tracking[32].

Supporting Activity: Collaborate with the National Bureau of Statistics to ensure the regular national representative population surveys and other specific sub-national surveys include relevant malaria indicators

NMCP will continue to collaborate with NBS to prepare, conduct, and disseminate the well-established national and sub-national representative surveys such as the DHS, MIS, and SPA[33].

Supporting Activity: Establish countrywide longitudinal vigilance of malaria parasitaemia in sentinel population: pregnant women and infants at RCH clinics, school-age children

Two major parasitological surveillance initiatives in sentinel population will be conducted during the implementation of this strategic plan: (1) longitudinal assessment of malaria parasitaemia in pregnant women and children under five will be scaled up to all RCH clinics, and (2) longitudinal malaria parasitaemia prevalence in school age children will be assessed in selected district representative primary schools. The initiatives will be implemented in collaboration with CHMTs and research institutions. Sentinel population parasitological surveillance will be providing continuous assessment of the status of malaria control and seasonal and geographical malaria risk mapping[34].

Supporting Activity: Establish and expand longitudinal monitoring of mosquito population dynamics and behaviour in sentinel sites and strengthen surveillance of insecticide susceptibility

Longitudinal entomological monitoring and insecticide susceptibility test will be implemented in collaboration with research institutions in sentinel sites countrywide. NIMR will continue to coordinate the institutions and provide capacity building to district-based entomological teams. Insecticide resistance test will be carried out annually in conformity with the standard WHO guidelines. Core vector population indicators will be selected to monitor continuously mosquito composition and dynamics[35].

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[32] (National Malaria Control Programme 2014)

[33] (National Malaria Control Programme 2014)

[34] (National Malaria Control Programme 2014)

[35] (National Malaria Control Programme 2014)

Supporting Activity: Coordinate and oversee the implementation of standard antimalarial efficacy studies as per WHO guidelines by national research institutions

Standard antimalarial efficacy studies will be conducted in alternating years to monitor the recommended antimalarials as per WHO guidelines. Molecular markers will also be collected to monitor resistance markers of drugs used for both treatment and chemoprevention of malaria. NMCP will coordinate all the research work by the different institutions[36].

Supporting Activity: Coordinate the collection, use, and interpretation of the programmatic monitoring of vector control initiatives (including LLINs, IRS, and LSM)

Routine monitoring of programmatic indicators of vector control programmes will be conducted by implementing partners. NMCP will coordinate the collection, use, and interpretation of the results. A standard set of indicators will be proposed for the initiatives[37].

Activity: Regularly update malaria epidemiological profile

In 2013 NMCP, in collaboration with INFORM and IHI, developed an epidemiological profile for malaria and its control. The document provides a series of malaria risk maps and related action points. The malaria epidemiological profile (2013) will be updated every two years[38].

Objective 4.3 – Evidence-Based Decision Making

4.3 Establish and maintain a comprehensive and effective malaria knowledge management system to collate, interpret, disseminate, and promote the use of quality malaria data for evidence-based decision making at national and district level

Supporting Activity: Establish a national SME Partnership Framework

The national framework for the implementation of SME activities will include updated SME annual plans, a revitalized governance structure, and a malaria operational research agenda. The framework will provide technical guidance to ensure that malaria data collection, assessment tools, and monitoring and evaluation initiatives are coordinated and standardized. NMCP has developed an SME plan and has established a malaria SME technical working group (TWG) and network. A malaria operational research agenda will be developed by NMCP and research partners to include essential research initiatives to guide the strategic plan implementation and provide evidence for innovative initiatives. The agenda and the identified operational research priorities will form the bases for resource mobilization.

Supporting Activity: Develop a national malaria data management plan and data repository to enable evidence-based decision making at all levels

The data management cell will be strengthen within the NMCP and will be responsible for systematic malaria data management. The cell will develop a malaria data management plan outlining how the different sources of malaria data can be consolidated, stored, and regularly updated. NMCP plans to develop a national composite malaria database (or *knowledge warehouse*) that brings together all the relevant databases in a manner that is user-friendly and easily accessible.

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[36] (National Malaria Control Programme 2014)

[37] (National Malaria Control Programme 2014)

[38] (National Malaria Control Programme 2014)

Supporting Activity: Undertake periodic malaria programme reviews and evaluation of the implementation of malaria strategic plan

Midterm and final programme reviews will be conducted to evaluate the status of the strategic plan implementation. This review will provide crucial information needed to update and adapt the malaria strategy where needed.

Objective 4.4 – System for Epidemic Preparedness

4.4 Design and support the implementation of a comprehensive malaria surveillance and response system for epidemic-prone districts to ensure that 80% of malaria epidemics are responded to within two weeks from the onset by 2020

Supporting Activity: Map the malaria epidemic-prone districts, including stratification of epidemic "hot spots"

The NMCP will map epidemic hot spots using the recently developed Malaria Epidemiological Profile, which provides ward-level transmission information. This mapping exercise will be discussed with the relevant district and will form the basis for a national contingency supply stock for epidemic containment. Post-epidemic assessment will be encouraged to further investigate local epidemic dynamics and to establish pre-emptive control measure.

Supporting Activity: Establish Malaria Epidemic Early Warning System and a Malaria Epidemic Early Detection System

A malaria epidemic early warning system (MEEWS), malaria early detection system (MEEDS), and rapid response is important to quickly reduce malaria burden in the event of malaria epidemics. NMCP plans to establish MEEWs and MEEDS in the epidemic-prone districts, including protocols for the production of alerts and action thresholds that will initiate field verifications and investigations. MEEWS will capitalize from weather information and other potential threats, such as interruption of malaria control services that may be able to trigger malaria outbreaks. The essential component for functional MEEDS is quality, accuracy and timely routine HMIS/IDSR data management plotted to detect an epidemic alert and trigger subsequent interventions to investigate and contain the outbreak.

Supporting Activity: Strengthen Capacity for malaria epidemics containment at district and health facility level in epidemic prone districts

NMCP will develop training packages for malaria epidemics prevention and control and a capacity building plan for the relevant districts. NMCP and partners will roll out a capacity building plan to improve capacity at district and health facility levels to respond to incumbent epidemics. Training will include development of a district-specific epidemics preparedness plan, standard operating procedures, and medical supplies contingency plans.

Supporting Activity: Implement malaria outbreaks response operations when and where necessary

The councils will be responsible for immediate response activities after the detection of a malaria outbreak. Immediate actions to provide appropriate malaria case management are needed to mitigate severe morbidity and mortality. Appropriate BCC initiatives are crucial to assure adequate engagement of the community in the response. Effective vector control measures should be taken into consideration according to local capacity and opportunities, especially after epidemic early warning, to pre-empt transmission, rather than an early detection.

4.3   Implementation Timeline and Action Plan

The implementation plan attached in APPENDIX 4: IMPLEMENTATION PLAN, identifies the key objectives and supporting activities previously identified in this section. The implementation plan also highlights when they will occur, as well as the party responsible for implementation and the source of funding.

4.4   Budgeting

The NMCP business plan for the period 2014-2017 is indicating a total needs for the implementation of this SME plan of USD 14,056,512. Through GOT and development partners a total of USD 10,832,478 have been obtained and anticipated, leaving a gap of USD 4,109,034 (Table 11). See for more details APPENDIX 5: DETAILED SME BUDGET, 2014 – 2020

4.5   Conclusion

As malaria prevalence across Tanzania continues to decline, surveillance, monitoring and evaluation of the disease will become increasingly important and play a larger role in disease elimination. The proposed changes to NMCP's surveillance, monitoring and evaluation systems will lead to realization of the following benefits:

- Focused interventions
- Identification of malaria prevalence trends over time and in specific regions of Tanzania
- Monitoring of health practices that are related to disease burden within the country
- Generation of hypotheses for areas requiring improvement.

NMCP is confident that the planned surveillance, monitoring, and evaluation activities will contribute to an improved understanding of the malaria burden carried by specific geographies and communities within Tanzania, and push the country forwards towards elimination.

Table 11: Summary of SME implementation budget for 2014-17

Source NMCP Business Plan 2015 October, in USD

Objectives	USD						
	Global Fund SFF	PMI	Other	Available	Gap	Needs	GF Requested
	698,850	6,836,550	1,200,000	8,735,400	9,596,480	18,331,880	5,436,033
Improve quality, completeness, and timeliness of malaria indicators within the routine health information system	36,986	1,350,000	250,000	1,636,986	2,627,127	4,264,113	1,450,000
Establish a comprehensive framework for collecting, processing and storing essential malaria indicators from periodic service delivery and programmatic surveys	469,290	5,091,550	950,000	6,510,840	5,721,250	12,232,090	3,431,053
Establish and maintain a comprehensive and effective malaria knowledge management system to collate, interpret, disseminate, and promote the use of quality malaria data for evidence-based decision making at national and district level	135,531	320,000	-	455,531	654,613	1,110,144	404,980
Design and support the implementation of a comprehensive malaria surveillance and response system for epidemic-prone districts	57,043	75,000	-	132,043	593,490	725,533	150,000

APPENDIX 1: STRATEGIC PLAN 2015-2020 LOGICAL FRAMEWORK

Programme Goal

Items	Indicators	Baseline and Target Values			Sources	Method	Frequency	Responsible
		2011/2012	2016	2020				
Goal	**Target**							
Reduce the average country malaria prevalence	Parasitaemia Prevalence in Children 6-59 months	10%	5%	1%	TDHS/MIS	National representative survey	3 years	NBS, NMCP
	All cause under 5 mortality rate	81	54	40	TDHS/MIS	National representative survey	3 years	NBS, NMCP
	Confirmed malaria cases per 1,000 persons per year	102/1000	60/1000	20/1000	HMIS/DHIS2	National representative survey	Annual	HMIS, NMCP

Integrated Malaria Vector Management

Items	Indicators	Baseline and Target Values			Sources	Method	Frequency	Responsible
		2011/2012	2016	2020				
Strategic Objectives								
1. To reduce transmission of malaria by scaling-up and maintaining effective and efficient vector control interventions	Reduce entomological inoculation rate (EIR) to <0.1 [39]	NA	<0.25	<0.1	Entomological reports	Sentinel sites	Annual	NMCP, Research Institutions (RI)
Specific Objectives	**Outcome indicators**							
1.1 Ensure universal access and use of the population to LLINs in all transmission settings and control stages	Proportion of population that slept under an LLIN the previous night	69%	80%	85%	THMIS/ TDHS	National repr survey	3 years	NBS, NMCP
1.2 Consolidate and expand IRS in epidemiologically and operationally suitable areas	Proportion of population at-risk who are protected by IRS				IRS reports	IRS census		NMCP
1.3 Implement larviciding interventions in selected urban areas where breeding sites are few, fixed, and findable	Percentage decrease in larval density in selected areas treated with appropriate larvicide measured on quarterly intervals	NA	50%	75%	Ento. Survey	Survey	Annual	NMCP, RI

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[39] It is recognized that measuring of the Entomological Inoculation Rate (EIR) is problematic and a representative baseline for Tanzania in not yet available. However, the aim is to establish a baseline through representative sampling by 2016.

Items	Indicators	Baseline and Target Values 2011/2012	2016	2020	Sources	Method	Frequency	Responsible
1.4 Promote effective environmental management for malaria control amongst targeted communities	Proportion of urban wards implementing environmental management to prevent mosquito breeding sites	NA	**25%**	**50%**	**NMCP&P report**	**Annual survey**	**Annual**	**NMCP**
1.5 Provide a strategic framework for coordination and continuous assessment for the implementation of evidence-based IMVC interventions	Number of evidence-based innovations for malaria vector control adopted and integrated introduced in Tanzania	NA	**1**	**2**	**NMCP&P report**	**End of implementation report**	**Annual**	**NMCP, Partners, Policy makers**

Malaria Diagnosis, Treatment and Preventive Therapies

Item	Indicators	Baseline and Target Values 2011/2012	2016	2020	Data Sources	Method	Frequency	Responsible
Strategic Objectives	**Target**							
2. To prevent the occurrence of severe morbidity and mortality related to malaria infection through promotion of universal access to appropriate early diagnosis and prompt treatment and provision of preventive therapies in vulnerable groups	Case Fatality Rate in patients admitted due to severe malaria (%)	**3%**	**2%**	**<1%**	**HMIS DHIS2**	**Web based reports and surveys**	**Annual**	**NMCP HMIS**
Specific Objectives	**Outcome indicator**							
2.1 Provide universal access to appropriate, quality and timely malaria diagnosis to all people with signs and symptoms of malaria	Percentage of children under the age of 5 with fever who had a malaria test the same or next day after onset of a disease, disaggregated by socio-economic groups	**25%**	**60%**	**80%**	**THMIS/ TDHS**	**National repr Survey**	**3 years**	**NBS, NMCP**
2.2 Provide universal access to appropriate, quality and timely treatment to all people who have malaria	Percentage children under the age of 5 with fever and tested positive for malaria parasites who were treated with recommended antimalarial the same or next day following the onset of fever, disaggregated by socio-economic groups	**33%**	**60%**	**80%**	**THMIS/ TDHS**	**National repr Survey**	**3 years**	**NBS, NMCP**
2.3 Provide appropriate and effective services to reduce the risk of malaria infection and its complications among populations biologically and socioeconomically vulnerable to malaria	Proportion of women with live birth in the previous two years who received two doses or more of SP (IPTp2+)	**32%**	**60%**	**80%**	**THMIS/ TDHS**	**National repr Survey**	**3 years**	**NBS, NMCP**

		Baseline and Target Values						
Item	**Indicators**	**2011/2012**	**2016**	**2020**	**Data Sources**	**Method**	**Frequency**	**Responsible**
2.4 Ensure that commodities used in malaria patient care and prevention are consistently safe, quality assured and available at the points of care	Proportion of public healthcare facilities that have no QAACT and mRDTs stock outs cointinuous for one week in the last 3 months	NA	90%	90%	EUV	Web	Weekly	NMCP
2.5 Deploy appropriate malaria case management interventions in case of outbreaks and resurgence situations to reduce the risk of severe morbidity and mortality	Proportion of emergency situation in which epidemic malaria case management interventions have been implemented within two weeks of onset of outbreak	NA	80%	90%	NMCP	Report	Annual	NMCP

Malaria Communication

		Baseline and Target Values						
Item	**Indicators**	**2011/2012**	**2016**	**2020**	**Sources**	**Method**	**Frequency**	**Responsible**
Strategic objective:	**Outcome indicators**							
3. To create an enabling environment where individuals and household members are empowered to minimize their own malaria risk and seek proper and timely malaria-treatment if and when needed	Proportion of caretakers who are able to take actions to protect their children from malaria	82%	85%	90%	THMIS/ TDHS	National representative Survey	3 years	NBS, NMCP
Specific Objectives								
3.1 Reinforce and update knowledge amongst all community members in Tanzania about appropriate malaria prevention, testing and treatment and promote desired positive behaviours	Proportion of population (disaggregated by age and sex) with knowledge of ways to avoid and treat malaria	92%	92%	95%	THMIS/ TDHS	National representative Survey	3 years	NBS, NMCP
3.2 Increase knowledge amongst vulnerable groups with elevated risk of malaria infection about their specific risk and the prevention and treatment options available to them	Proportion of women 15-49 years who know pregnant women are at higher risk of getting malaria	90%	90%	90%	THMIS/ TDHS	National representative Survey	3 years	NBS, NMCP
3.3 Influence social norms about healthy behaviours around malaria prevention and care, and encourage communities to initiate and implement community-based malaria control interventions	Proportion of women who state that malaria is the most serious health risk in the community	67%	70%	75%	THMIS/ TDHS	National representative Survey	3 years	NBS, NMCP
3.4 Create strong BCC public private partnership to maximize efforts, ensure consistency in approach, and avoid duplication	Number of BCC interventions and projects in line with the BCC strategy implemented by malaria partners	84%	87%	90%	NMCP&P report	Document review and site visits	Annual	NMCP and PPP

Baseline and Target Values								
Item	Indicators	2011/2012	2016	2020	Sources	Method	Frequency	Responsible
3.5 Raise the profile of malaria amongst policy and decision makers at all levels so that national, regional and district plans include appropriate interventions and sufficient budget to implement the malaria strategy	Proportion of CCHPs that include malaria interventions and budgets	14%	50%	80%	NMCP&P report	Document review and site visits	Annual	NMCP and LGA

Malaria SME

Baseline and Target Values								
Item	Indicators	2011/2012	2016	2020	Data Sources	Method of Verification	Frequency	Responsible
Strategic Objective	**Outcome Indicators**							
4. To provide timely and reliable information to assess progress towards the set global and national targets, to ensure resources are used in the most cost-effective manner and to account for investments made in malaria control	Comprehensive malaria programme review undertaken periodically using all available data sources	1	1	1	MPR	Report	Every 3 years	NMCP/ NBS/ Partners
Specific Objectives	**Outcome Indicators**							
4.1 Improve quality, completeness, and timeliness of malaria indicators within the routine health information system	Proportion of health facilities submitting complete reports within specified deadline through the HMIS	60%	80%	90%	DHIS2	Reports	Monthly/ weekly	NMCP/ District
4.2 Establish a comprehensive framework for collecting, processing and storing essential malaria indicators from periodic service delivery and programmatic surveys	Framework for collecting and storing malaria data developed and functioning	NA	functional framework in place	updated framework in place	NMCP&P report	Reports	Annual	NMCP/ research Institutions
4.3 Establish and maintain a comprehensive and effective malaria knowledge management system to collate, interpret, disseminate, and promote the use of quality malaria data for evidence-based decision making at national and district level	Proportion of periodic evaluation reports developed according to the national SME plan	NA	80%	90%	NMCP&P reports	Documents review	Annual	NMCP and implementing partners
4.4 Design and support the implementation of a comprehensive malaria surveillance and response system for epidemic-prone districts	Proportion of malaria epidemics responded to by district councils within two weeks from the onset	NA	50%	80%	NMCP&P reports	Reports	Annual	NMCP/ District

Malaria Programme Management, Partnership Development and Resource Mobilization

Items	Indicators	Baseline and Target Values			Sources	Method	Frequency	Responsible
		2011/2012	2016	2020				
Strategic objective:	**Target**							
5. Efficient programmatic and financial management of malaria control interventions at all levels, implemented through effective and accountable partnerships with adequate funding	**Programme performance as rated overtime through semi-annual independent evaluation (Global Fund)**	**B+**	**A+**	**A+**	**PUDR**		**Semi-annually**	**Heads of units NMCP**
Specific Objectives	**Outcome indicators**							
5.1 Improve the effectiveness and accountability of malaria control implementation by strengthening partnerships and cooperation with malaria control stakeholders at all levels	**Proportion of interventions within the annual implementation plan that have been successfully implemented**	**NA**	**75%**	**90%**	**NMCP&P Reports**	**Document Review**	**Annual**	**NMCP Head admin and finance**
5.2 Increase the level of resource mobilization to fund the strategic plan, according to the programmatic needs	**Proportion of total strategic plan budget funded**	**N/A**	**80%**	**90%**	**NMCP&P Reports**	**Document Review**	**Annual**	**NMCP Head admin and finance**
5.3 Promote a harmonized regional and inter-sectoral approach to malaria control	**Number of inter-sectoral and cross-border malaria initiatives developed (cumulative)**	**NA**	**2**	**4**	**NMCP&P Reports**	**Document**	**Annual**	**NMCP and RBM partners**

Key: NMCP&P: National Malaria Control and Partners; PUDR:progress update and disbursement request; HF: Health Facility; DHIS2: District Health Information Software; THMIS: Tanzania HIV and Malaria Indicator Survey; TDHS: Tanzania Demographic and Health Survey ; TSPA: TanzaniaService Provision Assessment;

APPENDIX 2: KEY INDICATORS FOR MONITORING MALARIA CONTROL AND PREVENTION ACTIVITIES

Key Output Indicators

`	Numerator (if applicable)	Denominator (if applicable)	Data source	Remarks
Diagnosis and case management				
Number RDTs distributed to health facility	Number RDTs distributed to health facility		LMIS, EUV, SPAM	
Number ACT and other essential antimalarials distributed to health facility	Number ACT and other essential antimalarials distributed to health facility		LMIS, EUV, SPAM	
Malaria specific case fatality rate	Number of malaria (confirmed and clinical) deaths reported in health facilities	Number of malaria (confirmed and clinical) admissions reported in health facilities	HMIS/DHIS 2	NMCP core
Percentage of confirmed OPD malaria cases that received appropriate treatment according to national guidelines	Number of confirmed OPD malaria cases that received appropriate treatment according to national guidelines	Number of confirmed OPD malaria cases	EUV, SPAM	NMCP core GF recommended
Percentage of pregnant women who received at least 2 doses of IPTp during the reporting period	Number of pregnant women who received at least 2 doses of IPTp during the reporting period	Number of pregnant women who made at least one antenatal care visit in 1 year	HMIS/DHIS 2	NMCP SP/PF HSSP IV GF recommended
Number of pregnant women who received 2+ dose of IPTp	Number of pregnant women who received 2+ doses of IPTp during the reporting period	Number of pregnant women who made at least one antenatal care visit in 1 year	HMIS/DHIS 2	NMCP Core
Percentage of all suspect malaria cases that received a parasitological test	Number of all suspect malaria cases that received a parasitological test	Number of all suspect malaria cases	HMIS/DHIS2	GF recommended
Annual blood examination rate (classic definition)	Number of all suspect malaria cases that received a parasitological test	Number of people in the population	HMIS/DHIS 2	NMCP core GF recommended
Blood examination rate (alternative simplified definition)	Number of all suspect malaria cases that received a parasitological test	Number of OPD visits	HMIS/DHIS 2	NMCP core GF recommended
Proportion of suspected malaria cases that received a parasitological test (malaria test rate)	Number of suspected malaria cases that receive parasitological test	Number of suspected malaria cases	HMIS/DHIS 2	NMCP Core
Proportion of confirmed malaria diagnoses	Number of confirmed malaria cases	Total number of malaria cases (clinical and confirmed)	HMIS/DHIS 2	NMCP core HSSP IV
Percentage of health facilities that	Number of health facilities that reported	Number of health facilities	LMIS, EUV	NMCP SP/PF

`	Numerator (if applicable)	Denominator (if applicable)	Data source	Remarks
reported no ACT stock-out for more than one week	no ACT stock-out for more than one week			GF recommended
Percentage of health facilities that reported no RDT stock-out for more than one week	Number of health facilities that reported no RDT stock-out for more than one week	Number of health facilities	LMIS, EUV	NMCP SP/PF GF recommended
Percentage of health facilities submitting timely and complete reports	Number of health facility submitting timely and complete reports	Number of health facility	DHIS2	GF recommended
Proportion of expected health facilities reports received	Number of health facility reports received	Number of health facilities reports expected	DHIS2	NMCP Core
Vector control (ITN/LLIN)				
Number of LLINs distributed through the different distribution channels (SNP, ANC and commercial market) annually	NA	NA	Monthly monitoring report/imple menting partners	PF, GF recommended
Percentage of targeted risk group receiving a LLIN	Number of LLINs distributed through the different distribution channels (SNP, ANC and commercial market)	Number of persons in risk groups targeted for receiving a LLIN	Monthly monitoring report/imple menting partners	GF recommended
Percentage of the population at risk potentially covered by nets distributed	Number of persons with a LLIN from number of LLIN distributed	Number of persons at risk	Quarterly CMM	GF recommended
Number of ITNs/LLINs sold commercially	NA	NA	Commoditie s Tracking	NMCP SP/PF
Vector control (IRS)				
Amount of insecticide procured	Amount of insecticide procured	NA	Commoditie s Tracking	PMI recommended
Number of people trained in IRS	Number of people trained in IRS	NA	Implementin g partners	PMI recommended
Number of environmental compliance management trainings per district	Number of environmental compliance management trainings per district	NA	Implementin g partners	PMI recommended
Percentage of households in designated targeted areas that received IRS in the last 12 months	Number of households sprayed in designated targeted areas in the last 12 months	Number of households in designated targeted areas	Implementin g partners	NMCP SP/PF GF recommended
Number of districts implementing IRS	Number of districts implementing IRS	NA	Implementin g partners	NMCP SP/PF
Surveillance /HMIS				
Number of sentinel sites established for monitoring insecticide resistance	Number of sentinel sites established for monitoring insecticide resistance	NA	Sentinel Surveillance	NMCP Surveillance
Number of studies for monitoring insecticide resistance	Number of studies of insecticide resistance completed according to WHO	NA	Sentinel Surveillance	GF recommended

`	Numerator (if applicable)	Denominator (if applicable)	Data source	Remarks
	protocol			
Number of sentinel sites established for monitoring therapeutical efficacy	Number of sentinel sites established for monitoring therapeutical efficacy	NA	Sentinel Surveillance	NMCP Surveillance
Number of studies for monitoring therapeutical efficacy	Number of studies for monitoring therapeutical efficacy completed according to WHO protocol	NA	Sentinel Surveillance	GF and PMI Recommended
Number of sentinel sites established for monitoring malaria vector	Number of sentinel sites established for monitoring malaria vector	NA	Sentinel Surveillance	NMCP Surveillance
Number of sentinel sites reporting malaria vector indicators	Number of sentinel sites established for monitoring malaria vector	NA	Sentinel Surveillance	NMCP Surveillance
Number of schools reporting parasite prevalence	Number of schools reporting parasite prevalence		Sentinel Surveillance	NMCP Surveillance
Number of health facilities reporting testing pregnant women at first attendances	Number of health facilities reporting testing pregnant women at first attendances			NMCP Surveillance
Supervision				
Percentage of supervision for monitoring and evaluation of the malaria programme	Number of supervision for monitoring and evaluation of the malaria program planned	Number of supervision for monitoring and evaluation of the malaria program performed	Implementing partners	NMCP SP/PF
Percentage of staff who received a supervisory visit during the reporting period	Number of staff who received a supervisory visit during the reporting period	Number of staff to be supervised during the reporting period	SPAM	GF recommended

Key Impact and Outcome for Monitoring & Evaluating Malaria Control and Prevention Activities in Tanzania

Definition	Numerator	Denominator	Data Source	Remarks
Impact Indicators				
All cause under-five child mortality	Number of < 5 years old deaths	Per 1,000 live births	DHS, DSS	NMCP Core and SP/PF GF recommended
Standardized laboratory-confirmed malaria cumulative incidence per year (total population, <5 and 5+)	Number of microscopy or RDT-confirmed malaria cases	Total population. Total < 5, > 5	DHIS2/HMIS	NMCP Core GF recommended
Inpatients malaria cases	No. of inpatient malaria cases per year	Per 10 000 population	DHIS2/HMIS	NMCP Core GF recommended
Inpatient malaria deaths	No. of in-patient malaria deaths per year	Per 1000 population	DHIS2/HMIS	NMCP Core GF recommended
Malaria specific deaths	Number of malaria deaths per year	Per 10 000 population	DSS	GF recommended
Anemia in children under five years of age	Number of children under five years of age with severe anemia Hb <8g/dL	Total number of children < 5 surveyed	DHS/MIS	GF recommended
Malaria parasite prevalence in children 6-59 months of age	Total number of children 6-59 months old with RDT or microscopy confirmed	Total number of children 6-59 months old surveyed	DHS/MIS	NMCP Core, SP/PF

Definition	Numerator	Denominator	Data Source	Remarks
	parasites in blood			GF recommended
Malaria parasite prevalence in sentinel population (school children and ANC 1st attendance)	Number of microscopy or RDT-confirmed malaria cases in sentinel population	Number of sentinel population tested	DHIS2/HMIS, SMPS	NMCP Core
Malaria test positivity rate	Number of microscopy or RDT-confirmed malaria cases	Number of microscopy or RDT-suspect malaria cases tested	DHIS2/HMIS	NMCP Core GF recommended
Entomological Inoculation rate	Sporozoite rate X human biting rate		MVS	NMCP SP/PF
Proportion of live births weighing less than 2,500g	Number of live births weighing less than 2,500g	Total number of live births	DHIS2/HMIS	NMCP core
Outcome Indicators (Coverage)				
Vector Control (ITN)				
Proportion of population that slept under an LLIN the previous night	Number of household members that slept under an ITN the night preceding the survey	Total number of household members who spent the previous night in surveyed households	DHS/MIS/NATNETS	NMCP core, SP/PF GF recommended
Percent of the household population with access to a LLIN within their household (assuming one LLIN covers two persons)	Total number of usual household residents who could sleep under a LLIN assuming that one LLIN covers two persons	Total number of household residents surveyed	DHS/MIS/NATNETS/CMM	NMCP SP/PF GF recommended
Percentage of households with at least one LLIN for every two people	Number of households with at least one LLIN for every two people	Total number of households surveyed	DHS/MIS/NATNETS/CMM	GF recommended
Percentage of children sleeping under LLINs	Number of children under five years of age who slept under an ITN the night preceding the survey	Total number of children under five years of age who spent the previous night in a surveyed household	DHS/MIS/NATNETS	NMCP SP/PF
Percentage of pregnant women sleeping under LLINs	Number of pregnant women who slept under an ITN the night preceding the survey	Total number of pregnant women who spent the previous night in surveyed households	DHS/MIS/NATNETS	NMCP SP/PF
Percentage of household with at least one net	Number of surveyed households owning at least one ITN	Total number of households surveyed	DHS/MIS/CMM	GF periodic review
Vector Control (IRS and LSM)				
Proportion of population protected by IRS in target areas in the past 12 months	Number of people living in houses sprayed with insecticide in the past 12 months in IRS target areas	Total number of people living in IRS target areas	DHS/MIS	NMCP core, SP/PF GF and PMI recommended
Proportion of houses protected by IRS in target areas in the past 12 months	Number of houses in IRS target areas sprayed with insecticide in the past 12 months	Total number of houses in IRS target areas	DHS/MIS/CMM	NMCP core, SP/PF PMI recommended
Proportion of households with at least one ITN and/or sprayed by IRS in the last 12 months	Number of households that have at least one ITN and/or have been sprayed by IRS in the last 12 months	Total number of households surveyed	DHS/MIS/CMM	GF recommended

Definition	Numerator	Denominator	Data Source	Remarks
Percent decrease in larval density in selected areas treated with appropriate larvicides, measured on quarterly intervals	Quarterly larval density in selected areas	NA	Malaria vector database	NMCP SP/PF
Proportion of urban wards implementing environmental management to prevent mosquito breeding sites	Number of urban wards implementing environmental management	Number of urban wards planned to implement environmental management	Malaria vector database	NMCP SP/PF
Number of evidence-based innovations for malaria vector control adopted and integrated introduced in Tanzania	Number of evidence-based innovation initiatives for malaria vector control adopted and integrated introduced in Tanzania	NA	Reports	NMCP SP/PF
Case Management				
Proportion of children under five years of age with fever in the past two weeks, that received ACTs according to national treatment policy within 24hrs of fever onset	Number of children under 5 years of age who had a fever in the past 2 weeks who received ACTs according to national treatment policy within 24 hours of fever onset	Total number of children under five years of age who had a fever in the past two weeks	DHS/MIS	NMCP SP/PF GF recommended
Proportion of children under five years of age with fever in the past two weeks, that received a diagnostic test according to national treatment policy within 24hrs of fever onset	Number of children under 5 years of age who had a fever in the past 2 weeks who received a diagnostic test according to national treatment policy within 24 hours of fever onset	Total number of children under five years of age who had a fever in the past two weeks	DHS/MIS	NMCP core and SP/PF GF recommended
Proportion of women who received at least two doses of IPTp during their last pregnancy that led to a live birth within the last 2 years	Number of women aged 15-49 years who received at least two doses of IPTp during their last pregnancy that led to a live birth within the last 2 years	Total number of surveyed women aged 15-49 years who delivered a live baby within the last 2 years	DHS/MIS	NMCP Core and SP/PF GF recommended
BCC				
Proportion of caretakers who are able to take actions to protect their children from malaria	Number of women aged 15-49 years who reported actions to be taken to protect their children from malaria	Total number of women aged 15-49 years surveyed	DHS/MIS	NMCP SP/PF
Proportion of population (disaggregated by age and sex) with knowledge of ways to avoid and treat malaria	Number of women aged 15-49 years who reported ways to avoid and treat malaria (disaggregated)	Total number of women aged 15-49 years surveyed	DHS/MIS	NMCP SP/PF
Proportion of women 15-49 years who know pregnant women are at higher risk of getting malaria	Number of women 15-49 years who know pregnant women are at higher risk of getting malaria	Total number of women aged 15-49 years surveyed	DHS/MIS	NMCP SP/PF
% of women who state that malaria is the most serious health risk in the community	Number of women who state that malaria is the most serious health risk in the community	Total number of women aged 15-49 years surveyed	DHS/MIS	NMCP SP/PF

Definition	Numerator	Denominator	Data Source	Remarks
Number of BCC interventions and projects in line with the BCC strategy implemented by malaria partners	NA	NA	Document review and site visits	NMCP SP/PF
% of CCHPs that include malaria interventions and budgets	Number of CCHPs that include malaria interventions and budgets	Total CCHP revised	Document review and site visits	NMCP SP/PF
Proportion of people who know the cause of, symptoms of treatment for or preventive measures for malaria	Number of people who know the cause of, symptoms of treatment for or preventive measures for malaria (disaggregated)	Total number of people surveyed	DHS/MIS	GF recommended
Potential Confounding Indicators				
Rainfall and temperature	Expressed as ml and degrees centigrade		Tanzania Meteorological Authority	N/A

APPENDIX 3 HMIS/DHIS2 INDICATORS

All IPD and OPD indicators are divided in age group (< 1 month, 1-11 months, 1-4 years, 5+ years) and gender (Male and Female)

	Indicator	Description	Frequency
OPD	Confirmed Malaria	malaria cases with a positive malaria test result with mRDT or blood smear	Monthly
	Clinical Malaria	probable malaria cases not tested but treated with antimalarials	Monthly
	Mild Moderate Anaemia	clinically or laboratory diagnosed	Monthly
	Severe Anaemia	clinically or laboratory diagnosed	Monthly
	Total OPD attendances:	all cases attending OPD	Monthly
	Suspect malaria cases:	To be estimated by adding up the number of malaria tests performed and the number of clinical malaria cases	Weekly
	Total malaria test:	number of patients tested by mRDT or Microscopy	Weekly
IPD	**Confirmed Malaria Admission**	malaria admission with a positive malaria test results either mRDT or blood smear	Monthly
	Clinical Malaria Admission	probable malaria admission not tested but treated with antimalarials and with a malaria discharge diagnosis	Monthly
	Severe Anaemia Admission:	patients with anaemia primary discharge diagnosis either clinical or laboratory confirmed	Monthly
	Total Admissions:	number of patients admitted	Monthly
	Confirmed Malaria Death	deaths due to malaria, with positive malaria test results either mRDT or blood smear	Monthly
	Clinical Malaria Death	probable death due to malaria, not tested but treated with antimalarials and with a malaria discharge diagnosis	Monthly
	Severe Anaemia Death	death due to anneamia, with death primary discharge diagnosis either clinical or laboratory confirmed	Monthly
	Total Deaths	number of patients died during the admission	Monthly
RCH	**IPTp 1**	ANC attendances receiving the first dose of IPTp	Monthly
	IPTp 2	ANC attendances receiving the second dose of IPTp	Monthly
	IPTp 3+	ANC attendances receiving the third and, eventually, further dose of IPTp	Monthly
	Antenatal first attendance	first ANC attendances before 12 weeks and after 12 weeks of gestational age	Monthly
	Antenatal first attendance malaria tests	first ANC attendances receiving a malaria test	Monthly
	Antenatal first attendance with malaria test positive	first ANC attendances with a positive malaria test	Monthly
	Hb <7 g/dl	Not included in DHIS	NA
	Antenatal LLIN delivery	Pregnant women who received a LLIN at ANC attendance	Monthly
	Infant LLIN delivery	Infant received a LLIN at EPI attendance	Monthly

APPENDIX 4: IMPLEMENTATION PLAN

Specific Objective, Strategic intervention, Activity, *Sub-Activity*		2015/2015	2015/16	2016 17	Funded Y, N, P	source of funds	Implementing Partner
Improve quality, completeness, and timeliness of malaria indicators within the routine health information system		xxx	xxx	xxx	P	GF, GOT PMI	NMCP, HMIS, PMI-C, PSS, IDSR
4.1.1	Support HMIS/DHIS units in the MoHCDGEC to improve quality of reporting malaria indicators and roll out of the electronic DHIS platform at all levels	xxx	xxx	xxx	N	TBD	NMCP, HMIS
	4.1.1.1 Promote the integration of specific malaria indicators in the routine HMIS	xxx			N	TBD	NMCP, HMIS
	4.1.1.2 Strengthen reporting and use of malaria indicators within the second generation district health informaation system (DHIS2)	xxx	xxx	xxx		GF	NMCP, HMIS
	4.1.1.3 Strengthen malaria surveilalnce via existing mHealth platforms (eIDSR)	xxx	xxx	xxx		PMI, GF	NMCP, PSS, PMI C, IDSR
4.1.2	Develop quality assurance/control system for data auditing and verification	xxx	xxx	xxx	N	TBD	NMCP
	4.1.2.1 Conduct data auditing and verification verification	xxx	xxx	xxx	N	TBD	NMCP
Establish a comprehensive framework for collecting, processing and storing essential malaria indicators from periodic service delivery and programmatic surveys		xxx	xxx	xxx	Y	GF, PMI, WB, DFID, GOT	NMCP, NBS, LGA
4.2.1	Establish selected sentinel districts/sites to capture non-routine malaria data on quality of care	xxx	xxx	xxx	Y		
	4.2.1.1 Strengthening of SME system through selected Sentinel Districts	xxx	xxx	xxx	Y	GF	NMCP, LGA
4.2.2	Collaborate with the National Bureau of Statistics to ensure the regular national representative population surveys and other specific sub-national surveys include relevant malaria indicators			xxx	P	GF, PMI	NBS
	4.2.2.1 Support implementation of National representative surveys			xxx	Y	GF, PMI	NBS
	2.2.2.2 Perform Periodic Malaria Surveys				P	GF	NMCP, Res
4.2.3	Establish countrywide longitudinal vigilance of malaria parasitaemia in sentinel population: pregnant women and infants at RCH clinics, school-age children				P	PMI, GF	NMCP, LGA, PMI-C
	4.2.3.1 Expand RCH clinics malaria sentinel population surveillance (RSPS)				P	PMI, GF	NMCP, LGA, PMI-C
4.2.4	Establish and expand longitudinal monitoring of mosquito population dynamics and behaviour in sentinel sites and strengthen surveillance of insecticide susceptibility	xxx	xxx		Y	GF, PMI	NMCP, Res
	4.2.4.1 Longitudinal entomological monitoring	xxx	xxx		Y	GF, PMI	NMCP, Res
	4.2.4.2 Conduct Malaria Vector Insecticide Susceptibility Tests (IST)	xxx	xxx		P	PMI	NMCP, Res
4.2.5	Coordinate and oversee the implementation of standard antimalarial efficacy tests as per WHO guidelines by national research institutions	xxx	xxx	xxx	Y	GF, PMI, WB	NMCP, Res
	4.2.5.1 Conduct Monitoring Efficacy of antimalarial treatment in 8 sentinel sites	xxx	xxx	xxx	Y	GF, PMI, WB	NMCP, Res
4.2.6	Coordinate the collection, use, and interpretation of the programmatic monitoring of vector control initiatives (including LLINs, IRS, and LSM)	xxx	xxx	xxx	P	PMI, GF, GOT	Res

Specific Objective, Strategic intervention, Activity, *Sub-Activity*		2015/2015	2015/16	2016 17	Funded Y, N, P	source of funds	Implementing Partner
	4.2.6.1 Conduct LLIN evaluation surveys	xxx	xxx	xxx	P	GF	Res
4.2.7	Regularly update malaria epidemiological profile	xxx		xxx	P	DFID, TBD	NMCP, Res
	4.2.7.1 Develop and update Country Epidemiological Profile	xxx		xxx	P	DIFID, TBD	NMCP, Res
Establish and maintain a comprehensive and effective malaria knowledge management system to collate, interpret, disseminate, and promote the use of quality malaria data for evidence-based decision making at national and district level		xxx	xxx	xxx	Y	GF	NMCP
4.3.1	Establish a national SME Partnership Framework	xxx	xxx	xxx	Y	GF	NMCP
	2.3.1.1 Strenghten capacity of the SME team of the NMCP	xxx	xxx	xxx	Y	GF	NMCP
4.3.2	Develop a national malaria data management plan and data repository to enable evidence-based decision making at all levels	xxx	xxx		P	GF, PMI	NMCP
	4.3.2.1 Establish and maintain a Centralized National Malaria Composite Database with programmatic and specific malaria indicators	xxx	xxx		P	GF, PMI	NMCP
4.3.3	Undertake periodic malaria programme reviews and evaluation of the implementation of malaria strategic plan				P	GF, PMI	NMCP
	4.3.3.1 Conduct Malaria Programme Review to evaluate the status of the strategic Plan				p	GF, PMI	NMCP
Design and support the implementation of a comprehensive malaria surveillance and response system for epidemic-prone districts		xxx	xxx		P	GF, PMI, TBD	NMCP, Res, PMI-C, TMA, LMU, PSS, LGA
4.4.1	Mapping malaria epidemic prone districts including identification of epidemic "hot spots" and investigation of local epidemic predisposing factors	xxx	xxx		N	PMI, TBD	NMCP, Res
	4.4.1.1 Develop maps of the identified malaria epidemic-prone districts with risk stratification	xxx	xxx		N	PMI, TBD	NMCP, Res
4.4.2	Strengthen Capacity for malaria epidemics containment at district and health facility level in epidemic prone districts	xxx			P	PMI	NMCP, PMI-C, LGA
	4.4.2.1 Disseminate the national malaria surveillance and response guidelines	xxx			P	PMI	NMCP, PMI-C
	4.4.2.2 Facilitate districts to develop malaria epidemics preparedness plans	xxx			P	GF	NMCP, LGA
4.4.3	Establish Malaria Epidemic Early Warning System (MEEWS) and Malaria Epidemic Early Detection System (MEEDS)	xxx			N	TBD	NMCP, IDSR, PMI-C, DHIS2, LMU, PSS, TMA
	4.4.3.1 Set up MEEWS at national and district level	xxx			N	TBD	NMCP, PSS, LMU
	4.4.3.1 Set up MEEDS at national, district and health facility level	xxx	xxx		N	TBD	NMCP, IDSR, PMI-C, DHIS2
4.4.4	Carry out malaria outbreaks response		xxx		Y	GF	NMCP
	4.4.4.1 Facilitate selected districts to implement malaria outbreak response		xxx		Y	GF	NMCP

APPENDIX 5: DETAILED SME BUDGET, 2014 – 2017

Source Business Plan 2014-2017 (in USD)

		USD							
		Total Available		Total Needed		Gap		Requested to GF NFM	
		Total 2013 to 2015	Total 2016 to 2017	Total 2013 to 2015	Total 2016 to 2017	Total 2013 to 2015	Total 2016 to 2017	Allocation	Above Allocation
4	To provide timely and reliable information to assess progress towards the set global and national targets, to ensure resources are used in the most cost-effective manner and to account for investments made in malaria control	$10,332,478	6,005,750	11,437,478	14,397,230	605,000	8,391,480	4,623,637	812,396
4.1	Improve quality, completeness, and timeliness of malaria indicators within the routine health information system	2,262,019	900,000	2,262,019	3,527,127	-	2,627,127	1,450,000	-
4.1.1	Support HMIS/DHIS units in the MoHCDGEC to improve quality of reporting malaria indicators and roll out of the electronic DHIS platform at all levels	2,262,019	900,000	2,262,019	3,027,127	-	2,127,127	1,000,000	-
4.1.2	Develop quality assurance/control system for data auditing and verification	-	-	-	500,000	-	500,000	450,000	-
4.2	Establish a comprehensive framework for collecting, processing and storing essential malaria indicators from periodic service delivery and programmatic surveys	5,974,067	5,105,750	6,974,067	9,727,000	500,000	4,621,250	2,618,657	812,396
4.2.1	Establish selected sentinel districts/sites to capture non-routine malaria data on quality of care	228,981	1,700,000	228,981	2,171,947	-	471,947	500,000	-
4.2.2	Collaborate with the National Bureau of Statistics to ensure the regular national representative population surveys and other specific sub-national surveys include relevant malaria indicators	2,143,650	1,500,000	2,143,650	2,682,156	-	1,182,156	1,000,000	-

Code	Activity							
4.2.3	Establish countrywide longitudinal vigilance of malaria parasitaemia in sentinel population: pregnant women and infants at RCH clinics, school-age children	282,361	-	782,361	736,189	500,000	736,189	600,000	-
4.2.4	Establish and expand longitudinal monitoring of mosquito population dynamics and behaviour in sentinel sites and strengthen surveillance of insecticide susceptibility	1,725,000	1,328,250	1,725,000	2,630,000	-	1,301,750	402,500	812,396
4.2.5	Coordinate and oversee the implementation of standard antimalarial efficacy tests as per WHO guidelines by national research institutions	1,142,876	577,500	1,642,876	1,155,777	-	578,277	-	-
4.2.6	Coordinate the collection, use, and interpretation of the programmatic monitoring of vector control initiatives (including LLINs, IRS, and LSM)	251,198	-	251,198	228,710	-	228,710	-	-
4.2.7	Regularly update malaria epidemiological profile	200,000	-	200,000	122,222	-	122,222	116,157	-
4.3	**Establish and maintain a comprehensive and effective malaria knowledge management system to collate, interpret, disseminate, and promote the use of quality malaria data for evidence-based decision making at national and district level**	**1,239,516**	**-**	**1,344,516**	**549,613**	**105,000**	**549,613**	**404,980**	**-**
4.3.1	Establish a national SME Partnership Framework	170,802	-	275,802	276,472	105,000	276,472	154,980	-
4.3.2	Develop a national malaria data management plan and data repository to enable evidence-based decision making at all levels	910,390	-	910,390	150,000	-	150,000	150,000	-
4.3.3	Undertake periodic malaria program reviews and evaluation of the implementation of malaria strategic plan	158,324	-	158,324	123,141	-	123,141	100,000	-
4.4	**Design and support the implementation of a comprehensive malaria surveillance and response system for epidemic-prone districts**	**856,877**	**-**	**856,877**	**593,490**	**-**	**593,490**	**150,000**	**-**
4.4.1	Mapping malaria epidemic prone districts including identification of epidemic "hot spots" and investigation of local epidemic predisposing factors	150,000	-	150,000	91,667	-	91,667		

4.4.2	Strengthen Capacity for malaria epidemics containment at district and health facility level in epidemic prone districts	560,504	-	560,504	253,920	-	253,920		
4.4.3	Establish Malaria Epidemic Early Warning System (MEEWS) and Malaria Epidemic Early Detection System (MEEDS)	-	-	-	150,000	-	150,000	150,000	-
4.4.4	Carry out malaria outbreaks response	146,373	-	146,373	97,903	-	97,903		