National Strategic Plan

for Malaria Elimination

2017-2021

National Malaria Programme
Timor-Leste

Table of Contents

List of Tables

List of Figures

List of Boxes

Acronyms used

ABER	Annual Blood Examination Rates
ACD	Active Case Detection
ACT	Artemisinin based combination Therapy
API	Annual Parasite Incidence
BSP	Basic Services Package
Bti	*Bacillus thuringiensis israeliensis*
BW	Body Weight
CHC	Community Health Centres
CHV	CHVs
CQ	Chloroquine
DOTS	Directly Observed Treatment Schedule
DRTL	Democratic Republic of Timor-Leste
ELISA	Enzyme-Linked ImmunoSorbent Assay
G6PDd	Glucose-6-phosphate Dehydrogenase deficiency
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
GPS	Global Positioning System
HR	Human Resources
IEC	Information, Education and Communication
IGR	Insect Growth Regulator
IPVM	Integrated Pest and Vector Management
IR	Insecticide Resistance
IRS	Indoor Residual Spraying
LLIN	Long Lasting Insecticide-treated Nets
LSM	Larval Source Management
M&E	Monitoring and Evaluation
MCH	Maternal and Child Health
MDA	Mass Drug Administration
MMO	Municipality Malaria Officer
NGO	Non-Governmental Organization
NHSSP	National Health Sector Strategic Plan
NMCP	National Malaria Control Programme
NMP	National Malaria Programme
NMS	National Malaria Strategy
PCD	Passive Case Detection
PCR	Polymerase Chain Reaction
Pf	*Plasmodium falciparum*
PSF	*Promotor Saúde Familiar*/CHVs
RDT	Rapid Diagnostic Tests
SISCa	Servisu Integradu da Saúde Comunitária/Integrated Community Health Services
SOP	Standard Operational Procedures
WHO	World Health Organization
WHOPES	World Health Organization Pesticide Evaluation Scheme

Executive Summary

The epidemiology of malaria in Timor-Leste has changed dramatically in the last decade, particularly in the last five years. In 2016, only 95 cases were reported compared to nearly 20,000 confirmed cases in 2011. This drop has come about due to a well-funded programme with a technically strong strategy built on the foundation of a rapidly evolving health system that is providing basic health services down to the household level.

Timor-Leste has already progressed to the malaria elimination phase with a national Annual Parasite Incidence (API) of less than one per 1000 population since 2013. Timor-Leste has already taken steps towards malaria elimination by re-orienting the programme in 2015 and commencing case and foci investigations in 2016. Indigenous transmission has been interrupted in three of the 13 municipalities for two years; there was no transmission in five other municipalities in 2016.

The National Malaria Strategic Plan 2015-2020 is out of date. The National Strategic Plan 2015-2020 was written with the goal of reducing the level of malaria morbidity and mortality in Timor-Leste in 2012 by 30% by the year 2017, and to further reduce cases by 20% by 2020. Instead, by 2016 morbidity had already decreased by 99 percent (compared to 2010) and mortality had reached zero. In addition, all the impact indicators, all the output and process indicators have been met or exceeded thereby making that plan obsolete. This National Strategic Plan for Malaria Elimination 2017-2021 was developed with the goal of interrupting indigenous malaria transmission by end 2021. Secondary objectives include prevention of re-introduction of malaria in municipalities where indigenous transmission has already been interrupted and to have zero deaths due to indigenous malaria.

The National Malaria Programme and the Ministry of Health are committed to malaria elimination by end 2021. A high level Task Force for Malaria Elimination directly under the Prime Minister will be established to sustain political and financial commitment and to oversee the implementation of the malaria elimination programme.

The National Strategic Plan for Malaria 2017-2021 is based on three key interventions and two supporting elements. The key interventions include universal access to early diagnosis and prompt treatment, malaria prevention and intensified surveillance. The two supporting elements are expanding research for innovation and strengthening the enabling environment. These approaches are based on the Global Technical Strategy for Malaria 2016-2030.

Universal access to malaria diagnosis and treatment will focus on three channels of service delivery: the public sector, community based organisations and the private sector. To ensure optimal case-management, surveillance and reporting during the elimination phase, private sector and community based organisation providers will be required to test and treat patients according to National Malaria Treatment Guidelines and will be required to notify all positive cases to the local health authorities within 24 hours of diagnosis. The Ministry of Health will develop and enact required legislature for this purpose.

Quality assured RDTs and/or microscopy facilities will be available at all health care institutions in the public sector, the private sector and outlets of community based organizations. While microscopy is available at larger institutions (National Hospital, Referral Hospitals, Community Health Centres), RDTs will be made available in larger institutions with microscopy facilities for use in emergencies, after normal working hours and in outreach clinics. RDTs will be available in all existing Health Posts as currently practiced. Quality RDTs and ACTs, as currently practised, will be available with malaria volunteers (PSF-*Promotor Saude Familiar*). Additional malaria volunteers will be recruited in the border sub-municipalities for intensified surveillance.

Treatment for falciparum and non-falciparum malaria will be based on national treatment guidelines. All malarial infections will be treated with ACTs. Radical treatment of vivax infections is currently done using the eight-week regimen and will continue. If point-of-care G6PDd testing becomes available, the programme will commence the 14-day regimen if the patient is not G6PD deficient. The DOTS strategies for all confirmed malaria patients will be continued and follow up of confirm cases will be initiated for to ensure parasite and clinical clearance.

Active case detection will be intensified among vulnerable populations such as populations living in border areas and in foci, service personnel serving in these areas, and other risk groups including migrant labour. Additional health posts will be established including at border crossing points. Pregnant women in border areas, Oecusse municipality in the first trimester during the visit of antenatal clinics and in foci, and blood donors will be screened for malaria.

Use of Long Lasting Insecticidal Nets (LLINs), Indoor Residual Spraying (IRS), larval breeding source reduction, use of larvivorous fish and personnel protection methods have been used as vector control measures in the country; the two major strategies for malaria prevention have been LLINs and IRS. As the country moves towards malaria elimination, the focus of operations shifts from malaria prevention to intensified surveillance with a shift from mass distribution of LLINs and preventive IRS to focal application of both interventions for protecting high risk populations and as a part of the response to foci.

The selection of vector control interventions will be guided by an eco-epidemiological assessment informed by malaria case and entomological surveillance data. Implementation will be done within the 'Integrated Vector Management' (IVM) framework to ensure optimal use of resources. Use of insecticides in vector control will be guided by technical recommendations provided in the National Insecticide Resistance Monitoring and Management Plan which was developed based on WHO's 'Global Plan for Insecticide Resistance Management in Malaria Vectors'. Monitoring of insecticide resistance will be carried out every year.

Targeted mass distribution of LLINs will continue in Oecussi municipality because it is surrounded by Indonesia's West Timor where the malaria incidence is 2-3 times higher than in Timor Leste and where the land and sea border between the two countries is very porous. In addition, large development projects have been initiated within the municipality with large scale influx of foreign labour from neighbouring Indonesia who are likely to bring in imported malaria in to the country and initiate local malaria outbreaks. Furthermore, mass LLINs distribution will be carried out in Sucos in border areas with West Timor in Covalima and Bobonaro districts.

In Atauro island, large scale migration of fishermen to Indonesia occurs and many cases of imported malaria due to this activity have been recently reported. The situation will be assessed and targeted distribution of LLINs may be considered if necessary.

Focal IRS will be carried out in response to case detection in all houses within a 1.5 km radius of a case. This will be an additional intervention in areas where LLINs have already been distributed. Insecticides used for IRS will be of a different class to that used for LLINs as per WHO recommendations and the national insecticide resistance monitoring and management plan of Timor-Leste. The insecticides used for IRS will be rotated yearly.

IRS will also be used to protect populations resident in established foci. IRS will be carried out in 2017 in Oecusse municipality and the border areas of Covalima and Bobonaro municipalities due to their proximity to West Timor and in Atauro island. The decision as to whether to continue with IRS further in Oecusse municipality and in the border areas of Covalima and Bobonaro municipalities will be reviewed annually based on available epidemiological and entomological data and the malaria situation in the province of Timor in Indonesia.

Regular Distribution of LLINs to pregnant women through antenatal clinics will be carried in Oecusse municipality, Sucos in the border areas with West Timor in Bobonaro and Covalima municipalities and Atauro island as per the Reproductive Maternal Neonatal and Child Health Strategy 2015-2020.

As the National Malaria Programme moves from the control phase to the elimination phase, the focus of the surveillance system must change. In the control phase the focus is on cases which are reported as aggregate data monthly. In the elimination phase surveillance changes to a case based approach where the focus is on infections which must be detected, notified immediately, radically treated and investigated. This change is critical during the elimination phase. Documentation of all surveillance activities is required for eventual certification.

The National Malaria Programme started case-based surveillance with case and foci investigation in 2016. Case-based notification, investigation and response strategy for malaria elimination is immediate notification through phone call within 24hrs, foci investigation and classification within 3 days, reactive based case detection within 5 days, entomology Surveillance within 3-5 days, and IRS /LLINs within 10 days and monitoring of parasite and clenical clearance day 0,1,2,3,7,21,24 and 28 days by combination of DOTs and microcopy Guide lines and reporting formats have been developed and there is a formal verification system in place. Case-based surveillance will be intensified to include the private sector and community based organizations.

Routine entomological surveillance that was done during the control phase will be scaled back and eventually limited to foci investigation except in Oecusse municipality and Hera Suco in Dili municipality. Special entomological surveys will be carried out if there is an unusual increase of cases in each area.

As part of strengthening the enabling environment, intra- and inter-sectoral collaborations will be enhanced and initiated. A major effort will be focused on establishing and facilitating cross border collaboration to ensure that malaria elimination is sustainable in Timor-Leste by promoting “elimination of malaria in the island of Timor”. Other activities will include carrying out behavioural change communication and developing a sensitive monitoring and evaluation system.

1. Background

1.1 Introduction

Malaria was a major public health problem in the country 10 years ago. With implementation of evidence based malaria control measures, the reported number of malaria cases decreased from 223,002 cases in 2006 to less than 100 cases in 2015 and 2016.

The National Malaria Control Strategy 2015-2020 was written with the goal of reducing the level of malaria morbidity and mortality in Timor-Leste in 2012 by 30% by the year 2017, and to further reduce cases by 20% by the year 2020. The strategy was based on four strategic approaches: 1) Enhancing case management through early case detection and delivery of effective antimalarial therapies, 2) Universal access to LLINs, 3) Integrated vector management, and 4) Epidemic preparedness and prevention, forecasting and outbreak response; and three cross cutting approaches: 1) Behavioural Change Communication (BCC) through Information, Education and Communication (IEC) campaigns, 2) Monitoring and evaluation, and 3) Operations and implementation research.

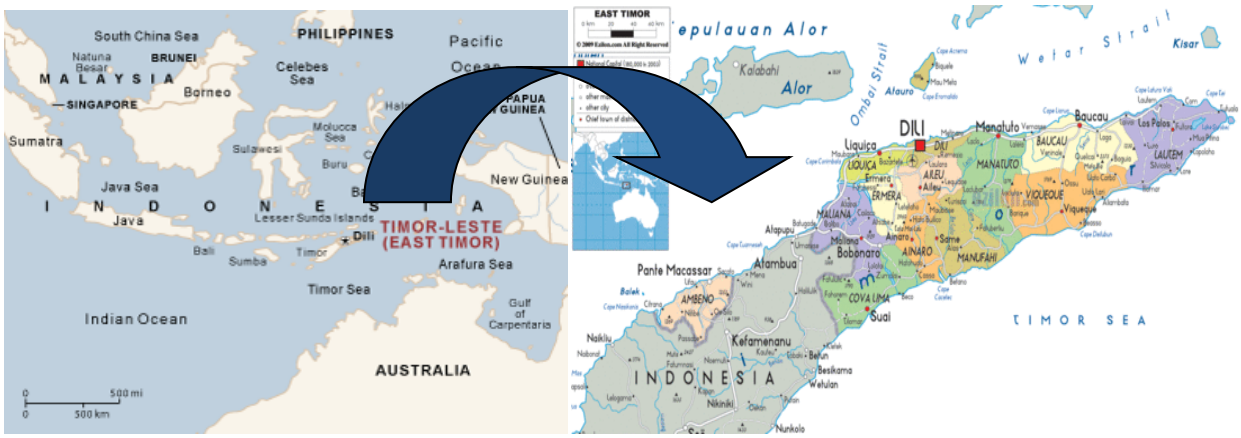
The National Malaria Control Programme (NMCP) has exceeded all the impact targets of the National Malaria Control Strategy 2015-2020. Performance of the coverage/output indicators far exceeds the set targets. The API for the whole country has been less than one per 1000 population since 2013, the benchmark index to commence the elimination phase. In 2015 and 2016, the API was 0.07 and 0.08 per 1000 population, respectively. In 2016, malaria was reported in only five out of 13 municipalities in the country with 88 out of 95 (93%) cases being reported from Oecusse municipality. No cases of malaria have been reported for two years (2015 and 2016) in three municipalities (Aileu, Lautem and Liquica). There have been no deaths due to malaria in 2015 and 2016.

Based on the progress made, the external mid-term review team recommended that Timor-Leste move into the elimination phase. Moving into elimination requires programmatic changes with a different set of objectives. strategies and inputs. This National Strategic Plan for Malaria Elimination 2017-2020 is developed with the objective of having zero indigenous malaria cases by end 2021.

1.2 Country profile

The location of the *Republica Democratica de Timor-Leste* (referred to as Timor-Leste in subsequent sections) in relation to its neighbours is shown in Figure 1. It occupies primarily the eastern half of the island of Timor, with West Timor being part of the Republic of Indonesia. The country includes the nearby islands of Atauro and Jaco, in addition to Oecusse, an exclave in Indonesian West Timor. The island of Timor is located between 8°50′S and 125°55′E, and the country covers a total area of 14,954 square kilometres (National Statistics Directorate, 2014). The island's topography consists of 80% mountains with the highest peak of Gunung Tatamailau, reaching up to 2960 m. The maximum east-west length is 364 kms and the maximum north-south length is 149 kms. The coastal plains comprising swamps are narrow; there are no major highland valleys or permanent rivers.

Figure 1. Map of location of Timor-Leste



The country is divided into 13 municipalities (formerly called districts) which includes Dili, the capital of the country. Each municipality is divided into sub-municipalities (formerly called sub-districts), and each sub-municipality is divided into *sucos* (village); each *suco* comprises a few *aldeias* (hamlets). In total, there are 13 municipalities, 65 sub-municipalities, 442 *sucos* and 2225 *aldeias* (National Statistics Directorate, 2014). Dili is the largest city and the main port. The second-largest city is the eastern town of Baucau. Dili has the only functioning international airport; there is an airport in the exclave of Oecussi with regular flights to and from the mainland.

The President of the Republic is the head of state of Timor-Leste elected by popular vote for a five-year term. The leader of the majority party elected to Parliament is invited to be the Prime Minister by the President. The Prime Minister functions as the head of government. The Ministry of Health (MoH) is under the purview of the Minister of Health.

Power is delegated from the central administration to the local administration (municipality). Health services are provided by the local administration. In mid-2014, the Timor-Leste government made the Oecusse municipality a Special Economic Zone. The administration of the Special Economic Zone has, autonomous privileges with different rules and regulations which govern the rest of the country.

1.3 The health system

Medical and health care is a fundamental right of a citizen in the constitution of Timor-Leste. The State is obliged to protect and promote that right through the establishment of a national health system that is universal, general, provided free of charge wherever possible, and managed through a decentralized participatory structure.

While acknowledging that health problems and their determinants are not solely within the boundaries of the health sector and its responsibility, the MoH envisions a broad definition of health to ensure *"Healthy East Timorese people in a healthy East Timor"*. The MoH envisages a

Timorese community enjoying a level of health that will allow them to develop all their potentialities in a healthy environment. The vision also reflects an aim to reduce poverty to a point where the level of production and income allows all Timorese individuals to enjoy a healthy life and to have the minimum means to cover basic needs.

In consistent with the vision statement, the mission of the MoH is to strive to ensure the availability, accessibility and affordability of health services to all East Timorese people, to regulate the health sector and to promote community and stakeholder participation as well as other sectors.

The MoH comprises 5 directorates for community health services; planning and finance; administration, logistics and procurement; hospital and referral services; and for human resources. The NMCP is under the Department of Communicable Disease Control which is under the Directorate of Community Health Services. The curative institutions are under the Directorate of Hospital and Referral services.

Medical care in Timor-Leste is provided by six hospitals (five Regional Hospitals and one National Hospital, 69 community health centres and 273 active health posts in the public sector; in addition, there are 56 active private sector providers (including the informal sector), most of whom are in Dili (Table 1). The government plans to have a 442 health posts in the country, one each for each suco. Three hundred and six health posts have been established but only 273 are currently active (Table 1). Primary health care services are provided through the District Health Service structure, with Community Health Centres, Health Posts and Mobile Clinics servicing geographically defined populations within a framework of the basic services package (BSP) while incorporating SISCa (Integrated Community Health Services). Management authority and responsibility has been devolved to district health teams.

As part of primary health care services, a national family health programme was initiated in July 2015. In this programme, domiciliary visits are made by teams comprising a medical practitioner and health staff stationed at health posts with the aim of identifying health problems in families and prioritizing them. Details of households and family members including their health status are obtained. Persons with health conditions and illnesses that require further treatment and/or follow up are identified. These persons are referred for appropriate care. Data are entered into a national database.

Table 1. Health care institutions in Timor-Leste

Municipality	Public Sector						Private sector		
	CHC		Health Posts		Regional Hospital	National Hospital	In operation	Closed	not renewed / registration expired
	Established	Active	Established	Active					
Aileu	4	4	28	12			1		
Ainaro	4	4	18	14	1		4	1	2
Bobonaro	6	8	24	24	1		2		
Baucau	8	6	28	24	1		3	3	
Covalima	7	7	13	13	1		1	1	
Dili	7	6	18	17		1	29	0	13
Ermera	6	6	23	27			6		6
Lautem	5	5	31	25			2		
Liquiça	3	3	18	22			3		3
Manatuto	6	6	21	19			1		1
Manufahi	4	4	23	17			1		1
Oecusse	4	4	17	17	1		1		1
Viqueque	5	5	44	42			2		1
Total	69	68	306	273	5	1	56	5	28

1.4 Overview of the National Malaria Control Programme

The NMCP was established in 2003 under the Communicable Disease Control Division. At its inception in 2003, the National Malaria Unit had only two temporary National Malaria Control Officers and one Driver employed by the GFATM round 2 Grant. NMCP is responsible for planning, implementation, monitoring and evaluation of malaria control activities in the country. At the National level, there is a Programme Manager under whom all NMCP activities are carried out. The National Malaria Programme was strengthened in 2010 through a GF Round seven grant. Under the Programme Manager, there are four regional malaria officers, an M&E officer, a data entry officer, three vector control officers, an administration officer and an entomology team consisting of 4 entomology assistants and an insect collector. A long term technical adviser funded by the global fund was recruited to improve the technical and managerial capacity of the NMCP.

District Malaria Officers have been appointed to all 13 districts. Focal points for malaria were appointed for 29 high risk malaria sub districts in 2009 and 36 were appointed in 2012. The district health teams work in consultation and in coordination with the Regional Malaria Officers at the National level. Four district entomological teams were established in 2013. Furthermore, spraying supervisors and spray machine operators were recruited as temporary staff from August to December every year since 2010 to carry out IRS in epidemic prone areas of six districts prior to the malaria high transmission season. The organogram of the NMCP is given in Figure 2. The implementation arrangements are given in Figure 3.

Figure 2. Organogram of the National Malaria Control Program

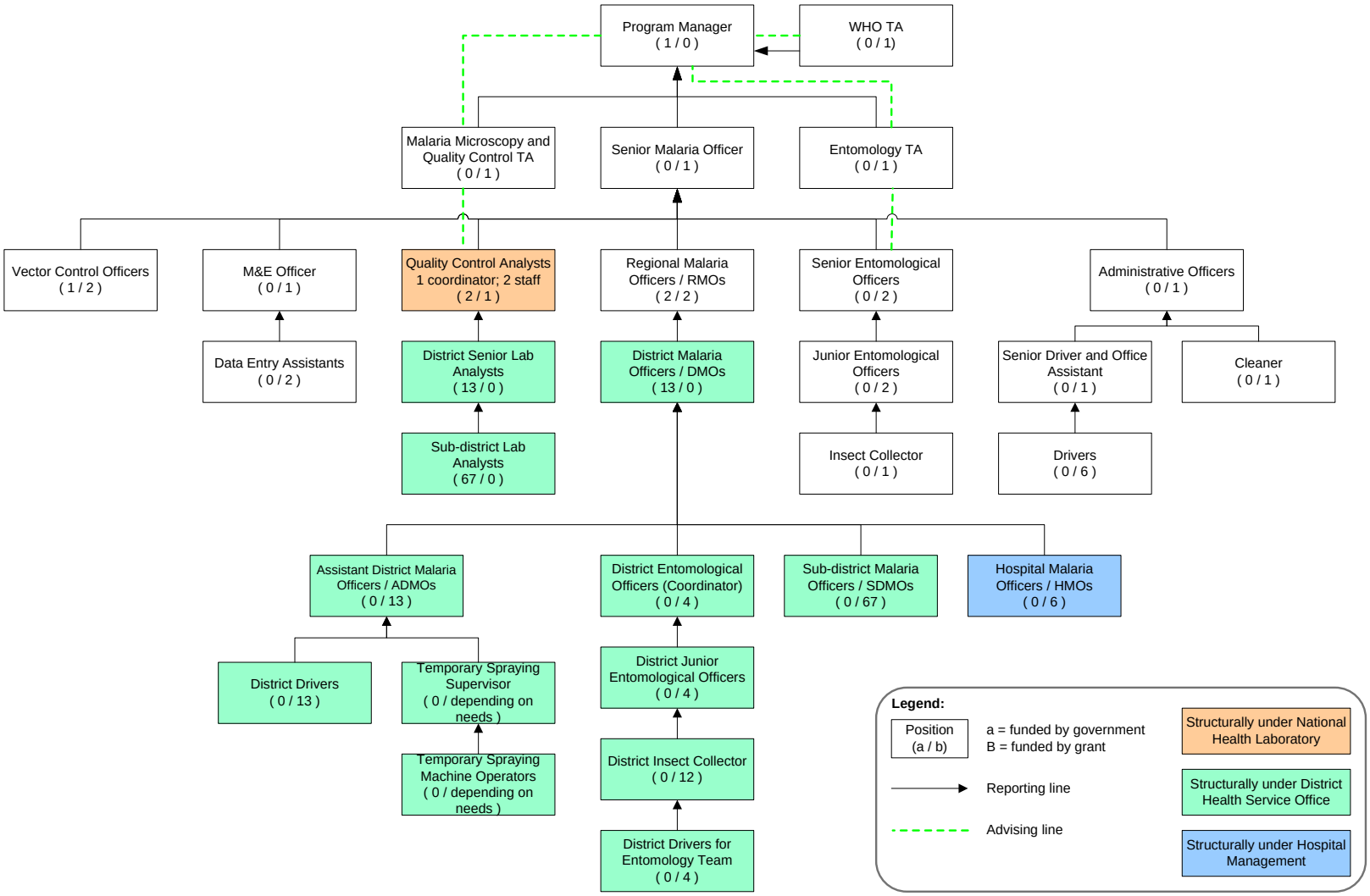
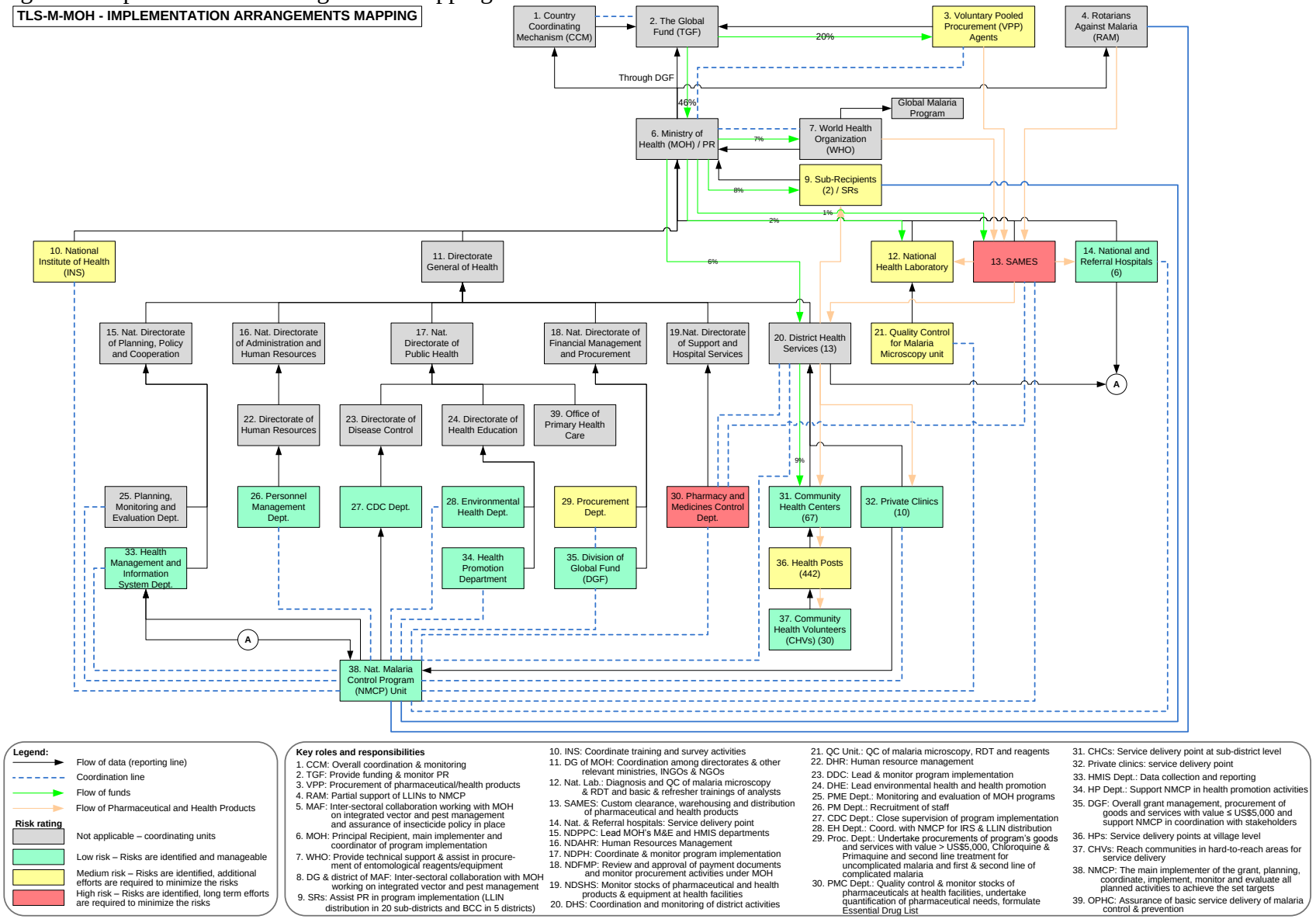


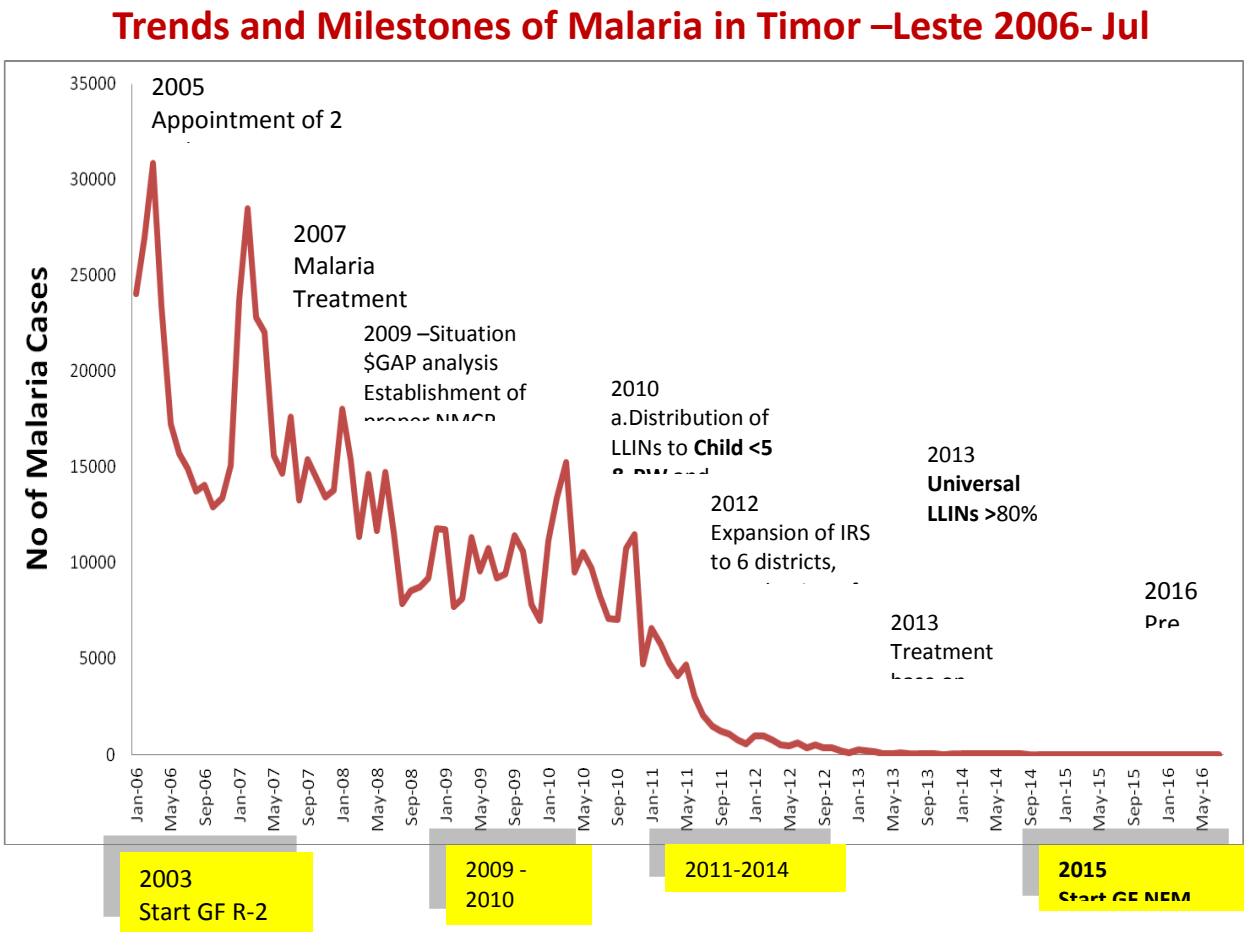
Figure 3. Implementation Arrangements mapping



1.5 Milestones in malaria control in Timor-Leste (Figure 4)

- 2005 –Establishment of the NMCP in Timor-Leste with two Officers
- 2006-Implementation of the National Malaria Control Strategy 2003-2013
- 2007- Implementation of National Malaria Treatment Guidelines
- 2007 July: Introduction of ACT and monovalent RDTs (which detect *P. falciparum*)
- 2009 April – Initiate GF round 7 for malaria control
- 2009 September-Strengthening of NMCP by employing staff at national level (Regional Malaria Officers, Entomology Teams, Quality Control Analysts) and District teams consisting of 13 District Malaria Officers (now designated as Municipality Malaria Officers) and 29 malaria focal points in high risk malaria sub-districts (sub-municipalities).
- 2010- Revision of the National Malaria Control Strategy 2010-2020
- 2010- Distribution of 166,605 LLINs to children <5 and pregnant women
- 2010 August-December- Implementation of Indoor Residual Spraying (IRS) as a pilot study in 5 sub-districts in Covalima, Manatuto and Dili Districts
- 2011 February- Introduction of bivalent RDTs which detect both *P. falciparum* and *P. vivax*
- 2012 January- initiation of GF round 10 malaria grant
- Expansion of IRS to 6 districts.
- 2013- Treatment based on confirmed diagnosis
- 2013- Universal coverage of risk population with LLINs
- 2016- Transited into pre-elimination/elimination phase

Figure 4. Trends of malaria and milestones of NMCP in Timor-Leste 2006-2016



1.6 Malaria Situation in the country

The malaria landscape in Timor-Leste has dramatically changed in the last 10 years (Tables 2 and 3 and Figure 5). The reported number of malaria cases has reduced from 223,002 cases in 2006 to 80 cases in 2015 and 95 cases in 2016. The national API in 2015 and 2016 was 0.07 and 0.08, respectively, within the criterion to target elimination. Since 2013 the national API has been less than 1 per 1000 population. In 2015, malaria cases were reported from nine municipalities (Table 3). In 2016, three municipalities that did not report cases in 2015 had zero cases in 2016 (Aileu, Lautem and Liquiça). In addition, in 2016, no cases of malaria were reported from Ainaro, Baucau, Covalima, Manatuto and Manufahi municipalities.

Of the 95 cases reported in 2016, one case from Dili was treated as a "suspected" case despite microscopy and RDT being negative. The rest of the 94 confirmed cases were reported from 5 municipalities. Both in 2015 and 2016, the majority of cases were reported from Oecusse municipality (49 out of 80 in 2015and 88 out of 95 in 2016 with an API>1 per 1000 population). Some of the factors that are responsible for this situation include geographic location of the district outside the mainland making supervision difficult, being bordered by Indonesia's West Timor which is still in the malaria control phase coupled with undocumented migration across a porous border, capacity of the district malaria team and administrative delays (the major reason) that contributed to delayed case and foci investigations and response in 2016.

A major reason for the decline in the number of reported cases is the decrease in the number of clinically treated cases due to the rapid scale-up of quality malaria diagnosis by Rapid Diagnostic Tests (RDTs) in remote areas through community health volunteers and other health staff. A later directive to treat only confirmed cases also helped. Another important reason for the decline in malaria incidence was the scaling up of vector control operations based on entomological surveillance and epidemiological stratification that assessed vulnerability and receptivity.

In 2012 and 2013, the Annual Blood Examination Rate (ABER) was about 10%. ABER has declined since then probably reflecting the decreased transmission. Although instructions have been given to test all fever cases for malaria, the decrease in malaria incidence is likely to result in fewer referrals for malaria testing. The ABER by district for 2016 is given in Figure 6. It is essential that an ABER of 5-10% be maintained especially as there is recent evidence of malaria transmission in different parts of the country.

With the introduction of RDTs, malaria diagnostic and treatment services were extended to remote hard-to-reach areas. With the reduction in the number of cases, sometimes both RDT and microscopy are performed. This is a good practice as the skills of Laboratory Analysts may also be waning due to the low number of cases being reported. All positive cases are microscopically confirmed at the National Laboratory by expert laboratory analysts.External competency assessments of laboratory analysts have been carried out in 2008, 2011 and 2016 for accreditation purposes in accordance with WHO recommended standards.

In the past malaria transmission was correlated with the rainy season. The rainy season generally extends from about December/January to about April. Malaria transmission peaks during this time – the first trimester of the year. With the reduction in the number of reported malaria cases, the seasonal variation of malaria transmission has disappeared and cases are now reported sporadically.

Malaria deaths

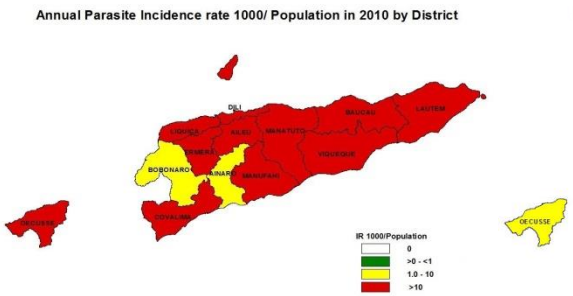
The highest number of deaths due to malaria (n=58) were reported in 2006 and 2010. The number of deaths due to malaria has shown a steady decline since then and zero deaths were reported in 2015 and 2016. The decline in the deaths due to malaria is a direct result of early detection of cases, provision of effective treatment and making available intravenous drugs and suppositories in Community Health Centres with inpatient facilities and in higher level institutions. As death reporting is not mandatory in the country and as most deaths occur in the community, this needs to be verified with robust data from the field.

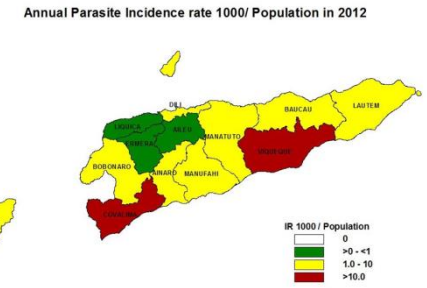
Table 2. Number of malaria cases detected and deaths by species 2006-2016

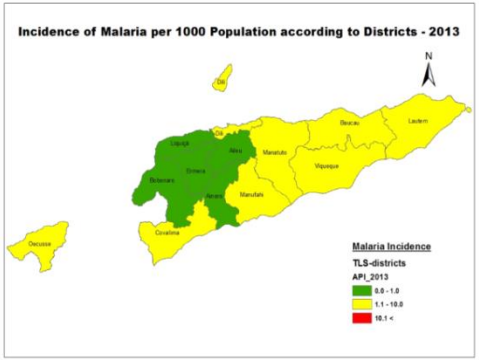
Year	Population	Clinically treated cases	Confirmed cases	*Pf*	*% Pf*[1]	*Pv*	Mixed infections	Total	Deaths	API[2] (/1000 pop)	Incidence[3] (/1000 pop)
2006	1,015,187	185,106	37,896	24,219	64.44	13,477	200	223,002	58	37.33	219.7
2007	1,047,632	168,533	46,869	34,174	73.26	12,544	161	215,402	26	44.74	205.6
2008	1,080,742	97,621	45,973	34,406	75.43	11,295	272	143,594	10	42.54	132.9
2009	1,114,534	85,799	40,999	34,517	85.57	12,246	567	133,129	56	36.79	119.4
2010	1,149,028	78,822	40,250	28,350	70.82	11,432	154	119,072	58	35.03	103.6
2011	1,092,104	16,418	19,740	14,261	80.96	3,759	1,720	36,153	16	18.08	33.1
2012	1,118,429	940	5,262	2,016	56.52	2,288	958	6,202	4	4.70	5.50
2013	1,145,048	17	1025	373	50.05	512	140	1042	3	0.90	0.90
2014	1,172,529	5	342	118	59.36	139	85	347	1	0.29	0.30
2015	1,200,670	0	80	33	70.00	24	23	80	0	0.07	0.07
2016	1,229,486	1	94	51	89.36	10	33	95	0	0.08	0.08

[1] For %*Pf* calculation, *Pf* and mixed infections were included
[2] For API calculation, only confirmed malaria cases were taken
[3] For calculation of incidence, both confirmed and clinically treated cases were included.

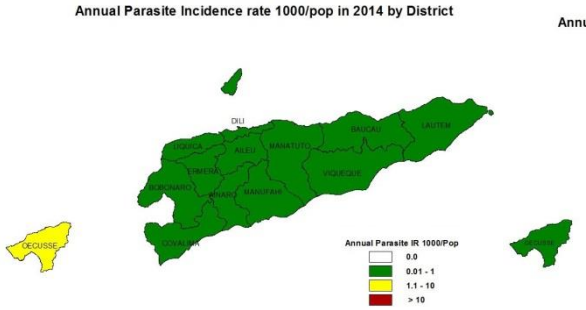
Figure 5. Malaria incidence in Timor-Leste 2010-2016

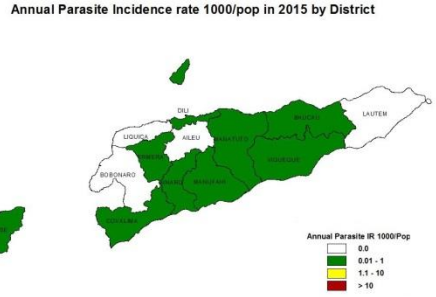






page 18





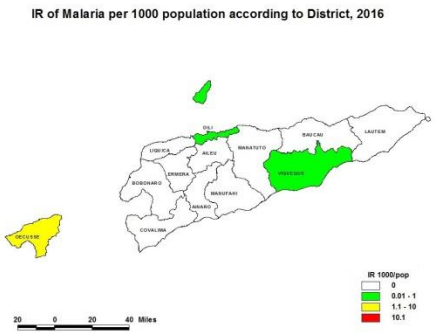


Table 3. Number of malaria cases and API by district 2011-2016

District	Population (2010 census data)	2011		2012		2013		2014		2015		2016	
		Number of cases	API (per 1000 pop)	Number of cases	API (per 1000 pop)	Number of cases	API (per 1000 pop)	Number of cases	API (per 1000 pop)	Number of cases	API (per 1000 pop)	Number of cases	API (per 1000 pop)
Aileu	45,512	784	17.2	9	0.2	1	0.02	1	0.02	0	0.00	0	0
Ainaro	59,382	875	14.7	188	3.2	34	0.54	5	0.08	1	0.02	0	0
Baucau	111,484	4,246	38.1	371	3.3	97	0.81	7	0.06	4	0.03	0	0
Bobonaro	89,787	1,146	12.8	220	2.5	20	0.20	6	0.06	0	0.00	2	0.02
Covalima	60,063	2,940	48.9	1,073	17.9	75	1.17	34	0.52	5	0.07	0	0
Dili	234,331	5,177	22.1	1,372	5.9	265	1.05	51	0.20	5	0.02	3	0.01
Ermera	114,635	1,732	15.1	96	0.8	7	0.06	4	0.03	2	0.02	1	0.01
Lautem	60,218	5,484	91.1	256	4.3	30	0.47	3	0.05	0	0.00	0	0
Liquiça	63,329	290	4.6	105	1.7	18	0.26	5	0.07	0	0.00	0	0
Manatuto	43,246	1,473	34.1	167	3.9	20	0.44	7	0.15	1	0.02	0	0
Manufahi	48,894	4,070	83.2	278	5.7	150	2.87	41	0.77	1	0.02	0	0
Oecuse	65,524	2,043	31.2	408	6.2	136	1.98	141	2.00	49	0.68	88	1.19
Viqueque	70,177	5,893	84	1,659	23.6	189	2.51	42	0.55	12	0.15	2	0.02
Total	1,066,582	36,153	33.9	6,202	5.8	1042	0.91	347	0.30	80	0.07	95	0.08

API > 1.0 per 1000 population

0 <API ≤1.0 per 1000 population

API = 0 for one year

API = 0 for two years

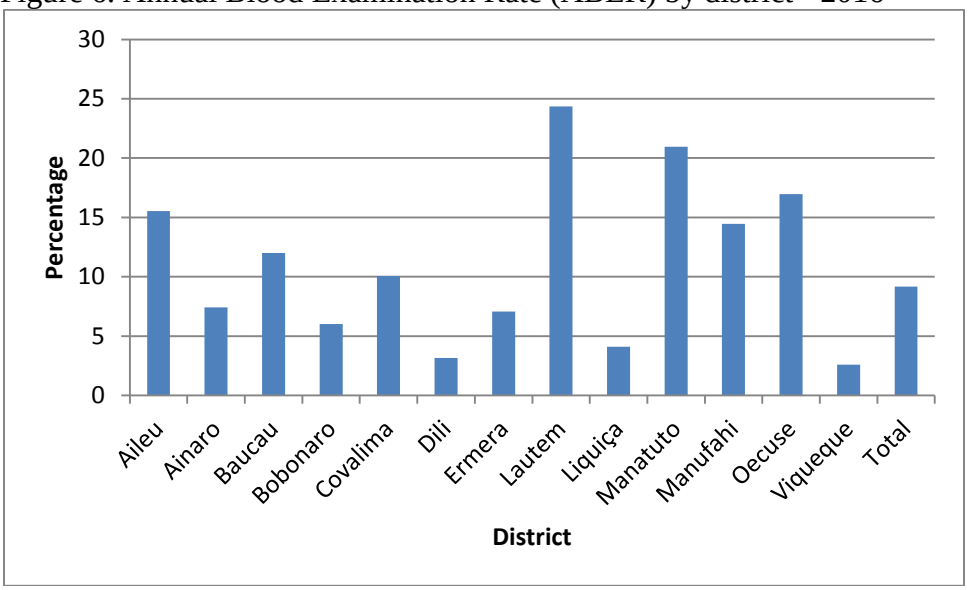
Table 4.Parasitological surveillance performance 2006-2016

Year	Population	Number of blood smears examined	No of RDTs used	Number of blood smears examined + Number of RDTs used	Number of people tested	Number of microscopically and RDT confirmed cases	*P. falciparum*	*P. vivax*	Mixed	TPR[1] (%)	ABER[2] (%)
2006	1,015,187	96,485	NA	96,485		37,896	24,219	13,477	200	39.28%	9.50%
2007	1,047,632	114,283	NA	114,283		46,869	34.174	12,544	161	41.01%	10.91%
2008	1,080,742	92,870	NA	92,870		45,973	34,406	11,295	272	49.50%	8.59%
2009	1,114,534	85,538	34,152	119,690		40,999	34,517	12,246	567	34.25%	10.74%
2010	1,149,028	110,494	85,751	196,245		40,250	28,350	11,432	154	20.51%	17.08%
2011	1,080,742	82,175	127,272	209,447		19,740	14,261	3,759	1,720	9.42%	19.38%
2012	1,114,534	64,318	117,599	181,917	117,599	5,211	1,962	2,288	958	4.43%	10.55%
2013	1,145,050	56,192	121,991	178,183	121,991	1,025	373	512	140	0.84%	10.65%
2014	1,172,528	30,515	86,592	117,107	87,209	342	118	139	85	0.39%	7.44%
2015	1,200,669	30,253	90,835	121,088	91,277	80	33	24	23	0.09%	7.60%
2016	1,229,486	30,703	94,651	125,354	108,174	94	51	10	33	0.09%	8.80%

[1] Test Positivity Rate (TPR) was calculated as ((Number of microscopically and RDT confirmed cases)/(Number of blood smears examined+Number of RDTs used))*100 for years 2006-2011. From 2012 onwards, TPR was calculated as ((Number of microscopically and RDT confirmed cases)/(Number of people tested))*100.

[2] Annual Blood Examination Rate (ABER) was calculated as ((Number of blood smears examined+Number of RDTs used)/(population))*100 for years 2006-2011. From 2012 onwards, ABER was calculated as ((Number of people tested)/(population))*100.

Figure 6. Annual Blood Examination Rate (ABER) by district - 2016



Malaria parasites

P falciparum remains the dominant species among malaria infections. In 2016, *Pf* infections (*Pf* mono infections and mixed infections) accounted for 89% of all malaria infections (Tables 2 and 4). The proportion of mixed infections, all confirmed by microscopy, is high reflecting an increased proportion of vivax infections which is to be expected with reduction in transmission. As point of care testing for G6PDd is not available in the country, the NMCP has adopted the strategy of administering weekly doses of primaquine over 8 weeks under DOTS for vivax infections since October 2016. For *P.falciparum* infections, a stat dose of primaquine was started at the same time. *P. ovale* and *P malariae* are not diagnosed in Timor-Leste.

Age and gender distribution

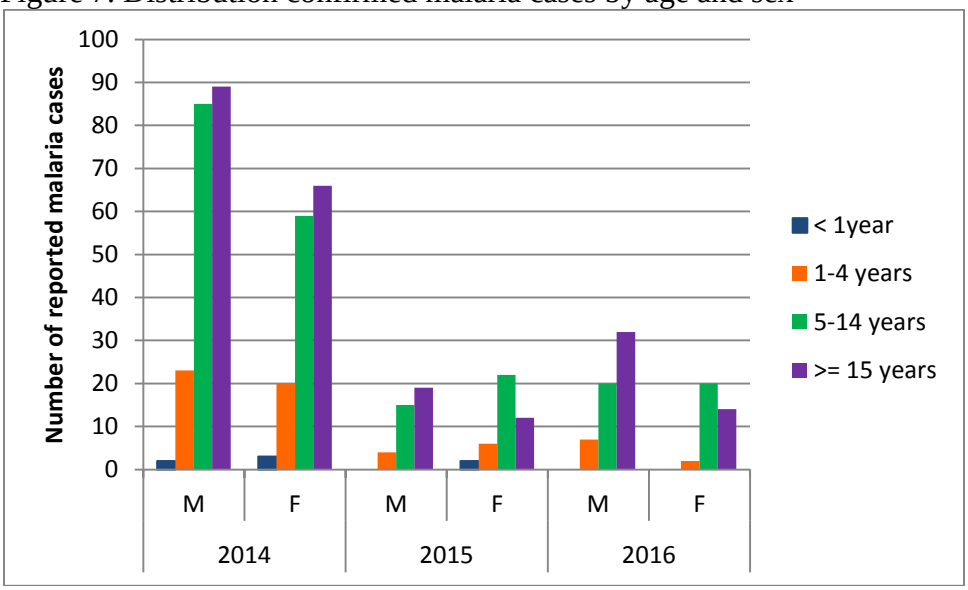
The majority of malaria cases occurred in males in 2014 and 2016 reflecting a possible occupational exposure (Figure 7). In the past, about 35% of infections were reported among children under five that comprised approximately 15% of the population. The pattern is now changing with the most number of cases being reported in the age groups above five years.

High risk populations

Covalima and Bobonaro municipalities of Timor-Leste share a land border with Indonesia's West Timor; Oecusse municipality is exclaved in West Timor. The land border is very porous and there is unregulated free movement of people across the border. Families have been separated by the border. It is difficult to characterise this migrant population and target specific interventions. The malaria incidence in West Timor is 2 to 3 times higher than in Timor-Leste and the malaria programme is in the control phase. The influx of malaria cases from West Timor is the biggest challenge for malaria elimination in Timor-Leste. Protecting this vulnerable population in a highly receptive area will remain a major thrust area.

An analysis of malaria cases reported in 2015 and 2016, indicates that malaria occurs mainly in adults. Cases have also been reported among farmers who engage in slash and burn agriculture.

Figure 7. Distribution confirmed malaria cases by age and sex



Very often they are accompanied by their adolescent children as well. There were two workers from Indonesia among the cases in Oecusse municipality in 2016.

Malaria has also been reported among short term travellers to Indonesia including migrant fishermen on their return.

Previous MIS surveys have revealed LLIN usage among pregnant women and children under five years of age is about 90 percent. Still, pregnant women are considered a risk population and a LLIN is provided to pregnant females during the antenatal period through the maternal health programme. In addition, populations living in areas which are flood prone are also considered vulnerable and IRS is carried out in these areas.

There still exists hard-to-reach areas which are addressed by posting malaria volunteers (currently, there are 33 CHVs posted) in a cluster of hamlets (villages) far from peripheral health posts. Those volunteers are equipped with RDTs, Artemisinin-based Combination Therapy (ACT), Choloroquine (CQ) and educational materials such as flipcharts. In 2015 and 2016, approximately 30% of cases were detected in the community by these CHVs highlighting their roles in the control and elimination phases.

Malaria vectors

Vector surveillance and bionomics studies carried out since 2007 have reported that there are 13 *Anopheline* species in the country. *An. barbirostris* and *An. Subpictus* have been incriminated as the primary and secondary vectors based on vector incrimination studies using ELISA and salivary gland detection for *sporozoites* (Yapabandara et al., 2014). It has been demonstrated that peak biting behaviour of *An. subpictus* and *An. barbirostris* extends from 18:00 hours to 22:00 hours and 23:00 hours to 2:00 hours, respectively. Both species rest on walls, roof and back and underside of furniture. Indoor to outdoor biting ratio of these species is 1:1.5. Larval surveys have revealed that *An. barbirostris* and *An. subpictus* breed in fresh water river and stream bed pools and slow moving water with vegetation. *An.subpictus* also breeds in brackish water pools

in the coastal areas. Both species are susceptible to malathion, permethrin, λ-cyhalothrin, bendiocarb, deltamethrin, bifenthrin, DDT and fenitrothion. The bionomics and behaviour of the incriminated vectors require that an integrated approach to vector control be used. Long Lasting Insecticidal Nets (LLINs), Insecticide Residual Spraying (IRS), larval breeding source reduction and personal protection are used for vector control. Entomological surveillance carried out from 2015 to date has revealed that there is an increase of *An. sundaicus*, a major vector of malaria in Indonesia, especially in Oecusse municipality and the coastal areas of the mainland. Therefore, there is a need to further carry out vector incrimination and bionomics studies.

Vector control

LLINs and IRS are the major vector control methods used in Timor-Leste in addition to environmental manipulation and larval source management which are conducted as part of integrated vector management. IRS was added in 2010 as the protection provided by LLINs was not adequate as the biting habits of the mosquito extended from 6 pm to 6 am, prior to the sleeping patterns of the population. A single cycle of spraying prior to the high transmission season extending from January to April was carried out over the past few years; in 2016, in Oecusse municipality, two cycles of spraying was done in response to the outbreak of malaria. Lambdacyhalothrin was used for IRS from 2010 to 2015. Bendiocarb was used for IRS in 2016. Currently, insecticides chemically unrelated to pyrethroids impregnated into LLINs are used for IRS as per WHO recommendations. In addition, integrated pest and vector management techniques were piloted and are being used. Larviciding is done occasionally. Universal access to LLINs is a major component of the national strategy for malaria control. In addition to LLIN distribution, there is a programme that is coordinated through Malaria Volunteers and HealthNet, a sub-recipient of the NMCP, to visit houses and help householders to hang up the nets.

1.7 Malaria situation in the region

Timor-Leste is a member of the WHO South-East Asia Region comprising 11 countries. Two countries in the region (Maldives and Sri Lanka) have been certified as malaria-free by the WHO. Both *P.falciparum* and *P.vivax* infections are common in the malaria endemic countries in the region except in DPR Korea where only *P.v*ivax infections are reported. Three countries in the region (Timor-Leste, Bhutan and Nepal) are progressing towards elimination goals. The other countries are also considering eventual malaria elimination keeping in line with targets of the Global Technical Strategy for Malaria 2016-2030.

Timor-Leste shares a 280 km land border with Timor province of Indonesia (West Timor). Many families are divided by the border and large scale undocumented migration takes place across this border. There are many islands belonging to the Republic of Indonesia in the close vicinity of Timor-Leste. Many Timorese people frequently visit these islands for various reasons. There are also many Indonesian citizens visiting Timor-Leste as well.

The malaria incidence in Timor province of Indonesia is 2-3 times higher than in Timor-Leste and the programme is still in the control phase. Oecusse municipality and border areas are extremely vulnerable to malaria.

Cross border collaboration has been initiated between Timor-Leste and Timor province of Indonesia facilitated by the Country Coordinating Mechanisms of the two countries. The first meeting was held in January 2017. It is expected that this collaboration would be strengthened with a view to achieving malaria elimination in island of Timor.

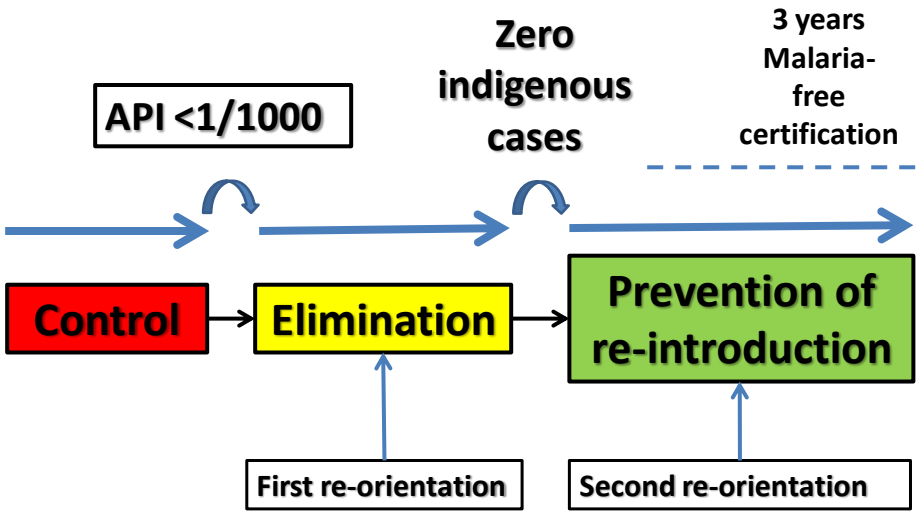
1.8 Moving from malaria control phase to elimination phase

Timor-Leste is moving quickly towards malaria elimination. In 2016, only 95 cases were reported compared to nearly 20,000 confirmed cases in 2011. This drop has come about due to a well-funded programme with a technically strong strategy built on the foundation of a rapidly evolving health system that is providing basic health services down to the household level.

Based on the malaria elimination continuum (Figure 8), Timor-Leste has already progressed to the malaria elimination phase with the country API being less than 1 per 1000 population since 2013. A programme re-orientation was carried out in 2015. In 2016, case and foci investigations were started. Indigenous transmission has been interrupted in 3 municipalities for 2 years; there was no transmission in 5 other municipalities in 2016.

The next steps in the malaria elimination continuum are to interrupt indigenous transmission to zero cases and from there to maintain that status for three years to obtain WHO certification of "malaria-free" status.

Figure 8. Malaria elimination continuum



2. STRATEGIC FRAMEWORK (2017–2021)

2.1 Vision, mission, goals and principles

VISION

A "malaria-free" Timor-Leste by end 2021 to enable the people of DRTL to achieve their full potential.

MISSION

Plan and implement a comprehensive malaria elimination programme to interrupt malaria transmission in Timor-Leste.

GOAL

To eliminate malaria transmission in Timor-Leste by end 2021.

OBJECTIVES

1. To interrupt indigenous malaria transmission by the end of 2021.
2. To maintain zero mortality due to indigenous malaria.
3. To prevent re-introduction of malaria in districts that have already interrupted malaria transmission.

GUIDING PRINCIPLES

- Building country ownership and leadership, and fostering partnerships between the National Malaria Programme and communities, other sectors (agriculture, finance, education, defence, etc.), implementing partners including non-governmental organizations and faith based organizations, UN agencies, developmental partners, and technical agencies to forge the elimination phase through a multi-sectoral approach.
- Efforts towards elimination are accelerated through combinations of interventions responding to local needs and adapted to country specifications.
- Intensified malaria case-based surveillance and case and foci investigation are required to enable elimination.
- Universal access to malaria prevention and treatment is available to vulnerable populations.
- Information systems that facilitate identifying and monitoring foci of malaria transmission are required to optimize implementation of interventions for malaria elimination.
- Equity in access to services for the most vulnerable and hard-to-reach populations is essential.

Strategies

Objective 1: To interrupt malaria transmission by the end of 2021.

a. Re-orient public and private health sector staff towards malaria elimination.
b. Re-orient National Malaria Programme towards malaria elimination.
c. Provide universal access to malaria diagnostic and treatment services free of charge
d. Detect all infections early and treat all patients with quality assured antimalarials based on national treatment guidelines to ensure radical cure and prevention of secondary transmission.
e. Ensure all suspected cases are tested for malaria (microscopy or RDT).
f. Notification of all positive infections within 24 hours.
g. Investigate all cases and foci within 5 days of notification.
h. Protect vulnerable populations and residents in foci.
i. Respond quickly to prevent spread of malaria and containment of outbreaks (including distribution of LLINs and/or IRS, larviciding and environmental manipulation and management if needed).
j. Quality assurance of malaria diagnostic services.

Objective 2: To maintain zero mortality due to indigenous malaria.

a. Provide universal access to malaria diagnostic and treatment services free of charge.
b. Detect all infections early and to treat all patients with quality assured antimalarials based on national treatment guidelines to prevent complications and secondary transmission.
c. Ensure all suspected cases are tested for malaria (microscopy or RDT).
d. Ensure availability of antimalarial medicines at all diagnostic and treatment facilities including injectables and suppositories at all hospitals and treatment centres with in-ward facilities for treatment before referral.
e. Ensure availability of adequate intensive care facilities in all referral hospitals and in the National Hospital.

Objective 3: To prevent reintroduction of malaria in districts that have already interrupted malaria transmission.

a. Intensify surveillance in all districts.
b. Establish web based real time surveillance system.
c. Notify all cases immediately.
d. Investigate cases and foci including entomological surveillance and reactive ACD within 5 days of notification.

e. Establish response teams for quick and effective response within 10 days of notification.
f. Have adequate buffer stocks of LLINs, insecticides, diagnostics and antimalarial medicines.
g. Protect vulnerable populations with LLINs and IRS where necessary.
h. Strengthen cross border collaboration with Timor province of Indonesia and facilitate sharing of sub-national data.
i. Establish diagnostic and treatment centres at border crossings.

2.2 Approach

Prioritization

Based on the available statistics, there has been an epidemic of malaria in 2016 with foci transmission in Oeccusi municipality. Given its strategic location exclaved by West Timor governed by Indonesia with an API that is 2-3 times higher than in Timor-Leste, the population in this district, especially in the border areas, is vulnerable to malaria. In addition, communities in areas bordering West Timor are also at high risk due to the malaria situation in West Timor. These areas need to be prioritized for prevention.

High risk groups and mobile populations across the border need to be identified and protected. In addition, farmers engaged in slash and burn agricultural practices and migrant fishermen are also vulnerable to malaria.

Programme phasing

Timor-Leste has already transited from the transmission reduction phase to the elimination phase with the national API being <1 per 1000 population. Some areas are in the prevention of re-introduction phase. The current focus is on elimination of malaria in the entire country, where measures are targeted to remaining foci and surveillance intensified with measures to rapidly detect and cure every infection. There will be a re-orientation of entomological activities with phasing out of entomological surveillance except for case and foci investigation, in Oecusse municipality and monitoring of insecticide resistance.

2.3 Key interventions and supporting elements

The National Malaria Programme strategy is based on the following three key interventions and two supporting elements. The three key interventions are:

1. Early diagnosis and prompt treatment.
2. Malaria prevention.
3. Intensified surveillance (malaria infection and entomological surveillance).

The two supporting elements are:

1. Expanding research and innovation for improved delivery of services
2. Strengthening the enabling environment.

2.4 INTERVENTION 1 – Early diagnosis and prompt treatment

2.4.1 Universal access

Targets:

100% of suspected malaria patients receive a parasite-based diagnosis

100% of confirmed malaria patients receive effective treatment based on national treatment guidelines within 24 hours of confirmation of diagnosis.

Achieving universal access to malaria diagnosis and treatment requires three channels of service delivery: the public sector, community based organisations and the private sector. To ensure optimal case-management, surveillance and reporting during the elimination phase, private sector and community based organisation providers will be required to test and treat patients according to National Malaria Treatment Guidelines and will be required to notify all positive cases to the local health authorities within 24 hours of diagnosis. The Ministry of Health will develop and enact required legislature for this purpose.

Universal early diagnostic testing based on blood examination by RDTs or microscopy will be available at all health care institutions in the public sector, the private sector and outlets of community based organizations. While microscopy is available at larger institutions (National Hospital, Referral Hospitals, Community Health Centres), RDTs will be available in larger institutions with microscopy facilities for use in emergencies, after normal working hours and in outreach clinics. RDTs will be available in all existing Health Posts as currently practiced. Quality RDTs and ACTs, as currently practised, will be available with malaria volunteers (PSF-*Promotor Saude Familiar*). These services will be provided to the additional health posts the government of Timor-Leste intends to establish in the future. Additional malaria volunteers will be recruited in the border sub-municipalities for intensified surveillance. Diagnostic methods having a higher sensitivity than RDTs and microscopy, such as Polymerase Chain Reaction (PCR) or other molecular based techniques, will be established and used in specific situations when there are discrepancies in the diagnosis but will not be used for routine case detection and management.

Treatment for falciparum and non-falciparum malaria will be based on national treatment guidelines, which are in-line with WHO guidelines. Currently, ACTs (arthemeter/lumefantrine) is the recommended first line antimalarial drug for the treatment of uncomplicated falciparum malaria except in the first trimester of pregnancy. A single dose of 0.25 mg per kg bw is given to falciparum patients as a stat dose to eliminate gametocytes that may transmit the disease. This does not require prior testing for G6PDd and has been recommended as safe by WHO. Currently, chloroquine is used as the first line drug for uncomplicated *P.vivax* infections. Based on recommendations of the external mid-term review and the findings of the in-country therapeutic efficacy study, it is proposed to use ACT (artemether/lumefantrine) as the first line drug for treatment of uncomplicated *P. vivax* malaria. Due to unavailability of point of care testing facilities for G6PDd at present, the 8-week Primaquine regime is given at weekly intervals under DOTs. When point of care testing for G6PDd will be available, the 14 day Primaquine regime will be started for *P. vivax* infections in patients who are not G6PD deficient. The DOTS strategy for all confirmed malaria patients will be continued.

Strengthening microscopy–based diagnosis

Microscopy will be gold standard for confirmation of all infections in the elimination phase. Quality assured microscopy will be made available at hospitals and CHCs. Newly recruited laboratory analysts will be trained in microscopy and already recruited laboratory analysts will receive re-fresher training based on needs identified through QA.

Strengthening and expanding RDT-based diagnostic services

Bivalent RDTs capable of detecting falciparum and vivax infections will be available at all the public health sector institutions, NGO run health facilities and at the community level. All newly recruited Health Volunteers and staff of NGO run facilities will be trained on RDT use and interpretation of results. All RDT positive cases will be confirmed by microscopy.

Support case management, including the management of severe malaria

Clinicians "forgetting malaria" with malaria elimination leading to delays in diagnosis and treatment resulting in severe malaria and onward transmission of the infection have been reported in other countries. Clinicians will be regularly updated on the need to consider malaria in the differential diagnoses of fevers and the importance of testing for malaria. The training sessions (both group and individual) will be organized through the national and Municipality Health System. In addition to the need for testing fever patients for malaria, clinicians will be updated on features and diagnosis of severe malaria, need for immediate notification and treatment guidelines. In addition, special training will be provided to the clinicians (national and referral hospitals and CHCs with beds) on the management of severe malaria.

Artesunate suppositories (paediatric) and artesunate injections will be made available for pre-referral treatment at Community Health Centres with in-ward facilities and Referral Hospitals.

Directly Observed Treatment Schedule (DOTS) and follow up of confirmed cases

Confirmed malaria cases will be admitted, where possible, to ensure compliance to treatment. Patients, who are not admitted to wards, will be treated using a DOTS strategy where compliance to treatment will be directly observed by a health care personnel or Community Health Volunteer. In such situations, health care personnel will visit the patients to administer all doses. All patients will be followed up for 28 days (Days 0, 1, 2, 3, 7, 14, 21 and 28) based on NMP guidelines.

Provide community based diagnosis and treatment for malaria

Timor-Leste has a well-established free community based diagnosis and treatment services for malaria delivered by Community Health Volunteers (CHVs). Thirty percent of the confirmed malaria cases were detected by CHVs. At present, 33 malaria CHVs substantially complement and extend the reach of health services, particularly in rural and remote hard-to-reach malarious areas especially along the West Timor - East Timor borders. Currently, existing volunteers carry out active surveillance, diagnose malaria using RDTs, treatment uncomplicated malaria cases, supervise DOTs treatment, monitor LLIN usage by the community and conduct BCC activities by visiting houses in assigned areas. Additional malaria volunteers will be recruited in the border sub-municipalities for intensified surveillance, detection of infections and treatment of cases. Volunteers will monitor population movements, refer severely ill malaria patients, and assist in case and foci investigations and response. A needs-based training will be provided to new recruits. On-the-job training will be provided to CHVs by municipality and sub municipality

malaria officers. CHVs will meet regularly with supervisors and officers of the nearest health institution to assess inventories of supplies, and cross-checking and reporting of data.

A new initiative, the Family Health Programme, has commenced as part of primary health care services where clinicians make home visits to assess the health status of families and individuals. Active case detection of patients with a history of fever in the past two weeks and monitoring of LLINs usage will be started with this programme. In addition, ACD provided by SISCA outreach activities for hard-to-reach populations will continue as currently practised.

Provide diagnostic and treatment services for the armed forces and the police

Malaria diagnostic and treatment services for the armed forces and the police will be provided free of charge. Partnerships between the National Malaria Programme and the armed forces and the police will be developed to make this arrangement functional. Clinicians in the armed forces and the police will be trained on diagnosis and treatment of malaria. RDTs and ACTs will be provided to the armed forces and the police and they in return will have to provide data on their usage to the National Malaria Programme.Microscopy or RDT based screening will be carried out for all armed forces personnel before and after deployment in malaria foci.

Strengthening and monitoring private sector and faith based organizations case management services

Engagement of the private sector and faith based organizations in malaria diagnosis and treatment is crucial to a malaria elimination programme to ensure that no cases are missed. The role of private sector and other faith based organization institutions in malaria case management in Timor-Leste is clearly important, but is ill defined. The Health Facility Survey carried out in 2013 revealed that the private sector and other sector institutions have poor capacity for confirmation of a malaria diagnosis and relies mainly on clinical diagnoses. This survey also revealed that oral artemisinin monotherapies such as Artesunate are being used for treatment of uncomplicated malaria and was available in private sector health care facilities. The National Laboratory will carry out malaria microscopy training of laboratory analysts engaged in malaria diagnosis working in the private sector and in faith based organizations as has been done in the past. In addition, faith based organizations and the private sector institutions will be provided with quality assured RDTs and ACTs free of charge. In return, the organizations will have to provide data using national data collection formats (including zero reporting). Training and refresher training will be provided to clinicians and laboratory analysts working in private sector and faith based organizations.

Introduce G6PDd testing

G6PDd testing will be rolled–out gradually once point-of-care tests become available. A G6PDd diagnosis card will be issued. Findings will be mapped to support the development of a long-term policy on G6PDd testing and primaquine use.

Clinical audits of severe malaria cases and malaria deaths

Clinical audits of severe malaria cases and malaria deaths will be conducted to ascertain the reasons for severe disease and death with a view to finding out whether there were lapses on the part of the health services provided. These audits will be conducted with the participation of clinicians, NMP officers and relevant field authorities. SOPs to conduct the audits will be developed.

2.4.2 Active case detection

Vulnerable populations

Active case detection among vulnerable populations will be conducted. Vulnerable populations include communities in border areas and other high risk groups such as farmers engaged in slash and burn agricultural practices, migrant labour attached to construction companies specially in Oecusse municipality and migrant fishermen from Timor-Leste who visit malarious Indonesian islands for fishing purposes (especially those from Atauru Island).

With major development activities taking place in Oecusse municipality, there is an influx of foreign labour mainly from Indonesia. It is possible that these workers may introduce malaria parasites to the country. Facilities to screen such persons for malaria will be set up and necessary procedures adopted.

Provide diagnostic and treatment services at border crossings

There is a large amount of unregulated movement across the land border between west and east Timor. The API in West Timor is about two to three times higher than in Timor-Leste. Diagnostic and treatment services at border crossings will be established. Services will be provided free of charge irrespective of nationality. More cross border collaboration will be established especially to regularly share malaria data in neighbouring areas.

Screening of blood donors

All blood donors will be screened for malaria using RDTs at the National Hospital. This activity will be done by the staff at the National Laboratory. All positive RDTs and five percent of negative RDTs will be confirmed by malaria microscopy.

Screening pregnant women in malaria foci

NMP works closely with the Maternal and Child Health Department. As part of the national strategy on reproductive, maternal, new-born, child and adolescent health 2015-2019, screening of all pregnant women for malaria is routinely done during the first trimester. As pregnancy is no longer a risk condition for malaria but is a risk condition for severe malaria, screening of pregnant women for malaria will only be done in Oecusse municipality and in active foci using RDTs at the first antenatal clinic visit. Positive cases will be treated as per National Malaria Treatment Protocol.

All the above activities will enable maintaining an ABER between 5-10 percent.

2.4.3 Quality assurance

i. Diagnostics

Targets

95% Agreement rate for microscopy and RDTs

100% procurement of WHO pre-qualified RDTs

100% procurement WHO pre-qualified ACTs

100% of confirmed malaria cases treated according to national malaria treatment guidelines

Quality assurance of Microscopy

Quality assured microscopy is essential in the elimination phase to ensure laboratory analysts do not lose their skills in detecting malaria parasites as they see fewer and fewer positive slides. The existing quality assurance system will be strengthened. SOPs for malaria microscopy, RDT and Quality Assurance and Quality Control of malaria microscopy are available.

An external competency assessment has already been established and will be continued. Every two years, the National Malaria Programme will conduct an External Competency Assessment for senior laboratory analysts attached to the Quality Control Laboratory, the National Laboratory and in the municipalities. Quality assured diagnostic services will be provided throughout the country. This will be provided through confirmation of all cases and cross-checking of 10% of negative blood smears and RDTs. Cross-checking of blood smears and RDTs will be done by staff at the National Laboratory and level one grade laboratory analysts accredited by the external accreditation system.

Expert laboratory analysts (Grades 1 and 2) attached to the National Laboratory and district senior analysts in districts will carry out supervision at municipality level, provide re-fresher training for existing laboratory analysts and basic training for newly recruited laboratory analysts attached to health care institutions in public, private and NGO sectors. They will oversee procurement and distribution of quality microscopes, slides and reagents. Senior laboratory analysts in municipalities will carry out supervision of laboratory analysts attached to CHCs.

As malaria cases decrease, access to positive slides will become increasingly important for maintaining the laboratory analysts'skills. Slide banks at central and district levels will be maintained for training and testing.

Quality assurance of RDTs

WHO pre-qualified RDTs will be procured. QA of RDTs and SOPs for QA of RDT are in place. QA of RDTs will be continued as currently practised (batch testing, testing of field samples, and supportive supervision).

Quality assurance of antimalarial medicines

Adequate supplies of quality assured antimalarial medicines will be ensured. WHO pre-qualified ACTs and primaquine will be procured. Efforts to eliminate counterfeit and substandard medicine will be strengthened through legislature and random checks by officials of the Pharmacy Department of the Ministry of Health. The quality of antimalarial medicines will be monitored by SAMES. If required, samples of antimalarial medicines will be sent to a specialised laboratory in the region for testing.

Samples of drugs and other products found in the market will be taken for testing. As Timor Leste lacks facilities for pharmaceutical testing, the samples will be sent to a laboratory in the region for analysis. Vendors of substandard and/or counterfeit medicines will be severely reprimanded for which relevant laws will be enacted.

Quality Assurance of case management

Supervision on case management will be strengthened at public, private and NGO sector institutions with clear protocols in accordance with the National Malaria Treatment Guidelines. Clinical audits will be carried out as a routine activity. Corrective measures will be instituted in

suspected or under-performing institutions by re-training staff and monitoring the institutions closely.

2.4.4 Monitoring drug efficacy

Data on efficacy of recommended antimalaria medicines are needed to ensure that all infections are radically cured and malaria transmission is interrupted. With very low numbers of indigenous malaria infections reported, drug efficacy monitoring will be integrated with case based surveillance. All patients (regardless of age and parasitaemia levels) will be treated under direct observation. All patients will be clinically and parasitologically assessed on days 0, 1, 2, 3, 7, 14, 21, and 28. All blood smears collected on days 0,1,2,3, 7, 14, 21 and 28 days will be examined by expert laboratory analysts.

2.4.5 Engaging the private and other sectors

When conducting a malaria elimination programme, it is essential that all malaria infections are detected by the health system including from the services provided by the public and private sectors and community based organizations. Staff from the private sector and community based organizations will be trained in malaria diagnosis and will be invited to participate in external accreditation assessments free of charge. The institutions that participate in these training programmes will be requested to share data with NMP to strengthen surveillance. Furthermore, clinicians in the private sector and in community based organizations will be trained on National Malaria Treatment guidelines. Provision of RDTs and ACTs to these organizations will be considered if returns of their use will be provided.

2.5 INTERVENTION 2 - Malaria prevention

Use of Long Lasting Insecticidal Nets (LLINs), Indoor Residual Spraying (IRS), larval breeding source reduction, use of larvivorous fish and personnel protection methods have been used as vector control measures in the country; the two major strategies for malaria prevention have been LLINs and IRS. Universal access to LLINs was the main strategy for malaria prevention in the control phase of the programme. WHOPES approved LLINs were distributed using 2 strategies:

- Mass distribution at the rate of 1 net per 1.8 persons to protect populations living in malaria risk areas.
- Continuous distribution to pregnant women through antenatal clinics.

In addition, IRS was carried out in epidemic and flood prone areas in selected districts. As the country moves towards malaria elimination, the focus of operations shifts from malaria prevention to intensified surveillance so there needs to be a shift from mass distribution of LLINs and preventive IRS to focal application of both interventions for protecting high risk populations and as a part of the response to foci.

Target: To achieve >90% coverage of the 'at risk population' with appropriate malaria preventive interventions.

2.5.1 Vector control measures for transmission prevention

The selection of vector control interventions will be guided by an eco-epidemiological assessment informed by malaria case and entomological surveillance data. Implementation will be done within the 'Integrated Vector Management' (IVM) framework to ensure optimal use of resources. Use of insecticides in vector control will be guided by technical recommendations provided in the National Insecticide Resistance Monitoring and Management Plan which was developed based on WHO's 'Global Plan for Insecticide Resistance Management in Malaria Vectors'.

2.5.1.1 Long Lasting Insecticide-treated Nets (LLINs)

Protection of vulnerable persons

Targeted mass distribution of LLINs has been carried out in 2016 and 2017 in a phased manner. If the effective life span of a LLIN is three years, these nets should be effective till end 2019 and early 2020. Hence, there will be no more mass distribution of LLINs except if a focus is detected in an area where LLINs have not been distributed or where the coverage is shown to be low.

Targeted mass distribution of LLINs will continue in Oecussi municipality because it is surrounded by Indonesia's West Timor where the malaria incidence is 2-3 times higher than in Timor Leste and where the land and sea border between the two countries is very porous. In addition, large development projects have been initiated within the municipality with large scale influx of foreign labour from neighbouring Indonesia who are likely to bring in imported malaria in to the country and initiate local malaria outbreaks.

In Atauro island, large scale migration of fishermen to Indonesia occurs and many cases of imported malaria due to this activity have been recently reported. The situation will be assessed and targeted distribution of LLINs may be considered if necessary.

WHOPES approved LLINs will be procured.

Protection of populations living in border areas

The decision as to whether populations resident in border areas need further protection with LLINs beyond 2019 will be made based on the epidemiological situation of malaria in Timor-Leste and in neighbouring West Timor. Attempts will be made to share information and work closely with West Timor in bringing the malaria situation across the border under control through cross border collaboration which has just been initiated. Sharing of information at sub-national level will be facilitated and application of synchronised control measures will be promoted.

Protection of populations in disaster situations

A buffer stock of 10,000 LLINs will be kept for emergency situations such as an unexpected disaster.

Protection of armed forces personnel and Police officers

LLINs will be provided to armed forces personnel and police officers when they are stationed in malaria foci and in border areas.

Protection of foreign workers

LLINs will be provided to employers of companies who hire foreign and local labour engaged in projects (construction sites of buildings, roads, dams and bridges) in Oecusse municipality and in malaria foci to protect their workers. Efforts will be made to encourage employers to provide this benefit to their employees in the future at their own expense.

Protection of farmers engaged in slash and burn agriculture

Farmers engaged in slash and burn agriculture and living in malaria foci will be provided with single sized LLINs. Suco leaders will identify the farmers and inform the sub-municipality malaria officers who will then distribute the nets.

Protection of migrant fishermen

Migrant fishermen who travel to Indonesia for fishing have been identified as a vulnerable group. LLINs will be provided to them and their families to prevent infections being re-introduced and onward local transmission.

Protection of pregnant women

As there was evidence of malaria transmission in Oecussi municipality in 2016, pregnant females in the district will be provided with a LLIN as they have a high risk of developing severe malaria. LLINs will also be distributed to pregnant females living in the border areas of Covalima and Bobonaro municipalities as malaria transmission is high in bordering West Timor. LLINs will be distributed to pregnant females through ante-natal clinics conducted by the maternal and child health programme. The strategy of providing pregnant females in the district with LLINs will be reviewed every year based the latest available epidemiological data and vulnerability of the population of the area.

2.5.1.2 Focal Indoor Residual Spraying (IRS)

As the programme transits to the elimination phase, focal IRS will be carried out in response to case detection in all houses within a 1.5 km radius of a case. This will be an additional intervention in areas where LLINs have already been distributed. Insecticides used for IRS will be of a different class to that used for LLINs as per WHO recommendations and the national insecticide resistance monitoring and management plan of Timor-Leste. The insecticides used for IRS will be rotated yearly.

IRS will also be used to protect populations resident in established foci. IRS will be carried out in 2017 in Oecusse municipality and the border areas of Covalima and Bobonaro municipalities due to their proximity to West Timor and in Atauro island. The decision as to whether to continue with IRS further in Oecusse municipality and in the border areas of Covalima and Bobonaro municipalities will be reviewed annually based on available epidemiological and entomological data and the malaria situation in the province of Timor in Indonesia.

In accordance with the national policy, the choice of insecticide will consider safety, efficacy, cost, availability, and susceptibility of vectors based on the national insecticide resistance monitoring and management plan of Timor-Leste.

2.5.2 Larval source management (LSM) and larval control

LSM will be implemented through community mobilization where vector-breeding sites are 'few, fixed and findable' identified through larval surveillance carried out during case and foci investigations. As the NMP moves into malaria elimination, it is important to carry out environmental manipulation and management to reduce larval breeding as a permanent solution in areas where recptivility is high and where larval control can actually reduce man-mosquito contact..

The use of larvivorous fish may be an economically viable vector control option in Timor-Leste as *Apolocheilus panchax,* a larvivorous fish, is indigenous and contributes to mosquito reduction. Larval control will be carried out mainly in the dry season when permanent breeding sites of vectors are reduced and concentrated into a few manageable and treatable areas. In addition, Insect Growth Regulators (IGR) or *Bacillus thuringiensis israeliensis* (Bti) will be applied to semi-permanent breeding locations prior to the wet season.

2.5.3 Integrated pest and vector management (IPVM)

A pilot project on integrated pest and vector management was successfully carried out in collaboration with the Ministry of Agriculture. The project targeted training of farmers in reducing pests and vectors of disease including those of malaria and dengue. Data show that the yield of crops increased with reduction of pests. Furthermore, it was shown that there was a decrease of malaria vectors after environmental manipulation and modification in the rice cultivation areas. The methods used focused on sustainable vector control with no reliance on chemical insecticides.

This project will be further extended to other areas of the country in collaboration with the Ministry of Agriculture in a phased manner.

Use of mosquito repellents

Entomological investigations have revealed that the vectors of malaria *An. barbirostris* and *An. subpictus* show exophilic behaviour and start biting from 6:00 pm throughout the night till the next morning. Hence, it is important to protect villagers and labourers who work during the night (road construction workers, seasonal farmers etc.) from mosquito bites when they are not protected from LLINs or IRS, especially when outdoors, to reduce residual malaria transmission.

A study carried out on the repellent effects of citronella oil and other locally available methods revealed that citronella oil had an effective repellent effect for more than 6 hours. These methods will be promoted through community participation, and through collaboration with the Ministry of Agriculture, farmer organizations and other partners. Behaviour change communication strategies have already been developed. These techniques will be used to promote these practices.

2.5.4 Quality assurance of vector control

The quality of LLINs and insecticides will be ensured through procurement of WHO pre-qualified products. In addition, bio-efficacy studies will be carried out to determine the insecticidal activity of LLINs and IRS.

2.5.5 Mass Drug Administration (MDA) in special circumstances

MDA may be introduced as per WHO recommendations as an epidemic response or in the event of complex emergencies. Other applications may be considered pending WHO approval.

2.6 INTERVENTION 3 -Intensified surveillance

2.6.1 Parasitological surveillance

As the National Malaria Programme moves from the control phase to the elimination phase, the focus of the surveillance system must change. In the control phase the focus is on cases which are reported as aggregate data monthly. In the elimination phase surveillance changes to a case based approach where the focus is on infections which must be detected, notified immediately, radically treated and investigated. This change is critical during the elimination phase. Documentation of all surveillance activities is required for eventual certification.

2.6.1.1 Intensified case based surveillance

Target: 100% of cases detected will be notified within 24 hours

The National Malaria Programme started case-based surveillance with case and foci investigation in 2016. Immediate notification of cases by telephone within 24 hours of detection is practiced. Reporting formats have been developed and there is a formal verification system in place.

Case-based surveillance will be intensified to include the private sector and community based organizations. As malaria is a notifiable disease, legislation will be developed and enacted to ensure notification of cases by the private sector and community based organizations.

2.6.1.2 Real time web based surveillance system

Target: Develop and implement a real-time web-based surveillance system by end 2017

Currently NMP uses a paper based reporting system. As the programme moves into the elimination phase, a real-time web based surveillance system is needed for quick response and for monitoring of case and foci investigations and response.

A real-time web based system will be developed using the DHIS2 platform which has many applications for the malaria elimination phase. The system will feed in raw data at the periphery independent of the HMIS. However, once data are processed and verified, information will be relayed to the national HMIS of the Ministry of Health. Data will be entered at the district level; the Municipality Malaria Officer will be responsible for data entry and providing regular updates on case and foci investigations. Data will be verified at central level by the Regional Malaria Officers, M&E Officer and the Programme Manager in consultation with the Municipality Malaria Officer at monthly meetings.

2.6.1.3 Mapping of cases and epidemiological features using geographical information systems

Mapping of epidemiological and case data aids planning and monitoring of activities which are critical for malaria elimination. An appropriate software will be procured for mapping of data. Regional Malaria Officers and the M&E officer will be trained in using this software. Regional, municipality, sub-municipality malaria officers, Entomology officers and vector control officers will be provided with GPS monitors and tablet computers to record and transmit geographic data

pertaining to all malaria cases. Regional, municipality, sub-municipality malaria officers and vector control officers will be trained on use of GPS monitors and transmission of data. GPS monitors will be used to record geographic data pertaining to IRS, LLINs and vector breeding places. One officer will be recruited to maintain the GIS data base**.**

2.6.1.4 Engaging the private and other sectors in surveillance

The NMP through the National Laboratory and Municipality Health Services will collaborate with the private sector to obtain surveillance data to monitor progress of the elimination phase. This will be done through gaining the trust of private and other sector organizations. See section 2.4.5 for details.

2.6.1.5 Case and foci investigation

Targets:

- ✓ *100% of cases investigated within 5 days of notification*
- ✓ *100% of foci investigated within 7 days*

Cases will be investigated within 5 days of notification by the Municipality Malaria Officer in collaboration with the sub-municipality malaria officer of the respective area. Investigations will focus on determining whether the infection was locally acquired or imported, the risk population in the area and receptivity for onward transmission. A detailed history will be obtained from the patient with a particular reference to a travel history to a malaria endemic area, contact with a case and living in area where other cases have been reported, Reactive case detection and entomological surveillance will be carried out in a 1.5 km radius area around the index case to look for evidence of local transmission or its potential. Based on the findings of the investigation the case will be classified accordingly.

When an area is designated as a "suspected focus", a focus investigation will be carried out to assess the potential of malaria transmission, to monitor and evaluate the impact of interventions and to classify the status of the focus. Within a focus, routine entomological surveillance will be carried out prior to and during the transmission season. The classification of the focus will be reviewed annually.

2.6.1.6 Individual case files

A separate paper based file for each case will be maintained at district and national level. The file shall contain the following:

- ✓ The completed case and focus investigation form
- ✓ Details of ACD conducted in the area
- ✓ Details and summary results of entomological investigations conducted
- ✓ A map of the area
- ✓ Actions taken

The Municipality Malaria Officer will be responsible for maintaining files at district level. The original file will be sent to the National Malaria Programme and a copy will be kept at the Municipality Malaria Office. The Regional Malaria Officers, M&E Officer and the Programme Manager shall be responsible for this activity at the central level.

2.6.1.7 National malaria case register

The National Malaria Programme is currently maintaining a national malaria case register. The programme will continue to maintain this register.

The national malaria case register will contain the following basic information:

- ✓ Case number
- ✓ National Identity card number
- ✓ Name of patient
- ✓ Age and sex of patient
- ✓ Permanent home address and contact details including mobile phone number
- ✓ Occupation
- ✓ Details of institution where the case was detected
- ✓ Diagnosis type (ACD, PCD etc.) and method used
- ✓ Species and parasitaemia
- ✓ Treatment provided
- ✓ Likely location of acquiring infection with supporting evidence
- ✓ Case classification
- ✓ Names and signatures of review panel.

The Regional Malaria Officers, M&E Officer and the Programme Manager shall be responsible for this activity at the central level.

2.6.1.8 Files for each focus

A separate folder for each focus will be maintained and updated annually. The folder will contain the following:

- ✓ The completed focus investigation form
- ✓ Details of malaria cases detected.
- ✓ Details of ACD conducted in the area
- ✓ Details and summary reports of entomological investigations conducted
- ✓ Annual summary results
- ✓ A map of the area
- ✓ Actions taken

The Regional Malaria Officers, M&E Officer and the Programme Manager shall be responsible for this activity.

2.6.1.9 National malaria focus register

A malaria focus register having the following basic information will be maintained and updated annually:

- ✓ Focus name
- ✓ Municipality
- ✓ Population
- ✓ Number of malaria cases by month
- ✓ Treatment details of cases
- ✓ Details of entomological investigations conducted
- ✓ Actions taken
- ✓ Focus classification
- ✓ Names and signatures of review panel.

The Regional Malaria Officers, M&E Officer and the Programme Manager shall be responsible for this activity at the central level.

2.6.1.10 Documentation of surveillance activities

For malaria elimination certification, a rigorous review of the programme is done by an expert

panel. The panel looks for evidence that malaria transmission has been interrupted and that the system can respond to outbreaks if any occurs.

All surveillance activities will be documented and archived. The following documents will be maintained by the M&E Officer and the Programme Manager.

- ✓ Annual reports of the national malaria programme.
- ✓ Reports of reviews of the programme including Global Fund reviews.
- ✓ National Strategic Plan for malaria elimination.
- ✓ National M&E plan.
- ✓ Case and focus files.
- ✓ Case and focus registries.
- ✓ Details of blood examination for malaria.
- ✓ Details of routine entomological surveillance activities.
- ✓ Details of community engagement.
- ✓ Details of inter-sectoral collaboration activities.

2.6.1.11 Strengthening supervision and monitoring and evaluation

To ensure that activities are carried out according to plan, supervision of antimalariaactivities need to be strengthened. Supervisory visits will be undertaken on a regular basis by the national level staff.

Monitoring and evaluation is a key component of an elimination programme. Monthly review meetings will be held to monitor progress at municipality and national levels. At central level, progress review meetings will be held at least once in three months.

A separate budgetary allocation will be made for supervision, and monitoring and evaluation.

2.6.1.12 Ensure rapid response

Target:
Response initiated within 10 days of notification of 100% of cases

Notification of a malaria case requires quick action to prevent further spread of infection. Appropriate response after entomological and other investigations will include provision of outpatient services in the area, eliminating mosquito breeding sites, larviciding breeding sites, LLIN distribution and/or IRS as may be needed.

A designated rapid response team comprising four to eight personnel from among national and municipality officers that can be deployed at short notice and can carry out the above activities has already been established. A Rapid Response Team at national level will be dispatched to problem areas at short notice. The national level team consists of the Regional Malaria Officer assigned to the respective municipality (for supervision, assisting in mass blood survey and in IRS/LLIN distribution), a quality control laboratory analyst (for confirmation of the malaria case by microscopy and to assist in the mass blood survey) and a entomology team consisting of 3 officers (for entomological surveillance); a vehicle will be designated for this purpose.

The members of the team may be personnel who perform other routine work but will be released for rapid response. Task shifting of existing personnel will be carried out during the review of

the HR plan for elimination.

The municipality team will comprise of different categories of personnel – municipality malaria officer, sub-municipalitymalaria officer and a driver. The team will have a designated leader and be assigned a vehicle when needed. Adequate buffer stocks of RDTs, antimalarial medicines, LLINs, insecticides and other consumables will be stocked and made available when needed.

2.6.1.13 Develop Standard Operating Procedures and guidelines

As the focus of surveillance must be changed for the elimination phase, standard operating procedures and guidelines need to be developed or updated for all routine activities. SOPs for elimination activities have already been developed and staff have also been trained.Standard operating procedures or guidelines will be developed or updated for the following:

- ✓ Malaria treatment guidelines will be revised
- ✓ Surveillance for web-based system

After developing or updating guidelines/SOPs, all staff will be trained in their application.

2.6.2 Entomological surveillance

Entomological knowledge is key to selection of appropriate vector control interventions and monitoring their impact on vector mosquito populations. Routine entomological surveillance that was done during the control phase will be scaled back and eventually limited to foci investigation except in Oecusse municipality. Special surveys will be carried out if there is an unusual increase of cases in each area. Entomological surveillance will be carried out as follows:

2.6.2.1 Entomological surveillance for trend observation

Entomological surveillance for trend observation will be carried out in defined foci and Oecusse municipality given the recent outbreak of malaria in the district and its vulnerability by the national entomology team. Entomological surveillance will include assessment of species distribution and densities, aquatic larval habitats, feeding and resting behaviours. An increase of *An. sundaicus,*a major vector of malaria in Indonesia, has been reported in Oecusse municipality. Vector incrimination studies will be carried out and studies on vector bionomics will be carried out if *An.sundaicus* is incriminated as a vector.

2.6.2.2 Entomological surveillance for case investigation

Entomological surveillance will be carried as part of routine case and foci investigations to determine vector abundance and potential for onward transmission. Entomological surveillance will be carried as part of routine case foci investigations to determine vector abundance and potential for onward transmission in designated foci. Entomological techniques used for these operations may include cattle baited net trap collections, larval collections, human landing collections and any other method as required. Entomological surveillance for case investigation will be completed within 7 days of notification of a case. The national team and regional teams will be deployed to different parts of the country to carry out these activities.

2.6.2.3 Insecticide resistance monitoring

Insecticide Resistance (IR) monitoring will be conducted once per year as per recommendations in the insecticide resistance monitoring and management plan. The findings of these investigations will form the basis of selection of appropriate vector control interventions and monitoring their impact on mosquito populations. Insecticide resistance (IR) monitoring will be

done using standard WHO bioassay kits in five sentinel sites. Surveys will be conducted in additional sites as required (e.g. in outbreak areas where IR may be responsible for the outbreak and in areas at high risk of IR).

2.6.2.4 Monitoring coverage and quality of vector control interventions

The National Malaria Programme will monitor the coverage and quality of vector control interventions such as IRS, LLINs, and the residual efficacy of insecticides periodically using bio-efficacy tests and surveys.

2.6.2.5 Redefining roles of entomology teams

As entomological surveillance for trend observation will be carried out in Oecusse municipality and entomological investigation in the active foci will be carried out during the elimination phase, task shifting within the teams will be done based on a re-defined HR plan.

2.7 SUPPORTING ELEMENT 1 - Expanding research for innovation

This supporting element is important in the malaria elimination phase to find out solutions for local problems. Studies conducted among farmers in the country have shown the impact of the successful implementation of an integrated pest and vector management programme in Manatuto municipality in collaboration with the Ministry of Agriculture. This pilot study will be extended to other municipalities.

With the limited resources available, the following studies will be carried out:

a. incrimination of *An. sundaicus* as a malaria vector;
b. prevalence of molecular markers for drug resistant strains of the parasite;
c. prevalence of G6PDd in the country;
d. efficacy of personal insect repellants and insecticide treated clothes;
e. genotyping of malaria parasites; and
f. health facility survey to determine outbreak preparedness.

2.7.1 Annual review of research

A Technical Working Group for research will be established to identify and prioritise operations research for malaria elimination. This committee will organise and conduct an annual review of research conducted in the country to update programmatic strategies and future research priorities.

2.8 SUPPORTING ELEMENT 2 -Strengthening the enabling environment

As described in the Strategy for Malaria Elimination in the South-East Asia Region (2016–2030), Supporting Element 2 will:

- Strengthen and maintain political commitment and ensure adequate financial support for elimination.

- Support capacity development appropriate to the implementing strategy
- Strengthen health systems to facilitate elimination.
- Provide comprehensive services to meet the needs of all at risk populations, including mobile populations and migrants.
- Foster inter-sectoral collaboration, community involvement and collective action.

The adoption of the elimination strategy increases the need for leadership and management in the malaria programme. Operations will need to be managed with rigor and flexibility, supported by robust monitoring and quality control. The programme will need to be responsive to the evolving needs of the elimination effort to accelerate programmatic impact.

An enabling environment for the smooth functioning and cordial working partnerships of all stakeholders of the elimination programme will be set up. The following activities will be carried out:

2.8.1 Ensure political commitment and financing

The Government of the DRTL is committed to malaria elimination by end 2021. The Ministry of Health has endorsed this plan. The government has expanded the health services of the country by establishing a large number of institutions providing health care services in the country in the recent past. The Family Health Programme that is being conducted as part of primary health care services involves a novel approach where houses are visited and families and individuals are prioritized for services. The government has shown commitment to malaria control and its elimination by recruiting 13 District Malaria Officers and other staff in to the permanent cadre of the National Malaria Programme. The government proposes to absorb more staff in the future.

GFATM has enabled the Ministry of Health to carry out the malaria control programme with funding through 3 grants from 2006 onwards. The programme has achieved remarkable results where the reported number of malaria cases has declined dramatically from 223,002 cases in 2006 to 95 cases in 2016 (refer Table 2). The country has now reached elimination status. The success of the programme is testimony to the good use of funds.

A malaria elimination programme requires political commitment and financial sustainability; otherwise substantial gains by investments made so far may be lost very quickly. A high level National Task Force on Malaria Elimination will be set up under the auspices of the Prime Minister. Other members of the National Task Force will comprise the Ministers of Health, Agriculture, Defence, Finance and representatives of any other sector whose cooperation is required for the malaria elimination programme. The Task Force shall meet every 6 months and review progress of the malaria elimination programme. The National Task Force on Malaria Elimination will take the lead in ensuring political commitment and sustaining funding for the programme.

A special committee will be established in Oecusse municipality for strengthening programme implementation, and monitoring and evaluation of the malaria elimination phase in the autonomous region.

2.8.2 Ensure robust health sector response

A robust health sector response is required to successfully implement a malaria elimination programme. Although standard operating procedures for response and other functions in the elimination phase have already been developed, there still exist some gaps in response. The gaps are due to administrative, financial and technical reasons.

Based on this elimination strategy, all cases must be notified within 24 hours, investigated within 5 days and a response mounted within 10days of notification. For this purpose, an emergency fund will be established whereby funds could be released at short notice to carry out these activities.

The National Malaria Programme will recruit 50 malaria volunteers and station them in hard-to-reach areas and in border areas. The Malaria Volunteers will be trained in using RDTs, interpreting results, treating patients, surveillance, and maintaining records and stock balances.

Several vacancies exist in health institutions. These vacancies will be filled at the earliest to ensure that all persons have universal access to malaria diagnosis and treatment. All new recruits will be trained on relevant aspects of the elimination programme. In addition, staff already in the programme will be provided with re-fresher training for malaria elimination.

Procurement and supply chain management must be strengthened to prevent stock-outs and expiry of diagnostics and antimalarial drugs. A computerized inventory system and proper training of staff will be able to overcome most of the current problems faced in this regard. Currently, MSupply, a pharmaceutical supply chain software programme, is being piloted in Dili municipality and is expected to be rolled out to the rest of the country.

Health sector responsiveness must be improved to provide a wide range of services especially primary health care services. Integrating different programmes such as immunization and MCH programmes will facilitate implementation of malaria elimination interventions.

Frequent training and reminding health workers about malaria is necessary. With the reduction in the number of malaria cases during elimination, malaria becomes a forgotten disease as health care workers tend to forget malaria and do not test for malaria. Health workers need to be constantly reminded of malaria during elimination. Special programmes will be conducted for clinicians.

2.8.3 Strengthen health sector work force and malaria expert base

2.8.3.1 Human Resource Training

The National Health Sector Strategic Plan for 2011 to 2030 (NHSSP) and the National Malaria Control Strategy for 2015 to 2020 (NMS) have identified capacity building as an essential component in the achievement of the strategic goals of providing comprehensive quality primary and hospital care services, establishing a strong support system for health care delivery, and promotion of greater community and partnership participation in the improvement of the health

system. For the national malaria programme, capacity building has been identified as a priority to consolidate the gains achieved through continuous investments in malaria control.

There is a shortage of trained human resource capital in the country at both the central and district levels. The following categories of staff require further training and enhancing of skills.

- ✓ Malaria Volunteers require training in using RDTs, interpreting results, treating patients, surveillance and maintaining records and stock balances.
- ✓ National, municipality and sub-municipality malaria unit staff require refresher training in basic malariology and surveillance
- ✓ National and municipality malaria officers require training in leadership and management.
- ✓ At the national level, a malaria expert base should be developed. The training of at least 2 persons at master's level in malariology/epidemiology and/or entomology will be undertaken.

Training in the following areas will be expedited to ensure successful implementation of the elimination phase:

- o Programme management skills – programme management training will be provided to national staff and all MMOs.
- o Additional epidemiology training, along with training in analytical skills for use in planning, implementation and monitoring and evaluation of the programme will be provided to the M&E Officer, and Regional and District Malaria Officers.
- o Surveillance in an elimination setting (training has been provided but more training is required for strengthening below mentioned areas)
  - Case investigation and classification
  - Focus investigation and classification
  - Response
- o Logistics management to include forecasting, inventory management, storage and distribution for staff at all levels.
- o Communication and facilitation skills for staff at all levels
- o Advocacy, networking and community mobilization for staff at all levels.

A study tour for Regional Malaria Officers and selected Municipality Malaria Officers will be organised in a country that has recently eliminated malaria in the region to provide hands-on experience on malaria elimination.

2.8.3.2 Update Human Resource (HR) development plan

Most of the officers (three Regional Malaria Officers, Entomology Officers and Sub-Municipality Officers and drivers) attached to the National Malaria Programme are temporary and funded by the Global Fund. It is important to recruit these highly trained and motivated staff as permanent officers of the Ministry of Health for the sustainability of the malaria elimination programme. The HR plan will be reviewed and updated taking into consideration the roles and responsibilities, and the skills required of staff during the elimination phase. The job descriptions will be revised and task shifting will be required. Staff will be recruited as permanent staff in a phased manner. These staff can be integrated to assist other vector borne disease control programmes after the country has achieved "malaria-free" certification.

2.8.4 Technical Assistance

Technical assistance is required from a malariologist for smooth operation and successful implementation of the malaria elimination phase in the country. Quality assurance of microscopy has been developed with technical assistance. To strengthen the QA system and to train laboratory analysts technical assistance will be required. Technical Assistance will be required in other areas for various issues as they arise.

2.8.5 Enacting and enforcing legislation

Enacting and enforcing legislation is important to ensure that all malaria cases are notified, that unregulated, substandard and counterfeit antimalarial medicines are not available in the market and that pesticides are regulated.

2.8.5.1 Legislation for notification of cases

Although malaria is a notifiable disease, notification is generally not done by the private sector. Ten clinics of community based organizations report to the National Malaria Programme. Legislature will be enacted to ensure that all private sector and community based organizations will notify malaria cases within 24 hours of detection.

2.8.5.2 Legislation to control sale and quality of antimalarial medicines

Legislation will be enacted and enforced to ban the import, registration, distribution and sale of oral artemisinin monotherapies, substandard and counterfeit drugs and drugs not included in the national malaria treatment guidelines. Random checks and raids of medicine outlets will be carried out by officers of the Ministry of Health and the Police.

2.8.5.3 Legislation to control sale and quality of pesticides

There is no approved pesticide law in the country. A pesticide law is required to avoid marketing of counterfeit pesticides and importation of expired pesticides to delay the emergence of insecticide resistance in malaria vectors and other pests of public health importance. The MOH will work with the Ministry of Agriculture to finalise the pesticide law by inclusion of pesticides used for public health purposes in to the existing Law. MOH will facilitate the MOA to obtain approval from parliament.

2.8.6 Behaviour Change Communication and advocacy

Behaviour change communication and advocacy will be targeted to different categories via different approaches using different strategies in coordination with the Department of Health Promotion of the Ministry of Health.

2.8.6.1 Advocacy for the general public and community participation

Community participation is a key to the success of any community based intervention. Communities will be made aware of the elimination programme and what is required of them. Advocacy for the general public will be based on group activities and one on one individual briefings. Group advocacy sessions will be conducted during outreach activities. Individual one on one session will be conducted during house visits by Malaria Volunteers, other partners such as Health Net and by health care personnel engaged in the Family Health Programme.

An effective social marketing programme for malaria elimination will be developed to raise awareness about malaria elimination in communities.
Communities will be made aware of the following:

- ✓ Symptoms of malaria
- ✓ Complications of malaria
- ✓ How to diagnose malaria
- ✓ Where to go for diagnosis
- ✓ The importance of taking the full course of antimalarial treatment
- ✓ Transmission of the disease
- ✓ How to prevent malaria (eliminating mosquito breeding sites, use of LLINs, etc)

These topics will also be included in the school curriculum.

Special messages will be targeted at vulnerable groups such as populations living along the West Timor border, farmers engaged in slash and burn agriculture and fishermen who frequently visit Indonesian islands for fishing. The messages will be delivered during one-to-one encounters and during group discussions. Some advocacy material has already been developed for these activities. More material needs to be printed.

2.8.6.2 Advocacy for health care personnel

Advocacy for health care personnel will focus on the need for considering malaria in the differential diagnosis of fever patients and the need to test all fever patients for malaria. This will be done via regular training programmes.

In addition, clinicians will be encouraged to use the opportunity of the consultation to educate people regarding malaria elimination and the importance of being tested for malaria, the need to comply with treatment and measures of prevention. Educational materials that have already been developed for this purpose will be provided to clinicians.

2.8.7 Develop partnerships and engage in multi-sectoral activities

Partnerships help to disseminate malaria elimination interventions to a wide spectrum of the community especially the most vulnerable. With partnerships, there is a sense of ownership of the programme by all partners and sharing of resources thereby enhancing the uptake and effectiveness of interventions.

Partnerships will be developed within the health sector between departments of the Ministry of Health and between other sectors including the academia, research institutions, industry, NGOs, private sector, and others such as agriculture, irrigation, water supply, forestry, private sector, law enforcement agencies including the armed forces etc.

Regular meetings with partners will be held to review activities and see ways as to how the partnership can be enhanced further. Partnerships will also be sought to deliver services to communities in hard-to-reach areas.

In addition, partnerships and collaborative activities will be developed with other sectors such as Finance, Education, Agriculture, the armed forces and the police. The cooperation of the armed forces and the police will be sought for obtaining malaria data and for malaria prevention

activities.

The Ministry of Education will be engaged for malaria prevention activities that will be carried out through schools. The Ministry of Agriculture will be engaged in to develop the Pesticide law and its enactment. The integrated pest and vector management programme will be carried with the assistance of farmers in collaboration with the Ministry of Agriculture.

2.8.8 Cross-border collaboration

Cross border collaboration is essential in reducing the receptivity of border areas and the vulnerability of the populations resident in these areas given the variance in malaria transmission across the border. Cross border discussions commenced in January 2017 facilitated by the CCMs of the two countries. This activity will be further strengthened under the direct guidance of the Task Force for Malaria Elimination that is to be established. The malaria programmes of the two areas will meet at least once in six months to share data and experiences and to strategically plan joint control/elimination activities. In addition, sub-municipality information will be shared monthly.

2.8.9 Monitoring and Evaluation

A new Monitoring and Evaluation Plan with revised performance indicators will be developed to monitor the implementation and progress of the malaria elimination programme based on the National Strategic Plan for Malaria Elimination 2017-2020. The revised indicators of the performance framework are given in Annex 1.

Quarterly progress review meetings will be carried out at the National Malaria Programme headquarters with the participation of Municipality Malaria Officers. In addition to reviewing progress of antimalarial activities including reporting of cases and case and foci investigations, data will be cross-checked and verified. Quarterly review meeting will be conducted to ensure compliance with the performance framework at district and national level.

Supervision of elimination activities will be intensified. All case investigations and response will be supervised by district and national level officers.

Programme activities will be evaluated annually by district and national level authorities. A Malaria Indicator Survey and external mid-term review will be conducted in late 2019.

2.8.10 Logistics and transportation

A logistics information management specialist will be hired to assess the logistic information management system and to recommend ways how to improve the system as the malaria elimination phase must run smoothly without any stock outs minimizing wastage. The need for early and adequate response requires the availability of vehicles in running condition at hand to meet any emergency. An emergency fund that can be accessed in an emergency will be established.

3 SITUATION ANALYSIS

The progress made by the National Malaria Programme in bringing down the burden of malaria in the country to elimination levels has been outstanding. The major strengths and weaknesses of the National Malaria Programme, and the opportunities and threats facing the programme in moving towards malaria elimination are given in Box 1.

The major strengths of the National Malaria Programme is the presence of well-trained highly motivated staff under a strong leadership. There is an extensive health care delivery system with quality assured RDTs and ACTs available at the community level. The evolving primary health care system is reaching to hard-to-reach areas. The strong surveillance system is in place but needs to be further strengthened to achieve malaria elimination.

Malaria continues to be a problem in Oecussi municipality due to its geography and unique circumstances. Foreign workers who come to work in development projects initiated in the country are not tracked and poses a potential threat to bring imported malaria into the country. The existing surveillance system does not receive data from the private sector; for malaria elimination, private sector data needs to be linked to the national surveillance system.

The is a lack of flexibility in dispersal of funds in emergencies for rapid response to foci and outbreaks. There is also weak pharmaceutical legislation and enforcement to ensure availability of quality antimalarial medicines in the market and non-sale of medicines not recommended by the National Malaria Programme. The pesticide law should include public health pesticides.

A major weakness of the National Malaria Programme is the very small number of staff that has been recruited on a permanent basis by the government. Almost 90% of the staff are funded by the Global Fund. For successful malaria elimination, more staff need to be recruited on a permanent basis.

It is envisaged that Timor-Lestecan achieve malaria elimination and “malaria-free” certification within 5-10 years with continued support and commitment. With improvement in health infrastructure and regulation of the private health sector, there is greater scope for collaboration with the private sector.

The major threat to malaria elimination is waning political and financial commitment. Sustained funding from the Global Fund and other international partners is the key to successful malaria elimination in Timor-Leste.

Other threats to malaria elimination are the loss of skills of both clinicians and laboratory analysts in diagnosing malaria with dwindling number of malaria cases and the malaria situation in neighbouring West Timor and other islands of Indonesia that surround Timor-Leste.

Box 1. Situation Analysis

Strengths

- ✓ Achieved Pre-Elimination status – cases already down to zero in most districts
- ✓ Strong health system including an evolving primary health care system that focuses on families.
- ✓ Well-established health infrastructure at all levels.
- ✓ Strong leadership and young highly-motivated staff.
- ✓ Strong surveillance system is already in place.

Weaknesses

- ✓ Problems in Oecussimunicipality that could hold back the rest of the country achieving elimination.
- ✓ Lack of engagement with the private health sector.
- ✓ Lack of knowledge about development projects that may result in influx of foreign workers.
- ✓ Lack of flexibility in dispersal of funding for rapid response to foci and outbreaks.
- ✓ Large number of temporary staff.
- ✓ Weak pharmaceutical legislation and enforcement;
- ✓ Pesticide law not approved

Opportunities

- ✓ With continued support and commitment the Country can reach elimination within 5-10 years.
- ✓ Surveillance system will prevent reintroduction so after three years of zero cases, Timor-Leste can apply for malaria-free status
- ✓ DHIS2 will provide a strong platform for the surveillance system
- ✓ Collaboration with the private sector and multi sectoral support for elimination efforts will be strengthened.
- ✓ Community support for elimination and its overall improvement and sustainability of the achievements can be mobilized.
- ✓ Strong cooperation with Kupang and neighboring areas of Indonesia can be established.
- ✓ The Family Health Programme of the Primary Health Services can be the basis for malaria surveillance because it registers families and individuals.

Threats

- ✓ Skills required for diagnosis and treatment with disappearing cases will be forgotten.
- ✓ Changes in political support resulting in reduced government spending on malaria needed to carry the program through to elimination and continued maintenance of a malaria free country.
- ✓ Changes in the availability of global fund and other international financial support needed to carry out the program through to elimination.
- ✓ Major changes in the malaria situation in surrounding parts of Indonesia that could spill over and threaten TL.
- ✓ Government may not be willing to pay the same, affecting staff motivation
- ✓ Decentralization not taking into account the technical and managerial challenges; requires strong technical leadership from the central level.

Bibliography

National Statistics Directorate (2014).Timor-Leste in Figures.http://www.statistics.gov.tl/wp-content/uploads/2016/06/Timor-Leste-In-Figures-2014.pdf

National Statistics Directorate (2016a).Timor-Leste Population and Housing Census – Data Sheet.http://www.statistics.gov.tl/wp-content/uploads/2016/11/Wall-Chart-Poster-Landscape-Final-English-rev.pdf

National Statistics Directorate (2016b). At-A-Glance: Poverty in Timor-Leste in 2014. http://www.statistics.gov.tl/wp-content/uploads/2016/11/16009_TL_Broch_R02.pdf

WHO (2012). Disease surveillance for malaria elimination: an operational manual. Geneva: World Health Organization.

WHO (2016). Global Technical Strategy for Malaria 2016-2030. Geneva, World Health Organization.

Documents reviewed

- Manual for Malaria Microscopy
- SOPs for Quality Assurance and quality control of Malaria Microscopy
- Bench aids for malaria microscopy
- Checklist for supervision of laboratory analysts
- National Malaria Treatment Protocol
- Manual for Entomology Field and Laboratory Techniques
- Guidelines for Malaria Vector Control
- Guidelines on Indoor Residual Spraying for Malaria Control
- Keys to identify Anopheline mosquitoes in Timor-Leste
- Guidelines for LLINs distribution
- Guidelines on Bioassay tests to evaluate bio-efficacy and persistence of insecticides on treated surfaces
- Guidelines for determination of the susceptibility of adult mosquitoes to insecticides
- Guidelines for determination of the susceptibility of mosquito larvae to larvicides
- Guidelines on the use of larvivorous fish
- SOP for Entomology trend and foci surveillance
- LLINs distribution plan 2016-2017
- National Policy and Strategy on the Use of Pesticides in Public Health
- Manual of Judicious Use of Insecticides for Vector control
- Guidelines for Integrated Pest and Vector Management
- Flip chart for training of farmers on IPVM
- Guidelines on malaria preparedness and outbreak response
- Guidelines on malaria control and prevention for CHVs

Annex 1
Indicators for performance framework 2017-2021

Indicator	Baseline	2017	2018	2019	2020	2021
Impact indicators						
Reported number of confirmed indigenous malaria cases	95	<95	<95	<95	45	20
Proportion of indigenous infections due to *P.falciparum*	0.89	0.8	0.75	0.5	0.25	0
Malaria I-9(M): Number of active foci of malaria	31	30	25	20	10	5
Malaria I-3.1(M): Inpatient malaria (indigenous cases) deaths per year: rate per 100,000 persons per year	0	0	0	0	0	0
Outcome indicators						
Malaria O-7(M): Percentage of existing ITNs used the previous night	97%			>90%		
Malaria O-9(M): Annual blood examination rate: per 100 population per year (Elimination settings)	8%	8%	8%	8%	8%	8%
Coverage indicators						
Number of long-lasting insecticidal nets distributed to at-risk populations through mass campaigns	272,849		7,627	2000	66,387	0
Proportion of population at risk potentially covered by long-lasting insecticidal nets distributed	0.95	0.9	0.9	0.9	0.9	0.9
Number of long-lasting insecticidal nets distributed to targeted risk groups through continuous distribution (pregnant women)	28,074		13,729	13,729	13,729	13,729
Proportion of population protected by indoor residual spraying within the last 12 months in areas targeted for indoor residual spraying	0.95	0.9	0.9	0.9	0.9	0.9
Proportion of suspected malaria cases that receive a parasitological test at public sector health facilities	100%	100%	100%	100%	100%	100%
Proportion of suspected malaria cases that receive a parasitological test in the community	100%	100%	100%	100%	100%	100%
Proportion of suspected malaria cases that receive a parasitological test at private sector health facilities	Baseline data will be obtained in 2018		50%	75%	100%	100%
Proportion of confirmed malaria cases that received first-line antimalarial treatment at public sector health facilities	100%	100%	100%	100%	100%	100%

Indicator	Baseline	2017	2018	2019	2020	2021
Proportion of confirmed malaria cases that received first-line antimalarial treatment in the community	100%	100%	100%	100%	100%	100%
Proportion of confirmed malaria cases that received first-line antimalarial treatment at private sector health facilities	Baseline data will be obtained in 2018		50%	75%	100%	100%
Proportion of health facilities without stock-outs of key commodities during the reporting period (quarterly)	100%	100%	100%	100%	100%	100%
Proportion of confirmed cases fully investigated and classified	100%	100%	100%	100%	100%	100%
Proportion of malaria foci fully investigated and classified	95%	100%	100%	100%	100%	100%
Percentage of health management information system or other routine reporting units submitting timely reports according to national guidelines (quarterly)	13	13	13	13	13	13