MALARIA MANUAL OF OPERATION

Republic of the Philippines
Department of Health
OFFICE OF THE SECRETARY

FOREWORD

The Malaria landscape has changed tremendously in the last ten years. More provinces have been declared malaria free and many provinces have zero malaria case in the past two to three years. By the end of 2017, malaria cases in the country have been reduced by 93% compared to the 2003 baseline. Deaths have been reduced by 99% compared to the same baselines (142,000 cases to 4,038 cases and 164 deaths to 3). The geographical extent of locally transmitted/indigenous malaria cases have been reduced to 181 barangays in 36 municipalities in 7 provinces from the previous malaria endemicity coverage of 15, 686 barangays in 487 municipalities in 53 provinces. A total of 42 provinces have been officially declared by the department as malaria-free provinces. The target is to increase the number of malaria-free provinces to 72 by the end of 2020 for the last Philippine province to reach elimination no later than 2024 en route to achieving country-wide elimination status by 2030. Efforts must be exerted to ensure that every step in the transition to elimination status is properly documented. A robust amount of information will be required to support our claim of country-wide disease free status when the country makes its request for assessment.

Between now and then, we will continue to exercise eternal vigilance and enduring patience in ensuring that whatever gains the program has achieved remains intact and protected. In those last remaining areas where malaria remains a problem, quality health care, ready access to high quality health care services, both preventive and curative should remain the norm of each and every health system at the national and local level, in both public and private sector. The challenge is to accelerate these initiatives to levels where disease elimination is more readily achieved, while at the same time, integrating and mainstreaming these activities into a regular, comprehensive set of health care services for the community.

Critical recognition and acute awareness of this outstanding achievement will be instrumental in helping us sustain this status and move towards our goal of country-wide disease free status.

This malaria manual of procedure embodies the struggle, dreams and aspirations of eliminating malaria using the most advanced tools, socially and culturally acceptable interventions that is strengthening the local health systems.

The country's program implementation, in line with the FOURmula One for Health Plus or F1+ which expands the four pillars of health reforms and highlights greater focus on performance accountability, is in the forefront of these developments. Revision of the manual is necessary to keep up with all these health reforms that are attuned to the needs of frontline health workers. These updates conform with international developments spearheaded by the World Health Organization (WHO) to make it more responsive to the current state of malaria in the country. The Philippines hopes to eliminate malaria by 2030.

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UP PGH Collage of Public Health
World Health Organization (WHO)

Abbreviations and Acronyms

AL	Artemeter - Lumifantrine
AOPH	Annual Operational Plan for Health
AP	Active Province
APLMA	Asia Pacific Leaders Malaria Alliance
BHW	Barangay Health Workers
CHD	Centre for Health Development
CHO	City Health Office
DOT	Directly Observed Treatment
GFATM	Global Fund for AIDS TB and Malaria
GPS	Global Positioning System
GTS	Global Technical Strategy
IVM	Integrated Vector Management
LGU	Local Government Unit
LLIN	Long Lasting Insecticidal Net
MESU	Municipal Epidemiology Surveillance Unit
MFP	Malaria-Free Province
MMC	Municipal Malaria Coordinator
MSAT	Mass Screening and Treatment
MTR	Medium Term Review
NCDMFP	National Committee for Declaration of Malaria Free Provinces
NCIP	National Commission for Indigenous Population
NSPCEM	National Strategic Plan for Control and Elimination of Malaria
NSP	National Strategic Plan
OFW	Overseas Filipino Worker
PACD	Pro-active Case Detection
PESU	Provincial Epidemiology and Surveillance Unit
PHA	Philippine Health Agenda
PHO	Provincial Health Office
PhilMIS	Philippine Malaria Information System
PIDSR	Philippine Integrated Disease Surveillance and Response
PIPH	Philippine Investment Plan for Health
PMC	Provincial Malaria Coordinator
PPCD	Personal Protective Clothing and Devices
PQ	Primaquine
PSFI	Pilipinas Shell Foundation Inc.
QN	Quinine
RACD	Reactive Active Case Detection
RDT	Rapid Diagnostic Test
RESU	Regional Epidemiology and Surveillance Unit
RHM	Rural Health Midwife
RMC	Regional Malaria Coordinator
RSI	Rural Sanitation Inspector
SDG	Sustainable Development Goals
WHOPES	World Health Organization Pesticide Evaluation Scheme
ZP	Zero - Indigenous Province

Contents

Brief Introduction to the Manual

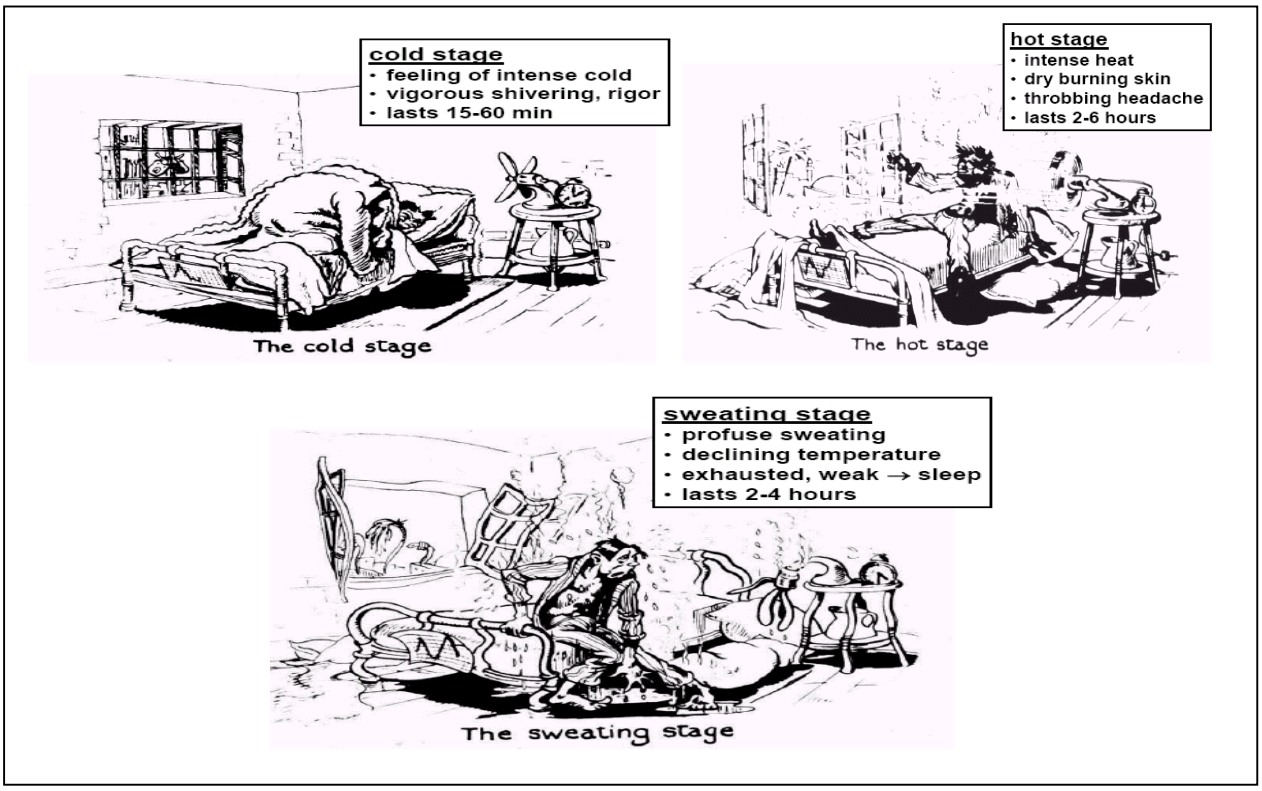
The country is aiming for a Malaria Free Philippines by 2030 or earlier. This manual was written for the LGU health workers multi-tasked by the numerous health programs to answer the health needs of the community. The manual was simplified and condensed for easy understanding the roles they must do to eliminate malaria in every corner of the country. The risk of re-introduction of the parasite is always present coming from outside the country and from the remaining active foci of malaria locally. This manual introduces 1-3-5 response strategy to prevent re-introduction of malaria and integrated malaria control method to eliminate malaria in the remaining active malaria foci. There is new stratification process and new terminologies to conform to global technical strategies. Brief definitions and explanations are inserted in the text for easy understanding. The progress of the program is faster than expected and with the vigilance of every health worker malaria elimination is within reach. This manual will guide them to search for the remaining malaria parasites in the community.

Unit I Program Overview

1 The Disease

Malaria is a parasite that reproduces in the mosquito, inside human red blood cells (RBC) and in the liver cells. They reproduce inside the RBC then burst the cell releasing substances that induce chills, fever and sweating producing the classical symptoms of malaria (*Fig. 1.1*). Released parasites invade another RBC. The cycle repeats every 48 to 72 hours. Thousands of RBCs are destroyed with each cycle resulting to anaemia weakening the human body. Some malaria parasites, instead of replicating develop into the– sexual stage called gametocytes. Gametocytes are picked up by mosquitoes where they undergo maturation and sexual reproduction. After about ten days, they are transmitted as sporozoites to another human when mosquito takes another blood meal. The parasites invade liver cells of the new victim, reproduce and burst the host liver cells releasing thousands of parasites into the blood. The life cycle goes on until it is interrupted by mosquito control and treatment of humans hosting the parasites.

Fig. 1.1 Malaria Paroxysm



There are four species of human malaria namely: *Plasmodium falciparum (Pf), Plasmodium vivax (Pv), Plasmodium malariae (Pm)* and *Plasmodium ovale (Po).* Seventy percent (70%) of all malaria cases in the country are *P. falciparum*. It is also responsible for severe or complicated malaria causing mortality. *P vivax* causes about 30% of cases. It is also capable of producing complicated malaria but to a lesser extent. *Plasmodium vivax (Pv)* and *Plasmodium ovale (Po)* have dormant stages in the liver called hypnozoites. They are the causes of relapsing malaria several months or maybe years after the initial infection.

2 Global Malaria Situation

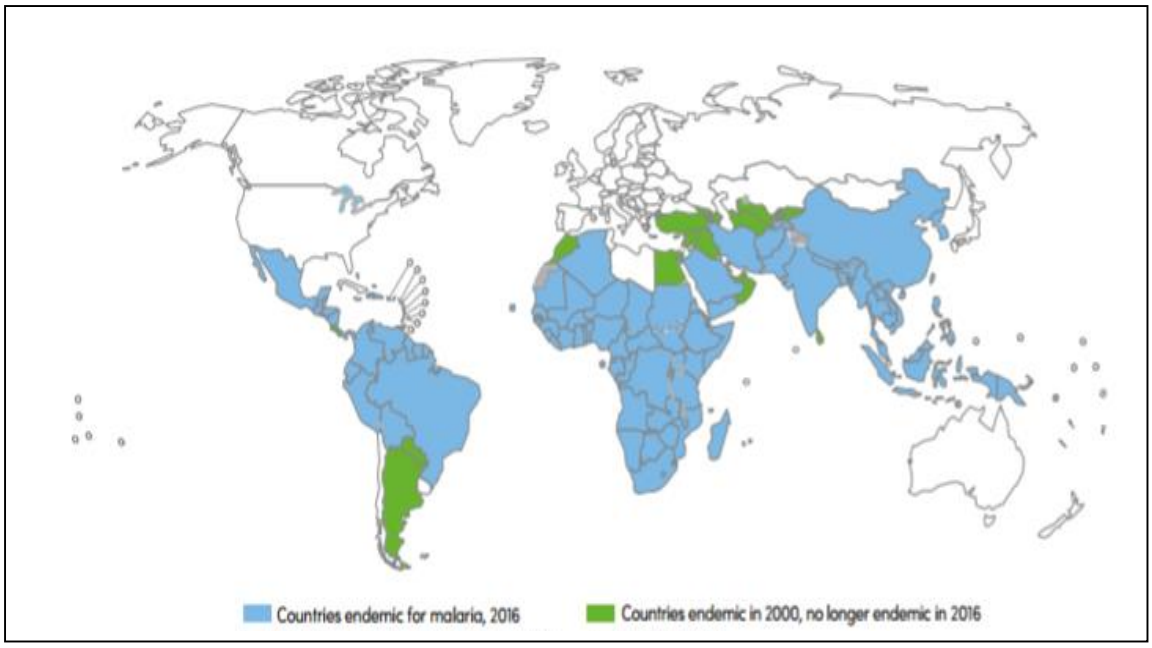
Global malaria incidence is on the decline since 2009 because of increase funding and large scale implementation of interventions (WHO, A Framework for Malaria Elimination 2017). Ninety one (91) countries and territories reported malaria transmission in 2015 (*Fig 1.2*). There was 41% reduction of cases from year 2000 to 2015. There were 429,000 malaria deaths globally in 2015. Ninety two percent (92%) of malaria deaths were from WHO African Region. Children below 5 years old contributed 72% of all malaria deaths globally (World Malaria Report 2016). Acceleration of reduction of incidence occurs after the introduction of better medicines (Artemisinin-Lumefantrine combination therapy), insecticide treated nets and increase in funding support.

Decrease in incidence rates is estimated to have been greatest in the WHO European Region (100%) and the WHO South-East Asia Region (54%). In Southeast Asia and Pacific regions, malaria is still considered a problem in Papua New Guinea, Lao People's Democratic Republic and Solomon Islands. The countries of Malaysia, South Korea and China are aiming to eliminate malaria by 2020.

Malaria elimination is the buzz word today. Thirty one (31) countries have eliminated malaria and have been certified malaria free by the WHO since 1955. Seventeen (17) countries attained zero indigenous cases for 3 years or more between 2000 and 2015.

Malaria is fighting back. A pocket of drug resistance to artemesinin was identified in Mekong sub region. This is a big threat to global malaria elimination. Containment of artemesinin drug resistant malaria is going on through the leadership of the World Health Organisation, but drug resistance can happen anywhere if medicines are not properly used.

Fig. 1.2 Malaria Endemic Countries (source: WHO, 2016 World Malaria Report)



3 National Malaria Situation

The Philippine Malaria Program Mid-term review (MTR) showed that the national malaria program achieved the targets earlier than expected. The reduction of incidence is 66% since 2010. Total reported malaria cases in 2016 were 6604. Palawan Province contributed 92% (6132) of the total reported cases. Among 81 provinces of the country, only 8 have indigenous malaria, 32 are certified malaria free and 41 have no indigenous malaria. Out of 1634 municipalities in the country, malaria is only present in 40 (2.4%) municipalities. Eighteen (18) of 40 municipalities contributed 98.3% of all reported malaria cases. The problem area had shrunk as shown in the malaria endemicity map (*Fig 1.3*) (*Table 1.1*).

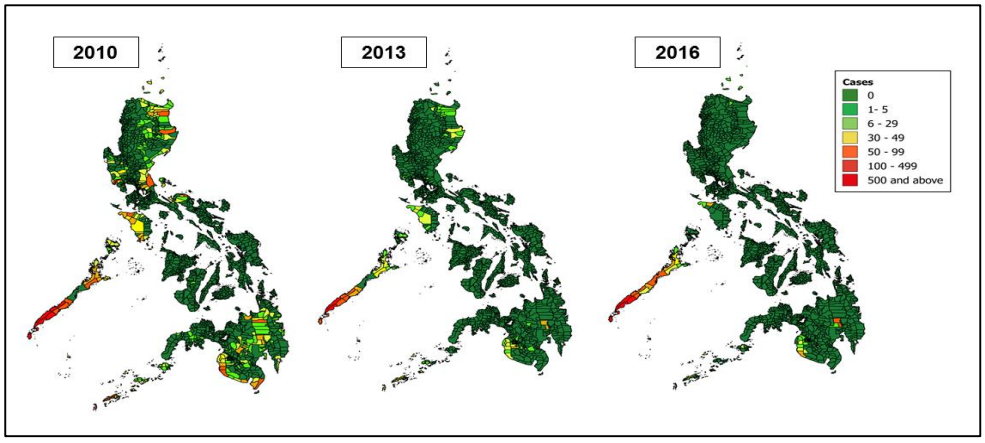
The problems in the 8 remaining provinces are diverse. Political instability, armed conflict and cultural practices of the IPs are challenging and may need the involvement of other disciplines or sectors. The current malaria situation is awesome but fragile. Outbreaks may occur. This is the risk the provinces is facing because of increase in vulnerability owing to loss of natural immunity over time coupled by mobility of population for various reasons. In 2014-2015 cases increased by 65% contributed by Palawan Province brought about by delay in vector control and increase in case detection activity by deployment of RDT to more sites.

MTR recommended improvement in the quality and timeliness of diagnosis and adherence to treatment protocol, continue to expand and maintain the availability of RDT diagnosis by BHWs in peripheral areas with persisting malaria transmission or risk. Regarding vector control it is recommended that practices and evidence for vector control interventions should be reviewed and rationalized under an updated focal approach to stratification. In areas where cases approach or reach zero, strong surveillance is necessary and timely response with aggressive vector control only in special risk situations.

In the area of human resource, MTR recommended strengthening of capacity at the LGU level particularly entomology, vector control and microscopy quality assurance. Elimination hubs must strengthen surveillance and have staff capable of analysing and responding to emerging situations

Program monitoring, integrated surveillance and effective case investigation and response at the community level should also be strengthened with particular emphasis on foci of transmission. Careful, intensive and more frequent monitoring from central and provincial level is needed in problem areas.

Fig. 1.3 Malaria Endemicity Map, 2010 – 2016



4 Malaria Status of Provinces

The vision of the program is a malaria-free country by 2030. The program is pursuing sub-national malaria elimination. The Department of Health (DOH) certifies the province as malaria free if they meet certain conditions particularly the ability to sustain malaria free status. Provinces are in different phases of transition. Provinces in the zero indigenous malaria are in the process of satisfying the criteria needed for declaration particularly sustaining their zero malaria status through heightened surveillance and building capability to respond rapidly.

Provinces with barangays stratified under active transmission area are classified under active province or A province. Indigenous cases occur in these provinces. When they succeed in interrupting transmission and after a year of zero indigenous case, the province is classified as zero indigenous province or Z province. The country must show the capability of rapid response to a malaria case and the communities ready to cooperate. They need 3 years of zero indigenous cases after which they can request the DOH for preliminary assessment. They will be certified malaria free after 5 years of zero indigenous case and pass the assessment for malaria free status. It is then classified as malaria-free province or MF province.

Table1.1 Category List of Provinces

Criteria	Provinces with indigenous malaria (A province)	Zero indigenous malaria (Z province) and Malaria-Free provinces (MF province)
Operational Objective	Interrupt transmission	Prevent re-introduction of parasite
Number of Provinces	8	73 (no local transmission)

List of Provinces	Cagayan Davao del Norte Maguindanao Mindoro Occidental Palawan Sultan Kudarat Sulu TawiTawi	Ilocos Norte, Ilocos Sur, La Union, Pangasinan Mountain Province, Kalinga, Apayao, Ifugao, Abra Batanes, Isabela, Nueva Vizcaya, Quirino, Nueva Ecija, Bulacan, Pampanga, Bataan, Tarlac, Zambales, Aurora, Cavite, Batangas, Laguna, Quezon, Rizal, Marinduque, Mindoro Oriental, Romblon, Masbate, Camarines Norte, Camarines Sur, Albay, Sorsogon. Catanduanes, Cebu, Iloilo, Northern Leyte, Bohol, Guimaras, Biliran, Siquijor, Camiguin, Negros Occidental, Negros Oriental, Antique, Western Samar, Southern Samar, Eastern Samar, Capiz, Aklan, Southern Leyte, Agusan Del Norte, Agusan del Sur, Surigao Del Norte, Surigao del Sur, Dinagat Islands, Bukidnon, Lanao del Sur, Lanao del Norte, Misamis Oriental, Misamis Occidental, Compostela Valley, Sarangani, Davao del Sur, Davao Oriental, Zamboanga del Sur, Zamboanga del Norte, Basilan, North Cotabato, South Cotabato

5 Vision, Goal and Objectives

Vision **:** A Malaria–Free Philippines by 2030

Mission **:** Further accelerate malaria control and transition towards Elimination

Goal **:** By 2022, to reduce malaria incidence in the Philippines by 90% relative to a 2016 baseline and to increase the number of malaria free provinces from 32 to 74.

Objectives **:**

Objective 1 (*Universal Access*) – To ensure universal access to reliable diagnosis, highly effective and appropriate treatment and preventive measures

Objective 2 (*Governance and Human Resources*) – To strengthen governance and human resources capacity at all levels to manage and implement malaria interventions

Objective 3 (*Health Financing*) – To secure government and non-government financing to sustain malaria control and elimination efforts at all levels

Objective 4 (*Health Information and Regulation*) – To ensure quality malaria services, timely detection of infection and immediate response, and information and evidence to guide malaria elimination

6 Guiding Principles

The NSPCEM in the Philippines 2017-2022 is guided by the overall results of both reviews, recognizing the varying status and individual circumstances of the different LGUs.

The Plan continues to pursue the achievement of the Sustainable Development Goal of ending the epidemic of malaria infection in affected countries and the APLMA and ASEAN commitments to achieving malaria elimination in the Asia-Pacific Region by 2030.

The strategies elaborated in the Plan take a health system strengthening approach to malaria control and elimination (rather than, for example, including a separate objective relating to health system functions). The updated NSPCEM also remains clearly and recognizably aligned with the PHA of the new administration, and following a health systems approach means that the strategies for both control and elimination areas can be addressed under the one service delivery objective (but as clearly differentiated strategies).

In particular, the principal objective of the Plan (*Objective 1*) reflects the administration's fundamental guarantee in relation to service delivery in the health sector: universal access to quality health care and services at all life stages. The technical approaches supporting this objective are strongly guided by Pillars 1 and 2 of the WHO GTS and Regional Framework.

Other objectives are also recognizably aligned with other guarantees and/or major strategies of the PHA, and with Pillar 3 and the supporting elements of the GTS and Regional Framework: strengthening Program governance; rationalizing and, where necessary, strengthening the malaria work force; maintaining the financing needed to sustain progress towards accelerated malaria control and elimination (including through improved utilization of *PhilHealth* financing for malaria diagnosis and treatment as a component of primary health care, especially among the poor); strengthening information systems; and ensuring strong regulatory and quality assurance (QA) functions.

7 Policy Directions

Overall Policy Direction

Efforts will be geared towards accelerating the program towards elimination, attainment of malaria –free status and prevention of reintroduction.

Policy Direction 1

Area stratification down to the barangay/sitio level will be applied on the basis of rate of transmission to guide the application of appropriate package of interventions and prioritization of resources. Provinces reaching zero indigenous malaria will reclassify their barangay following the elimination framework stratification of malaria endemic foci with its corresponding intervention packages.

Policy Direction 2

The program will ensure universal access to early diagnosis and prompt treatment. Microscopy remains the gold standard for malaria diagnosis. Rapid Diagnostic Tests will complement microscopy in situations where microscopy will not be immediately available. Treatment must make use of effective anti-malarial drugs, with guidance from results of up-to-date efficacy studies done in the country.

Policy Direction 3

Universal coverage of vector control measures will also be ensured. Use of insecticide treated nets (ITN), particularly the more cost-effective long lasting insecticidal nets (LLIN) is the main vector control measure. Indoor residual spraying (IRS) with insecticide shall be adopted in areas where the use of net is not culturally acceptable, displaced population and epidemic situations. IRS will also be done with guidance from the results of epidemic and foci investigations.

Policy Direction 4

Quality assurance for malaria microscopy, treatment and vector control measures will be expanded to all endemic provinces, cities and municipalities, and must be sustained in malaria-free areas

Policy Direction 5

Malaria surveillance will be used as a core intervention aimed at detecting suspect malaria cases and confirming every infection for proper classification and management particularly in areas that have been assessed to have interrupted transmission and/or declared malaria-free. Epidemic management and response will be integrated with the Philippine Integrated Disease Surveillance and Response (PIDSR) and established at all levels of administration.

Policy Direction 6

Health Promotion will be enhanced through the delivery of key messages focused to each group of stakeholders and according to the stratification category of areas.

Policy Direction 7

Local capacities of malaria program management will be strengthened and coordination among and between levels of administration relative to malaria program efforts and resources will be streamlined.

Policy Direction 8

Efforts will be exerted for LGU's to design or adopt financing mechanism to sustain malaria operation towards elimination and to maintain their malaria-free status.

8 Strategies

Strategy 1.1 Maintain focal malaria interventions in municipalities and barangays with active foci

Strategy 1.2 Ensure continuous access to malaria diagnosis, treatment and preventive measures in zero-indigenous malaria and malaria-free provinces

Strategy 1.3 Implement responsive malaria interventions among identified vulnerable population groups

Strategy 1.4 Increase demand for and support to effective anti-malaria interventions and services

Strategy 2.1 Establish functional organizational structures and malaria work force at all Levels

Strategy 2.2 Strengthen the policy environment, management systems and coordination mechanism in support of malaria elimination

Strategy 3.1 Secure adequate government and non-government financial resources in support of malaria control and elimination

Strategy 4.1 Ensure high quality malaria diagnosis and treatment, through effective quality assurance systems

Strategy 4.2 Maintain high quality and effective vector control measures

Strategy 4.3 Strengthen malaria case surveillance and response systems in support of malaria elimination according to the Malaria Surveillance and Response Strategy

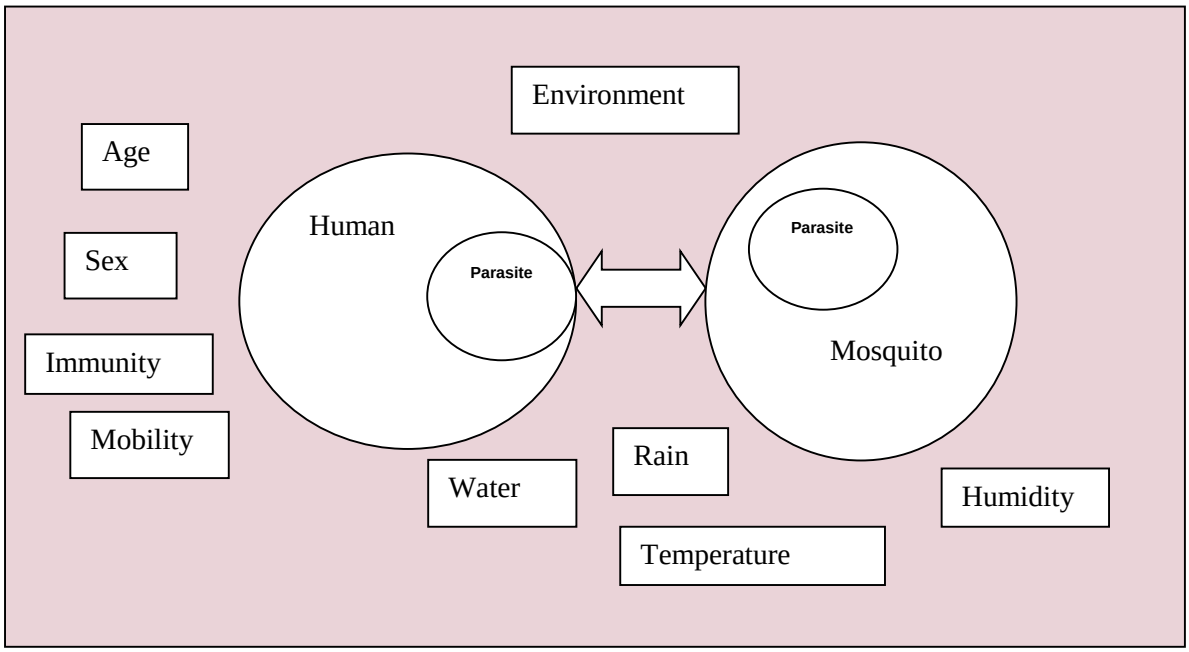
Strategy 4.4 Maintain effective malaria program monitoring and evaluation systems

Unit II Epidemiology of Malaria

1 The Environment

Environment consists of all the circumstances, people, things and events that influence life. Living things have activities that change the environment (*Fig 2.1*). Increase of human population puts pressure to the environment. Increase in human activities result to global climate change which then influences every creature on earth. Malaria is no exception. Climate change favours wider geographical distribution of mosquitoes thus increasing the potential for wider malaria distribution too. Mosquitoes have survived extreme weather conditions. Their population recovers fast. Water is the most important for their development and reproduction. Seasonal increase of malaria cases is the result of seasonal changes in rainfall, creating more streams where mosquitoes breed, and high humidity that prolongs the life of adult mosquitoes. Longer life means more blood meals and egg laying and more mosquitoes and possibly more malaria.

Fig 2.1 Interplay of factors in the environment determines malaria transmission.



2 The Vector

Rain creates water pools and streams where mosquitoes lay their eggs that favor abundance of mosquitoes. It also provides high humidity prolonging their life span and increasing their total egg output.

Development of the parasite from gametocytes to sporozites takes 9 to 12 days in the mosquito gut. Infected mosquito remains infective for the rest of its life. High humidity during the rainy season favors longevity of mosquito. Longevity of the infected mosquito is the most important factor in the transmission of malaria. They take a blood meal every three days and each bite transmits the parasites. Longer life means more bites thus more transmission.

There are five identified malaria vectors in the country. Their bionomics important for the control program is listed in *Table 2.1* below.

Table 2.1 Selected Characteristics of Malaria Vectors in the Philippines

	An flavirostris	***An. litoralis***	***An. balabacencis***	***An. mangyanus***	***An. maculatus***
Flight range (in km)	1.5 -2.0	10.0-15.0	2.5	1.5 – 2.0	2.5
Breeding site	Slow flowing, fresh water streams, shaded, abundant on foothills.	Brackish water	Small water collection, rock pool, hoof tract	Slow flowing streams in wooded areas	Semi-stagnant streams along sides of shallow rivers with mat of algae
Peak biting time	10:00 pm to 2:00 am	10:00 pm to 4:00 am	8:00 – 10:00 pm	10:00–12:00 pm	-
Feeding site	Indoor and outdoor	Outdoor	Indoor and outdoor	Indoor and outdoor	Indoor and outdoor
Resting site	Indoor and outdoor	Indoor and outdoor	Outdoor	Outdoor	Outdoor

Mosquitoes can fly 1.2 to 2 km from breeding site unaided by the wind but *An, litoralis* can fly 10 to 15 km. Usually the mosquito fly within 500 meters from the breeding site to search for blood meal. Houses nearest the breeding site are at higher risk and there are reports that they tend to visit the same house. Table 2.1 shows the characteristics of the vectors useful for designing vector control methods. Control methods can target the larval stages at the breeding site or target the adult females in their resting and feeding sites. Only adult female mosquitoes need a blood meal for the development of their eggs. They feed and lay eggs every 48 to 72 hours increasing the chance of exposure to applied vector control methods.

Mosquitoes can change their behaviour from indoor biter to outdoor biter and vice versa. They can sense insecticide on sprayed walls and avoid it and they can develop physiological resistance to insecticides contributing to complexity of malaria control and elimination.

3 The Parasite

There are four species of human malaria. *Plasmodium falciparum* (*Pf*) is the predominant malaria species in the country at around 70% followed by *Plasmodium vivax (Pv)* at around 30%. Rare infection with *Plasmodium malariae* (*Pm*) is reported. *Plasmodium ovale (Po)* has not been reported in the recent past. A fifth parasite, *Plasmodium knowlesi (Pk)* has been identified in humans in Palawan Province, Philippines and neighbouring Malaysia. It is a malaria parasite of the monkey.

Severe malaria is usually from *Pf* infection but recent literature reported *Pv* can also cause severe malaria. *Pv* and *Pm* have dormant stages in their life cycle called hypnozoites producing relapse several weeks or years after treatment of the initial infection. Hypnozoites do not produce any symptom and no laboratory test is available to detect their presence in the liver. Relapse may pose a challenge for malaria elimination. Some strains of *Pv* relapse more often than others. They can relapse within 30 days to as long as 2 years.

Malaria parasites reproduce both sexually and asexually. Sexual reproduction happens in mosquito. It is called sporogony producing sporozoites. Sporozites is the infective stage that goes with mosquito saliva during blood meal. Schizogony is the asexual reproduction. It happens in liver cells and in red blood cells (RBC). One complete life cycle of the parasite i.e. gametocyte stage from one victim to gametocyte stage of the next victim, is called incubation interval (*Table 2.2*). Keeping incubation interval in mind is the key to understanding malaria control and elimination.

Table 2.2 Location and Stages of Parasite Life Cycle

Location	Stages of Life Cycle		Reproductive Phase	
Human RBC (1^0 victim)	Gametocytes (male & female)			One incubation interval (25-35 days)
Mosquitoes	Zygote		Sporogony (8 to 10 days)	
	Ookinete			
	Oocyst			
	Sporoblast			
	Sporozoites			
Human Liver (2^0 victim)	Schizont (tissue)	Hypnozoites (*Pv* and *Po*)	Exo-erythrocytic schizogony (12-15 days, longer in *Pv*) or Incubation Period	
		Schizont (tissue)		
Human blood plasma	Merozoites		Erythrocytic cycle/schizogony (48 to 72 hours) *merozoites invade another RBC every time they mature,(*symptomatic stage)	
Human RBC	Trophozoites (ring form)			
	Schizont (erythrocytic)			
Human blood plasma	Merozoites			
Human RBC	Gametocytes (male & female)		Gametogony (9-11 days in *Pf*)	

The parasite life cycle has different stages in different location and they reproduce in each location (*Table 2.2*). The number of offspring varies with species. *Pf* produces more offspring (exo-erythrocytic cycle) than the rest thus producing more parasites that damage RBC (Table 2.3). *Pf* makes RBC sticky blocking the capillaries of brain and other internal organs.

Table 2.3 Number of Offspring from a Single Parasite

Parasite Species	Sporogony (in mosquitoes)	Schizogony(in humans)	
		Exo-erythrocytic (liver)	***Erythrocytic (RBC)***
Pf	~1000	30,000	8-24
Pv	~1000	10,000	12-14
Pm	~1000	15,000	8-12
Po	~1000	15000	6-12

4 The Human Host

Mobility

Both human and mosquito have the ability to move from one point to another. Humans carry the parasites farther and more frequent than mosquitoes. Returning Overseas Filipino Workers (OFW), armed groups, local and international tourists, seasonal workers, nomadism, internal displacement and migrations are some of the reasons for mobility. Infected humans carry the parasites with them wherever they go. They can re-introduce the parasites to the community if the vectors are present. Malaria parasites can live in human body for 2 years or more without treatment if they do not kill the host. Mosquitoes have limited flight range but sometimes are accidentally carried by planes or ships to a more distant place.

Immunity

Lack of immunity predisposes individuals to development of severe malaria. People living in non- endemic areas are not exposed to malaria hence no development of immunity. People living in former endemic areas lose their immunity over time. Pregnant women have altered immunity while children under five years old living in endemic areas have yet to develop their immunity through natural exposure to the parasite. Semi-immune people in endemic areas have mild symptoms or none at all. They have no symptom that prod them to seek medical consultation therefore the infection is not detected. They are the undetected source of parasites in the community sustaining transmission.

Behaviour

Human behaviour detrimental to malaria control and elimination are treatment seeking behaviour and mosquito bite prevention. Each day of delayed treatment is a day of feeding mosquitoes with parasites. Every night of unprotected sleep is a feast of parasite loaded meals for the vector mosquitoes or vice versa.
Human behaviour provides complexity to malaria control. Improper intake of medicines creates a chance for development of drug resistance.

Nightly use of mosquito net is another human behaviour needed to protect from mosquito bites. Behaviour is the manifestation of the belief system. It has been ingrained into the community and handed down through generations and offers a challenge to the program especially among members of the indigenous population (IPs).

Living Condition

Mosquitoes can easily enter the house if the walls are not complete or there are gaps in the walls, eaves or floor. Poverty maybe a factor in house construction but there are cultural groups who prefer to have good ventilation by not completing the walls. Mosquitoes usually visit the house nearest the breeding site and there are reports that they visit the same house feeding in the same household.

Poverty dictates the living condition of the family and the community. Inadequate food production, lack of education and poor health are conditions commonly found in malaria endemic communities. Malaria pushes them further down to this cycle of poverty.

Society

Community members working together for common good have changed the course of the disease in many areas both in and outside the country. The end goal of malaria elimination and prevention of reintroduction is sustainable only if there is active participation of the community members. Conflict between social groups, political groups, ideological groups or cultural groups hinders delivery of health services thus favouring malaria transmission. These are the challenges to the delivery of health services particularly towards malaria elimination.

Health Service Providers

Health service providers can change the course of the disease if they have commitment, capability, coordination and control (4Cs). Experience has shown that without these 4Cs, the disease will keep going on. Delayed intervention, stock outs of medicines, undetected malaria, poor coordination among health units were just some of the reasons in the past for the continuous presence of malaria after more than 50 years of malaria control service. Quality assurance of health service delivery is necessary to move the program forward and eliminate malaria once and for all.

Unit III Approaches and Interventions

1 Malaria Elimination

Policy Direction
Efforts will be geared towards accelerating the program towards elimination, attainment of malaria –free status and prevention of reintroduction.

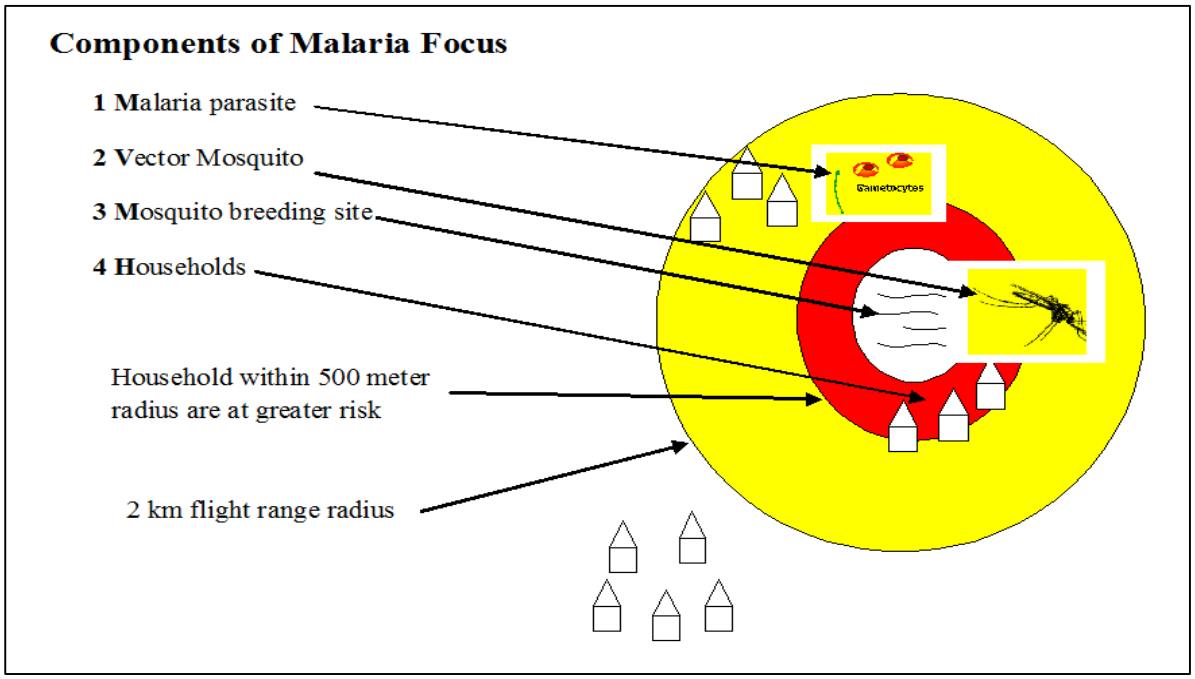
Malaria elimination is the interruption of local mosquito-borne malaria transmission resulting to the reduction the incidence of infection caused by human malaria parasites to zero, in a defined geographical area as a result of deliberate efforts with strategies containing measures to prevent re-establishment of local transmission.

Malaria elimination does not mean complete elimination of disease-causing determinants such as the mosquito vectors or the malaria parasites. It also does not mean complete absence of reported malaria cases in a country. The focus is on local, active mosquito-borne infections. Imported malaria cases are expected to continue to occur due sporadically due to the migration and emigration of people brought on by international travel. (*Malaria Elimination A field manual for low and moderate endemic countries WHO; 2007*)

Malaria transmission focus consists primarily of the mosquito vector breeding site and the houses within the flight range of the vector (Fig. 3.1). The transmission focus is said to be active if there is indigenous malaria case/s for the past 3 years, cleared if there is no indigenous malaria case in the past 3 years. The focus is said to be receptive if the mosquito vector exist even if there is no malaria parasite in the focus (*A Framework for Malaria Elimination, WHO, 2017*). Confluence of transmission foci result to wider geographical distribution of malaria. As the foci are cleared, the geographical distribution shrinks and what remains are pockets of transmission focus. Reaching this stage increases the feasibility of eliminating malaria.

Receptivity is the ability of the ecosystem to allow transmission of malaria.
Vulnerability is the probability of malaria parasite importation into a country or area.
A Framework for Malaria Elimination, WHO, 2017

Fig 3.1 Components of Malaria Focus



Mosquitoes can fly 2 km from the breeding site but observation and reports say they search for blood meal nearest their breeding site usually within 500 meters and there are studies that they usually visit the same household or the immediate neighbour.

1.1 Malaria Elimination Strategy

Program Policy Directions in transitioning from control to elimination

- Focused application of diagnostic and treatment and vector control measures
- Quality assured malaria interventions
- Continued funding support to sustain efforts for intensive control measures in higher transmission areas, elimination strategies in areas with low transmission, and prevention of resurgence in areas already declared malaria free
- Effective malaria elimination programmes with realistic targets expressed in a comprehensive and funded plan of action, backed up by government commitment at the highest levels.
- Adherence to national strategies and international standards

1.1.1 Surveillance

People coming into the community as well as residents who travelled in malaria endemic areas or country must be tested for malaria. They must be kept under observation for development of malaria symptoms for at least 2 weeks (incubation period). Passive case detection (PCD) must be able to detect the relapse and triggers another round of active case detection (ACD) to look for secondary cases arising from the relapse case. Once the community is cleared of malaria, surveillance through PCD will be the major activity to prevent reintroduction of malaria.

1.1.2 Fortnightly ACD

Control methods must be applied simultaneously in the locality with active transmission and ACD repeated every 2 weeks (fortnightly) to detect the parasite emerging from incubation. Fortnightly ACD is crucial because gametocytes of *Pf* appear on the second week of illness. It is a race of time between case detection and treatment vs biting mosquitoes. Two incubation intervals without any case detected in ACD is a good sign that the parasite is no longer in the community except those who have hypnozoites in their liver. It can reactivate for as long as two years or longer. Primaquine can kill parasite in the liver but since there is no diagnostic method to recognise those who are harbouring the parasite in the liver, they will be missed and the hypnozites reactivate later on to continue its life cycle. PCD must be able to detect parasites emerging from hypnozoites stage.

1.1.3 Simultaneous intervention activities

Simultaneous interventions are the key to eliminate malaria in a transmission focus. Malaria is an endemic disease. It circulates in localities with susceptible hosts and mosquito vector. The parasite is dynamic. It does not stay in just one host owing to nature of its life cycle. Program activities affect only one particular segment of the parasite life cycle. Each segment must be considered a separate reservoir because it can repopulate the other segments affected by the control method. Simultaneous activities (health promotion + vector control + MBS then ACD) will eliminate parasite in the community. Elimination activities have to be sustained because of hypnozoites of *P vivax* and *P ovale.*

2 Prevention of re-introduction of malaria

Barangays/sitios classified as residual non-active and cleared may remain receptive to malaria as long as the vector mosquito is present owing to the presence of suitable breeding site. The threat of reintroduction is always present because of movement of people who maybe carrying parasite from other endemic areas or from local people harboring hypnozoites from previous *Pv* infection.

2.1 Early Detection and Quality assured Diagnosis

- Community members must be active in screening people visiting or migrating into the barangay for the presence of malaria symptoms. It must be communicated to community official and community members that their area is malaria free and they should be always on guard to sustain their status.

2.2 Readily Accessible Effective Treatment

- Malaria medicines must be initiated within 24-48 hours of diagnosis. It has to be available within few hours travel time. Medicine has to be effective to attain parasitological cure and to prevent transmission of parasite. Delay in treatment endangers the life of the patient.

2.3 Epidemiologic Investigation of cases and foci

- Every case of malaria needs to be investigated to determine the location of transmission and places visited by the patient where it might have been reintroduced. Each place visited by the patient must be investigated and placed under heightened surveillance.

2.4 Coordination of responses to prevent indigenous cases

- Prevention of reintroduction is a community effort i.e. all stakeholders. It does not necessarily mean residents of the barangay only or health sector only because everything is at stake and many people will be at risk. Local health personnel must not hide a case of malaria just to be safe from humiliation but they must ring the alarm for the potential of local spread. Malaria is a disease with great epidemic potential.

2.5 Foci Management in residual non-active and cleared foci and malaria free provinces

- Community must also be active participants in bio-environmental management of the breeding sites. Encourage the community to establish bio ponds where they can raise larvivorous fish and seed the breeding site to control mosquito population.
- Regular quarterly or semi-annual monitoring visit by RSI/MMC will encourage the community to manage the foci themselves to keep mosquito population at low level.
- Municipalities and cities should maintain a record of all foci and a map of their municipality/city showing all the foci and the breeding sites with their GPS location (longitude and latitude) and status of malaria transmission. (*See Annex 2*.)

3 Malaria Elimination Hub

Administrative Order no. 2013-0007 provided guidelines in the establishment of malaria elimination response hubs in all malaria free provinces (including NCR) and areas which have achieved zero indigenous malaria transmission. Malaria elimination response hub refers to a structure equipped with diagnostic capabilities, entomologic surveillance capacity, laboratory equipment and supplies, anti-malaria drugs and vector control commodities established in areas malaria free areas to prevent the re-introduction of malaria. Presence of elimination hub is criteria for declaring a province as malaria-free.

Elimination hub is manned by; (a) provincial malaria coordinator and other local health staff trained on malaria surveillance; (b) entomologist-designate; (c) trained physician in malaria case management; (e) health promotion officer (HEPO); (f) medical technologist/validator and; (g) vector control response team. Elimination hub has to sustain malaria-free status of the province/city through multiple interventions to prevent re-introduction of the disease.

Sub-National Malaria Elimination

The country embarks on eliminating malaria at sub national level. There are already 42 malaria free provinces since the start of elimination campaign. There is progressive transition of provinces from active to zero-indigenous status as a result of successful program. Provinces are classified based on the occurrence of indigenous case/s:

a. Active Provinces or APs are those provinces still reporting indigenous cases.

b. Zero indigenous province or ZPs are those provinces without indigenous case of malaria for the past 2 years or longer

c. Malaria-Free Provinces or MFs are those certified malaria free by the national program.

3.1 Criteria and requirements for declaring provinces as malaria free

Mandatory Requirements:

a. Absence of confirmed indigenous malaria cases in the last 5 years

b. Lab register – past 5 years

c. Surveillance reports in the past 5 years (including case/foci investigation reports)

d. Presence of a functional malaria elimination response hub

e. Presence of a functional provincial surveillance system

f. Presence of a functional system for diagnosis and treatment of malaria

g. A line list of all health facilities (public and private) providing malaria diagnostic and treatment services available anytime.

h. Compilation of all malaria reports in the past 10years.

i. Vector control report in the past 10 years (including QA of vector control) in the past 5 years with entomological investigation reports

j. Functional entomological surveillance;

k. Functional quality assurance system for malaria microscopy (QA reports in the past 5 years)

l. Cross border collaborations/operations

m. Sustainability plan next 5 years and budget utilization report in the past 5 years

n. Local Issuance/Ordinance on elimination hub requirements

o. Annual Operation Plan for Health (AOPH)/Provincial Investment Plan for Health (PIPH) to support provincial malaria activities and operations

3.2 Certification Process

3.2.1 Self-assessment by the province

- The province conducts self-assessment based on their records and reports to satisfy the mandatory and additional requirements mentioned above.
- Preparation of the Provincial /National Report
- Preparation of municipality reports

3.2.2 Validation by the regional office

- Review provincial report
- Regional Office validates the evidences for certification upon completion by the province and endorse the provincial report National Office if all the requirements are satisfied

3.2.3 Validation by the National Office

- National Office reviews the report, validates the completeness and consistency of the reports and the readiness of the province to sustain malaria free status upon endorsement of the regional office.

3.2.4 National Committee for Declaration of Malaria Free Provinces *(NCDMFP*) approves certification

4 Stratification of Malaria Endemic Areas

Policy Direction
Area stratification down to the barangay/sitio level will be applied on the basis of rate of transmission to guide the application of appropriate package of interventions and prioritization of resources. Provinces reaching zero indigenous malaria will reclassify their barangay following the elimination framework stratification of malaria endemic foci with its corresponding intervention packages.

Malaria foci was defined as circumscribe area or formerly malarious area that contains the epidemiologic and ecological factors necessary for malaria transmission. Malaria focus is classified as active, residual non-active and cleared (*Table 3.1*) as adapted from WHO Framework for Malaria Elimination (2017).

4.1 Stratification of Barangays/Sitios

Table 3.1 Classification of malaria foci
(*source: WHO, A Framework for Malaria Elimination 2017)*

Type of focus	Definition	Operational Criteria
Active	A focus with going transmission	Locally acquired case/s has been detected within the current calendar year.
Residual non-active*	Transmission interrupted recently (1-3 years ago)	The last locally acquired case was detected in the previous calendar year or up to 3 years earlier.
Cleared*	A focus with no local transmission for more than 3 years	There has been no locally acquired case for more than 3 years, and only imported or/and relapsing or/and induced cases may occur during the current calendar year.
**These will revert to active foci immediately once an indigenous case is identified from the area.*		

Barangay will be the unit for stratification (or classification) of malaria focus. Barangay will be subdivided further into locality if the barangay radius is more than 2 kilometres taking into consideration the flight range of the vector. The package of intervention for each stratum is listed in *Table 3.3*.

Prioritization among active foci will be through the string of months with indigenous cases if the resources are limited.

a. **First priority**: Barangays/sitios with string of 6 months or more indigenous case/s in a year for the past three years.
b. **Second priority:** Barangays/sitios with string of less than 6 months indigenous cases in a year for the past three years.

Stratification is updated every year using the past three year's data (moving 3 years). Successful program implementation will show progressive reduction of Barangay/sitios from active to residual non-active and eventually to cleared foci. When all barangays and sitios of the provinces are cleared for 5 years they are eligible for certification as malaria free province provided they meet the set criteria (*page 23-24*).

4.2 Package of intervention per malaria focus

Table 3.2 Package of intervention per malaria focus

Intervention	Active Foci	Residual Non-Active Foci	Cleared Foci
Objective	Mop–up parasite pool	Prevent Re-introduction	Prevent Re-introduction
Disease Surveillance	PCD±ACD	PCD	PCD
Case-Foci investigation	✓	✓	✓
Response strategy	Introduce 1-3-5	1-3-5	1-3-5
Diagnostic Method	Microscopy or RDT	Microscopy or RDT If malaria is highly suspected... validate with PCR	
Follow-up Smear	Microscopy	Microscopy	
IVM approach (LSM, where appropriate)	✓	✓	✓
LLIN	✓	✓	Continue to promote sleeping inside mosquito net
IRS	Supplemental	Border operations (in areas bordering active foci) and in Receptive areas with high vulnerability (evacuation centers, housing for workers – mining, military, forest workers). Imported case in receptive areas (1-3-5)	
Vector Surveillance	✓ Susceptibility Testing	✓ (receptivity risk mapping; linked to the case/foci investigation)	
Health Promotion (Key Messages)	"Sleep inside mosquito net every night" "Seek early consultation" "Refer people with Symptoms"	"Seek early consultation" "Refer people with Symptoms" "Sleep inside mosquito net every night"	"Seek early consultation" "Sleep inside mosquito net every night" "Refer people with Symptoms"
Operational Research	As needed		

4.3 Stratification Records and Foci Registry

Stratification records among municipalities must follow the recommended format (*Annex 3*). Municipalities must keep historical records of stratification for each barangays/sitios by year. This will become the foci registry when the province advanced to zero indigenous province or malaria-free province.

4.4 Classification of Provinces

Provinces are classified based on the presence of local transmission as follows:

1. Active Province (AP) refers to those provinces with active transmission in at least one barangay or sitio.
2. Zero indigenous Province (ZP) refers to those provinces with zero-indigenous malaria.
3. Malaria Free Province (MFP) refers to those provinces declared malaria free by the Department of Health

5 Disease Surveillance

Policy Direction
Malaria surveillance will be used as a core intervention aimed at detecting suspect malaria cases and confirming every infection for proper classification and management particularly in areas that have been assessed to have interrupted transmission and/or declared malaria-free. Epidemic management and response will be integrated with the Philippine Integrated Disease Surveillance and Response (PIDSR) and established at all levels of administration.

Surveillance is the systematic collection, analysis, interpretation and dissemination of data for use in public health action to reduce morbidity and mortality and to improve health. Malaria is one of the reportable diseases in the Philippine Integrated Disease Surveillance and Response (PIDSR) system, the main infectious disease surveillance and reporting system of the Department of Health. It covers all cities and municipalities of the country including private and government health clinics and hospitals. Surveillance provides data primarily for detection of epidemics as well any other uncommon trend or pattern in disease occurrence and is the basis for evidence based decision making in response to “out of the expected” occurrences of the disease

PIDSR is first and foremost a surveillance system and not a regular Monitoring and Evaluation system. It does not provide all the data needed by the program for decision making. The implementation of the Global Fund to Fight Aids, Tuberculosis and Malaria (GFATM) gave rise to the demand for more in-depth and program-evaluating data and as a result, the Philippine Malaria Information System (PhilMIS) was developed. However, it is limited to the provinces supported by the Global Fund project.

Surveillance differs between Active (AP) Provinces and Zero Indigenous Provinces (ZP) together with Malaria Free Provinces (MFP). As country progresses towards elimination surveillance becomes more active. Malaria-free provinces and zero indigenous malaria provinces aim to prevent re-introduction of parasite and to sustain their zero indigenous status. Active provinces (AP) aim to reduce cases and their geographical spread and prevent outbreaks through early detection, thorough assessment and prompt treatment of all cases.

Surveillance in malaria-free (MFP) and zero indigenous provinces (ZP) is proactive. Early detection of suspect malaria cases, assessment, treatment and concomitant investigation to assess risk of re-introduction is the cornerstone of surveillance activity. This approach is embodied by the 1-3-5 surveillance strategy/approach. Establishing intensified facility-based case finding based on re-defined standard case definitions and maintenance of access to quality diagnostic facilities are the main working principles. Establishing regular screening protocols for re-entering emigrants or visitors to malaria receptive community is recommended. The process consists of an intensive personal interview of the migrant/visitor a thorough physical assessment, determining if they fit the suspect malaria profile, undergoing a confirmatory laboratory testing for malaria parasite and treat according to the prescribed protocol if necessary. Directly observed treatment (DOT) is applied to those with malaria positive smear and a series of weekly blood smear is taken to monitor the response to treatment.

Table 3.3 Comparison of utilization of surveillance data between active provinces (AP) and malaria free/zero indigenous malaria provinces (MFP/ZP)	
Active Provinces (AP)	Malaria Free (MFP) and Zero Indigenous Malaria (ZP) Provinces (1-3-5 approach)
MESU reports malaria cases *every Friday*	Malaria case/s reported *within 24 hours*
PESU encodes data and send report to RESU	Case Foci investigated within 3 days
PESU compares weekly incidence against previous year data of the same period	Interventions (IRS/ACD/IEC) applied within 5 days
PESU provides feedback to MESU	Monitoring of cases on D 3,7, 28 for *Pf* and extended monthly for 6 months for *Pv*
MESU provides feedback to MHO and MMC	Screening of visitors, incoming migrants and local residents who visited endemic area
MHO and MMC decide the course of action *(please see response in page 27.)*	

5.1 Malaria Case Detection

Case detection can be classified into passive case detection and active case detection. It is called passive case detection when patient seeks the health worker for consultation. Active Case Detection (ACD) is the process of aggressively looking for fever cases in the community, requiring a regular house-to-house visit by the health staff and volunteer workers to identify cases. Active case detection (ACD) can be subdivided further to pro-active case detection (PACD), reactive case detection (RACD), and mass screening and treatment (MSAT) formerly called mass blood survey (MBS). Table 3.4 show the differences between ACD varieties.

Table 3.4 Varieties of active case detection		
Type of ACD	**Procedure**	**Objective**
Proactive case detection (PACD)	Every house in the community is searched for people with symptoms who are then tested for malaria.	Lower burden of parasite in the community
Reactive case detection (RACD)	Household members of the index case and immediate neighbors get tested for malaria.	Gather evidence of re-introduction of malaria
Mass Screening and Treatment (MSAT) or Mass Blood Survey (MBS)	Everyone in the community is tested for malaria	Search for asymptomatic malaria carrier

5.1.1 Active case Detection (ACD)

Active Case Detection (ACD) is the process of aggressively looking for fever cases in the community, requiring a regular house-to-house visit by the health staff and volunteer workers to identify cases.There are several varieties of active case detection:

5.1.1.1 Pro-Active case detection (PACD).

The objective of PACD is to lower parasite pool in the community. It is conducted by visiting every house in the community every 2 weeks and those with symptoms (fever) are tested and treated if positive.

5.1.1.2 Reactive ACD (RACD)

The objective of RACD is to gather evidence of re-introduction of malaria. It is done by visiting the household of a case under investigation and every member of the household and their neighbours are tested for malaria regardless of symptom. It is applicable to residual non-active and cleared and all barangays of malaria-free and zero-malaria provinces.

5.1.1.3 Mass screening and treatment (MSAT) or Mass blood survey (MBS)

The objective of MBS is to look for asymptomatic malaria or malaria carriers. It is conducted by taking blood smear of every individual in the community (regardless of symptom) and those found positive are given treatment.

Steps in doing active case detection

1. Determine your objective (PACD, RACD or MSAT)

2. Determine resources needed
   a. *Human Resource*
      i. Med tech/Microscopist
      ii. RSI
      iii. RHM
      iv. Field Assistant Workers
      v. Transport Operator

   b. *Materials*
      i. Locality sketch map and demographic data
      ii. Glass slide
      iii. Slide Box
      iv. Blood lancet
      v. Cotton
      vi. Alcohol
      vii. Biosafety equipment
      viii. RDT kits
      ix. Anti-malaria medicines
      x. Recording forms
      xi. Transportation and other provision

> ***Note:*** *Determine whether the microscopy will be onsite. This will depend on accessibility of the community. If microscopist will not be onsite there must be provision that those found positive will receive treatment within 24 to 48 hours. Those with symptoms during the visit maybe tested with RDT if microscopy is not on site and if positive are treated immediately.*

3. Arrange the date of visit with the barangay official and emphasize need for total area coverage.

4. On the date of visit, divide the team and assign areas to visit.

5. Visit every house and write the names of everyone staying in the house.

6. Ask if anyone have malaria symptom. Use RDT for immediate diagnosis and treatment of those with malaria symptoms. Write the result of RDT and the treatment given in ACD form.
7. Prepare blood smear of everyone who have no symptoms (for MSAT/MBS). If doing PACD, take smear of those with malaria symptom and those who had malaria in the past.

8. Dry the smear, label and keep in slide box.

9. Update the spot map for new houses and new individuals.

10. Remind everyone to sleep inside the mosquito net every night to prevent malaria.

11. Proceed to the next house and repeat Steps 6 to 10.

12. After visiting all the houses the team meets to consolidate the data and update the locality map.

13. Have an exit conference with Barangay official and assure them you will provide treatment for those who will turn positive for malaria.

14. Submit the blood smears for examination.

15. Return to barangay and administer treatment if there is positive smear. Prepare blood smear of everyone living in the house with positives smear (for ACD).

16. Schedule the next visit 2 weeks later.

17. Follow-up Visit after 2 weeks. Coordinate with Barangay officials

> **Objectives of follow-up visit**: (a) catch those who are in the incubation period and pre-patent period during the previous visit, (b) follow up smear from those who completed treatment from previous visit, (c) take blood smear of people staying with positive smear to identify asymptomatic carriers

18. Visit every house and search for people with symptoms of malaria.

19. Write the name of person with symptoms in ACD form and prepare blood smear.

20. Repeat Steps 10 to 17

21. Terminate the activity if there is no more positive smear for 4 consecutive visits (2 incubation intervals or 2 months).

Utilization of ACD data

ACD data provides a glimpse of malaria incidence on the day the activity was conducted. High SPR (>2%) denotes high malaria incidence on that point of time (point prevalence). Mass screening and treatment (MSAT) will provide better confidence about the real prevalence. It will also provide information on proportion of *Pf* and *Pv*, gametocyte rate among Pf, fever rate among positives and rate of asymptomatic infections. High proportion of Pf denotes high transmission. If high proportion of *Pv*; moving towards elimination, treatment failure or Pv outbreak. High gametocyte rate among *Pf* denotes late treatment seeking behavior and probably higher incidence in the coming weeks or months. High asymptomatic implies high level of partial immunity of the community. This information will guide program managers to improve interventions.

5.1.2 Passive Case Detection (PCD)

Passively collected surveillance data is a tool of epidemiology. It provides information on "what" is the problem (malaria incidence), "when" (weekly and monthly data), "where" (affected barangays) and "who" (name, age, sex, occupation) are the affected population segment. Possessing these information guides us "how" (decision making) to tackle the problem. Data quality particularly completeness and timeliness will make decision better and appropriate.

Response for PCD detected cases

Objective of response in zero-malaria (ZP) and malaria free provinces (MFP) is to prevent reintroduction of malaria parasite. This is also the response for barangays/sitios of active provinces (AP) stratified under residual non-active and cleared barangays/sitio. The response is rapid following 1-3-5 response strategy.

PCD surveillance data in active provinces

PCD surveillance data in control provinces is for monitoring the trend of malaria, for monitoring impact of interventions and for stratification. Stratification is utilized for prioritization. PCD Surveillance data for zero indigenous malaria provinces (ZP), malaria free provinces (MF) and in barangays/sitios of active provinces (AP) under residual non-active and cleared strata must follow **1-3-5** approach i.e. report within **1day**, begin case/foci investigation within **3 days** following notification and plan and implement intervention within 5 **days**. The objective of the response is prevention of reintroduction of malaria (*Table 3.25*)

Table 3.5 Response to PCD Malaria Report from Zero-indigenous malaria province (ZP), residual non-active and cleared barangays of Active provinces (AP), and malaria-free provinces (MF province)

Step	**Response Activity**	
1	Malaria case reported	Go to step 2
2	Secure blood smear or RDT used to diagnose the case Validate (cross read) the laboratory test. (if Positive treat accordingly and do follow up smear on day 3 and day 28) (if negative stop and consider other illness)	Go to step 3
3	Investigate the case using Malaria investigation form .Investigation Sheet (Annex 5) and classify	
	Imported	Go to step 4
	Indigenous	Go to step 4
4	Investigate the focus using foci investigation form(Annex 6) and classify according to receptivity and vulnerability	
	Receptive (with breeding site within 2 km radius) Vulnerable (with frequent influx of infected people)	Go to step 5
	Non Receptive (No breeding site)	Go to step 9
5	Active case detection every 2 weeks If negative continue PACD for 8 weeks Positive	Go to step 8 Go to step 6
6	Do vector control (IRS or LLIN)	Go to step 7
7	Mobilize the community to: - Manage the breeding site -Look for cases and bring to health center for laboratory diagnosis - Campaign to sleep inside LLIN every night	Go to step 8

8	Monitor vector control activity of community every quarter Vector Surveillance (include larval dipping, carabao baited trap (CBT))	Go to step 9
9	Passive Case Detection Update foci registry	Go to step 1

Cities and Municipalities with Barangays/sitios classified under active foci but with an API less than 1/1,000 population are recommended to adapt the 1-3-5 response strategy and develop their structure and surveillance as such. The response in active foci is aimed at interrupting transmission and preventing increase and spread (*Table 3.6*). They must follow the elimination strategy as discussed earlier.

Table 3.6 Response to PCD reports from active foci barangays.

Step	**Activity**	
1	Monthly comparison of case compared to previous year	Go to step 2
2	Increasing?	Go to step 3
	Decreasing? Continue monthly monitoring	
3	Visit the community and do rapid assessment Ask for: LLIN use last night Any movement of population into the area?(local population who visited other areas, immigrants, OFW's) Do they seek early consultation? Do they complete malaria treatment?	Go to step 4
4	IEC campaign based on result of step 3	Go to step 5
5	Draw spot map (Google Map maybe use) Plot the houses Mark the house of the cases Plot the breeding sites No breeding site	Go to step 6 Go to step 7
6	Check the land area. Divide if the land area is more than 2km (flight range of vector) from barangay proper	
7	Delimit the area of transmission i.e. with cases and breeding site People maybe contracting malaria somewhere else if there is no breeding site.	Go to step 8
8	Consider supplementary IRS Request for bioassay of LLIN Check quality of microscopy/diagnostic test	Go back to step 1

PCD Malaria Records

Hard copy of monthly record of cases by barangay/sitio must be printed because electronic files can be lost from breakdown of computer system and computer viruses.

Data from PCD must be separate from ACD to avoid confusion during data analysis particularly monthly incidence of the disease and SPR.

The recommended format for PCD record is illustrated in Annex 6. Monthly malaria record by barangay/sito must be kept and updated at the end of each month. Comparing the data with PESU record is desirable for uniformity and completeness. The table will come handy during stratification, planning, monitoring and evaluation at the barangay level. This is also the evidence to show active transmission in the barangay/sito.

String of transmission will show as string of months in the monthly record with malaria cases in a particular barangay/sitio. A barangay/sito showing string of 3 months may need additional control activity like supplementary IRS, community mobilization or ACD with IEC campaign for regular use of mosquito net and early consultation and treatment. Interrupted transmission will not show string of months with malaria in the monthly record of barangay/sitio.

6 One-Three–Five (1-3-5) Response Strategy

The Malaria Control and Elimination Program recognizes the need to sustain a functional and robust surveillance system that will ensure that all suspect cases are immediately detected and notified within 1 day (24 hours) of consultation. All notified cases are investigated thoroughly to confirm the diagnosis and treatment and classify types of cases within 3 days of notification, and focus investigation are conducted to each confirmed case within 5 days of case notification to determine the types of the focus, and take actions within 5 days of case notification to response to the intervention needs of different types of focus. This system, briefly called as 1-3-5 strategy, transforms the control-oriented malaria surveillance system into a core intervention to meet the need of a resilient malaria program for elimination. It aims to prevent reestablishment of malaria in cleared areas.

The 1-3-5 response strategy is applicable in all provinces declared malaria free (MF), zero-indigenous malaria provinces (ZP), and in municipalities with API <1/1000 population among the 8 active provinces (AP).

Implementation Guide

6.1 Malaria case notification within 24 hours of consultation

6.1.1 Case Detection

6.1.1.1 All malaria suspects shall be subjected to malaria laboratory diagnosis by either microscopy, RDT or by molecular modalities in Barangay Health Stations, RHU center, Hospital or Private clinics.

6.1.1.2 Malaria microscopy or RDT shall be done within 24 hours upon patient consultation.

6.1.1.3 Confirmed positive test must be treated immediately following the treatment protocol. (*See malaria treatment directory in page 46*).

6.1.2 Case Notification

6.1.2.1 All confirmed and clinically diagnosed malaria cases are to be notified through PIDSR within 24 hours upon patient consultation

6.1.2.2 For each confirmed or clinically diagnosed malaria case, the nurse or physicians or other health worker shall send a notification **within 24 hours** to their respective Municipal Epidemiology and Surveillance Unit (MESU) or City Epidemiology and Surveillance Unit (CESU) via voice calls or SMS and /or by other means with the following minimum patient details:

i. Name;
ii. Sex;
iii. Age;
iv. Residential address of the patient
v. Malaria diagnosis and treatment given, if available
vi. Name, dress and contact details of facility/health worker

6.1.2.3 The MESU/CESU shall acknowledge the receipt of the notification via voice calls or SMS and/or other means from the reporting local-health facility. Notification is considered completed when the minimum information has been confirmed received by the MESU/ CESU.

6.1.2.4 The MESU/CESU shall immediately inform the Malaria Program Coordinator (MPC) of the City/Municipality. The MESU/MHO/MPC shall immediately inform the PHO (PESU and PMC) of the reported cases. The PHO shall be responsible in informing the RHO while the RHO shall be responsible in informing the EB and the DPCD- IDO. Exhange of information, depending on where the information originates shall be vertical (up and down) and horizontal.

6.1.2.5 The MESU/CESU shall encode the patient details into the online PIDSR software using the minimum information of the malaria case from the local health facility/health worker.

6.1.2.6 In areas where online PIDSR is not available,the patient information are encoded into the PIDSR offline version by which the mdb file of the PIDSR can be sent at the end of each day.

6.1.2.7 Knowledge Management and Information Technology Services – Immediate notification of each malaria case encoded in the Case Investigation Form in the online PIDSR shall be sent to all other administrative levels, Provincial, Regional and National level both for the Disease Surveillance Units and the Malaria Program.

6.2 Malaria Case Investigation within 3 Days of case notification

6.2.1 The CESU/ MESU and the Malaria Program Coordinator shall jointly conduct the case investigation within 3 days, using the Case Investigation Form in the PIDSR (*Annex 5*).

6.2.2 The case investigation shall include confirmation/reconfirmation of the malaria laboratory tests done/results which shall be done by the Provincial or Regional malaria microscopy/RDT validator.

6.2.2.1 ***Not a Malaria Case*** – no further investigation shall be done. Seek for other cause of the patient's symptoms.

6.2.2.2 ***Confirmed Malaria Case*** – proceed with Malaria Focus Investigation

6.2.3 The case investigation shall also include review and confirmation of management and treatment of malaria cases which can be performed by the Provincial or Regional Malaria Program Coordinator.

6.2.4 Classify the malaria case's type.

6.2.4.1 Indigenous Malaria Case
6.2.4.2 Imported Malaria Case
6.2.4.3 Induced Malaria Case

6.2.5 The Malaria Case Investigation shall be done and completed within 3 days upon case notification.

6.2.6 The Malaria CIF shall be accomplished and signed by both CESU/MESU/PESU and the Malaria Program Point Person. The completed Malaria CIF shall be encoded into the PIDSR (online or offiline) by the MESU/CESU/PESU.

6.3 Focus investigation within 5 days of case notification

The purpose of focus investigation is to assess the risk of local transmission and conduct appropriately response in the area of concern .The process of foci investigation and classification can help evaluate the risk of onward or secondary malaria transmission where the case was diagnosed or the case resides.

The area can either be classified as a focus or non-focus depending on the result of the thorough investigation.The prescribed Foci Investigation Form (*Annex 6*) shall be used in investigating all foci.

6.3.1 Focus Investigation

Focus investigation, administrated using Focus Investigation Form, involves collection of the following information:

6.3.1.1 Basic information of the index case and the focus, including address, population, geocoordinates, etc.

6.3.1.2 Environmental and ecological assessment – to collect the information and data on altitude, topography and vegetation of the surroundings of a focus,

6.3.1.3 Conduct of malaria vector survey including mapping of potential breeding sites in the surroundings (2 km far from the residential location of the index and newly found cases)

6.3.1.4 Review the previous focus classification of the area – Check the database of foci registry/ annual classification

6.3.1.5 Review of Epidemiological Survey – (5 years)
Review malaria incidence in the past 5 years,

6.3.1.6 Cultural, Social and Economic assessment

6.3.1.7 Conduct reactive case detection:

6.3.1.7.1 The RACD includes rounds of screening of the 5 groups of people, following detection of a local or imported case in a receptive area (usually through ACD):

6.3.1.7.1.1 Family members
6.3.1.7.1.2 Neighbours
6.3.1.7.1.3 Co-workers
6.3.1.7.1.4 People in areas recently visited by the index case, and populations living within the flight range of anophelines from relevant breeding sites

The rounds should be continued at regular intervals, until no more cases are detected. Fever may and may not be a criterion for testing, depending on resources and the epidemiological situation.

6.3.2 Determine Receptivity

Receptivity of a site to malaria transmission depends on the presence of vectors and the existence of environmental and climatic conditions favourable to malaria transmission.

6.3.2.1 If a site is located at a very high altitude area or a highly urban area (downtown only of the provincial capital cities in the Philippines) with no vectors, then it is classified as non-receiptive site, or

6.3.2.2 If current survey, as part of the focus investigation, or the surveys conducted at the site in the past 5 years, reported presence of any of the vectors for malaria (*An. Flavirostris, An. Balabacensis, An. Maculatus, An. Litoralis, An. Mangyanus,* or other confirmed Species of anophelines mosquito transmitting locally malaria), then the site is classified as receptive site,or

6.3.2.3 If a site does not have past or present entomological evidence of malaria vector presence, but its topography is either mountainious/valley or coastal, its vegetation of surroundings is forest, bush or rice/crop fields, and it has fresh water stream(s), brackish water, swamps with fresh running water, it is classified as receptive site. Otherwise, classifying it as non-receptive site.

6.3.3 Classify the Transmission Status of a Receptive Site

Once the receptivity of the area has been determined, a thorough review of relevant data including environmental, ecological, epidemiological, entomological, social and economic factors is essential to determine the status of malaria transmission of a receptive site.

The status of malaria transmission is classified into the following three categories:

6.3.3.1 Active: locally acquired case(s) have been detected within the current transmission season or calendar year;

6.3.3.2 Residual non-active: the last locally acquired case(s) was detected within the previous transmission season/calendar year or up to 3 years earlier; other kinds of cases may occur, i.e imported, induced or relapsing/old cases.

6.3.3.3 Cleared: no transmission was detected within the last three years; imported, induced or relapsing/old cases detected in current calendar year or transmission season.

6.3.4 Determine the vulnerability of the receptive site

A focus is vulnerable if there is frequent influx of infected individuals or groups or near the border of an active focus (within the flight range of the vector).

6.4 Implementation of Response Interventions within 5 days of case notification

Once the focus has been classified, the malaria team shall implement appropriate response according to the type of malaria focus.

6.4.1 Active Focus

6.4.1.1 Enhanced Passive Case Detection Services in health facilities

Review epidemiological data, including patient registration of RHU for potential under-reported cases

6.4.1.1.1 RDTs be available at all levels of health facilities and community level services

6.4.1.1.2 Quality-assured microscopy be available at hospitals and malaria laboratories at health facilities

6.4.1.1.3 Supported by supervision at different intervals

6.4.1.1.4 Maintain available of malaria diagnosis and treatment services

6.4.1.1.5 Test for malaria should be done for all individuals with fever at least for the next 3 years from the day the index CASE was detected.

6.4.1.2 Reactive Case Detection

To continue regular screening of the 5 groups of people at a focus namely: family members of the index case; neighbors; co-workers; people in the areas visited by the index cases; and population living within the flight range of the anophelines from relevant breeding sites.

6.4.1.3 Treatment

Administer treatment to confirmed indigenous, imported, induced or relapsing/old cases if any, and supervise the outcome of treatment. All patients must have follow up smear at least on days 0, 3 and 28.

6.4.1.4 Vector Control

6.4.1.4.1 Identify vector's species, susceptibility to insecticides being used, and the time and location (indoor and outdoor) of biting

6.4.1.4.2 Rapid assessment of the vector control strategies implemented in the active foci to quantitate the access to and use of LLINs and IRS, and to assess the quality of the interventions in the foci (e.g., what is the condition of LLINs) and insecticide levels present (whether on nets or applied to walls)

6.4.1.4.3 Implement IRS and LLIN rapidly after detection of the active focus

6.4.1.4.4 Implement supplementary vector control if justified

6.4.1.5 Health Education

Promotion of key messages such as acceptance and usage of LLIN and IRS, acceptance to the screening and malaria tests, vigilance of fever surveillance and for health workers to keep malaria as a potential cause of illness of fever cases, and immediate consultation to the nearest health facility for any fever cases.

6.4.2 Residual Non-Active Focus

6.4.2.1 Enhanced Passive Case Detection Services in health facilities
Same as that for active focus
Test for malaria should be done for all individuals with fever at least for the next 3 years from the day the index CASE was detected.

6.4.2.2 Active case detection
Same as actives case detection in the population and initiate reactive case detection to cases reported

6.4.2.3 Treatment
Provide treatment to any imported, induced or relapsing/old cases detected. All patients must have follow up smear on days 1,3,7,14,21, and 28.

6.4.2.4 Vector Control
Same as that for active case detection but can be less intensive.

6.4.3 Cleared Focus

6.4.3.1 Passive Case Detection: Test should be done for all individuals With fever at least for one year from the day the index CASE was detected

6.4.3.2 Several rounds of active case detection as a minimum

6.4.3.3 Assessment of the risk of transmission, and decide if same vector control may be needed depending on the magnitude of the risk

6.5 Register the Focus in the Foci Registry

The Malaria Focus database shall be updated as needed. PHO, RHO and DPCB shall keep a file of the Foci Investigation form. The original form shall be kept by DPCB. The MHO shall register the focus in the online focus registry and illustrated in a municipal map. The PHO and RHO shall ensure that the foci registry is updated regularly.

Steps in the response strategy are illustrated in Table 3.7 below.

Table 3.7 Steps in 1-3-5 response strategy

DAY	STEP	ACTIVITIES	NOTES
ONE (1)	1	Malaria Suspect? ... Go to step 2	From all levels of health care inclusive of private and public clinics and hospitals.
	2	Confirmatory Test (Microscopy or RDT) Negative …. Repeat the test after 8 to 24 hours … STOP if test remains negative Positive … Go to step 3	BSMP must be made among RDT positives to establish baseline for case follow-up.
	3	Treat case accordingly upon confirmation of diagnosis (See Treatment Directory page…) … Go to step 4	
	4	Report case to MESU, PESU and RESU within 24 hours with the following information: • Name • Age • Sex • Complete residential address of the patient • Malaria Diagnosis and Treatment given • Name, address and contact details of facility/health worker … Go to step 5	Case notification can be through online/offline PIDRS or cellular phones whichever is faster.
	5	MESU confirms receipt of notification and together with MMC **validate**, **investigate** and **classify** the case using malaria case investigation sheet (Annex…) • Imported • Relapse • Introduced • Indigenous Go to step 6	

	6	MESU encode the data to PIDSR	
THREE (3)	7	MMC do reactive active case detection (RACD) Introduced case/s … Go to step 8 No positive cases … Repeat 7 and STOP after 2 rounds of no positive tests… Go to step 13	Immediate treatment of positive cases is a must.
	8	Determine classification of focus from foci registry Active focus … Go to step 10 Residual focus … Go to step 11 Cleared focus … Go to step 12 Unclassified focus … Go to step 9 Classification not updated … Go to step 9	Once an indigenous case appeared in residual or cleared focus it immediately reverts to active focus classification. Foci registry must be updated as frequent as possible. Municipalities must keep updated list of malaria foci.
	9	Do focus investigation using the foci investigation form (Annex 5) Receptive… Go to step 8 Non-Receptive… Go to step 13	Receptive foci are those with malaria vector mosquitoes. A receptive focus will have high vulnerability if there is high population flow.
FIVE (5)	10	Activities for Active Focus • Do integrated vector management (IVM) within 5 days from case notification • Vector Control (LLIN/IRS) • Reactive ACD • Proactive ACD • Health Education Go to step 13	See Stratification of barangays in pp.
	11	Activities for Residual Focus • Enhanced PCD • PACD + RACD • Treatment of cases • Vector Control • Health Promotion Go to step 13	
	12	Activities for Cleared Focus • ACD several rounds • Assess risk of transmission • PCD • Treatment of all positive cases • Health promotion Go step 13	
	13	Update/Register focus in foci registry	See forms in Annex 2

7 Confirmatory Diagnosis of Malaria

Policy Direction
The program will ensure universal access to early diagnosis and prompt treatment. Microscopy remains the gold standard for malaria diagnosis. Rapid Diagnostic Tests will complement microscopy in situations where microscopy will not be immediately available. Treatment must make use of effective anti-malarial drugs, with guidance from results of up-to-date efficacy studies done in the country.

- Laboratory test is necessary to have a definitive diagnosis of malaria and have the appropriate treatment because symptoms of malaria are similar to other febrile illnesses.
- Negative test can be repeated **after 24** hours if malaria is highly suspected especially if patient have history of travel or come from a malaria endemic area or country.
- The program utilizes microscopy or rapid diagnostic test (RDT) to confirm malaria diagnosis.
- Confirmatory tests, both RDT and microscopy, are subjected to **quality assurance** process to cope with the rigours necessary for malaria elimination.

7.1 Malaria Microscopy

- Microscopy is the gold standard for malaria diagnosis. Microscopy demonstrates malaria parasite in stained blood smears on a glass slide.
- Microscopy is performed by trained Med Tech or Volunteers who passed the required proficiency rating in the basic malaria microscopy training.
- Proper collection, preparation, labelling, drying fixing, and staining of malaria blood films to produce high quality, specimens for microscopy is a must.
- A standard blood smear has thick and thin blood film in one glass slide.

Equipment and Materials for blood smear preparation and examination

- Disposable lancet
- Glass slide (preferably w/frosted end)
- 70% Alcohol
- Cotton
- Pencil
- Gloves
- Bio Safety container for sharps (puncture resistant)
- Bio Safety container for infectious wastes
- Methanol (Absolute)
- Giemsa Stain
- Immersion Oil (Type A)
- Buffer salt or tablet
- Coupling jar
- Staining Rack
- Slide Rack
- Graduated cylinder (10 ml and 100 ml)
- Pipette
- Tally counter (min: 2-placer)

- Microscope
- Lens Paper
- Forms (result, registry, referral, etc.)
- Slide box
- Filter paper for blood spots

Procedure for preparation of Blood Smear for malaria microscopy

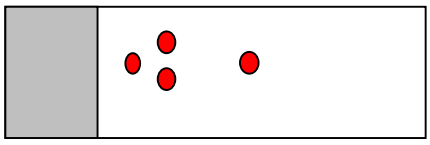
- Hold the patient's hand and select the third or fourth finger from the thumb. Use the big toe for infants.

- Clean the finger/toe with a piece of cotton soaked with 70% alcohol, using firm strokes to remove grease and dirt from the ball of the finger/toe.

- Puncture the ball of the finger/toe with a sterile lancet.

Precautions in preparation of blood smear
Wear gloves when collecting blood for malaria blood films
Use new, pre-cleaned and grease-free glass slides
Use new lancet for each patient. NEVER reuse blood lancets.
Always label the glass slides with the slide ID no., patient's name, age, sex, date and time of collection before taking a blood film.

- Apply gentle pressure to the finger/toe to express the first drop of blood and wipe it away with a dry piece of cotton wool. Make sure that no strands of cotton remain on the finger/toe as these cotton strands maybe mixed with the blood
- Collect 3small drops (approx.2 ul/drop) of blood on one end of the slide and 1drop on the middle of the same slide as shown below.



- Prepare the thin film first. Place the slide on a flat surface, using another glass slide as spreader, at an angle of 45^0 spread the blood away from the 3 drops. Push steadily to have a tapering smear with feathery edge.

- Using the corner/edge of the same spreader, prepare the thick film by joining the three drops of blood in a circular manner, starting from the outside going inward to make 1 cm diameter of blood film.

- Air dry the blood smear. When using a glass slide w/o frosted end, label the slide on the thicker portion of the thin blood film. Indicate slide number, name of the patient, slide number and date of collection using lead pencil as shown below.

- Send blood smear to laboratory for staining and examination. (*See Annex 7 for procedure of Giemsa staining method*)

Blood Smear Examination Results

The microscopist records the data of the patient in the laboratory microscopy log book, process the smear using Giemsa stain, examine the smear and release report using a standard code as shown in *Table 3.8* below.

Table 3.8 Code for Microscopy Result

Microscopy Report Code	Code Interpretation
F	*P falciparum* trophozites only
Fg	*P falciparum* gametocytes only
F+g	*P falciparum* trophozoite and gametocytes
F w/ schizonts	*P falciparum* trophozoite and schizont*
F+g w/ schizonts	*P falciparum* trophozoites, gametocytes and schizonts
V	*P vivax* (any or all stages seen)
M	*P malariae* (any or all stages seen)
O	*P ovale* (any or all stages seen)
VFg	Mixed infectionof*P vivax* and gametocytes of *P falciparum*
VF	Mixed infection of *P vivax* and trophozoites of *P falciparum*
MFg	Mixed infection of *P malariae* and gametocytes of *P falciparum*
MF	Mixed infection of *P malariae* and trophozoites of *P falciparum*
MVFg	Mixed infections of *P malariae, P vivax* and gametocytes of *P falciparum*
NMPS	No Malaria Parasite Seen
Note: *Schizont of *P falciparum* in peripheral blood smear is indicative of severe malaria	

7.2 Rapid Diagnostic Test (RDT)

- Rapid Diagnostic Tests detect malaria antigen in the blood of the patient.
- Test result is available within 15 to 20 minutes.
- Advantages of RDT lies in its simplicity, easy to use, requires little training, and do not require electricity nor expensive equipment.

- RDT comes in different design as cassette, card or strip and different antibodies to parasite antigens.
- The program deploys RDT in hard to reach areas through trained volunteers. Clinics and hospital can use RDT in times of emergency, if there is no trained Med Tech and in situations where no Med Tech is on duty.

RDT contains proteins (antibodies) that will deteriorate in high temperature and high humidity. Observe required care during transport and storage to preserve quality.

Table 3.9 Target antigens of commercially available RDTs

Parasite Species	Parasite Antigens		
	Histidine Rich Protein (HRP2)	pLDH	Aldolase
Pf species	✓		
Pv species		✓	
Pan Specific (all species)		✓	✓
Specific to some other species		✓	

Materials for RDT

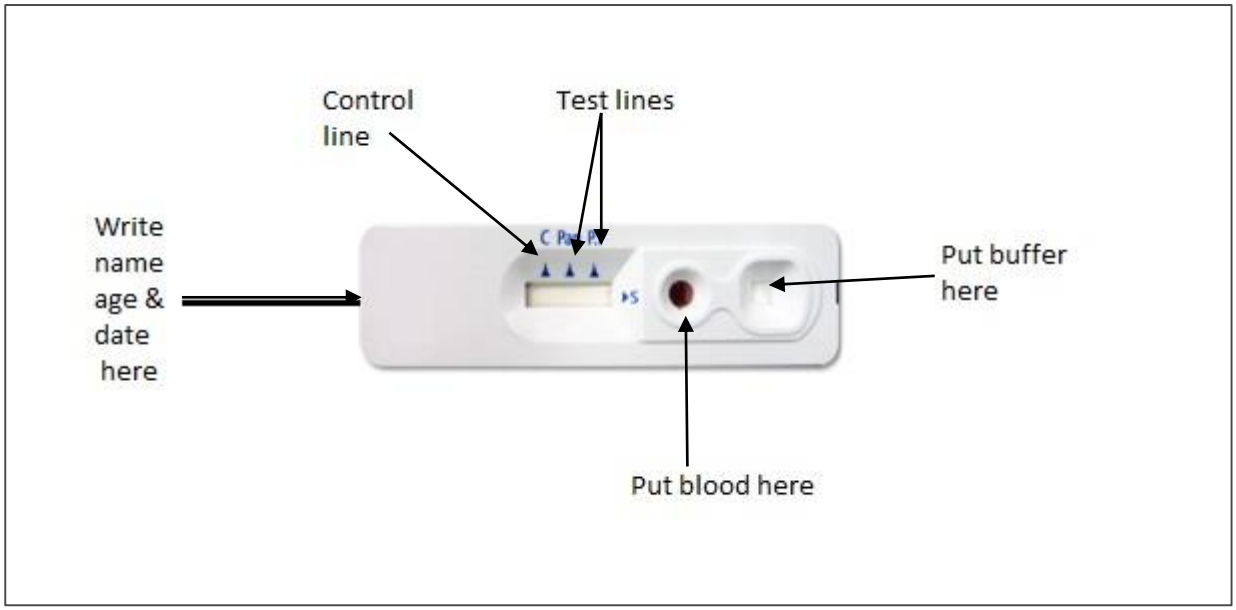
- RDT Kits
  - RDT
  - Blood transfer device
  - Running Buffer
- Lancet
- Alcohol swab
- Gloves
- Dry Cotton Swabs
- Sharp Disposal Container
- Bio-hazard bag (same as in MM)
- Clock timer
- Pencil
- Ballpen
- Forms (same as in MM

Procedure for RDT

- Prick the finger to extract blood.
- Fill the required amount of blood using blood transfer device to well “S” (Fig 3.2)
- Put the required amount of buffer into well “A”
- Wait for the required reaction time and read the result

NOTE: Different RDT brand have different procedure. **Read the accompanying instructions carefully and follow them strictly.** Different brands have different volume of buffer and different reading time. Buffer is not interchangeable even if the brand is the

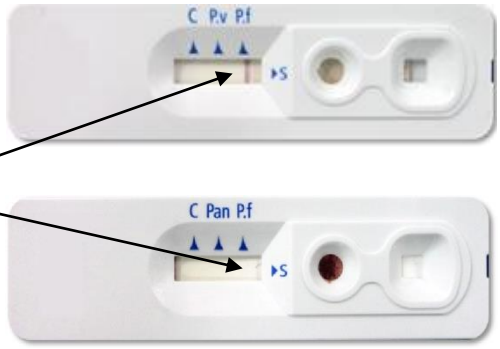
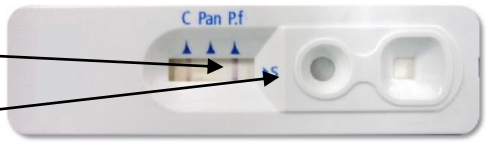
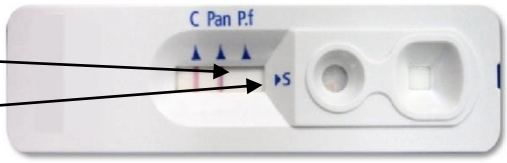
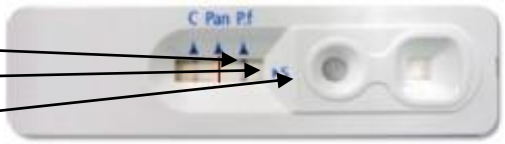
Fig. 3.2 Sample of cassette type RDT (Different brands may have different design and procedure. Always read the accompanying leaflet before using RDT kit).



Reading RDT Result

- Lines will appear after the prescribed reaction time. Line in C (control) means the test is properly performed and the RDT is of good quality. More lines will appear if the blood contain malaria antigen as shown below (Fig 3.3). See the accompanying leaflet with the kit for the correct interpretation of the result.
- The test is not valid if there is no line in "C" and the test must be repeated even if there is line in Pan &/or Pf.
- Some RDTs are designed for detection of *Pf* only and others are designed to detect *Pf* plus other parasite.
- Be familiar with the available RDT in your clinic for proper procedure and correct interpretation of results.
- Record the result in the RDT log book with the pertinent information of the patient.

Fig. 3.3 Appearance of RDT Cassette after reaction time with result lines

Criteria	Appearance after 15 minutes	Result
No line in C		**Invalid test** Note: Repeat test using a new cassette.
Lines in C and Pf		***P. falciparum***
Lines in C and Pan		***P. vivax*** Note: It can also be *P.malariae* or *P. ovale*
Lines in C and Pan and Pf		**Mixed infection**

7 Malaria Case Management

Treatment of each case of malaria is both curative and preventive. The curative aspect relieves the symptoms by using schizontocidal drugs. The preventive side kills the gametocytes to block transmission and to prevent relapse in species that have hypnozoites.

Treatment for malaria must be based on a positive test by either microscopy or RDT. Negative test can be repeated not neglecting to look for other causes of febrile illness. Negative test of patients who are severely ill or unconscious do not prohibits anyone to manage the case as malaria especially if the patient comes from a malaria endemic area or recently visited an endemic area or stayed in malaria endemic country. Response to treatment must be monitored closely especially if the case is imported from an African country or Mekong Sub-region. There are anecdotal reports that patients from Africa do not respond well with first line treatment given locally (Artemeter Lumfantrine) while in Mekong Sub region (Cambodia, Lao PDR, Thailand) drug resistance to artemisinin has been identified.

Directly observed treatment (DOT) is the preferred approach particularly in malaria free and zero-indigenous provinces. Completion of dose for every case is important to prevent drug resistance.

Every treated case must have follow-up smear weekly for 4 weeks to monitor response to the treatment. Follow up smear is extended monthly for 6 months to detect relapse if the infection is from *Pv* or *Po*. Treatment failure must be reported to CHD for identification of drug resistance. Adverse reactions to anti-malaria medicines must likewise be reported.

Treatment failure is presence of parasite in the blood smear anytime during the follow up period.

Malaria may present as uncomplicated infection or it can present as a complicated infection i.e. there are life threatening conditions. Early recognition of complications can save the life of the patient.

8.1 Uncomplicated Malaria

I Malaria Prophylaxis

Visiting the Countryside Prophylactic medicine is advised if visiting the 8 provinces with indigenous malaria most especially if they are going to have “night time outdoor activities**”**, otherwise, they can contact the local health unit for specific locality where they need to take prophylaxis. More than 90 % of our country is free from malaria transmission and prophylaxis has no practical value most of the times.

Working or Visiting other Countries It is best to follow the prophylactic treatment of destination country. Do research before travel. Prophylactic medicines are to be taken before reaching the destination to have adequate protection within the blood before potential exposure to the parasite.

Mosquito Bite Prevention Health workers are credible and important sources of malaria information according to previous survey. Health worker should inform the travellers how to

prevent malaria. Sleeping inside mosquito net, staying inside screened houses, use of mosquito repellents, wearing long sleeve clothes and long pants will deter mosquito bites thus prevent malaria.

II Medicines for Management of Malaria Based on Revised National Treatment Protocol

Drugs for malaria and its complications are listed in Table 3.10 with their dose and available preparations in the country. Anti-malaria drugs are seldom found in local drug stores. They can be requested from elimination hubs of the provinces (MFP and ZP) and in the health clinics/BHS of active provinces (AP).

Table 3.10 List of Medicines for Treatment of Malaria and Complications

Medicine	Available preparations	Dose/kg body weight	Remarks
Anti-malaria			
Artemeter - Lumifantrine (AL)	Arthemeter 20 mg/ Lumefantrine 120 mg	5-24mg/kg 29-144 mg/kg	
Primaquine (PQ)	7.5 mg tab 15 mg tab	0.25 mg/kg	Contraindicated to children below 1 year old, G6PD deficient patients, pregnant women and lactating mothers of infant whose G6PD status is unknown.
Chloroquine (CQ)	150 mg base/tab	25 mg/kg total dose	Day 1&2 dose is 10 mg/kg Day 3 dose is 5 mg/kg
Quinine (QN)	300 mg/tab 600 mg/tab 300 mg/ml ampule	10 mg/kilo/dose (maximum dose of 2,000 mg)	May give 20mg/kilo loading dose for severe malaria
Artesunate	Vial of 60 mg Rectal suppository 50 mg, 200 mg, 400 mg	2.4 mg/kg/dose × 3 dose q12h Use 3mg/kg for patients weighing less than 20kg	Shift to standard dose of A-L + PQ after the third dose (24 hours) if patient can tolerate.
Clindamycin	300 mg/cap	10 mg/kg/day	
Doxycyline	100 mg/cap		Contraindicated to children less than 8 years old and pregnant mothers.
Tetracycline	250 and 500 mg/cap		Contraindicated to children less than 8 years old and pregnant mothers.
Diazepam	10 mg/2ml amp	0.3 mg/kg as a slow iv push over 2 min or 0.5mg/kg intra-rectally.	Do not give more than 2 doses in 24 hour
Phenytoin	100mg/2ml amp	18 mg/kg loading dose then 5mg/kg per day for 48 hours	
Furosemide	10 mg/ml amp	0.6mg/kg 40 mg (adult dose)	

50% Dextrose		500 mg/kilo 5ml/kg of 10% thru peripheral line followed by 5ml/kg/hour of 10% dextrose or 10ml/kg/hour of 5% solution	Diluted to 10% before use. Dilute 1 volume of 50% dextrose with 4 volumes sterile water to get 10% dextrose
Ringer's Lactate Solution	250ml, 500 ml and 1 litre bot.	In children <12 months old give 30ml/kg bw in 1h, then 70ml/kg bw over the next 5h Children ≥12 months old, give 30ml/kg over 30mins, then 70ml/kg over next 2½h.	Assess hydration after the first dose and repeat 30ml/kg if the pulse is still week. Monitor urine output to assess kidney function.
Isotonic Saline Solution	1 Liter bottle		Alternate IVF if Ringer's Lactate solution is not available

III Treatment of Confirmed Malaria

Malaria infection has a broad range of manifestations. It can be an asymptomatic infection in one end to an infection with severe manifestations and multi-organ failure on the other end. Confirmatory test and clinical manifestations must be taken into consideration in order to manage the case properly. Deterioration can be rapid and death can come from the infection or its complications.

Directory for treatment regimen of malaria based on the revised treatment protocol is shown in Table 3.1l. Use the table by looking at the diagnosis and condition of the patient in the first column then follow the row to the right where the diagnosis is, follow the row for the treatment regimen then go to the page where the dosing table is located. The tables list the number of tablets by weight or by age group.

Keep in mind that the treatment of malaria consists of schizontocidal (curative) plus gametocidal (transmission blocker) or anti-relapse medicines (tissue schizontocidal). Gametocytes do not produce symptoms but they should be treated to block transmission. Hypnozoites (*Pv and Po)* reactivates several months later and continue transmission. Fourteen (14) day course of primaquine will kill the hypnozoites in the liver and prevent relapse. Primaquine is contraindicated to pregnant mothers and children below 1 year old because of the unknown status of glucose–6–phosphate dehydrogenase (G6PD) enzyme which is anti-oxidant. Primaquine can cause hemolysis among people with G6PD enzyme deficiency. Primaquine is used as anti-gametocte (single dose) for *Pf* and as anti-relapse (14 day course) for *Pv* and *Po.*

Tourist and Students from Malaria Endemic Countries

Visitors and students from malaria endemic countries may be found positive during screening. Close monitoring of response to treatment is needed because they may be carrying different strain of parasite that may not be susceptible to the medicines provided by the program.

Table 3.11 Malaria Treatment Directory

Condition of Patient	Diagnosis	Treatment Regimen	Directory Dosing Table
Uncomplicated	Pf	AL + PQ anti-gametocyte (1 day)	Table 3.12 *(pp 48)* & Table 3.13 *(pp 49)*
	Pm		
	Pv	AL+ PQ anti-relapse (14 days)	Table 3.12 *(pp 48)* & Table 3.15 *(pp 51)*
	Po		
Uncomplicated mixed infection	*Pf+Pm*	AL + PQ anti-gametocyte (1 day)	Table 3.12 *(pp 48)* & Table 3.13 *(pp 49)*
	Pf +Pv	AL + PQ anti-relapse (14 days)	Table 3.12 *(pp 48)* & Table 3.15 *(pp 51)*
	Pf+Po		
	Pv+Pm		
	Pv+Po		
	Pm+Po		
Severe Malaria	*Pf*	Artesunate IV for 24 hours then A-L+ PQ anti-gametocyte (1 day)	Table 3.16 *(pp 52)* then Table 3.12 *(pp 48)* & Table 3.13 *(pp 49)*
	Pv	Artesunate IV for 24 hours then A-L+ PQ anti-relapse (14 days)	Table 3.16 (*pp 52)* then Table 3.12 *(pp 48)* & Table 3.15 (*pp* 51)
	Pv	QN + antibiotic + PQ anti-relapse (14 days)	Table 3.18 *(pp 53)* & Table 3.15 *(pp 51)*
	Pre- referral	Children -Artesunate suppository Adults - Artesunate im/iv	Table 3.17 *(pp 52)* Table 3.17 *(pp 52)*
Treatment Failure *Pf*			
Children< 8 years old	*Pf*	QN + Clindamycin + PQ anti-gametocyte (1 day)	Table 3.18 *(pp 53)* & Table 3.13 (*pp 49)*
Adults	*Pf*	QN + antibiotic + PQ anti-gametocyte (14 days)	Table 3.18 *(pp 53)* & Table 3.13 (*pp 49)*

Treatment Failure *Pv*			
Children< 8 years old	*Pv*	QN+ Clindamycin+ PQ anti relapse (14 days)	Table 3.18 (*pp 53*) & Table 3.15 (*pp 51)*
Adults	*Pv*	QN + antibiotic+ PQ anti-relapse (14 days)	Table 3.18 *(pp 53)*& Table 3.15 *(pp 51)*
Relapse *Pv* or *Po*	*Pv* or *Po*	CQ + PQ anti-relapse (14 days)	Table 3.14 *(pp 50)* & Table 3.15 *(pp 51)*
Pregnant			
First Trimester	*Pf* uncomplicated	QN + Clindamycin (adult dose)	Table 3.18*(pp 53)*
	Pf severe		
	Mixed		
	Pv	CQ	Table 3.14 (*pp 50)*
	Pm		
	Po		
Second and Third Trimester	*Pf* uncomplicated	AL + Clindamycin (adult dose)	Table 3.12 (*pp 48*)
	Pf severe		
	Mixed		
	Pv,	AL	Table 3.12 (*pp 48*)
	Pm		
	Po		
Two weeks Postpartum- (completing treatment of malaria while pregnant)	*Pf*	PQ anti-gametocyte	Table 3.10 (*pp 44)*
	Pm		
	Pv	PQ anti relapse× 14 days	Table 3.15 (*pp 51)*
	Po		
	Mixed		
Lactating mothers	*Pf*	AL + Clindamycin +PQ anti-gametocyte	Table 3.12 *(pp 48)* & Table 3.13 (*pp 49)*
	Pv	CQ + PQ anti-relapse× 14 days	Table 3.14 *(pp 50)* & Table 3.15 *(pp 51)*
	Pm	AL + PQ anti-gametocyte (1 day)	Table 3.12 *(pp 48)* & Table 3.13 *(pp 49)*
	Po	AL + PQ anti-relapse (14 days)	Table 3.12 *(pp 48)* & Table 3.15 *(pp 51)*
	Mixed	AL + Clindamycin PQ anti-relapse (14 days)	Table 3.12 *(pp 48)* & Table 3.15 *(pp 51)*

Table 3.12

Dosing Schedule of Artemeter-Lumefantrine (AL)

Preparation: Blister packs of 6×1, 6×2, 6×3, and 6×4 tablets

Use body weight to administer the correct dose

(Use age If weight cannot be taken but observe caution for under dosing among overweight and over dosing for underweight individuals.)

Body weight(kg)	5 - <15 kg	15 - <25 kg	25 - <35kg	≥35 kg
Age	(6 mos.– 3 y.o.)	(4- 8 y.o.)	(9-13 y.o.)	If (≥13y.o.)
Day 1 Initial Dose	1 tab	2 tabs	3 tabs	4 tabs
8 hrs after	1 tab	2 tabs	3 tabs	4 tabs
Day 2 am	1 tab	2 tabs	3 tabs	4 tabs
pm	1 tab	2 tabs	3 tabs	4 tabs
Day 3 am	1 tab	2 tabs	3 tabs	4 tabs
pm	1 tab	2 tabs	3 tabs	4 tabs

Drug information

Artemether is lipophilic and fairly readily absorbed from gastro-intestinal tract. It is 95 to 99% protein bound. It is metabolized by the liver and excreted through feces and urine. It has a half- life of 2 hours. Lumefantrine is highly lipophilic and readily absorbed if taken with fatty meal. It has a half-life of 3 days. Combination of medicine with short and long half-life delay development o drug résistance. They are active against blood forms of malaria including young gametocytes.

AL is well tolerated. Reported side effects include nausea, dizziness and headache.

Table 3.13

Dosing Schedule of Primaquine (PQ) as Anti-Gametocyte Preparation: Tablets of 7.5 mg and 15 mg base (Single Dose on Day 1)

Use body weight in kilogram (kg) to compute the right dose.

Dose per kilo is 0.25 mg base given single dose on Day 1.

Computation by weight:

Let

A= Body weight B= 0.25 mg

C= 15 mg base per tablet D= dose in tablets of 15 mg base

Note: if 7.5 mg tab is available change C and D to 7.5 mg

Then $D=(A\times B)\div C$

Use age if weight cannot be taken but observe caution for under dosing among overweight and over dosing for underweight individuals.

	< 1 y.o.	1-3 y.o. (10-15 kgs)	4-6 y.o. (16 – 30 kgs)	7-11 y.o. (31-60 kgs)	≥ 12 y.o (61 -90 kgs)
7.5 mg base/tab	contra-indicated	½	1	2	3
15 mg base/tab	contra-indicated	¼	½	1	1 ½

Drug Information

Primaquine is an 8-aminoquinoline derivative with a potent action against intrahepatic forms of all human parasites. It has gametocidal effect against all species. It is readily absorbed when taken orally with a peak plasma concentration of 1 -3 hours and a half life of about 5 hours. Blood and urine should be examined periodically for evidence of hemolysis. Patients should be warned to stop medicine if they notice darkening of urine or if they develop abdominal pain or pallor. Tablets must be kept in well closed containers protected from light.

Table 3.14

Dosing Schedule for Chloroquine (CQ)

Preparation: 150 mg base per tablet

Use body weight in kilogram (kg) to compute the right dose.
Dose in Day 1 and Day 2 is 10 mg/kg
Dose in Day 3 is 5 mg/kg

Computation by weight:
Let
A= Body weight B= 10 mg
C= 150 mg base per tablet D= dose in tablets of 150 mg base
Note: Change B to 5 mg if computing for Day 3 dose
Then D=(A×B)÷C

	AGE					
Day of Treatment	0-11 months	1-3 y.o.	4-6 y.o.	7-11 y.o.	12-15 y.o.	≥ 16 y.o.
Day 1	1/2	1	1 ½	2	3	4
Day 2	½	1	1 ½	2	3	4
Day 3	1/2	1/2	1	1	1 ½	2

Drug Information

Chloroquine is active against blood forms of malaria except gametocytes. It is completely absorbed after oral administration and widely distributed in the body. It is metabolised in the lived and eliminated slowly from the body, 55% eliminated via the kidney. Taking the drug with food helps avoid gastrointestinal intolerance.

Table 3.15
Dosing Schedule for Primaquine (PQ) Anti-relapse Treatment (14 daily doses)
Preparation: 7.5 mg and 15 mg base per tablet

Use body weight in kgs to compute the right dose.

Dose per kilo is 0.25 mg base/day for 14 days starting on Day 1.

Computation by weight:

Let

A= Body weight(kg) B= 0.25 mg dose per kg

C= 15 mg tab (base) D= dose (in tablet of 15 mg base)

Then

D= (A×B) ÷ C

Use age as basis if weight cannot be taken but observe caution for under dosing among overweight and over dosing for underweight individuals.

Age		0-11 months	1-6 years (10-15 kg)	>7 years (16-30 kg)	(31-60 kg)	(61-90 kg)
Number of tablets per day for 14 days	7.5 mg base/tab	contra-indicated	½	1	2	3
	15 mg base/tab	Contra-indicated	¼	½	1	1 ½

Drug Information

Primaquine is an 8-aminoquinoline derivative with a potent action against intrahepatic forms of all human parasites. It has gametocidal effect against all species. It is readily absorbed when taken orally with a peak plasma concentration of 1 -3 hours and a half-life of about 5 hours. Blood and urine should be examined periodically for evidence of hemolysis. Patients should be warned to stop medicine if they notice darkening of urine or if they develop abdominal pain or pallor. Tablets must be kept in well closed containers protected from light.

Table 3.16

Dosing Schedule for Artesunate IV

Preparation: Artesunate 60 mg vial

for reconstitution with accompanying sodium bicarbonate and then saline solution

Body Weight (kg)	Dose per kg body weight	Dose 1 (0 hour)	Dose 2 (12 hour)	Dose 3 (24 hour)	Shift to Oral A-L + PQ after Dose 3
<20	3.0 mg/kg				See Table 3.9 for AL dosing and Table 3.10 for PQ dosing
>20	2.4 mg/kg				
25	2.4 mg/kg	1 vial	1 vial	1 vial	
25 -50	2.4 mg/kg	2 vials	2 vials	2 vials	
51 –75	2.4 mg/kg	3 vials	3 vials	3 vials	
75-100	2.4 mg/kg	4 vials	4 vials	4 vials	

Drug Information

Artesunate kills young circulating ring parasites.

The drug is well tolerated with no local or systemic adverse effects.

Table 3.17

Dosing Schedule for Artesunate Suppository

Preparation: 50, 200, and 400 mg suppository

Weight (kg)	Artesunate Dose
< 40	10 mg /kg (use appropriate number of 50 or 200 mg suppository)
40 – 59	400 mg (1 × 400 mg suppository)
60 – 80	800 mg (2 × 400 mg suppository)
> 80	1200 mg (3 × 400 mg suppository)

Artesunate suppository should be stored in refrigerator to make it ready for use. Chill suppository before use if there is no refrigerator for easy insertion into the rectum.

Table 3.18
Dosing Computation for Quinine Plus Antibiotic
Preparation of Quinine Sulfate : 300 mg and 600 mg tablet

Age Group	Quinine Sulfate (300 or 600 mg/tablet)	Plus anyone of the antibiotics below		
		Doxycycline 100 mg /cap	Tetracycline 250 & 500 mg/cap	Clindamycin 150 & 300 mg cap 150 mg/ml amp
Adults and Children >8 years old	10 mg salt/kg per dose every 8 hours for 7 days	3 mg/kg bw once a day (OD) for 7 days	250 mg4 times a day (QID) for 7 days	10 mg/kg bw twice a day (BID) for 7 days
Children ≤ 8 years old	10 mg salt/kg per dose every 8 hours for 7 days	Contra-indicated	Contra-indicated	10 mg/kg bw twice a day (BID) for 7 days

Drug Information

Quinine is blood schizontocidal drug. It is rapidly absorbed when taken orally with peak plasma concentration of 1-3 hours. Its half- life is 10 hours. It is metabolised in the liver and excreted in the urine. Quinine may promote insulin secretion and induce hypoglycaemia. Quinine injection must be protected from light.

Possible adverse drug reaction: hypoglycemia, arrhythmia

8.2 Complicated Malaria

I Pathophysiology

Red blood cells parasitized by *Pf* have knobs on the surface. They are sticky and adhere to endothelium of internal organs blocking circulation causing hypoxia. Another cause of hypoxia is anaemia produced by repeated destruction of RBCs as a result of parasite reproduction inside RBC. *Plasmodium vivax* infection can also produce severe malaria occasionally.

II Clinical features of severe malaria include one or more of the following:

- impaired consciousness (including unrousable coma)
- prostration, i.e. generalized weakness so that the patient is unable to sit, stand or walk without assistance;
- multiple convulsions (more than two episodes within 24h)
- deep breathing and respiratory distress (acidotic breathing)
- acute pulmonary edema and acute respiratory distress syndrome
- circulatory collapse or shock (systolic blood pressure < 80mm Hg in adults and < 50mm Hg in children)
- acute kidney injury
- clinical jaundice plus evidence of other vital organ dysfunction
- abnormal bleeding (disseminated intravascular coagulation)

III Laboratory and other findings

- hypoglycemia (< 2.2mmol/l or < 40mg/dl)
- metabolic acidosis (plasma bicarbonate < 15mmol/l)
- severe normocytic anemia (hemoglobin < 5g/dl or hematocrit of< 15% in children; <7g/dl, or hematocrit< 20% in adults)
- hemoglobinuria
- hyperlactataemia (lactate > 5mmol/l)
- renal impairment (serum creatinine> 265µmol/l) and
- pulmonary edema (radiological).

IV Management of complications

Table 3.19 Management of Malaria Complications

Hypoglycemia -Blood glucose of less than 0.2mmol/l (40mg/dl)		
Pathophysiology	Manifestations	Management
- poor oral intake due to vomiting or because of high insulin level induced by quinine therapy -reduced hepatic gluconeogenesis -increased peripheral utilization of glucose	Conscious patients -anxiety, sweating, dilatation of the pupils, breathlessness, a feeling of coldness, tachycardia and light-headedness. Unconscious patients -convulsions and extensor posturing	-Give 50ml of 50% dextrose (25 g) diluted with 100ml of any infusion fluid and infused over 3–5min. -Follow with an intravenous infusion of 200– 500mg/kg per hour of 5% or 10% dextrose. -Continue to monitor blood glucose levels because hypoglycaemia may recur even after treatment with intravenous dextrose

Acute Kidney Injury - raised serum creatinine(> 265µmol/L) and blood urea concentrations		
Pathophysiology	Manifestations	Management
-part of multi-organ dysfunction in fulminant infections - acute tubular necrosis -hypovolemia	Oliguria	-Infuse isotonic saline to correct hypovolemia -Peritoneal dialysis or hemodialysis if infusion fails to correct oliguria
Anemia - hemoglobin of < 5g/dl or hematocrit of < 15% in children - hemoglobin of <7g/dl, or hematocrit< 20% in adults		
Pathophysiology	Manifestations	Management
-destruction of parasitized RBC	Pallor	-transfusion of screened, compatible packed RBC or fresh whole blood - include the volume of transfused cells or blood in calculating fluid balance to avoid fluid overload
Pulmonary Edema -Radiologic evidence of pulmonary edema resembling acute respiratory distress syndrome (ARDS)		
Pathophysiology	Manifestations	Management
-Increased pulmonary capillary permeability -Fluid overload	-Increase respiratory rate -cough -difficulty of breathing	-Keep the patient upright - Give high concentration of oxygen -IV diuretic, such as furosemide at 0.6mg/kg (adult dose, 40mg) increase dose if necessary -Venesection if there is fluid overload and stop IV fluid
Continue on next page		
Continuation of Tale 3.19		
Metabolic Acidosis -Low plasma bicarbonate		
Pathophysiology	Manifestations	Management
-Microvascular obstruction by sequestered parasitized erythrocytes -Hypovolemic shock	-Labored, rapid, deep breathing (Kussmaul's breathing)	-Improve oxygenation by clearing the airway, increasing the concentration of inspired oxygen - Isotonic fluid (0.9% saline) by slow intravenous infusion to restore the circulating volume -Monitor blood pressure, urine volume (every hour) and jugular venous pressure
Shock -Systolic blood pressure less than 80 mm Hg		
Pathophysiology	Manifestations	Management
-inadequate intake -vomiting	-Cool hands and/or feet, capillary refilling time > 2seconds(include dengue table)	-Correct hypovolemia with maintenance fluids at 3–4ml/kg per hour

		-Take blood for culture, and start the patient on appropriate broad-spectrum antibiotics immediately
Manifestations of compensated and hypotensive shock		
PARAMETERS	COMPENSATED	HYPOTENSIVE
Sensorium	Clear and lucid	Decreased level of consciousness
Capillary refill	Prolonged (>2 secs.)	Very prolonged plus mottled skin
Extremities	Cool peripheries	Cold and clammy
Peripheral pulse	Weak and thread	Feeble or absent
Heart rate	Tachycardia	Severe tachycardia with bradycardia in late shock
Blood pressure	Normal systolic pressure but rising diastolic pressure; Narrowing pulse pressure Postural hypotension	Narrowed pulse pressure (<20 mmHg) or un-recordable blood pressure
Respiratory rate	Tachypnea	Hyperpnea or Kussmaul's breathing
Cerebral Malaria		
Pathophysiology	Manifestations	Management
-Microvascular obstruction by sequestered parasitized erythrocytes	-fever (37.5–41°C), followed by failure to eat or drink or anyone of the following: -Vomiting, cough, diarrhea(less common) -Prostration -Coma -Seizure -Abnormal motor posturing	-Parenteral anti-malaria (Artesunate or Quinine) for 24 hours or more. -Manage seizure with Diazepam -Correct anemia, bleeding, hypovolemia, hypoglycaemia--Look out for other central nervous system infections and manage accordingly
Abnormal Bleeding Disseminated intravascular Coagulation		
Pathophysiology	Manifestations	Management
	Bleeding gums Epistaxis Petechiae Subconjunctival haemorrhage Hematemesis Melena	Transfuse fresh blood, clotting factors or platelets as required Give Vitamin K, 10mg, by slow intravenous injection. - blocker (e.g. ranitidine)
Dehydration and Electrolyte imbalance -Raised blood urea (> 6.5mmol/l; > 36.0mg/dl) -Urinalysis reveals a high specific gravity, the presence of ketones, low urinary sodium and normal urinary sediment		
Pathophysiology	Manifestations	Management
Poor fluid intake Vomiting Diarrhea Hypovolemia	Decreased skin turgor Signs of decreased peripheral perfusion Oliguria	Rapid IV rehydration followed by oral rehydration therapy with Ringer's lactate solution For Infants-30ml/kg bw in 1h, then 70ml/kg bw over the next 5h

		For children ≥12 months old, give 30ml/kg over 30mins, then 70ml/kg over next 2½h Monitor urine output for adequacy of fluid infusion and respiratory rate for signs of fluid overload.
Hemoglobinuria		
Pathophysiology	Manifestations	Management
Intravascular haemolysis and hemoglobinuria precipitated by primaquine or other oxidant drugs in patients with G6PD deficiency	Dark urine	Transfuse screened fresh blood if necessary Dialysis if oliguria develops and blood urea and serum creatinine levels increase

8.3 Monitoring Response to Treatment

Drug resistance can develop to any anti-malaria regimen. All cases should be monitored by taking blood smear on Day 3, 7, 14, 21 and 28. Monitoring is extended monthly for 6 month for cases of *P vivax* and *P ovale* to detect relapse early. If weekly follow up smear cannot be followed weekly the least follow up smear can be on Day 3, 7 and 28. Responses to treatment are summarized in Table 3.16. It is based on clinical manifestations and blood smear result. It is showing the importance of doing parasite count in every malaria positive blood smear. Management of treatment failure is already discussed early in this chapter.

Table 3.20 Treatment Response

Response	Criteria
Adequate Clinical and Parasitological Response (ACPR)	Absence of parasitemia on Day 28 irrespective of temperature, without meeting any of the criteria of Early Treatment Failure or Late Clinical Failure or Late Parasitological Failure.
Early Treatment Failure (ETF)	Development of danger signs or severe malaria on Day 1, Day 2 or Day 3 in the presence of parasitemia; OR Parasitemia on Day 2 higher than Day 0 count irrespective of axillary temperature; OR Parasitemia on Day 3 with axillary temperature ≥ 37.5 °C; OR Parasitemia on Day 3 ≥ 25% of count on Day 0.
Late Clinical Failure (LCF)	Development of danger signs or severe malaria on any day from Day 4 to Day 28 in the presence of parasitemia, without previously meeting any of the criteria of Early Treatment Failure; OR Presence of parasitemia and axillary temperature ≥ 37.5^{o}C (or history of fever) on any day from Day 4 to Day 28, without previously meeting any of the criteria of ETF.
Late Parasitological Failure (LPF)	Presence of parasitemia on any of the scheduled return on Day 7, Day 14, Day 21 or Day 28, and axillary temperature < 37.5^{o}C without previously meeting any of the criteria of ETF.

9 Malaria Vector Control

Policy Direction
Universal coverage of vector control measures will also be ensured. Use of insecticide treated nets (ITN), particularly the more cost-effective long lasting insecticidal nets (LLIN) is the main vector control measure. Indoor residual spraying (IRS) with insecticide shall be adopted in areas where the use of net is not culturally acceptable, displaced population and epidemic situations. IRS will also be done with guidance from the results of epidemic and foci investigations.

Mosquitoes spend half of their life in water. Vector control for malaria can be against the aquatic stages of the mosquito or against the adult (Table 3.21). The choice will depend upon the desired effect, cost and bionomics of the vector. LLIN and IRS are ideal because they are selective of adult female mosquitoes and have long duration of effectiveness. LLIN is the primary vector control method because it kills the vector and acts as barriers to prevent mosquito bite. Reports showed that mosquitoes were able to bite before they are killed by the insecticides deposited in the wall by IRS i.e. mosquitoes were able to transmit the parasite before they are killed.

Malaria vector control relies heavily on chemical insecticide. Only insecticides that pass WHOPES must be used for vector control. The major criteria used in the choice of insecticides focus on its safety as indicated by the degree of hazard its use can impose. Basically insecticides classified as being unlikely to be hazardous are preferred to insecticides which are classified as being mildly or moderately hazardous. Other indicators for safety include the lethal dose 50 and the neurologic and dermatological toxicity indicators. Preferences for insecticides at the lower end of the spectrum is the norm. The second criteria is of course efficacy manifested as knock-down or kill-rate to the targeted insect carrier, Safety precaution must be observed in handling insecticide at all times.

Since LLIN distribution and use and IRS are used as complimentary measures, to avoid over-saturation with the insecticide, a different insecticide molecule is used for LLINs and for in-door residual spraying.

The program provides free LLIN in barangays stratified under active and residual non-active. It can also be provided to cleared barangays that convert to active as a result of re-introduction of malaria after a thorough case-foci investigation (*see Table 3.2).*

Reduction of breeding habitat if few and small in size can complement IRS and LLIN. Management of breeding site will be the vector control of choice when the parasite is already eliminated in a province.

Table 3.21 Purpose and Types of Vector Control	
Purpose	Type of Control
Reduction of longevity of vector population	IRS, LLIN
Reduction of vector densities	IRS and LLIN
Reduction of breeding habitats	Environmental modification and manipulation Chemical and biological larvicides

Malaria vector control relies heavily on chemical insecticide. Only insecticides that pass WHOPES must be use for vector control. Safety precaution must be observed in handling insecticide at all times.

Vector Control in Malaria Cleared Areas

Malaria cleared areas can still have vector control if they share borders with active foci or there are population movement (vulnerability) like evacuation centers, housing in development/mining sites. Scaling down of vector control activities in cleared foci is necessary to lessen environmental effects of insecticides. The program will continue to promote use of nets for cleared barangay(s)/sitio(s). Integrated vector management (IVM) will have greater role in malaria cleared areas as it will be targeting a wider range of vector borne diseases.

9.1 Long Lasting Insecticidal Net (LLIN)

- Objective of LLIN is to kill the mosquitoes thereby reduce the mosquito population.
- It is the primary malaria vector control of the program.
- Target vector mosquitoes of LLIN are those feeding indoor and biting late evening to early morning
- More than 80% of population must be sleeping inside the LLIN every night to provide community protection and reduction of incidence.
- NMCEP distributes free LLIN in Barangays/sitios stratified under active foci. All (100%) household must have LLIN. One free LLIN is distributed for every 2 persons in the household
- Distribution comes with instructions to sleep inside the mosquito net every night and proper care and washing of LLIN. Nets must be kept intact. Owners are encouraged to repair torn nets or those with holes.
- Insecticide in LLIN last for 2 to 3 years. Replacements are made depending on the type of LLIN.

Procedure for LLIN Distribution

Table 3.22 Procedure for LLIN Distribution		
Step	Activity	Remarks
1	Compute for LLIN Requirement A = Required LLIN B= Population of active foci barangays/sitios ÷ 2 C= Population of residual non-active barangays/sitios ÷ 2 D= Pop of malaria cleared barangays/sitios in receptive and vulnerable ÷ 2 E= 10% allowance F= Single (180x100x150 cm) = 70% G= Family (180x160x150 cm) = 30% $A_{(\text{required LLIN})}=(B+C+D) \times 1.1$ Size Distribution $F_{(\text{Single})} = A \times 0.7$ $G_{(\text{Family})} = A \times 0.3$	Net to population ratio is 1:2
2	Make a request for LLIN and send to Regional Office through PHO	
3	Wait for the delivery of LLIN	
4	Prepare activities for mass LLIN distribution: Lectures Distribution of information materials Request the presence of LCE's and other influential people Request target community to submit list of households with name and age of household members	
5	Mobilize Community for mass distribution of LLIN	
6	Gather the community members on scheduled date	
7	Deliver the speeches and other presentations	
8	Distribute LLIN with personal messages "Sleep inside mosquito net every night" and "use mild soap in washing the mosquito net".	
9	Ask the recipient for signature or thumb mark in the LLIN distribution form	
10	Prepare summary report of distribution and send copies to PHO and RO	
11	Revisit the community after two weeks and make a random interview of 25 households. Ask how many people slept inside the LLIN "last night" and how many did not. Record the result and make a report.	
12	Revisit the community at least quarterly, do the random interview and remind them to "**use mosquito net every night**".	
13	Keep a record of every monitoring visit to gauge the proportion of LLIN usage.	

9.2 Indoor Residual Spraying (IRS)

- Objective of IRS is to shorten the lifespan of adult mosquitoes, reduce mosquito population density and reduce man and mosquito contact

- Applied in barangays/sitios where sleeping inside mosquito net is not culturally acceptable and during epidemics.

- Target mosquito vectors that rests before and after a blood meal

- Supplementary vector control method when LLIN fails or until LLIN distribution coverage exceeds 85%

- More than 85% of houses must be sprayed to provide community protection

- Residual insecticide is effective when properly applied to wall surfaces.

- IRS deposits insecticide to the walls in the form of dust. Mosquitoes coming into contact to the sprayed wall are exposed to this powder and are carried in their hairs. The insecticide is absorbed and kills the mosquito later.

- Quality of spraying is important to be effective. Insecticide must be sprayed evenly on the surface of the wall. Proper spraying technique, appropriate spray can and right insecticide formulation are required for uniform distribution of sprayed insecticide.

- IRS must be applied by trained spray men. Participants perfect the technique through practice on spray board. They also learn the operation and proper maintenance of spray can, safe handling of insecticide and first aid for insecticide poisoning. One day refresher training for spray men must be conducted before deployment.

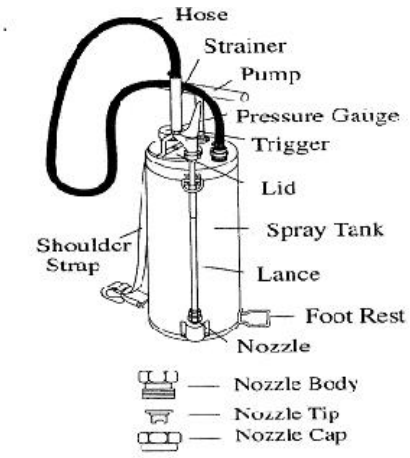
- The appropriate spray cans for IRS are those fitted with T-Jet 8002 nozzles (Fig 3.4). The discharge is fan shape with a discharge rate of 760 ml per minute at 55 to 45 psi operating pressure. Spray cans without these specifications will not be able to deliver the required quality of IRS and must not be use.

- Spraying a barangay must be finished within ten days or less. All houses (100%) in the target community must be sprayed to provide community protection. It will not be effective if less than 85 % of houses are sprayed.

- All surfaces inside the house that can be a resting place of mosquito must be sprayed. The sprayable surfaces are the inside walls, underneath the tables, chairs, cabinet, eaves, ceiling and other surfaces where mosquito can rest. Children's toys and graven images must not be sprayed. Outside walls not exposed to sun/rain can also be sprayed. Other structures where people sit/rest during the night must be sprayed including animal sheds.

- The procedure in IRS is detailed in *Annex 13.*

Fig.3.4 Spray can (left) and the fan shape discharge (right) of T-Jet 8002 nozzle tip.



- Insecticides suitable for IRS are listed in *Table 3.23*. All insecticide for IRS must be WHOPES recommended. Safety must be observed at all times while handling insecticide. Spray men must be provided with personal protective equipment namely wide brim hat, goggles, face mask, cover all suit, gloves and rubber boots.

Table 3.23 List of WHOPES Approved Insecticides for IRS

Insecticide	Dosage (gm/m^2)	Residual Effect (months)	Hazard Classification*
Pyrethroids			
Alphacypermethrin 5% WP	0.02 – 0.03	4 – 6	II
Bifenthrin 10%WP	0.025 – 0.05	3 – 6	II
Cyfluthrin 10%WP	0.020 – 0.05	3 – 6	II
Detamethrin 2.5%WP & 5% WP	0.02 – 0.025	3 - 6	II
Etofenprox	0.1-0.3	3 - 6	Unlikely to present acute hazard in normal use
Lambdacyhalothrin 10%WP	0.025 – 0.05	3 - 6	II
Carbamates			
Bendiocarb 80%WP	0.1 – 0.4	2 – 6	II
Propoxur 50 %WP	1 – 2	3 – 6	II
Organophoshate			
Malathion 50% WP	1.1 – 2.2	2 – 3	III
Fenitrothion 40% WP and 50% WP	2.0	3 – 6	II
Primiphos methyl WP	1.0 – 2.0	2 – 3	III

WHO Hazard Classification: Ia** -extremely hazardous, **Ib** -highly hazardous, **II** - Moderately hazardous, **III -** slightly hazardous9Ref)*

9.3 Integrated vector management (IVM)

- Defined as "a rational decision-making process for the optimal use of resources for vector control" and includes five key elements namely:
  1. evidence-based decision-making,
  2. integrated approaches
  3. collaboration within the health sector and with other sectors
  4. advocacy, social mobilization, and legislation, and
  5. capacity-building

- Involvement and cooperation of all stakeholders are necessary for successful vector control. The previous vertical set-up of the program had not carried the program to the present level. The accelerated achievement of the target was achieved on a background of a highly devolved health system. It has a semblance of IVM. There is evidence-based decision making (stratification, testing before treatment), collaboration with health sector and other sectors (Central Office, Regional offices, LGUs, PSFI, WHO, NCIP etc,), capacity building, integrated approaches (LLIN+IEC+ACD+case management), and advocacy.

- In the near future the LGUs will be the major player to sustain their malaria free status, integrating them with other vector borne diseases program and with the general health services is the most rational thing since the same individual performs all vector borne disease control tasks.

- Adjunct vector control methods are listed in *Annex 13*.

10 Health Promotion

Policy Direction
Health Promotion will be enhanced through the delivery of key messages focused to each group of stakeholders and according to the stratification category of areas.

I. Introduction

The national strategic plan for the elimination and control of malaria highlights the strategy (Strategy 1.4) on increasing the demand for effective malaria interventions and services such as vector control interventions, early diagnosis, prompt case management and treatment among the endemic population. It aims to improve knowledge and awareness of community members about malaria and malaria risk, improve their behaviors in seeking prompt and timely services from appropriate sources, comply with diagnosis and treatment protocols, and apply appropriate personal practices to prevent them from getting infected in the first place and from further transmitting the infection via mosquito vectors to other community members.

The focus of health promotion will be on expanding the implementation of behavior change interventions (e.g. CoMBI approach) to a wider range of LGUs and communities. The health promotion strategy will take note of the specific information needs of identified vulnerable groups and the dissemination process, tailoring it to the characteristics and needs of each group. Support must also be provided to ensure continuity of IEC in the Zero Indigenous Case and Malaria Free Provinces to keep community members alert to the possible re-introduction of the disease.

The National Center for Health Promotion (NCHP) of the Department of Health (DOH) is in the process of updating the National Policy on Health Promotion which will harmonize the various approaches on awareness raising and behavior change promotion. The “disease free zone initiative” promulgated in the health sector reform agenda, includes malaria-endemic areas as target for intensive campaign to eliminate the disease as a public health threat. It calls for the enhancement of health promotion activities coupled with strengthened surveillance activities to ensure that the targets for disease prevention, control and elimination are attained.

II. Objectives

This Chapter is primarily designed to guide local health care managers and service providers in the design and implementation of their respective health promotion initiatives to achieve communication objectives specific for influencing behavior that will result in further decline and eventual elimination of malaria. Specifically, it aims to:

(1) orient health staff on the importance, guiding principles, key strategies and appropriate health promotion activities;

(2) guide health managers and local officials in formulating their respective local health promotion plan; and

(3) provide a list of key messages and recommended channels/media as basis in developing local Information, Education and Communication (IEC) materials and other promotional supplements.

III. Policy Directions

Health promotion efforts will be geared towards the following directions:

Intensification of health promotion activities to support the elimination of malaria as a public health threat;

(1) Development and focusing of key messages to meet the specific needs and situations of localities at varying stages towards malaria elimination;
(2) Adaptation/localization of IEC approaches and initiatives to influence health practices and health seeking behavior among vulnerable and at risk groups; and
(3) Strengthening local health capacities to plan and undertake appropriate health promotion activities to support transition towards elimination of the disease.

IV. Guiding Principles

There are 3 basic principles to be observed in health promotion:

(1) Health promotion must involve the population as a whole in the context of their everyday life, rather than focusing on people at risk from malaria;

(2) Health promotion must be directed towards actions on the determinants of malaria transmission. This requires close cooperation among different sectors beyond health care, reflecting the diversity of conditions which influence health; and

(3) Health promotion must combine diverse but complementary approaches including communications, education, legislation, fiscal measures, organizational change, community development, and spontaneous local activities against malaria.

V. Key Strategies

Health Promotion shall follow the five areas for action that correspond to the key strategies.

A. Building Healthy Public Policy

Building healthy public policy activities target local government officials as well as policy makers at the national, regional and local levels. It requires advocacy for the development and issuance of the following policy instruments to support health: (i) laws, local resolutions and ordinances; (ii) executive orders; (iii) memorandum circulars; (iv) administrative orders; and (v) memorandum of agreement. The prevention, control and elimination of malaria require healthy public policy efforts in the following areas:

Areas for Healthy Public Policy Efforts
In Support of the Prevention, Control and Elimination of Malaria

(1) hiring and/or absorption of malaria personnel
(2) enrollment of households to Philippine Health Insurance (Phil-Health)
(3) allocation of budget to support local malaria operations (e.g. salary of personnel, logistics, orientation/training of health providers, participation in diagnostic quality assurance system, health promotion activities, incentives for barangay health workers, etc.)
(4) provision of logistics requirements: insecticide treated nets (ITNs), reagents, laboratory supplies, medicines and supplies for supportive treatment
(5) installation or networking of laboratory and diagnostic facilities including quality assurance (microscopy services) for both public and private facilities
(6) installation and maintenance of continuous surveillance, particularly in tracking malaria suspects
(7) establishment of system of close guarding and prompt reporting of possible entry of malaria infected persons in areas which have been declared malaria-free
(8) setting up of regulatory mechanism for the over-the-counter sale of antimalarial drugs

B. Creating A Supportive Environment

Creating a supportive environment involves increasing access to health services both, through improvement of physical location and set-up, as well as ensuring client-centered service provision. It also requires the creation of coalitions, networks, and inter-agency committees to multiply the number of people promoting particular health actions. To achieve this, the following activities must be undertaken:

Activities In Creating A Supportive Environment
for the Prevention, Control and Elimination of Malaria

(1) promotion of the availability of quality diagnostic and treatment services for malaria and where these can be availed at (e.g. barangay malaria microscopy centers in strategic areas, etc.).
(2) mobilization of private facilities to provide malaria prevention and control services.
(3) mobilization of local government units (LGUs) to devise distribution schemes for ITNs for hard to reach areas and among vulnerable segments of the population.
(4) establishment of network among contiguous/nearby health facilities to offer complete intervention measures to malaria patients (e.g. referral to a nearby laboratory facility, etc.).
(5) promotion of the adoption of Directly Observed Treatment (DOT) especially in hard to reach areas where it may be difficult for malaria patients to be going back and forth to complete their treatment.

Health promotion works through concrete and effective community action in identifying priorities, making decisions, planning strategies and implementing them to reduce malaria cases and prevent re-introduction of infection.

Activities In Strengthening Community Action for the Prevention, Control and Elimination of Malaria

(1) establishment of system of malaria treatment partner
(2) campaign for volunteers to participate in vector control activities especially in indoor residual spraying and border operations
(3) creation of malaria task forces (community-based network) that will develop and implement community-based malaria prevention program
(4) health education activities such as health forum during barangay assembly, community leaders' assembly, etc.
(5) establishment and maintenance of community surveillance system

D. Developing Personal Skills

Developing personal skills is done through provision of information and education on health and enhancement of people's life skills using all possible channels, opportunities and venues (e.g. home, school, workplace, etc.) by various relevant institutions or stakeholders with the required expertise.

Personal Skills Development

in Support to the Prevention, Control and Elimination of Malaria

(1) conduct of interpersonal communication between a health care provider in the facility with the malaria patient or between a health volunteer and a malaria patient in the community or at home particularly on the use of personal preventive measures against malaria.

(1) counseling of malaria clients by trained health care provider particularly on proper treatment, the need to come back for follow-up smears and indications for referral to higher level of facility
(2) conduct of bench conference or orientation of malaria patients on how to use the ITNs and other preventive measures in the environment.
(3) orienting community volunteers on how to undertake indoor residual spraying;
(4) orienting treatment partners how to administer the anti-malarial drugs and how to report the results of treatment.

E. Re-orienting Health Services

Reorienting health service delivery requires a change in the mindset and perspective of health service providers beyond provision of clinical and curative services. It involves sensitivity to cultural differences and preferences and recognition of the diversity in local situations and needs. In the context of a changing malaria epidemiology, it also requires a shift in orientation from control to pre-elimination and eventual elimination. Which in turn, will involve updating of knowledge and skills, and adoption of a extra sense of vigilance.

Health Service Reorientation Activities

In Support to Malaria Prevention, Control and Elimination

(1) promotion of the use of the revised stratification criteria and scheme in determining appropriate intervention package.
(2) training of health providers and managers on on the updated manual of operations for the program
(3) continuous updating of standards and protocols on quality assurance of malaria interventions (i.e. diagnosis, drug efficacy, vector control interventions) based on research and evaluation

VI. Guidelines

A. Formulation of Local Health Promotion Plan

All local government health units shall develop a Health Promotion Plan guided by the following steps:

Step 1. Analyze the health situation

The first step in formulating the Health Promotion Plan is to make a comprehensive assessment of the malaria situation in the locality. Analysis of the malaria situation entails the collection, organization and analysis of data in terms of the current status of malaria problem in the locality, the identification of factors influencing the malaria situation, the current behavior of the target clients and prioritizing the health promotion issues or problems to be addressed.

Step 2. Formulate Health Promotion Goal and Objectives

Goal and objectives are those that are desired to be achieved within a given time period through the use of different strategies and resources. These are based on the identified priority health promotion issues or problems and should be aligned with the goal of the Malaria Program. The objectives should clearly state the actions expected of the identified target audience.

Step 3. Formulate Strategies and Action Points

Identify next the key strategies and action points you need to undertake in order to achieve the set objectives. Take note the following summary of key strategies and action points as earlier defined under Guiding Principles - Section IV.

Step 4. Indicate Timelines for Each Action

Indicate the expected timelines each of the action points or activities will be implemented. You may express these in terms of months or quarters per year.

Step 5. Identify Locus of Responsibility

The locus of responsibility is the lead individual directly responsible for the conduct or completion of the planned activity or action point. It is important that the lead person responsible will be specified and not the office/agency.

Step 6. Determine Required Resources

Resources required to support health promotion activities must be identified, including the source. Internal sources include the budget of the local government, and DOH national and regional offices, while external sources include other government institutions, development partners or donors and the community.

B. Development of IEC Messages

The development of effective IEC messages and health promotion materials is a basic step in mounting health promotion activities intended to effect the desired changes in the awareness/knowledge, attitudes and practices of the different target audiences. .

B.1 Key Messages By Stratification Categories

In support of the overall malaria program direction towards elimination, there is a need to focus key messages on various groups of stakeholders in areas of different stratification status. Table 3.28 summarizes the key messages that need to be emphasized in each particular stratification classification.

Malaria Communication Plan

Changing to a desired behaviour is the purpose of health promotion. There are several stakeholders in malaria elimination and each stake holder needs to practice the desired behaviour for NMCEP to succeed. Listed below are the key messages to malaria stakeholder and the responsible person to send the message. It is upon the responsible person to decide on the channel to carry the key messages.

Table 3.24 Malaria Communication Plan

Key Message	Target Audience	Responsible Person
Sleep inside mosquito net every night	Community members Individual person seeking consultation	MHO, Hospital doctors and nurses, PHN, Microscopist, RSI, BHW, Spray man, FAW,
Keep your child inside mosquito net every night	Mothers	MHO, Hospital doctors and nurses, PHN, Microscopist, RSI, BHW, Spray man, FAW,
Seek early consultation	Community members Individual person seeking consultation	MHO, Hospital doctors and nurses, PHN, Microscopist, RSI, BHW, Spray man, FAW,
Take complete dose of anti-malaria medicines	Confirmed malaria patients	MHO, PHN, Microscopist, RHM, Hospital nurses and MD's
Construct and maintain bio pond	Community Leaders	MHO, PHN, RHM, RSI, BHW
Clear the stream banks and seed with larvivorous fish	Community Leaders and households near the breeding site	MHO, PHN, RHM, RSI, BHW
Test before you treat	RHM, PHN, MHO Hospital MD's	Provincial and Regional Program Managers
Wash LLIN every quarter	LLIN recipients	MHO, PHN, RHM, RSI, BHW
Use mild soap in washing LLIN	LLIN recipients	MHO, PHN, RHM, RSI, BHW
Keep mosquito net intact. Patch up holes in the net.	LLIN recipients Community members	PHN, RHM, RSI, BHW
Have your blood check for malaria	Returning OFW	BHW, Community Leaders, RHM, PHN DOLE, OWWA
Beware of Malaria Protect yourself from mosquito bite	Leaving OFW	National Malaria Program Manager, RMC through DFA, DOLE, OWWA
Take your malaria prophylaxis as prescribed	Leaving OFW	National Malaria Program Manager and RMC through DFA, DOLE, OWWA
Warn our outgoing and incoming OFW about malaria in their destination.	DOLE, OWWA, DFA, Recruitment Agencies	National Malaria Program Manager, RMC, PMC
Keep your province malaria free, support malaria elimination hub	LCE	PDOHO/DMO, PHO/Provincial Malaria Coordinators
Keep your municipality/city malaria free support campaign for mosquito control	LCE, MHO, CHO	RMC, PDOHO/DMO, PHO/Provincial Malaria Coordinators, MMC

UNIT IV Program Management

Policy Direction
Local capacities of malaria program management will be strengthened and coordination among and between levels of administration relative to malaria program efforts and resources will be streamlined.
Efforts will be exerted for LGU's to design or adopt financing mechanism to sustain malaria operation towards elimination and to maintain their malaria-free status.

1 Implementation Arrangement

Department of Health (DOH) national office provides direction for the national programs. This is the National Objectives for Health (NOH). This direction is in sync with global agenda, the *Sustainable Development Goals* (SDG), *Global Technical Strategy* (GTS), and *Framework for Malaria Elimination* of WHO. The national office develops long and medium term development plans and recommends strategies to attain the health objectives. The strategies are contained in the National Strategic Plan (NSP). It also contains the activities that must be accomplished to attain the goal. Milestones are identified to gauge progress. The strategic plan is converted to a short term plans called annual operational plans where specific activities and target accomplishments are written. The plan is then implemented and progress is monitored using predetermined indicators.

Local government units are recommended to follow the NSP to guide them in the attainment of NOH. Support in terms of funds, commodities, training and technical assistance are provided by the national and regional offices to the local government units. The national office collaborates with other international and local development partners for attainment of SDG.

Clear roles, division of labour and standards are basic requirements for achievement of health goals by a system segmented by law. LGU health system must follow the standards set by the national office but LGU can innovate to achieve the common goal which is malaria control and eventually elimination.

2 Planning

2.1 Annual Operational Plan

National strategic plan is converted to a more detailed annual operational plan (AOP) for implementation. Proposed AOP is made before the incoming year and revised when the final budget for year is approved. Steps in preparing AOP are as follows:

1. Review the operation of the previous year and evaluate the outcome of activities based on the reduction of cases.
2. Identify the necessary innovations for the improvement of program implementation.
3. Update stratification of barangays and summarize the number of houses and population by stratum.

It is recommended that the plan is in Excel® Software spreadsheet for ease in doing computations, summaries and M&E planning.

4. Determine the necessary activity based on stratum (Table 3.3 Stratification)
5. Determine the targets for each activity using the updated stratification data
6. Determine the resources needed by each activity and compute for the cost (Annex 9 Computation of logistics)
7. Determine the indicator for each activity based on the NSP indicator number. Additional indicators can be identified for local (municipal and provincial) program use.
8. Determine the budget code for each activity
9. Summarize the AOP and the budget
10. Submit AOP for final approval and provide copy to the PHO.
11. Prepare monitoring plan for the AOP

2.2 Activities/Strategies at the Municipal and City level

All malaria control and elimination operation level must perform their function to deliver the desired output. Municipal and City Health Offices are at the forefront of malaria control and elimination. All the activities and strategies of all health programs including malaria program converge at the city and municipal health offices. They are multi-tasks to deliver health services to the community. All health programs are competing for the fully loaded time of the frontline health workers. The typical staffing patterns in RHU/CHO and PHO are in Table 4.1 and Table 4.2. I t also contain their specific role in MCEP and the necessary training to perform their duties and contribute to the achievement of goal.

Table 4.1 RHU Staff and their Roles in NMCEP

RHU/CHO Staff	Activities/Output	Training Needed
Municipal/City Health Officer	Allocates budget for malaria program Planning Monitoring and Evaluation Case management Health Promotion	Malaria Field Operations Training Malaria Epidemic Management Malaria Elimination Training
Municipal/City Malaria Coordinator (Designated by the MHO from among RHU staff)	Planning Monitoring and Evaluation Inventory management Stratification Reporting and Recording	Malaria Field Operations Training Malaria Epidemic Management Training

Continuation Table 4.1

(cont.) RHU/CHO Staff	Activities/Output	Training Needed
Public Health Nurse	Reporting and Recording Stratification Logistics management Health Promotion Collaboration with other local sectors	Malaria Field Operations Training RDT TOT Logistics Management Training
Medical Technologist/ Municipal Validator	Laboratory Diagnosis Health Promotion Microscopy report	Basic Malaria Microscopy Refresher course for Malaria Microscopy
MESU Officer (designated by the MHO from among the RHU staff)	Surveillance, Recording, reporting, data analysis	PIDSR Malaria Epidemic Management Training
Rural Sanitation Inspector	Stratification Vector Control Vector Surveillance Case Foci Investigation LLIN Distribution Foci Management Health Promotion Community Organizing Development project monitoring	Malaria Field Operations Training IRS Training Training on Basic Entomology Epidemic Management Training
Rural Health Midwife	Malaria Surveillance PCD/ACD Case management LLIN Distribution RDT testing Health Promotion Community Organizing	Malaria Field Operation Training RDT Training
Casual Workers	ACD IRS Health Promotion	Blood smear preparation IRS Training
Volunteer Microscopist	Malaria Microscopy Case Management	Microscopy training for non-MedTech
RDT Volunteer	RDT Testing Case Management Health Promotion	RDT Training
Volunteer Health Worker	Information Dissemination Screening of migrants and visitors Health Promotion Assist in Community Organizing	Basic BHW Training

2.3 Activities/Strategies at the Provincial Level

Table 4.2 PHO Staff and their role in NMCEP		
Provincial Staff	**Activity/Output**	**Training Need**
PHO	Allocates fund for MCEP Establish malaria elimination hub	
Provincial Malaria Coordinator	Planning Monitoring and Evaluation Provides Technical Assistance to RHU/CHO Evaluates/Consolidate Municipal Operational plans Recording and reporting Logistics management Assure readily available anti-malaria medicine in the province accessible within 24 hours. Leads epidemic response Facilitates training of RHU/CHO staff in coordination with CHD Keeps inventory of skills Malaria Register filing	Malaria Field Operations Training Epidemic Management Training
PESU Officer	Surveillance Collection, analysis of data Provide feedback to MESU and RESU Leads in epidemic investigation	PIDSR Training
HEPO	Design information material suited for the local situation Develop collaboration with other stakeholders	
Provincial Staff	Activity/Output	Training Need
Supply Officer	Warehousing of malaria commodities Inventory management	Logistic management training
Provincial Vector Control Officer/Sanitary Engr./SI Entomologist Designate	Vector Surveillance Provides Assistance to RHU/CHO in foci management Assist in QA of vector control measures Functions as entomologist of the province	Malaria Field Operations Training Basic Entomology Training
Provincial Validator/City Validator	Supervise municipal microscopist Implement microscopy QA	Microscopy Training Proficiency Assessment for Validators Supervisory Training
Casual Workers *(The province hires casual workers (Spm, SqL, Ento aide) with support from CHD)*	Indoor Residual Spraying Active Case Detection	IRS Training

Continuation Table 4.2		
Malaria Elimination Hub		
Provincial and District Hospital (and DOH retained hospitals)		
Resident Physician (Pedia and IM)	Provides treatment of complicated and uncomplicated malaria among in patients	Severe Malaria Management Training
Hospital Pharmacist	Provide 24/7 availability of anti-malaria medicines	
Chief Nurse/ Infection Control Nurse	Reports malaria cases with 24 hours to PESU	
OPD Nurse Supervisor	Report outpatient malaria patients to Chief Nurse	
Hospital Laboratory	Provides laboratory diagnosis of malaria (Microscopy and RDT) Submit report to the ESU	Malaria Microscopy Training; RDT Training

2.4 Activities/Strategies at the Regional Level

Table 4.3 Regional Staff and their Roles in NMCEP		
RO/ Staff	Roles/Output	Training Needed
Regional Director	Allocates fund for MCEP	
Program Manager/ Expert/ Regional Malaria Coordinator (RMC)	Provides Technical Assistance Training Inventory Management M&E Evaluate Provincial AOP Provides Support to Provincial MCEP	MMFO Epidemic Management
RESU Officer	Collection and analysis of case reports Provides feedback to PESU, Epidemiology Bureau and RMC	PIDSR Training
Regional Entomologist	Conducts QA; IR Monitoring; Conducts entomological investigation; Facilitates entomology training; Submits report	Diploma in Applied Practical Entomology (DAPE)
Regional Validator	Conducts QA Facilitates Microscopy Training; submits report	Supervisory Training Pass Assessment for Validators
Supply Officer	Warehousing and distribution of malaria commodities Facilitates procurement	Logistics Management Training
Casual Workers/ Job Order	Assist in the implementation of the program	As per TOR

2.5 Activities/Strategies at the National

Table 4.4 National Agencies and Their Roles in NMCEP		
National Agencies/Committees	Roles	Training Required
DOH-IDO- Malaria Program Manager	Formulates policy on all aspect of malaria control and elimination program Prepares strategic plans Formulate guidelines Set standards Allocate funds Procurement and allocation of malaria commodities Provide Technical assistance Conduct Training Monitoring and evaluation Provide inputs in the health promotion strategies Coordinate with the Regional Offices and other DOH bureaus/division and government agencies Collaborate with other development partners	
Malaria Technical Working Group (refer to AO)	Provide technical assistance Assist in monitoring and evaluation	
Epidemiology Bureau	Malaria Disease Surveillance Data Base Management	
Health Promotion	Provides technical assistance Evaluates the effectiveness of existing communication strategy Coordinates with the NPM Modify Communication Plan for malaria	
RITM	Provides technical assistance in the development of guidelines/SOPs/training/ OR protocols on the ff: • Therapeutic Efficacy Study • QA of RDTs/ Microscopy • QA of vector control (LLIN) • Insecticide resistance monitoring • LLIN durability study • Program Identified researches Disseminate results Provide PCR confirmation (and provide training in RO with PCR machine) Conduct TOT as needed (including GIS)	
Development Partners	Provides technical assistance Capability Building Provides venue for coordination/ collaboration with other government agencies and sectors	

3 Logistics Management

Policy Direction
The program will ensure universal access to early diagnosis and prompt treatment. Treatment must make use of effective anti-malarial drugs, with guidance from results of up-to-date efficacy studies done in the country.

Changing malaria situation in the country dictates changes in managing commodities for malaria program. Anti-malaria medicine is not readily available in private drugstores but cases of imported malaria surface from time to time. Malaria program policy states that confirmed malaria must receive treatment within 24 to 48 hours. Malaria supplies must be available within a few hours travel from any point in the country. Keeping anti-malaria medicine in every barangay health station is ideal but it will entail huge inventory cost and wastage considering absence of local cases in 76 of 84 provinces in the country. Provincial malaria point person must identify strategic location where the medicine can be access and must inform the RHUs and private hospitals/clinics where and how it can be accessed. Table 4.5 is a list of malaria commodities. The national office procures and allocates them by region who in turn allocates them by province. Allocation will depend on the need of the province and the need will be computed from routine malaria reports from the provinces and municipalities. Reports with high quality are required for better allocation of commodities to prevent stock outs on one end and huge inventory cost on the other end. The LGUs can augment malaria commodities from their own budget provided they are of high quality and follow the standard set by the DOH. The computation of requirements is in *Annex 8*.

Table 4.5 Malaria Activities and the Needed Resources

Activity	**Malaria Commodities**	
Diagnostic	RDT	Lancets
	Slides	Giemsa
Case Management		
	Artemether- Lumifantrine	Quinine tab
	ACT6x1	Artesunate vial
	ACT6x2	Primaquine
	ACT6x3	Chloroquine
	ACT6x4	Doxycycline
	Artesunate suppository	Other anti-malarial drugs
	Artesunate IV	
Vector Control		
	LLIN	PPE set
	Single	Spray can repair kit
	Family	
	Insecticide	
	Spray can	
Note: Computation of requirements are in Annex 8		

3.1 Malaria Commodity Stock Level for Malaria-Free and Zero Indigenous Provinces

Universal access to malaria diagnosis and treatment must be followed even if the province has no local cases anymore. Malaria acquired outside the province and those carried by OFW are continuing threats to life and re-introduction of malaria. They should receive diagnosis and treatment services within 24 to 48 hours. Each province must be ready to provide diagnosis and treatment within the prescribed period. They must store adequate volume of malaria commodities to respond quickly. Table 4.6 below shows the stock level for each health clinic in malaria free and zero indigenous provinces. Stock level for control provinces will depend on the reported usage of the commodities and projections based on the AOP. Inventory must be monitored every month and physical count done quarterly.

Table 4.6 Stocking level for Malaria-free and Zero Indigenous Provinces

Item	RHU/CHO/DHO Stock Level	PHO/Elimination Hub/ Designated Referral Facility Stock Level	Regional Stock Level
RDT kit (box of 25 tests)	1	4	Multiply by the number of provinces and referral facility- for RDT, medicines and insecticides
A L 4x6 (good for 5 pat/tx facility)2-2-1	2	2	1
Chloroquine (box of 100's)	1	2	
Primaquine (box of 100's)	1	2	
Quinine 500 mg tab (bot x100)	1	2	
Quinine Ampoule 300 mg/ml		20	
Giemsa Stock Solution	500 ml/RHU		Giemsa Powder in Collaboration Centers/Giemsa Production Centers

Table 4.6 continuation			
Item	RHU/CHO Stock Level	PHO Stock Level	Regional Stock Level
Artesunate 60mg/ampoule		30	
Vector Control			
LLIN pcs		500	
Spray can (pcs)		10	
Insecticide sachet for IRS		500	
Insecticide for mosquito net treatment (tab/sachet)		500	

Provincial malaria coordinators (PMC) oversee availability of malaria commodities to each RHU/CHO and elimination hubs and maintain the prescribed stock level at all times. PMC see to it that each health unit, including provincial and district hospital, know where and how to access malaria commodities even on weekends and holidays (24/7).

4 Reporting and Recording

Evidence based decision making is the hallmark of malaria elimination. Sharing of data through regular and special reports is necessary at each level for objective assessment of implementation. A good quality report has correct data entry, complete and on time. Feedback to the sender must be made and must have comments, analysis and recommendations. This will inform the sender that the reports do not just sit on filing cabinets. List of malaria reports is in table 4.7 and Table 4.8. Forms can be downloaded at http://www.doh.gov.ph/publications/non-serials.

Table 4.7 Reports to the Regional and National Level	
Title of Report	**Source Document**
Malaria Cases and Death Report	Malaria Case Registry and Malaria Laboratory Registry
Malaria Cases and Death Quarterly Report	
Malaria Cases and Death Annual Report	
Vector Control Report	Malaria Vector Control Registry
Vector Control Semi-Annual Report	
Vector Control Annual Report	
Malaria Financial Report	Budget Utilization Rate
Malaria Budget Annual Report	
Malaria Commodity Inventory Report	National Online Stock Inventory Reporting System (NOSIRS)
Malaria Commodity Inventory Semi-Annual Report	
Malaria Commodity Inventory Annual Report	
Diagnostic and Quality Assurance Report	Malaria Laboratory Registry Malaria Blood Film Report
Malaria Diagnostic and Quality Assurance Quarterly Report	
Malaria Diagnostic and Quality Assurance Annual Report	

4.1 Local Records and Reports

Table 4.8 Records and Reports at the Municipal/CHO level	
Regular Activity	**Report**
IRS	Daily Spray man's Report
	IRS summary Report
	Vector Control Registry
LLIN Distribution	LLIN Distribution Form
	LLIN Distribution Summary Report
	Vector Control Registry
Active Cases Detection	ACD/MSAT Form
	ACD/MSAT Summary Form
Passive Case Detection	Malaria Case Report
	Malaria Case Registry
	Laboratory Log Book
	Monthly Malaria Laboratory Report

5 Program Monitoring and Evaluation

Monitoring and evaluation are basic functions of program managers just like planning. Monitoring is regular viewing of indicators to have an idea whether the objective/goal of the plan will be achieved. Monitoring is looking for problems that hinder achievement of objective/goal. Indicators will help identify existence of problem early enough to have time to rectify the situation and then make necessary corrective action to reach the goal. To cite an example, suppose a report says 100% LLIN distribution (input indicator) but there is no reduction of cases (impact indicator). The impact indicator is telling us there is a problem even if the input is 100% achieved. It is upon the program manager to investigate the root cause of the problem and institute corrective measures before the endpoint of the plan to attain the objective/goal of the plan.

The first step in monitoring is preparing a monitoring plan (*Table 4.9*). The M&E plan is based on the approved plan (NSP or AOP).

Table 4.9 Basic Steps in Monitoring and Evaluation		
Step	Activity	Example
1	Study the program plan	NSP
2	Make M&E plan consisting of a. Schedule (Gantt Chart) b. Inputs (activities) and their corresponding indicators to the Gantt Charts c. Milestones d. Estimate cost	
3	Gather the data as scheduled in the Gantt Chart	
4	Compare the impact indicator vs. the target	2017 cases vs. 5 yr average no. of cases
5	Brainstorm possible sources of discrepancy (variance) and gather evidence/information.	
6	Look at each input indicator and compare vs. target	
7	Assess each input using the following guide questions Is it the right input to produce direct impact? Is the input in the right time? Is the input in the right place? Is the input in the right quantity? Is the input of the right quality?	
8	Decide for the corrective measures to achieve the goal (impact).	

5.1 Monitoring by the National and Regional Level

Monitoring and evaluation for the regional and national level is wider in scope and the basis is the activities and targets written in the most recent National Strategic Plan. It follows the basic steps in M&E starting with M&E plan. Qualitative information gathering is also included in data collection to provide substance to the numerical targets. Result of the M&E activities are then used to improve the program quality. A template for M&E plan is shown Annex 10. Monitoring for the national level is a collaborative effort of all the agencies, committees and all organization involve in NMCEP.

5.2 Monitoring at the RHU/CHO and PHO Level

The objective of monitoring is to identify gaps/problem/**wastage** and look for solution before the end of the AOP. Below is an example of monitoring activity schedule at the municipal and provincial level (*Table 4.10*).

Table 4.10 Sample monitoring plan for RHU malaria control and elimination program													
Activity	Indicator	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Stratification Data	Stratified list of Barangay		X										
Local Fund for malaria	Approved local budget for malaria		X										
Malaria Cases	No. of cases	X	X	X	X	X	X	X	X	X	X	X	X
QA Microscopy	Glass slide film report						X					X	
IRS	Coverage of IRS				X			X			X		X
ACD	SPR BER				X			X			X		X
LLIN	Distribution Coverage LLIN Usage				X			X			X		X
Case-Foci investigation	Percent Investigated				X			X			X		X
Health Promotion					X			X			X		X
Community Mobilisation					X			X			X		X
Inventory	Stock out rate				X			X			X		X
Fund Utilisation	Utilisation rate				X			X			X		X
Evaluation and catch-up planning								X					X

Even if the indicators are showing that the program is doing well there may be some minor problems that can be solved and provide more efficiency to operation. Small improvements add up to give huge result. Asking the right questions will lead to discovery and understanding of the situation. Table 4.11 is a list of some guide questions in monitoring the program and identify problem situation.

Table 4.11 Some Guide Questions for Monitoring and Evaluation				
Monitoring/Evaluation Questions	**Indicator**	**Formula**	**Source of data**	**Probable Problems/Remarks *(to mention a few)***
Where are the cases this month? What is the problem barangay/sitio?	Monthly cases/Bgy		PIDSR	Epidemic

Table 4.11 continuation

Monitoring/Evaluation Questions	**Indicator**	**Formula**	**Source of data**	**Probable Problems/Remarks *(to mention a few)***
Is there vector control in place? When was it applied? Is it working?	% House sprayed	(No. of houses sprayed ÷ Total target number of house) x 100	IRS Report	Insecticide resistance Quality of spraying Change in vector behaviour
	% LLIN Ownership		LLIN Distribution report	Low LLIN use Holes/Tears in LLIN
	% Mortality of mosquitoes		Bioassay	Insecticide resistance
Are we detecting significant number of cases to cause reduction?	Slide Positive Rate (SPR) or Test Positive rate (TPR)	(No. of positive smear ÷ Total number of smear) x 100	Microscopy report PCD/ACD	High SPR is indicative of inadequate case detection. It may also mean there is epidemic.
Did we exert enough effort to find the cases?	Annual Blood Examination Rate (ABER)	(Total number of smear ÷ Endemic population) x 100	PCD/ACD	Low ABER creates doubt on the "real" incidence of malaria.
Are we winning the battle?	Percent *Pf*	(No. Pf ÷ total pos) x100	PIDSR/PCD/ACD	Normally Pf is about 70%. Reduction in proportion of Pf means the interventions are working. It can also mean there is *Pv* epidemic.
Are we going to hit the target reduction of annual parasite incidence (API) at the end of the year	Compare monthly cases with that of last year.		PIDSR / PCD Report	Lower monthly cases each month will translate to lower API at the end of the year. It is unwise to compute monthly parasite incidence.
Do we have efficient logistics management?	Stock out rates	No. of clinics reporting stock out ÷ Total no. of clinics	Inventory report	Poor distribution system. Poor re-ordering system

5.3 Malaria Program Indicators

There are many indicators in the program. The inputs in the plan determine the kind of indicator that will be collected to gauge progress of plan implementation. Basically indicators are the evidences that show progress or attainment of objectives and goal. All the indicators are predetermined by the National Strategic Plan. Some of the more common program indicators and their significance are listed in Table 4.12 below (source Philippine National Malaria Monitoring and Evaluation Plan 2014-2020).

Table 4.12 Selected program indicators and their significance

Indicator	Significance
Malaria morbidity rate	Measures trend of malaria morbidity and highlights location and quantity of transmission.
Malaria mortality rate	Monitors the impact of the malaria program on severe diseases and death.
Annual Parasite Incidence (API)	Tracks the trend in malaria endemicity
Annual blood examination rate (ABER) For active and residual non active. (suspected tested pos/endemic pop)	Signifies adequacy of cases detection. Increase level of confidence in "zero-ness" of cases in the area.
Slide positivity rate (SPR) or Test Positivity Rate (TPR)	Proportion of positives tests in a given sample. It triangulates ABER.
Pf gametocyte rate	Signifies delay either in diagnosis, or treatment seeking or case detection. Gametocytes of *Pf* are formed after more than seven days of symptoms.

5.4 Monitoring Progress of Malaria Elimination at the Provincial Level

Malaria elimination is not only interruption of transmission but removal of parasite in each and every parasite reservoir in the locality. The indicator suggested for malaria elimination is the Percentage of Barangays/sitios under cleared stratum. It must be 100% five years before 2030. It must be supported by ABER of 1-2%.

6 Quality Assurance

Malaria elimination relies on implementation with little margin of error. Malaria bounce back rapidly (outbreak) even with one case or parasite left in the community. There is no room for error in diagnosis and high quality vector control is necessary in elimination setting. Quality is also expected in reports based on timeliness and correctness of content.

6.1 Quality in Malaria Rapid Diagnostic Tests

Procured RDT is subjected to lot quality assurance test by RITM upon delivery in the country prior to distribution to end users. The batch that failed the test is returned to the supplier.

6.2 Quality Assurance for Microscopy

Malaria elimination requires high quality diagnosis because one missed case has a potential to re-introduce the parasite to the community. Microscopy has to be of high quality meaning the skill of microscopist must meet the standard needed by the elimination program.

Each malaria microscopist is regularly visited by their designated validators. Supervisory visit is guided by a checklist for a thorough observation of the workplace, equipment and output of the microscopist. Performance of the supervisee is gauged through cross reading of blood smears. Microcopists who underperform are sent for refresher training.

Selection of blood smears for validation

Malaria Free Province

- Any positive blood film must be submitted to Regional Collaboration Center and blood spots on filter paper must be submitted immediately to National Reference Laboratory (NRL) for confirmation by nucleic acid amplification assay

- Microscopists must enrol and pass in National External Quality Assurance (NEQAS) in Parasitology.

Zero- Indigenous Malaria Provinces

a. Immediate cross checking of reported positive cases

Submit positive blood film immediately to the assigned validator and dried blood spots on filter paper to the RITM (NRL-for Malaria) for confirmation by molecular assays.

b. Regular Cross checking/validation

Table 4.13 Procedure for selection of blood films for validation in zero-indigenous malaria provinces		
Step	Action	Notes
1	Collect all positive slides	
2	Keep all negative blood films until validated	
3	If blood films are less than 30, fill up Form 1 and submit together with blood films in a properly labelled envelop to the validator.	
4	If blood films are more than 30, ask the immediate supervisor to randomly select 10% , fill up Form 1 and submit together with blood films to the validator in a properly labelled envelop	
5	For mass blood survey (MBS) all positive blood films and 10% of the negative blood films are submitted for validation.	
6	If no blood film was examined write “NO BLOOD FILM EXAMINED” in Form 1 and submit to validator.	
7	Validator reads the blood film and provides feedback within 2 to 4 weeks.	
8	Validators send a panel of blood films to the microscopist to be examined for 2 weeks and send back result to validator for checking	Refer to WHO Quality Assurance Manual for more detail.

Active Provinces

Table 4.14 Procedure for selection of blood films for validation in active provinces (AP) category		
Steps	Action	Notes
1	Keep all blood films until validated	Submit positive blood film *P malariae* or P *ovale* to the assigned validator plus dried blood spots on filter paper to the RITM (NRL-for Malaria) for confirmation by molecular assays.

Table 4.14 continuation

Steps	Action	Notes
2	Prepare slides for selection of samples Separate slides by month. Separate positive and negative slides by month Select 5 positive smears and 5 negative smears for each month using either systematic sampling or simple random sampling as shown in the right. If positive smear is less than 5 then submit all for validation. If blood smear is less than ten, then submit all for validation.	Choose a method for selection of smears for validation. Either systematic sampling method or simple random sampling method is sufficient for slide selection. Sampling procedure is detailed below. <u>a. Systematic sampling method</u> -Arrange the slide by their slide number -Get the total number of positive slides for the month and divide by 5. -Round the quotient to make a whole number. - Example Total number of negative slide = 45 Divide 45 by 5 = 9 Then every 9th slide is included in the sample for validation Repeat the procedure for negative slide <u>b. Simple random sampling method</u> -Assign a number for each positive slide -Make numbered papers equal to the number of slides and put them in a box. -Shake the box and draw 5 numbers. These will be the slides for validation. -Repeat the procedure for selection of negative slides
3	Fill up Form 1 and place in an envelop	One envelop for each month.
4	Seal envelop and write the name of the facility and the microscopist and their code number.	If no blood smear was examined put “NO BLOOD FILMS EXAMINED” in Form 1.
5	Send envelop together with the slides placed in a slide box to the assigned validator	
6	Validator reads the blood film and provides feedback within 2 to 4 weeks.	Refer to Quality Assurance Manual for more detail.

6.3 Quality Assurance in Vector Control

Quality of vector control input is first assured by determining the sensitivity (Susceptibility test) of the vector to the insecticide prior to use and monitoring the effectivity of insecticide after its application (Bioassay test)

The program uses insecticides that passed WHO Pre Qualification Team-Vector Control (WHO-PQT-VC).
Susceptibility of the vectors to the insecticide being used in IRS and incorporated in LLIN should be done every 2 years per province by regional entomologists.

The quality of IRS is tested through bioassay of the sprayed walls within 1 week of application and 3 months later.
LLIN are also subjected to bioassay yearly. Residual efficacy evaluation of LLIN samples are tested every year. Samples are collected by regional entomologist with technical supervision from RITM.

Susceptibility Testing of Adult Mosquitoes to Insecticide

- Physiological resistance is the ability of a population of insects to tolerate doses of an insecticide which would prove lethal to the majority of individuals in a normal population of the same species.

- Susceptibility tests are carried out to determine the proportion of vector population that is physiologically resistant to a particular insecticide.

- It is performed to select new insecticide for vector control or to monitor performance of insecticide in current use.

Materials and Equipment

- WHO Susceptibility kit
    - Exposure/Holding tubes
    - Copper and silver rings
    - Insecticide impregnated filter papers
    - Oil impregnated control papers
    - Sucking tubes
- Nylon netting
- Rubber bands
- Cotton
- Timer
- Mosquito tray
- Scissors
- Masking tape
- Sugar solution
- Impregnated nets
- Untreated nets
- Hygrometer
- Stereoscope
- Mosquito cage

Procedure for conducting susceptibility test is detailed in Annex 10.

Bioassay Tests

Objectives of bioassay tests

- Determine the residual efficacy of an insecticide in a sprayed wall
- Evaluate the quality of spraying operation
- Determine the residual efficacy of an insecticide on bed nets and other materials like curtain
- Assess quality of treatment on bed nets
- Bioassay is done within 1 week after IRS and repeated after three months to compare mortality rates.
- Details of the procedure is in Annex 11

Materials /Equipment:

- Bioassay Kit
    - Plastic cones
    - Adhesive sponge tape
    - sucking tubes(bent or straight)
    - Straight sucking tubes
- Paper cups(preferably white color)
- Nylon netting
- Rubber bands
- Cotton
- Timer
-
- Mosquito tray
- Scissors
- Masking tape
- Result sheet
- 10% Sugar solution(e.g. 10g of sugar dissolve in 90ml clean water)
- Insecticide treated bed nets (for testing)
- Untreated nets (for control)
- Hygrometer
- Stereoscope

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List of Figures

List of Tables

List of Tables (*continuation*)

List of Annexes

Annex 1

Program Goals and Activities
NSPCEM 2017 – 2022
National Malaria Control and Elimination Program

Indicator	Base-line 2016	Target					
		2017	2018	2019	2020	2021	2022
1. Malaria Cases and Deaths		20%	40%	60%	70%	80%	90%
1.1 Number of confirmed malaria cases reduced by at least 90%	6,604	5,287	3,965	2,644	1,983	1,322	661
1.2 Number of confirmed malaria deaths reduced to zero	7	5	3	1	0	0	0
2. Province with API $\geq$ 1 per 1,000 at-risk population (Palawan)	1	1	1	1	1	1	1
2.1 Number of confirmed malaria cases reduced by at least 90%	6,132	4,906	3,679	2,453	1,840	1,226	613
3. Provinces with API < 1 per 1,000 at-risk population	7	7	7	7	6	6	6
3.1 Number of confirmed, indigenous malaria cases reduced by at least 90%	394	322	242	161	120	80	40
4. Provinces with zero indigenous malaria cases and malaria free	73	74	74	74	75	75	75
4.1 Number of provinces with zero indigenous cases (not yet declared malaria-free)	41	32	19	11	4	3	1
4.2 No. of provinces declared malaria-free	32	42	55	63	71	72	74

Strategies and Activities

Strategy 1.1 Maintain focal malaria interventions in municipalities and barangays with stable, unstable and sporadic transmission

1.1.1 Strengthen diagnostic lab supplies and equipment
- 1.1.1.1Procure and distribute laboratory supplies and equipment
- 1.1.1.2 Procure and maintain microscopes
- 1.1.1.3 Provide RDT kits
- 1.1.1.4 Procure and distribute G6PD POC test kits: conduct introductory training
- 1.1.1.5Training on Malaria Microscopy and RDT
  - a. Train and deploy additional RDT
  - b. Training on G6PD screening test administration
  - c. Train on RDT/BMMC supervision
  - d. On the job training for other RHU staff (non-Med Tech) on RDT
  - e. Training on Basic Microscopy for newly hired Med Tech as replacements
  - f. Refresher training on Malaria Microscopy (BMMC, RHU and Hospitals)

1.1.2 Enhance clinical management and treatment
- 1.1.2.1 Procure and distribute drugs/medicines
- 1.1.2.2 Train Health on clinical management course
  - a. Health personnel from RHU, Public and Private Hospitals

1.1.3 Undertake Vector control measures

1.1.3.1 Procure/distribute LLINs

1.1.3.2 Procure insecticides, spray cans and PPE

1.1.3.3 Conduct IRS (mobilization and orientation of spray men)
- 1.1.3.3.1 Conduct cross border operations

Strategy 1.2 Ensure continuous access to malaria diagnosis, treatment and preventive measures in zero-indigenous malaria and malaria-free provinces

1.2. 1 Orient Regions and LGUs on the enhanced Elimination guidelines

1.2.2 Organize Elimination Hub Team per region according to geographical protocol

1.2.3 Establishment of Elimination Hub
- 1.2.3.1 Assessment of provinces on key requirements of an elimination hub
- 1.2.3.2 Passage of ordinance/ resolution in support to elimination hub establishment and operation
- 1.2.3.3 Provide computer/ printer/UPS/ tablets
- 1.2.3.4 Provide lab supplies/equipment

1.2.4 Training of health personnel on diagnosis, clinical management, malaria surveillance and entomology
- 1.2.4.1 Training and orientation on Malaria Surveillance and Response Strategy Guide
- 1.2.4.2 Training on RDT
- 1.2.4.3 Training on microscopy
- 1.2.4.4 Clinical Management and treatment

1.2.4.5 Entomology Training
1.2.4.6 Refresher course on entomology
1.2.5 Procurement of drugs/medicine for stockpiles
1.2.6 Procurement of RDT kits
1.2.7 Provision of LLIN
1.2.8 Case detection/Disease Surveillance and Response
1.2.8.1 Case investigation
1.2.8.2 Foci investigation and response
1.2.9 Indoor Residual Spraying
1.2.9.1 Procure insecticide
1.2.9.2 Procure Spray cans
1.2.9.3 Procure PPEs
1.2.9.4 Mobilization of spray men
1.2.10 Border Operations
1.2.11 TA, Assessment and Validation of Malaria Free Provinces
1.2.12 Coordination Meetings and Planning
1.2.13 Continuing IEC and Response
1.2.14 Monitor WHO recommendations and register POC test for G6PD with FDA (operationalize via Strategy 1.1)
1.2.15 Monitor WHO recommendations and availability of tafenoquine and apply for FDA registration (operationalize via Strategy 1.1)

Strategy 1.3 Implement responsive malaria interventions among identified vulnerable population groups

Six other vulnerable or at-risk groups have been identified for further focused intervention:[1]

i) Forest workers and other informal occupational groups in remote areas;
ii) The military, who are intermittently assigned and re-assigned for field operations;
iii) Overseas Filipino Workers, whose work destination may bring them to high malaria-endemic countries;
iv) Tourists or constant travellers (both local and international);
v) Those living in communities that become sites of development projects that trigger movements exposing them to the disease.
vi) Internally displaced populations (IDP) as a result of war or armed conflict, military operations or occurrence of natural disasters;

1.3.1 Assess which vulnerable groups for focused innovative interventions (7 vulnerable groups)
1.3.2 Develop Strategy and Operational Plan for Specific Vulnerable Groups
1.3.3. Conduct consultations/meetings and advocacy with identified groups
1.3.4 MOU/MOA between DOH and concerned national/regional/local government agency
1.3.5 Semi- Annual Coordination meetings
1.3.6 Provide technical support to agencies/ organizations concerned with the vulnerable groups
1.3.6.1 KAP engagement for IP
1.3.6.2 Other vulnerable groups

Strategy 1.4 Increase demand for and support to effective anti-malaria interventions and services

- 1.4.1 Assessment of community-based health promotion events and other media channels
- 1.4.2 Develop Health Promotion Plan for Malaria Program
- 1.4.3 Develop IEC materials (print, video, radio plugs)
- 1.4.4 Continue integration of malaria messages in selected schools in 8 provinces
- 1.4.5 Assessment of the outcome of the malaria messages integration in school curriculum
- 1.4.6 Integrate malaria IEC during IRS, LLIN distribution, border operations, diagnosis and treatment sessions: multi-media (IEC print materials, video, radio plugs, caravan, and poster)
  - 1.4.6.1 Palawan
  - 1.4.6.2 Other Control Provinces
  - 1.4.6.3 Elimination areas
  - 1.4.7 Annual Celebrations (depending on the result of evaluation)
- 1.4.7 World Malaria Day
  - 1.4.7.1 Malaria Prevention Month
- 1.4.8 Malaria Program to engage in policy dialogue with other health sector actors regarding demand-side interventions for KAPs
- 1.4.9 Engage KAPs in IEC/advocacy for malaria elimination and community mobilization
- 1.4.10 Treatment hubs for IPs in Palawan (family-friendly outpatient accommodation near to treatment facilities)

Strategy 2.1 Establish functional organizational structures and malaria work force at all levels

- 2.1.1 HR Analysis at all levels
- 2.1.2 Expand personnel compliment at national level to address core functions
  - 2.1.2.1 Entomologist (1)
  - 2.1.2.2 IT person (1c/o KMITS)
  - 2.1.2.3 Technical Writer (1)
  - 2.1.2.4 Regional M& E/Surveillance officer (Palawan, Luzon-Visayas, Mindanao) and 1 National Level (4)
- 2.1.3 Include in the DOH – Rationalization Plan the above positions
- 2.1.4 Advocate among LGUs the designation of Malaria Point Persons to perform cor functions
  - 2.1.4.1 Negotiate deployment of the following personnel in remote areas
  - 2.1.4.2 DTTB doctors
  - 2.1.4.3 Med Tech Deployment Programs

Strategy 2.2 Strengthen the policy environment, management systems and coordination mechanism in support of malaria elimination

- 2.2.1 Finalize, issue and cascade to DOH-ROs and LGUs the following elements of the MOP related to case management:
  - 2.2.1.1 2nd edition of MOP on Malaria Program
  - 2.2.1.2 AO on DOH Malaria Reporting
  - 2.2.1.3 Revised Clinical Management with referral guidelines and Treatment Protocol
- 2.2.2. Develop/Enhance the following manual with accompanying AO/IRR
  - 2.2.2.1 Quality Assurance of Microscopy

2.2.2.2 Quality Assurance for RDTs
2.2.2.3 Retrieval/Disposal of LLINs
2.2.2.4 Guide for Malaria-Free Provinces on Ceasing IRS, LLIN distribution, border operations, etc.
2.2.2.5 Foci Mapping and Stratification
2.2.2.6 Enhance Guidelines on the assessment/validation and declaration of malaria-free provinces

Local Strategic and operational plans

2.2.3 Revise and issue M&E Guide based on updated NSPCEM
2.2.3.1 NSPCEM 2017-22 dissemination
2.2.3.2 Development of Sustainability Plan and Road Map
2.2.3.3.Advocacy for LGUs to incorporate malaria interventions in their P/MIPH and AOP based on Sustainability Plan
2.2.3.4 Assessment and Micro-Planning: Region and Province assisting municipalities to develop plan for control or elimination
2.2.3.5 Develop Area-Based Micro-Plan (municipal level)

Collaborating Centres

2.2.4.1 Package Training design, Modules Curriculum
2.2.4.1.1 Clinical Management training
2.2.4.1.2 Basic Microscopy (Troubleshooting / Maintenance)
2.2.4.1.3 RDT and RDT QA
2.2.4.1.4. Entomology Training
2.2.4.1.5 IRS Training
2.2.4.2 Organize team of trainers on various courses in each of the 7 collaborating centers
2.2.4.2.1 Diagnosis (Microscopy and RDT)
2.2.4.2.2 Clinical Management
2.2.4.2.3 Vector Control including Entomology
2.2.4.2.4 Surveillance and Response
2.2.4.3 Support Collaborating Centres
2.2.4.3.1 Replace Davao Collaborating Centre microscope and other equipment
2.2.4.3.2 Establish 3 more CC (2 in Luzon and 1 in Visayas)
2.2.4.3.3 Sustain CC Operations

Logistics Management

2.2.4.4.1 Enhance NOSIERS on malaria commodities (c/o PBSP)
2.2.4.4.2 Distribution of malaria commodities
2.2.4.4.2.1 Commodities in Strategy 1.1
2.2.4.4.2.2 Commodities in Strategy 1.2
2.2.4.4.3 Monitor stock levels (c/o Strategy 4.4)

Management Information System

2.2.4.5.1. Monthly data reconciliation sessions: PHO MCP Coordinator
2.2.4.5.2 Establish Malaria On-Line Information System
2.2.4.5.2.1 Develop the system

2.2.4.5.2.2 Pilot
a. Installation of equipment: hard ware (server, LAN, internet, etc.)
b. Orientation
c. 6-months pilot
2.2.4.5.2.3 Roll out training

Strategy 3.1 Secure adequate government and non-government financial resources in support of malaria control and elimination

3.1.1 Develop cost-sharing priorities between DOH and LGU
3.1.2 Advocate among provinces and municipalities incorporation of malaria interventions in their AOP
3.1.3 Integrate as a requirement in the criteria/guideline for issuing Malaria-Free Certificate the allocation of budget for sustaining Elimination Hub and advocate adoption
3.1.4 Continue engagement of WHO and other development partners for technical assistance
3.1.5 Advocate enrolment to *PhilHealth* (in-patient, IP Benefit Package)

Strategy 4.1 Ensure high quality malaria diagnosis and treatment, through effective quality assurance systems

4.1.1 Establish QAS baseline indicators and review/revise QAS Forms
4.1.2 Launch and orient Med Techs on the enhanced QAS guidelines
4.1.3 Quality Assurance of microscopy services (National Competency Assessment for Elimination Hub Med-Tech and potential Validator (Palawan and Provinces with API <, 1/1000)
4.1.3.1 Pre-qualification of validators from all 82 provinces, 7 CCs and 18 Regions
4.1.3.2 Training on Monitoring and Supervision
4.1.3.3 Slide Banking
4.1.3.4 Validation and onsite visit
4.1.3.5 Panel testing for malaria-free and elimination phase provinces (c/o Collaborating Centre)
4.1.3.6 Lot Testing for RDT
4.1.3.7 Lot Testing for Drugs/Medicines
4.1.3.8 PIR among medtechs/ microscopists
4.1.3.9 ReMiDi (Remote Microscopic Diagnosis)

Quality assurance of RDT services

4.1.3.10 TOT of DOH validators on RDT (for RHU plus Hospital MT) arrival
4.1.3.10.1 Orientation of RHU, Public Hospitals and Private hospitals (25%) on RDT QA (c/o DOH-RO CHD validators)
4.1.3.10.2 Conduct validation visits of RDT workers at various levels

QA for Case Management and Treatment

4.1.3.11 Conduct TES in designated sites every 2 years
4.1.3.11.1 Conduct drug quality testing c/o Collaborating Centre
4.1.3.11.2 QA Product Testing

4.1.3.11.3 Conduct malaria mortality review (as needed)
4.1.3.11.4 On-site validation of treatment compliance (c/o quarterly monitoring visits)

Strategy 4.2 Maintain high quality and effective vector control measures
- 4.2.1 Provide equipment/supplies for bioassay and susceptibility testing
- 4.2.2 Conduct bioassay test (per Region)
  - 4.2.2.1 Conduct bioassay tests on used LLIN
  - 4.2.2.2 Batch quality testing for LLINs
  - 4.2.2.3 Conduct bioassay test in post spraying operations in selected areas
- 4.2.3 Conduct susceptibility test (18 Sentinel Sites every two years.)

Strategy 4.3 Strengthen malaria case surveillance and response systems in support of malaria elimination according to the Malaria Surveillance and Response Strategy
- 4.3.1 Map-out/inventory of existing PESU/ MESU.
- 4.3.2 Orient MESU staff on PIDSR and Malaria Surveillance and Response Strategy together with surveillance, M&E, and supervision
- 4.3.3 Support improvement of quality of disease reporting through PIDSR
- 4.3.4 PIDSR Reporting (morbidity/mortality cases) in all provinces
- 4.3.5 Investigate and respond
- 4.3.6 Mapping and monitoring of known foci for transmission and annual classification/ reclassification

Strategy 4.4 Maintain effective Malaria Program monitoring and evaluation systems
- 4.4.1 DOH-CO semi-annual field monitoring
- 4.4.2 DOH –RP quarterly field monitoring

For Palawan
4.4.2.1 Establish external field monitoring team for Palawan
4.4.2.2 Conduct field monitoring on quarterly basis
4.4.2.3 Feedback/Planning Meeting with Palawan

National
4.4.3.1 PIR
- 4.4.3.1 National with ROs
- 4.4.3.2 DOH-ROs with Province/Municipalities
- 4.4.3.3 Province with Municipalities

4.4.3.2 Annual National Malaria Program Report
4.4.3.3 Mid-Term Evaluation

Operational Research
4.4.4.1 Develop, review and update operational research agenda for the Malaria Program
4.4. 4.2 Early candidates for special studies and/or research (subject to operational research workshop and agenda)
- 4.4.4.2.1 For Palawan
  - a. FGD
  - b. OR on MDA
    - i. Protocol Development
    - ii Drug Registration
    - iii Clinical Trial to test safety and efficacy

iv Possible pilot in circumscribed island setting
v Possible MDA roll-out (subject to trial and pilot outcomes)

c. Trial of new insecticide (e.g. non-pyrethroid, long-acting pyrethroid)
d. OR on screens in market place
e. OR/Trial on spraying of outside walls

4.4.4.2.2 Prevalence Survey in 6 other endemic provinces (ARMM, Sultan Kudarat, Davao Norte)

4.4.4.2.3 Other Surveys/Special Studies

a. BUS
b. Health Facility Survey
c. Behavioural studies in children aged 5 years and 6-14 years

4.4.4.3. Annual Malaria Research Forum

4.4.4.3.1 National

4.4.4.3.2 Regional

Annex 2

Foci Registry

National Malaria Control and Elimination Program

Municipality: _____ Province: _____ Region: _____

Foci (Barangay/Sitio)	Pop	Houses	Receptive (yes/no)	Vulnerable (yes/no)	Status (active, residual non-active, cleared)	Year Updated	Coordinates

Annex 3

Stratification of Barangays/Sitio
National Malaria Control and Elimination Program

Municipality: _____ Province: _____ Region: _____

			Monthly Malaria Cases 2018														Total Malaria Cases		
Barangay/ Sitio	Pop	Houses	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	Strata *Active Residual Cleared*	2017	2016	2015
Summary																			
	Pop	**Houses**	**No.**														**No.**	**No.**	**No.**
Active																			
Residual non-active																			
Cleared																			
Total																			

Annex 4

Annex 3.5 National Malaria Control and Elimination Program
Malaria Investigation Form

Name of Investigating Health Facility: _____	Complete Address of Health Facility: _____	Type of Facility: ☐Region ☐PHO☐RHU/CHO

I. PATIENT INFORMATION

Patient's First Name Middle Name Last Name			
Registry Number in the Malaria Registry: _____	Case Investigation Number: _____		
If Indigenous People (IP), indicate IP Group Name: _____	Nationality: _____		
Current Address: Prov/Mun/Bgy	Sex: ☐Male☐Female Pregnant?☐Y ☐ N If Yes, # of weeks of pregnancy_____	Date of Birth: ____/____/____ MMDDYY	Age: _____ ☐Days ☐ Months ☐Years
Permanent Address: Prov/Mun/Bgy	Name of Contact Persons/Informant:	Contact details:	
Occupation: ☐ OFW☐ Farmer ☐ Student ☐ Forest Worker ☐Phil National Police/PNP ☐ Fisherman ☐ AFP / Military / Marines ☐ Others _____	Name of Company/Employer:	Address of Workplace :	

II. CLINICAL DATA

Date of Onset of Symptoms: ____/____/____ MMDD YY Date of Consultation: ____/____/____ MM DD YY Signs and Symptoms / Reason for Consultation: ☐ Fever ☐ Headache ☐ Chills ☐ Pallor ☐ Others_____	Patient admitted?☐Y☐N Name of Facility of Admission: _____ Date of Admission: ____/____/____ MM DD YY Date of Discharge: ____/____/____ MM DD YY

III. LABORATORY TESTS DONE AND RESULTS		IV. Other signs and symptoms during hospitalization:
Date Smear was taken: ____/____/____ MM DD YY Result (check all parasite seen) ☐ *P. falciparum* ☐ *P. vivax* ☐ *P.malariae* ☐ *P.ovale* ☐ *P.knowlesi*(has to be confirmed by PCR) ☐ *NMPS (no malaria parasite seen)*	Date RDT test was done: ____/____/____ MM DD YY Result: ☐ *P. falciparum* ☐ *P. vivax* ☐*Pf Pan* ☐ *Non- Pf Pan* ☐ *Negative*	☐ Jaundice ☐ Severe Weakness ☐ Convulsion ☐ Respiratory Distress ☐ Poor urine output ☐ Coffee-colored Urine ☐ Impaired Consciousness ☐ Abdominal Bleeding

V. MALARIAL DRUGS ADMINISTERED

Drug Name (encircle the preparation used)	Indicate the number of drugs given to patient													
	Day 1 / / MM/ DD/YY	Day 2 / / MM/ DD/YY	Day 3 / / MM/ DD/YY	Day 4 / / MM/ DD/YY	Day 5 / / MM/ DD/YY	Day 6 / / MM/ DD/YY	Day 7 / / MM/ DD/YY	Day 8 / / MM/ DD/YY	Day 9 / / MM/ DD/YY	Day 10 / / MM/ DD/YY	Day 11 / / MM/ DD/YY	Day 12 / / MM/ DD/YY	Day 13 / / MM/ DD/YY	Day 14 / / MM/ DD/YY
Arthemether-Lumefantrine														
Artesunate Suppository(50mg /sup or 100mg/sup)														
Primaquine(15mg/tab or 7.5mg/tab)														
Chloroquine(26.5mg base/tab)														
Quinine Tablet(300mg/tab)														
Quinine Ampule(600mg/2ml or 300mg/1ml)														
Others_____														
Others_____														

VI. EXPOSURE HISTORY

History of blood transfusion in the past 2 weeks? □ Yes □ No

If yes, indicate the following: Date of Transfusion: ____/____/____Name of Facility of Blood transfusion:
MM DD YY

_____

History of malaria infection in the past 36 months? □ Yes □ No Name of Facility of Diagnosis:_____

If yes, indicate the following: Date diagnosed: ____/____/____
MMDD YY Species:_____

History of Travel

A. History of Travel in the past 2 months before onset of signs and symptoms?

□ Yes □ No If yes, indicate places visited below:

Places Visited with overnight stay: (Sitio/Bgy, Municipality, Province)	Travel Period	
	Date of Arrival	Date of Departure

B. History of Travel 2 months after onset of signs and symptoms?

□ Yes □ No If yes, indicate places visited below:(***Applicable for Diagnosis and/or investigation was done late)

Places Visited with overnight stay: (Sitio/Bgy, Municipality, Province)	Travel Period	
	Date of Arrival	Date of Departure

VII. Contact Tracing – Possible onward transmission:

Did any of the family members, visitor/s in the house or neighbors and other contacts have similar symptoms or illness during the last 6 weeks after the date of onset of signs and symptoms? □ Yes □ No

If yes, provide details below:

Name	Age	Address	Describe illness/symptoms	Date when illness was observed	Contact Number

VIII. CASE CLASSIFICATION				IX. TREATMENT COMPLIANCE	X. DISEASE OUTCOME
A. By Transmission	B. Epidemiological Classification	C. Case Type	D. Severity (for confirmed cases only)		
□ Local Transmission ◊Indigenous Case □ Imported Case, specify province/country: _____ □ Induced	□Suspect □Probable (Clinically Diagnosed) □Confirmed (microscopy or RDT)	□ New Case/Infection □ Old Case ◊ Relapse ◊ Recrudescence	□ Uncomplicated □ Severe	□Completed □Not Completed □ Non-Compliant (Not in accordance with the recommended NMCEP treatment guideline)	□Cured □Failed □No Laboratory Follow-up □Died Date Died: ___/___/___ MM DD YY *Final Diagnosis:* _____ *Concomitant Disease:* _____ *(If Died) Underlying Cause of Death:* _____

Brief story about when and where patient got malaria:

Period of Investigation:	Name and Designation of Investigator/s:
Start Date: _____/_____/_____ MM DD YY End Date: _____/_____/_____ MM DD YY	Contact Numbers: Email Address:

DEFINITIONS:

CASE CLASSIFICATION

A. Classification by Transmission

- **Local Transmission - Indigenous*** — malaria case due to mosquito-borne transmission and acquired within the provincial territory, without strong evidence of a direct link to an imported case.

- **Imported*** — malaria case due to mosquito-borne transmission and acquired outside the province or the Philippines. The origin of imported cases can be traced to a known malarious area outside the province or the Philippines to which the patient has traveled.

- **Induced*** — malaria case not due to mosquito-borne transmission. Induced cases may arise from a congenital infection or by contamination with infected blood.

B. Epidemiological Classification

- **Suspect Malaria Case* -** Malaria is suspected if a patient has fever and any of the following:
  a) living in an area where malaria is endemic;
  b) history of travel to a malaria endemic area;
  c) history of recent malaria infection in the previous month(s);
  d) history of *P. vivax* infection;
  e) history of blood transfusion in the previous month(s).

- **Probable Malaria Case** -** (Clinically diagnosed) Suspected malaria case without a laboratory test to confirm malaria infection but nevertheless given/administered with malarial drugs.

- **Confirmed Malaria Case*** - Suspected malaria case in which malaria parasites have been confirmed to be present in a patient's blood by microscopy or a rapid diagnostic test.

C. Type:

- **New Case/Infection** — Established through a malaria patient database review; the patient has no record of malaria infection in the past 28 days for *P.falciparum*, and 3 years for *P.vivax or* the malaria case cannot be directly linked to any of the existing malaria patient records.
- **Old Case** — Established through a malaria patient database review; this is a malaria case that can be directly linked to an existing malaria record. They can be classified into two:
  - **Relapse*** — Renewed manifestation of an infection after temporary latency, arising from activation of hypnozoites;therefore limited to infections with P. vivax and P. ovale. (Malaria Elimination Guide book)
  - **Recrudescence** — In the absence of hypnozoites, there is a renewed manifestation of the parasite. Often in a *P. falciparum malaria patient, the parasites can be present within 4-12 weeks from previous infection as a result of the parasite either not being eliminated by the immune system or treatment failure. Information on treatment management and/or patient's treatment compliance and/or follow-up smears need to be reviewed and investigated thoroughly.*

D. Severity(for confirmed cases only)

- **Uncomplicated Case*** — malaria case with no manifestations of the following symptoms e.g. jaundice, severe weakness, convulsion, respiratory distress, poor urine output, coffee-colored urine, impaired consciousness, abdominal bleeding).
- **Severe Case*** — malaria case among children less than 1 year old and pregnant women, and / or, —malaria case with at least one or more symptoms e.g. jaundice, severe weakness, convulsion, respiratorydistress, poor urine output, coffee-colored urine, impaired consciousness, abdominal bleeding).

TREATMENT COMPLIANCE:

- **Completed –**The Patient completed the NMCEP recommended treatment regimen.
- **Not Completed -** the patient did not complete the NMCEP recommended treatment regimen.
- **Non-Compliant**– the patient was treated not in accordance with the recommended NMCEP treatment guideline.

DISEASE OUTCOME:

- **Cured –** Patients who have completed the recommended treatment with negative results of follow-up laboratory smears on Day 28.
- **Failed** – Patient's whose result of lab still has presence of parasite, regardless whether the patient completed the recommended treatment or not.
- **No Lab Follow-up** - Malaria patient with no follow-up at the end of the Day 28.
- **Died** - Patient who died of any cause while under going anti-malaria treatment.

Definitions derived from:
** Malaria Manual Of Operations, 2014, Malaria Control and Elimination Program, Department of Health, Philippines*
***Disease Surveillance for Malaria Elimination, An Operational Manual 2012, World Health Organization.*

Annex 5

Annex 3.6 NATIONAL MALARIA CONTROL AND ELIMINATION PROGRAM
Focus Investigation Form

Focus ID Number: (autogenerated) _____

1. Reference to the Index Malaria Case

a) **Name: (First Name, Middle Name, Surname)**
b) **Address: (sitio/purok, Barangay, Municipality, Province)**
c) **Malaria Species:** □ P.falciparum □P.vivax □P.malariae □P.ovale □P.knowlesi
d) **Classification of the Case:**
□ **Local**o indigenous
□ **Imported,** specify the place such as barangay, municipality, province, or country (if from abroad)
□ **Induced**
e) **MIF Number:**_____
f) **Date of notification:**_____

2. Reference to Focus

a) **Region:** _____ **Province:** _____
Municipality: _____ **Barangay:**_____
Purok/Sitio: _____
b) **Geo Coordinates:** ____° ____' ____"N, ____° ____' ____"W
c) **Total Population:** _____
d) **Total Households:** _____
e) **Total Houses:** _____

I. FOCUS HISTORY

A. MALARIA CASES IN THE PAST 5-YEARS (including indigenous, imported cases, induced)

Year	Population	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Total														

B. Malaria Cases by Species and Indigenous/Imported

Year	Total Cases		*P. falciparum*		*P. Vivax*		*P. malariae*		*P. ovale*		Mix/Non-Pf		Probable	
	Ind	Imp	Ind	Imp	Ind	Imp	Ind	Imp	Ind	Imp	Ind	Imp	Ind	Imp
Total														

C. RESULTS OF MALARIA CASE DETECTIONS IN THE PAST 5 YEARS
Number of Malaria Case Detected by Active and Passive Case Detection

Year	Total Cases	*Pf*	*Pv*	Other Species	Active Case Detection				Passive Case Detection			
					No. of Suspects Examined	*Pf*	*Pv*	Other Species	No. of Suspects Examined	*Pf*	*Pv*	Other Species
Total												

Annex 3.6 NATIONAL MALARIA CONTROL AND ELIMINATION PROGRAM
Focus Investigation Form

D. STRATIFICATION OF THE FOCUS IN THE PAST 5 YEARS		
Year	Strata	Remarks
1		
2		
3		
4		
5		

II. RECEPTIVITY (the ability of an ecosystem to allow transmissionof malaria)

1. History of local transmission in the last 5 years?
□ **Yes** □ **No**

2. Past Entomological Surveys /Studies
Were surveys Done? □ Yes □ No

If yes, pls answer the questions below.
a. When: mm/yy – mm/yy (the latest)
b. Malaria Vectors present? □ Yes □ No
If yes, check all vectors present in the focus:
□ *An. flavirostris* □ *An. litoralis*
□ *An. maculatus* □ *An. balabacensis*
□ *An. mangyanus*

3. Brief results of current entomological surveys
Were surveys Done? □ Yes □ No

If yes, pls answer the questions below.
a. When: mm/yy – mm/yy (the latest)
b. Methods applied:
□carabao-bait trap
□larval Collection
□adult mosquito collection
□ human-landing catch
□ Others, specify:_____

b. Malaria Vectors present? □ Yes □ No
If yes, check all vectors present in the focus:
□ *An. flavirostris* □ *An. litoralis*
□ *An. maculatus* □ *An. balabacensis*
□ *An. mangyanus*

4. Site shares border with an endemic/receptive sitio:
□ Yes □ No

If yes, give the names of the close endemic /sitio:
_____
_____
_____

5. Environmental Condition
a. Altitude:_____(m)
b. Topography of the location (click as many):
□ Mountainous/valley
□Plain
□ Coastal

c. *Vegetation of surroundings*(click as many):
□ Forest
□ Bush
□ Rice/crop fields

d. Potential breeding sites existing in surroundings(click as many):
□ Fresh water stream(s)/creek(s)
□ Brackish water
□ Swamp(s)
□ Lake(s)
□ Other temporary breeding sites, specify:
_____

Receptive? □ No
□ Yes, if it satisfies one of the following criteria below:
□*If positive results in items 1,2,3 and/or 4;*
□*If at least one item in5b, 5c and 5d is present*

Annex 3.6 NATIONAL MALARIA CONTROL AND ELIMINATION PROGRAM
Focus Investigation Form

III. VULNERABILITY	IV. ACCESS TO HEALTH SERVICES
1. Accessibility to the site: □ Motorbike□ Pumpboats □ Jeepney□ Sea vessel □ Bus□ by foot/walking/trek □ by animal-ride 2. Presence of the following risk factors that can result to unexpected pattern or sudden influx of population: □ migrant workers involved in ○ *seasonal farming* ○ *forestry/forest product gathering* ○ *mining* □Mobile traders eg. Tabuan, market day □ road/business/residential development □ internally displaced population due to conflicts, disasters and others □ military/police camp □ tourists from high endemic countries eg. foreign students, businessman □ OFW – returning OFW from endemic countries □ Others _____ **Vulnerable?**□ No □ Yes, if one item in 1 and 2 is present.	Distance from the nearest Barangay Health Station: (describe means of time and transportation or by foot) Distance from the nearest Microscopy/RDT Site: (describe means of time and transportation or by foot) Distance from the nearest RHU: (describe means of time and transportation or by foot) Distance from the nearest Hospital: (describe means of time and transportation or by foot)

E. VECTOR CONTROL INTERVENTIONS IN THE PAST 5 YEARS
Mosquito Net / LLIN Distribution and Indoor Residual Spraying

Years	Mosquito Net / LLIN			IRS			
	Target Pop	Number of LLIN Distributed	% Coverage (1:2 Net: persons)	Insecticide Used	No. of Targeted Households for Spraying	Number of Houses Sprayed	% Coverage
Total							

F. OTHER VECTOR CONTROL ACTIVITIES

Year	

Annex 3.6 NATIONAL MALARIA CONTROL AND ELIMINATION PROGRAM
Focus Investigation Form

V. REACTIVE CASE DETECTION (in the range of 2 km radius of the index cases)													
Date of RACD (mm/dd/yy)	**Laboratory Exam Done**			**Result / Species**								**Number of Patients Treated**	**Remarks**
	Micros -copy	RDT	Total (Micrsocopy& RDTs) Done	Pf	Pv	Pm	Pk	Po	Neg/ NMPS	Pf Pan	Non Pf Pan		

***** attach the linelist of all patients found positive in an RACD**

Annex 3.6 NATIONAL MALARIA CONTROL AND ELIMINATION PROGRAM
Focus Investigation Form

VI. FOCUS INVESTIGATION CONCLUSION: *TYPE OF RECEPTIVITY AND FOCUS*	
A. Classify the Focus by Receptivity ☐ **Receptive** ☐ **Non-Receptive:** **B. Classify the Focus by Vulnerability:** ☐ **Vulnerable** ☐**Non- Vulnerable**	**C. Type of Focus** ☐**Active** ,Locally acquired case(s) have been detected within the *current transmission season or calendar year.* ☐**Residual Non-Active,** The last locally acquired case(s) was detected in the previous transmission season/calendar year or up to 3 years earlier. Other kinds of cases may occur. i.e Imported, induced or relapsing/old cases ☐**Cleared-up,** Imported, induced or relapsing/old cases detected in current calendar year or transmission season. Not classified as active or non-active residual. I.e. no transmission for last 3 years (no implications for certification /validation.

VII.	GEOGRAPHICAL LOCAL MAP Draw or attach the geographical local map including its borders, locations of HHs, location of index cases), health facility location, roads, etc)

VIII.	Recommended measures to be taken to prevent possible onward spread of the current malaria infection from the focus, if any (provide details)

Annex 3.6 NATIONAL MALARIA CONTROL AND ELIMINATION PROGRAM
Focus Investigation Form

IX. INVESTIGATION TEAM and DURATION OF INVESTIGATION

Period of Investigation: Start Date: ___/__/___ End Date: ___/__/___
mm ddyy mm ddyy

Name of the Team Leader: _____
(Name and Designation)

List the members of the investigation team:

1. _____ (Name and Designation)
2. _____ (Name and Designation)
3. _____ (Name and Designation)
4. _____ (Name and Designation)

Noted by the Provincial Health Officer: _____

Annex 6

Monthly Malaria Record

National Malaria Control and Elimination Program

Year:			Municipality:					Province:				Region:				
			Number of cases													
Barangay/Sitio	Pop	Houses	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Total																

Annex 7

Procedure for Staining Blood Films Using Giemsa Stain

National Malaria Control and Elimination Program

Giemsa is a differential stain composed of methylene blue and eosin. The nucleus is stained red and while the cytoplasm is blue. Blood smears can be stained singly or by bulk using 3% for regular staining or 10% Giemsa stain solution in pH7.2 buffered water for rapid staining.

Materials:

- Giemsa Stock Solution
- Methanol
- Graduated Cylinder
- Staining trough
- Timer
- Buffered water (pH 7.2)
- Pasteur pipettes
- Drying rack
- Tap water

Steps	Batch staining	Individual staining
1	Fix the thin film individually by dipping it briefly in methanol. Avoid fumes of methanol from reaching the thick film. Let it dry.	Fix the thin film individually by dipping it briefly in methanol. Avoid fumes of methanol from reaching the thick film. Let it dry.
2	Arrange blood films in the staining jar	Dehemoglobinized the thick blood film using tap water.
3	Prepare 3% Giemsa stain solution by mixing 3 ml Giemsa stock solution into 97 ml of buffered water (pH7.2). Mix the solution gently.	Dry the blood film
4	Pour the 3% Giemsa solution gently into the staining jar. Make sure every slide is under the stain solution. Keep the jar away from sunlight	Prepare 10% Giemsa stain solution by mixing 9 drops of Giemsa stock solution to 3 ml of buffered water (pH7.2).
5	Wait for 30 to 45 minutes for staining and dehemoglobization.	Place the dry blood film in the staining rack.
6	Pour clean tap water into the through to float off the iridescent scum and wash it off from the jar.	Flood the smear with 10% solution and wait for 5 to 15 minutes.
7	Immerse the jar in a vessel with clean tap water.	Gently pour tap water to float off the scum and wash it off from the slide.
8	Rinse slide briefly and gently under running tap water.	Lift the slide when all the scum is washed off and gently rinse in tap water.
9	Arrange the slide in a drying rack face down	Dry the slide in the rack face down.
10	Air dry or blow dry	Examine the slide when completely dry
11	Examine the slide when completely dry	

Annex 8

Computation of Logistics

National Malaria Control and Elimination Program

Anti-malaria Drugs

Specifications: Fixed dose combination containing 20 mg arthemether and 120 mg lumefantrine per tablet.

Computation of AL Requirement

Presentations of AL (A) Box of 30 blister packs (B) Blister packs Blister pack of 24 for age group >13 years Blister pack of 18 for age group 9-13 years Blister pack of 12 for age group 4–8 years Blister pack of 6 for age group 6months to 3 years (C) Number of Pf cases by age group >13 years old 9-13 years 4-8 year 6 months – 3 years (D) Buffer stock = 25% of C (E) Lead time = 30% of C **Computation per age group** AL Requirement (Box) =((C+D+E)÷30) – F Summary of Annual AL Requirement Box of 30×24 blister packs= _____ Box of 30×18 blister packs= _____ Box of 30×12 blister packs= _____ Box of 30× 6 blister packs= _____ Add required standby stock for Zero Malaria, Malaria Free Provinces and DOH retained hospitals.	**Notes:** If Pf cases is not disaggregated by age then make an assumption that: 68% =>13 years old 12% = 9-13 years 12%= 4-8 year 12%= 6 months – 3 years Lead time represent delay from purchase order to delivery of goods. It is adjustable. In Zero- Malaria and Malaria- Free Provinces the standby stock level is 10 blister packs consisting of 4 blister packs of 24 and 2 each for other age group for each health facility. This will entail huge inventory cost considering the number of health units and short expiration of medicine. Mechanism must be devised by the province to store the medicine in strategic location ideally with less than one hour travel time. Medicines must be accessible 24/7. Blister packs can be open to adjust for the total tablets needed by the patient in situation where the appropriate blister pack is out of stock. Tablets from different blister packs have the same milligram content of active ingredients per tablet.

Specification: Chloroquine 250 mg tablet(150 mg base) Packaging Specification: Box of 100 tablets in blister pack of ten tablets Expiration date: 2 years	
Computation A= Box of 100 tablets in 10 blister packs B= 10 (Number of tablets to treat a case) C= Total number of *Pv, Pm and PO* D= Buffer stock = 25% of C E= Lead time = 30% of C F= Current Stock Level (in boxes) G= Standby stock for Zero-Malaria, Malaria-Free Province and DOH Retained Hospital Computation of annual requirement $A_{(box)} = ((C+D+E)\times 0.1)+G - F$	Notes Standby stock level for Zero Malaria, Malaria Free Province and DOH retained hospital is one box each.

Primaquine tablet 26.3 mg (15 mg base) as diphosphate Box of 100 tablets in blister pack of 10 tablets Expiration date: 2 years	
Computation of Primaquine requirement A= Box of Primaquine requirement B= Total Pf and Pv cases × 3 C= Total Pv and Po cases × 14 D = B+C E= Buffer stock = 25% of D F= Lead time = 35% of D G= Current Stock Level (in boxes) H= Standby stock for Zero-Malaria, Malaria-Free Province and DOH Retained Hospital Computation of annual requirement $A_{(box)}= ((D+E+F) \times 0.1) + H - G$	Note: Standby stock level for Zero Malaria, Malaria Free Province and DOH retained hospital is two boxes each.

Quinine 325 mg (300 mg base) tablet as sulfate Packaging Box of 10 blister packs 10 tablets	
Computation of requirement A = box of Quinine tablets B= Total Pf cases × 10% C= B×30 tab per case D= Buffer stock = 25% of C E = Lead time = 35% of C F = Current stock level (in box) G= Standby stock for Zero-Malaria, Malaria-Free Province and DOH Retained Hospital $A_{(box)}$= ((C+D+E) × 0.1) + G - F	Note: Quinine tablet is distributed to health facilities with physicians trained in management of severe malaria. Standby stock level for Zero Malaria, Malaria Free Province and DOH retained hospital is three (3) boxes each.

Quinine Ampoule Specifications: Quinine 100mg/ml as hydrochloride in 1 ml ampoule Box of ten (10) ampoules Expiration: 2 years	
Computation of requirement A = box of Quinine ampoule B= Total Pf cases × 10% C= B× 20 ampoule per case D= Buffer stock = 25% of C E = Lead time = 35% of C F = Current stock level (in box) G= Standby stock for Zero-Malaria, Malaria-Free Province and DOH Retained Hospital $A_{(box)}$ = C+D+E+G - F	Note: Quinine ampoule is distributed to health facilities with physicians trained in management of severe malaria. Standby stock level for Zero Malaria, Malaria Free Province and DOH retained hospital is three (3) boxes each.

Artesunate Ampoule Specification: 60 mg artesunic acid per ampoule with diluent of 5% sodium bicarbonate solution Packaging: 1 box of 10 ampoule and 10 diluents Expiration date: 2 years	
Computation of requirement A = box of Artesunate ampoule B= Total Pf cases × 10% C= B× 8 ampoule per case D= Buffer stock = 25% of C E = Lead time = 35% of C F = Current stock level (in box) G= Standby stock for Zero-Malaria, Malaria-Free Province and DOH Retained Hospital $A_{(box)}$ = C+D+E+G - F	Note: Artesunate ampoules are distributed to health facilities with physicians trained in management of severe malaria. Standby stock level for Zero Malaria, Malaria Free Province and DOH retained hospital is four (4) boxes each.

Artesunate Suppository Specifications: Active ingredient: Preparation: 100 mg and 400 mg rectal suppository Packaging: Box of 10 rectal supp Expiration: 2 years	
Computation of Requirement A = box of Artesunate rectal suppository B= Total Pf cases × 10% C= Buffer stock = 25% of B D = Lead time = 35% of B E = Current stock level (in box) F= Standby stock for Zero-Malaria, Malaria-Free Province and DOH Retained Hospital A=B+C+D-F Divide A for proportion of 100 mg and 400 mg suppository	Notes: Standby stock level for Zero Malaria, Malaria Free Province and DOH retained hospital is one box of 100mg supp and one box of 400 mg supp.

Annex 9

Monitoring and Evaluation Plan Template for Municipal Level

National Malaria Control and Elimination Program

Strategy/Activity Number	Target	Indicator Number	Data Source	Date of Collection	Resources needed	Cost

Annex 10

Procedure for Susceptibility Test
National Malaria Control and Elimination Program

The purpose of the Insecticide Susceptibility Test is to determine the susceptibility/resistance profiles of vectors against currently used insecticides. The DOH-Regional Office must conduct Susceptibility Test using the WHO standard test kit in coordination with the Collaborating Center. At least four sites (two sites per year every two years) per region will be chosen for insecticide susceptibility testing.

Procedure for Insecticide Susceptibility Test using standard WHO Tube Bioassay

1. Insert a 12x15 cm sheet of clean white paper into each of the holding tubes (green-dotted). The paper should be rolled into a cylinder to line the wall of the plastic tube and fastened in position using a silver spring-wire clip. A slide unit is attached to one end of each holding tube.
2. Collect carefully adult female mosquitoes using a manual aspirator. Mosquitoes should be collected in lots of 10 or less.
3. Introduce batches of 20 mosquitoes into each holding tube through the filling hole of the slide units. Close the slide. Prepare five replicates with each type of insecticide-impregnated paper and three replicates for the oil-treated control paper.
4. Once the mosquitoes have been transferred, the slide unit is closed.
5. The holding tubes are set in an upright position with the screen-end up for a 1-hour pre-test holding period for acclimatization of the mosquitoes.
6. At the end of this time, any dead and/or damaged mosquitoes are removed and replaced.
7. Three control tubes (green-dotted) are prepared by lining with a sheet of oil-impregnated paper fastened using silver spring-wire clip. Five exposure tubes (red-dotted) are lined with a sheet of insecticide-impregnated paper fastened in position using copper spring-wire clip.
8. Hands should be thoroughly washed with soap and water after handling the impregnated paper of each insecticide to avoid contamination of the papers of the other insecticides.
9. The control/exposure tubes are attached to the corresponding vacant screw-top on the slides.
10. With the slide unit open, the mosquitoes are blown gently from the holding tubes into the control/exposure. Once all the mosquitoes are in the control/exposure tubes, the slide unit is closed.
11. The holding tubes can be detached and set aside.
12. Control/Exposure tubes (with the slide unit) are set in a vertical position, with the screen-end up, under conditions of diffused illumination and adequate humidity.
13. Record the number of mosquitoes knocked down in each control and exposure tubes every 5 minutes for 60 minutes in susceptibility data sheets. The relative humidity and temperature are also recorded during the susceptibility test.
14. Attach the holding tube into the slide at the end of the 1-hour exposure period.
15. Open the slide and the mosquitoes are blown back into the holding tubes. The control/ exposure tubes are detached from the slide unit.
16. Set the holding tube vertically so that it stands on the slide. Provide cotton pads/balls soaked in 10% sugar solution and place moist towel onto the screen of the tubes.
17. Keep the holding tubes for 24 hours in a secluded, shaded place where the temperature does not exceed 30°C and protected from ants.
18. At the end of the 24-hour post-exposure, the number of dead mosquitoes is counted and recorded on the forms provided. Affected mosquitoes that are unable to walk should be counted as dead.

19. At least 3 replicates will be conducted. 20. Calculation of Susceptibility Test Mortality

$$\text{Test mortality} = \frac{\text{Total number of dead mosquitoes} \times 100}{\text{Total number of mosquitoes exposed}}$$

A similar calculation should be made in order to obtain a value for the control mortality.

1) Where the test control mortality is between 5% and 20%, the final percentage mortality will be corrected using Abbott's formula:

$$\text{Corrected mortality} = \frac{(\%\ \text{test mortality} - \%\ \text{control mortality}) \times 100}{(100 - \%\ \text{control mortality})}$$

2) If the control mortality is below 5%, no correction is necessary. If the control mortality is above 20%, the tests must be discarded.

Interpretation of the susceptibility test results

- 98 – 100% mortality: indicates susceptibility to the insecticide
- <98% mortality: suggest possibility of resistance that need further investigation for confirmation

Annex 11

Procedure for Bioassay Test
National Malaria Control and Elimination Program

The purpose of Bioassay Test is to determine the residual effectiveness of new and currently used insecticides in vector control; and to evaluate quality of vector control operations.

Wall Bioassay

1. Affix the WHO bioassay cones onto the sprayed walls using adhesive sponge tape at heights of 2m, 4m and 6m. For the control, affix the cone onto a piece of clean cardboard.

LLIN Bioassay

Affix the cones onto 5 different positions: (1) bottom of one of the side panels, (2) 25 cm from the bottom of next side panel, (3) center of the roof panel, (4) 50 cm from the bottom of the third side panel, and (5) top side of the last side panel. Exclude position (1) as it may be exposed to excessive abrasion in routine use. For the control, affix the cone onto a piece of untreated net.

3. Transfer 10 wild caught female Anopheles vector mosquitoes into each cone using a sucking tube; making sure that the end of the tube does not touch the treated surface. Cover the top opening of the cone with absorbent cotton.
4. Record the temperature and relative humidity before, during and after the test.
5. Expose the mosquitoes for 30 minutes for Wall Bioassay Test (3 minutes for the LLIN bioassay test). 6. After the exposure period gently transfer the mosquitoes, including those knocked down, into the styro cup covered with net cover with small holes in the side. Plug the hole with cotton ball to prevent mosquitoes from escaping.
7. Label the styrocups accordingly.
8. Mark the position where the cones were fastened using a pentel pen marker.
9. Count and record the number of dead or knocked down after 1 hour.
10. Provide cotton pads/balls soaked in 10% sugar solution and place a pad of moist towel onto the screen of the styro cup.
11. Keep the styro cups for 24 hours in a secluded, shaded place, where the temperature does not exceed 30 °C. The tubes should be protected from ants by placing them on a platform standing in a pan of water.
12. Count mosquito mortality after 24 hours. Mosquitoes that are unable to walk due to missing limbs (2 or more), mosquitoes that are unable to fly due to tears in membranous wings, and the like will be counted as mortality. Mortality of the vector mosquitoes from the bioassay test should not be lower than 80%. If the result falls below 80%, another round of spraying cycle is recommended.

Calculation of Susceptibility Test Mortality

$$\text{Test mortality} = \frac{\text{Total number of dead mosquitoes} \times 100}{\text{Total number of mosquitoes exposed}}$$

Where the test control mortality is between 5% and 20%, the final percentage mortality will be corrected using Abbott's formula:

$$\text{Corrected mortality} = \frac{(\%\ \text{test mortality} - \%\ \text{control mortality}) \times 100}{(100 - \%\ \text{control mortality})}$$

If the control mortality is below 5%, no correction is necessary. If the control mortality is above 20%, the tests must be discarded.

Interpretation of the susceptibility test results

- 98 – 100% mortality: indicates susceptibility to the insecticide
- <98% mortality: suggest possibility of resistance that need further investigation for confirmation

Annex 12

Procedures for Indoor Residual Spraying

National Malaria Control and Elimination Program

Planning IRS operation

- Regular IRS operation is two months before the peak of transmission season. It is when the vector population is naturally down and operation will not be hampered by rains. Availability of funds usually delays the operation. Assuring availability of funds months ahead will ensure timely IRS operation. Table below shows computation of cost for IRS operation for one cycle or once a year operation. Follow the same computation for the second cycle by substituting the data of the target number of houses and duration of spraying.

Computing cost of IRS operation (one cycle)

Cost Computation of one cycle Indoor Residual Spraying (IRS) Operation	
Computation of IRS Labour Cost	Notes
Let: A = Number of Barangay for IRS B = Number of houses for IRS C = Duration of operation (in days) D = Number of sprayed houses per day to finish within C= B÷C E = Average daily output of Spray Squad = 40 F = Number of spray squad needed = D÷E G = No. of Squad Leader (Sql) required = F H = No. of spray man (Spm) needed = F × 4 I = Rate per day of Spm J = Rate per days of SQL K= Rate per day of transport allowance and per diem L= Total salary of Spm = I×H×C M = Total Salary of Sql= J×H×C O = Total allowance and per diem=(F+C)×C×K P = Total Labour cost$_{(one\ cycle)}$=L+M+O	IRS must be finish before the start of rainy season. IRS in one barangay must be finish within 10 days or less. Deploy more squad to finish within 10 days. Salary rates and allowances depend on the prevailing rate in the region. Computation is for one spraying cycle.
Computation for cost of insecticide	
Let Q = Number of houses for IRS= NO. of sachet of insecticide	One house will consume one spray can load of insecticide or shortly one load.

R = Cost of one load S = Total cost of insecticide = A×B	Follow manufacturer's direction in the number of sachet per spray can load.
Computation of Total cost of one cycle IRS operation	
Let T = Incidental Cost (%) U = Total spraying $Cost_{(one\ cycle)}$=(P×T)+P+S	Percentage of incidental cost varies.

Spraying Itinerary and implementation

- Itinerary must be ready before spraying for ease of movement of the team. Start from the most distant barangay moving towards the centre. Consider road access to minimize movement of team and equipment. Sketch map is necessary for operation and it facilitates monitoring. Make a sketch map or update the old one during operation.

- Preparing the household
    - Inform the household of the spraying schedule and the purpose of spraying, giving them time to prepare and vacate the house.
    - Inform the house occupants that they must leave the house before spraying.
    - Areas occupied by sick people who cannot be moved must not be sprayed.
    - Take out all household items, including water, food, cooking utensils and toys from the house.
    - Move, cover or take out furniture to allow easy access in spraying walls. Items that cannot be moved should be well covered.
    - Keep or cage pets and domestic animals away from the house.

- Preparing the Equipment
    - Examine the sprayer to ensure that all parts are complete, assembled correctly, and in good working condition.
    - Try out the sprayer by first using clean water to ensure that the equipment does not leak.
    - Calibrate the nozzle tip. Fill the spray can with water and pump to 55 psi. Open the trigger for one minute and collect the discharge. It must be 360 ml in one minute. Change the nozzle tip if the discharge is more than 798 ml.
    - After ensuring that the sprayer works, begin the task at hand
    - Each spray person must bring spare parts, gasket and tools for repair of spray can.
- Mixing of Insecticide
    - Use proper personal protective clothing and devices (PPCD) - elbow length rubber gloves, goggles for eye protection, mask, and cover-all.

- Always read and follow the instructions of the manufacturer before mixing the insecticide.
- Pour the correct volume of water as indicated in the manufacturer's instructions inside the sprayer.
- Add the insecticide into the water-filled spray tank.
- Pump the open tank to mix the insecticide.
- Close the tank and pump until the pressure gauge reads 55 psi.
- Agitate the tank intermittently while spraying to prevent settling of insecticide at tank bottom.
- Pump more air if the pressure falls below 45 psi.

- Actual Spraying of House
  - Move furniture, wall decors and other belongings away from the wall preferably out of the house or into the middle of the room and cover them.
  - Close the windows so that the inner side will be sprayed.
  - Start spraying in the innermost room starting at the right side of the door moving clockwise ending at the left side of the door.
  - Spray the underside of the tables and furniture and other surfaces where mosquito can rest.
  - Open the windows and spray the eaves and outside part of the house not exposed to sunlight or rain.
  - Spray underneath the floor in elevated houses.
  - Spray other structures where people sit during the night.
- Procedures After Spraying
  - Advise household occupants to stay outside until spray is dry (at least 30 minutes to 1 hour).
  - Sweep or mop floors before allowing the children or pets back to the house;
  - Do not clean or wipe the sprayed wall.
  - Advise households to prevent mosquito bites that carry malaria

- Maintenance of Equipment at the end of each day
  1. De-pressurize the tank and pour out any remaining water into pit latrines or into a pit away from water sources.
  2. Fill the tank half-full with clean water.
  3. Replace the lid.
  4. Shake the tank so all inside surfaces are washed.
  5. Pump up to 3 bar pressure.
  6. Spray water through nozzle.
  7. De-pressurize the tank
  8. Unscrew the strainer housing and wash the strainer.
  9. Reassemble the strainer.
  10. Remove the nozzle tip and wash; Use soft toothbrush to remove insecticide and dirt at nozzle tip. Do not use hard object to clean nozzle tip.
  11. Re-fit the nozzle.
  12. Clean outside of the tank.

13. With lid open, turn tank upside down, open the on/off valve and let the water drain out of the hose and lance.
14. Ensure the lance is parked to protect nozzle when not in use.
15. When storing the sprayer for a long period, hang it upside down with lid open to allow air circulation

- Safety Precautions
    - Wear PPE while handling insecticides.
    - Do not eat, drink or smoke while spraying.
    - Wash hands and face with soap and water after spraying and before eating, smoking or drinking.
    - Shower or bathe at the end of day's work and change into dry clean clothes.
    - Wash coveralls and other protective clothing with soap and water at the end of each working day.
    - If insecticide gets on the skin, wash off immediately with soap and water.
    - Change clothes immediately if they become contaminated with insecticides.
    - Inform immediate supervisor at once, if you do not feel well.
    - Do not allow a spray person to work more than 4 consecutive days a week.
    - Require each spray person to undergo a yearly medical check-up.
- Disposal of excess insecticide and empty packaging
    - Put the washings of insecticide into pit latrines.
    - Never pour the remaining insecticide into rivers, pools or drinking water sources.
    - Return empty sachets/packaging to the supervisor/squad leader.
    - Never re-use empty insecticide containers.
    - Dispose surplus insecticide in pit latrines or bury them away in areas from water sources.
    - Never wash materials and equipment used in treatment in rivers, streams or ponds as insecticides are toxic to fishes, shrimps and animals.
    - Destroy empty insecticide containers to prevent reuse for other purposes.

Supervision

- Squad leader (SqL) is the immediate supervisor of the spray men. Close supervision is important to achieve the desired quality of spraying. Squad leaders must be observant on the speed of traverse, dripping walls and leaks in the spray can. Errors in spraying must be corrected immediately and spray man must always be motivated to apply the insecticide uniformly with minimum supervision.

Reporting

- Spray men make a report of daily accomplishments and submit it to squad leader (SqL) at the end of each day. The SqL summarizes reports daily and another summary report for each barangay. The report is submitted to the municipal malaria coordinator (MMC). Summary report will be prepared by the MMC at the end of spraying cycle and forward a copy to the Provincial Malaria Coordinator (PMC).
- Secondary data can be generated from these reports like IRS coverage, refusal rate and some qualitative data like reason for refusal. The report can also be the source document for updating demographic record of the barangay.

Integration with other intervention

- Active case detection and health education must always be with IRS to reduce the parasite pool in the community. Health messages must be “sleep inside mosquito net every night and to seek treatment immediately”. Another person may be added temporarily to spray team during the first day of IRS in a barangay to conduct house visits and seek community members with malaria symptoms for blood test and treatment. This will remove parasite reservoir among human with symptoms.

Monitoring the effect of IRS

- The municipal malaria coordinator should conduct monthly monitoring in areas where IRS has been done. They should be validated by the Provincial Malaria coordinator.
- Monthly malaria record of barangay is useful for monitoring the effect of IRS. The month when IRS took place can be shaded (Annex16) and the cases 12 months before and 12 months after can be compared. It is expected that reduction of cases will be observed after IRS. Problem exists if there is no reduction of cases after IRS. It can be insecticide resistance, low coverage and poor quality of spraying, removal of insecticide deposit by householders or outdoor biting of the vector. Investigation is needed and evidence must be gathered to identify the root cause of the problem.

Annex 13

Adjunct Vector Control Methods
National Malaria Control and Elimination Program

1. Larval source management

    - Vector control of choice for malaria-free provinces
    - Seeding and re-seeding of stream/breeding site with larvivorous fish
    - Mosquito larva is natural food for the fishes. *Gambusia sp* and *Poecilia sp* are small in size, reproduce rapidly and voracious larvae eaters. They can be raised in tanks/drums and reseed the streams where mosquitoes breed.
    - Biological control with *Bacillus thuringensis*
    - *Bacillus thuringensis*is bacteria poisonous to mosquito larvae and other insects. *Bacillus thuringensis* is produced in the laboratory is mixed with carrier (sawdust or rice hull) and broadcast to breeding site.

2. Breeding site management

    - *Environmental management*
        - Stream bank clearing to increase flow of water and expose the larvae to larvivorous fish
        - Clearing of vegetation along the stream to expose the stream to sunlight and to remove resting areas of adult mosquitoes

    - *Environmental modification*
        - Automatic siphon flush and drown the larvae
        - Pipe draining usually done in coastal areas directed against mosquitoes breeding in brackish water.

3. Zoo prophylaxis

    - Large animals like cattle and carabao are tied near the houses to divert mosquito feeding away from humans.

4. Space Spraying

    - Fogging or Ultra Low Volume application
    - Use during extreme emergency
    - Effect do not last longer than one hour
    - Need special equipment
    - Very expensive

5. Insecticide treated materials

    - Treatment of curtains or ordinary mosquito nets in case LLIN is not immediately available

Procedure for Treatment of Mosquito Net	
Materials 1. Mosquito net 2. 200 ml to 500 ml water 3. Insecticide tablet WT formulation 4. Big plastic bag 5. Wide mouth 1L PET bottle	**Notes**: One family size polyethylene mosquito net will need 200 ml to 500 ml of water to moisten it evenly.
Procedure 1. Put 200 ml to 500 ml of water and insecticide tablet in 1 L PET bottle and agitate until the tablet is fully dissolved. 2. Place the mosquito net inside the big plastic bag and pour the insecticide solution. 3. Squeeze the bag to remove air. 4. Hold the lid of plastic bag tightly. 5. Put on a table or flat surface and knead to evenly distribute the insecticide solution. 6. Stand for a few minutes to allow excess solution to collect at the bottom of plastic bag. 7. Remove the treated mosquito net and air dry. 8. Return the mosquito net to the owner and remind to "sleep inside mosquito net every night".	Avoid "EC" and "SC" insecticide formulation because the carrier will damage the polyethylene material of the net. Wear PPE while treating mosquito nets. Remind mosquito net owner to: • Avoid frequent washing • Do not use bleach and detergents in washing • Do not dry in the sun after washing • Sleep inside mosquito net every night

List of Insecticides for Treatment of Conventional Mosquito Nets

Table 3.23 List of WHOPES Approved Insecticide for Mosquito Net Treatment		
Insecticide	Formulation	Dosage (in mg/m^2 of net)
Alpha-cypermethrin	SC* 10%	20 – 40
Cyfluthrin	EW** 5%	50
Deltamethrin	SC 1% WT*** 25% WT 25% with binder	15 to 25
Etofenprox	EW 10%	200
Lambda-cyhalothrin	CS*** 2.5%	10-15
**Suspension Concentrate* **Emulsion oil in water* ***Water dispersible tablet* ****Capsule Suspension*		

Annex 14

Reporting Forms
National Malaria Control and Elimination Program

PHILIPPINE MALARIA INFORMATION SYSTEM (PhilMIS)

MONTHLY MALARIA SUMMARY FORM

Month of _____, 20__

PROVINCE _____

MUNICIPALITY _____

	NAME OF HEALTH WORKER	POSITION/DESIGNATION	BGY/BHS/RHU	NO. OF SLIDES EXAMINED	NO. OF POSITIVE SLIDES	NO. OF RDTs DONE	NO. OF POSITIVE RDTs	DATE SUBMITTED	SIGNATURE	NO. OF MPRFs SUBMITTED TO THE PHO	REMARK(S)
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											

TOTAL NO.OF MPRFs SUBMITTED TO THE PHO: _____

PREPARED BY: _____

POSITION: _____

DATE PREPARED: _____

REVIEWED IN THE RHU BY: _____

POSITION: _____

DATE REVIEWED: _____

INDOOR RESIDUAL SPRAYING SUMMARY FORM

For the Month of _____

MUNICIPALITY/PROVINCE: _____
INSECTIDE USED: _____
SOURCE OF INSECTICIDES: _____

DATE OF SPRAYING	BARANGAY	SITIO/PUROK	NUMBER OF HOUSES TARGETED	NUMBER OF HOUSES SPRAYED	TOTAL NUMBER OF OCCUPANTS	AMOUNT OF INSECTICIDES USED	REMARKS

PREPARED BY: _____
POSITION: _____
DATE PREPARED: _____

REVIEWED IN THE RHU BY: _____
POSITION: _____
DATE REVIEWED: _____

RECEIVED IN THE PHO BY: _____
POSITION: _____
DATE RECEIVED: _____

MOSQUITO NET DISTRIBUTION SUMMARY FORM

For the Month of _____

MUNICIPALITY/PROVINCE: _____
SOURCE OF NEW NETS: _____
TYPE OF NETS: ( ) LLIN ( ) CONVENTIONAL

DATE OF DISTRIBUTION	BARANGAY	PUROK/ SITIO	TOTAL NUMBER OF OCCUPANTS	TOTAL NUMBER OF HHs GIVEN NETS		NUMBER OF MOSQUITO NETS DISTRIBUTED					TOTAL NUMBER OF NETS GIVEN	REMARKS
				IPs	Non-IPs	SMALL/SINGLE	HAMMOCK	MEDIUM	FAMILY SIZE	EXTRA_ LARGE		

PREPARED BY: _____ REVIEWED IN THE RHU BY: _____ RECEIVED IN THE PHO BY: _____
POSITION: _____ POSITION: _____ POSITION: _____
DATE PREPARED: _____ DATE REVIEWED: _____ DATE RECEIVED: _____

Annex 15

Evaluating the effect of IRS or vector control activities
National Malaria Control and Elimination Program

Shaded months show the date of IRS. Compare the cases 12 months before and 12 months after IRS. It is expected that application of intervention will reduce the number of cases in the succeeding months.

Barangay Abante, Population 700 Houses 134													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2014	3	5	2	0	3	7	12	5	3	1	1	0	
2015	1	2	1	4	6	9	2	6	2	7	1	2	
2016	0	2	2	0	0	4	3	4	2	0	0	1	
2017	3	5	2	6	3								

Comparison

Month of IRS from table above is April 2015

Number of cases 12 months before IRS (April 2014 to March 2015) =36

Number of cases 12 months after IRS (May 2015 to April 2016) = 39

Conclusion: IRS has no effect in the number of cases based on the table above.

END MALARIA NOW