MINISTRY OF HEALTH MALAYSIA

# GUIDELINES FOR MALARIA VECTOR CONTROL IN MALAYSIA




MALARIA UNIT
VECTOR BORNE DISEASE SECTOR
DISEASE CONTROL DIVISION
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2022
(1st Edition)

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Guidelines For Malaria Vector Control In Malaysia

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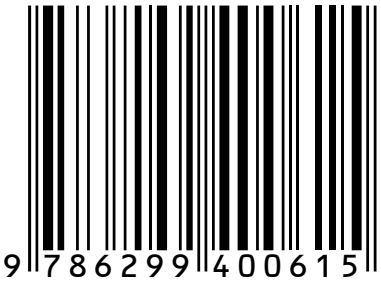


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## FOREWORD

Malaria vector control using Indoor Residual Spraying (IRS) has been carried out in Malaysia since the 1960s. Distribution of insecticide treated nets (ITN) on a large scale in malarious area was introduced in the 1990s. The National Malaria Programme also adopted the Intergrated Vector Management (IVM) concept to determine the strategic plan for malaria vector control since 2011.

The main objectives of IRS and ITN/LLIN implementations are to protect people at-risk of malaria from mosquito bites and to supress mosquito density to a level that could minimize malaria transmission. To achieve these objectives, IRS and ITN/LLIN must be implemented in compliance with minimum requirements and Standard Operation Procedures (SOP). Inevitably, IRS and ITN involve the use of insecticides which could be detrimental to the safety of staffs involved in the implementation. Therefore, guidelines on use of PPE is vital to ensure safety of the operators involved.

Despite the widespread use of IRS and ITN in Malaysia, formal national guideline for implementation of malaria vector control has not been developed. Hence, a comprehensive guideline for malaria vector control implementation is very much needed in Malaysia. This guideline will outline the malaria vector control strategies in the Elimination Phase of Malaria Programme.

I would like to congratulate the authors and reviewers of this guideline for their contributions in making this guideline a reality. I hope implementers at all level will benefit from this guidelines to ensure that malaria vector control are implemented in the most effective, coordinated and organized manner to ensure people at risk of malaria are protected.

**Datuk Dr. Norhayati Binti Rusli**
Director of Disease Control
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## ABBREVIATIONS

ACD : Active Case Detection

a.i. : Active ingredient

CFV : Control flow valve

CS : Capsulated suspension

DDT : Dichlorodiphenyltrichloroethane

DHO : District Health Office

ERA : Entomological Risk Assessment

GR : Geographical reconnaissance

IR : Incidence Rate

IRS : Indoor Residual Spraying

ITN : Insecticide Treated Net

IVM : Integrated vector management

LLIN : Long-lasting insecticidal net

LSM : Larval Source Management

MDA : Mass Drug Administration

MOH : Ministry of Health

$m^2$ : Square metre

PCD : Passive Case Detection

pHI : Proportionate Hole Index

PPE : Personal Protective Equipment

PSI : Pounds per Square Inch

RV : Receptivity and Vulnerability

WG : Wettable Granules or Water- dispersible granules

WHO : World Health Organization

## OVERVIEW OF MALARIA VECTOR CONTROL

### CURRENCT POLICY

- Malaria vector control must be implemented in all Active Malaria Foci, Residual Non-Active and Cleared Foci with high and medium RV index.

- However, vector control in Cleared Foci with medium RV index could be given the lower priority if resources were limited.

### PRINCIPLES

- To protect population at risk from mosquito bites that could cause malaria infection. This is to be achieved by preventing human-vector contact by reducing the vector population or direct protection from mosquito bites.

### OBJECTIVE

- The general objective of this guideline is to provide guidance for programme managers, vector control team and other health professionals in implementating of malaria vector control activities.

### CORE INTERVENTIONS

- There are two (2) available core interventions for malaria vector control i.e IRS and ITN/LLIN.

### SELECTION OF CORE INTERVENTIONS

- IRS or ITN/LLIN is implemented in Active Foci, Residual Non Active Foci and Cleared Foci with high or medium RV index to ensure total protection of population at risk of malaria.

- Combination of IRS and ITN/LLIN can still be considered in localities with unfavourable house wall structure.

### IMPLEMENTATION OF CORE INTERVENTIONS

- IRS or ITN/LLIN are implemented for six (6) cycles in Active Foci/ Residual Non Active Foci.

- For Cleared Foci with high or medium RV index, IRS or ITN/LLIN is implemented for a minimum of two (2) cycles.

- All the interventions should be carried out regularly at six (**6) month interval**, except in special situations where the interval could be shorter.

**FOCAL SPRAYING AND SPECIAL SPRAYING**

- No more applicable in malaria elimination phase.

**INSECTICIDE TREATED NET/ LONG-LASTING INSECTICIDAL NET**

- LLIN is highly recommended for isolated and remote area such as interior aboriginal settlement in peninsular Malaysia and in Sabah/Sarawak.

**SUPPLEMENTARY INTERVENTIONS**

- Larva Source Management (LSM) is the commonly used supplementary intervention for malaria vector control.

- Space spraying can be considered as supplementary intervention for malaria. However, its effectiveness is not clear.

**STOPPING OF MALARIA VECTOR CONTROL ACTIVITIES**

- The decision to stop vector control intervention should be based on detailed analysis that includes assessment of the receptivity and vulnerability level of a foci. If the RV index in the foci remains high or medium, vector control activities need to continue.

# CHAPTER 1:

# MALARIA VECTOR CONTROL IN MALAYSIA

## 1.1 MILESTONES OF MALARIA VECTOR CONTROL IN MALAYSIA

### Eradication Phase, 1960-1980

The core intervention for malaria vector control during the eradication was Indoor Residual spraying (IRS) using DDT insecticide. It was carried out in Sabah and Sarawak since 1961. In Peninsular Malaysia, residual spraying was started in 1967.

### Control Phase (1980-2010)

Prior to 1995, the core Intervention for vector control was IRS was conducted in endemic localities.

In 1995, the vector control method was reviewed to include ITN as the second core intervention based on various research conducted in Sabah, Kelantan and Pahang [10]. Implementation of vector control was further refined by adding a clear locality prioritization method using disease burden (i.e. Malarious localities: localities with IR > 10/10,000 populations; potentially malarious localities: localities with IR 1 - 10/10,000 populations; malaria free localities with IR <1/10,000 populations) [17]. Both IRS and ITN were implemented at 6 monthly intervals for a minimum of 8 cycles.

In 1997, MOH Malaysia replaced DDT with synthetic pyrethroids insecticide for IRS. Concurently the insecticide for impregnation of ITN was also synthetic pyrethroids.

### Pre-Elimination Phase, 2011-2015

In the pre-elimination phase, IRS and ITN remained as the core interventions of malaria vector control. Locality prioritization for vector control activities was based on disease burden as described in **Table 1** and **2**.

**Table 1: IRS Prescriptions by locality classification**

| Classification of Localities | IRS Prescriptions |
|---|---|
| Red (Incidence > 1/ 1000 population) | Type: Regular<br>No. of cycles: Eight (8)<br>Intervals: six (6) monthly<br>Coverage : 100%<br>Insecticide dosage: ≥ 0.02 g/m$^2$ for deltamethrin and 0.03 g/m$^2$ for *lambda cyhalothrin* |
| Yellow (Incidence < 1/ 1000 population) | Type: Focal residual spray<br>coverage : 100%<br>No. of cycles: two (2) cycles (minimum) |

| Classification of Localities | IRS Prescriptions |
|---|---|
| Green (receptive and vulnerable) | Intervals: six (6) monthly<br>Coverage: 100%<br>Insecticide dosage: ≥ 0.02 g/m$^2$ for d*eltamethrin* and 0.03 g/m$^2$ for *lambda cyhalothrin*. |

**Table 2: ITN Prescriptions by locality classification**

| Classification of Localities | ITN Prescriptions |
|---|---|
| Red (Incidence >1/ 1000 population) | Impregnated bed net coverage: 100%<br>Bed net impregnation intervals: six (6) monthly<br>No. of cycles: eight (8) cycles<br>Bed net to population ratio : not less than 1 for every 2 people |
| Yellow (Incidence <1/ 1000 population) | Impregnated bed net coverage: 100%<br>Bed net impregnation intervals: six (6) monthly<br>No. of cycles: two (2) cycles (minimum)<br>Bed net to population ratio : not less than 1 for every 2 people |
| Green (receptive and vulnerable) | |

The terms Focal Spraying and Special Spraying were introduced in the pre-elimination phase of the programme. Focal spraying was implemented in yellow (Incidence <1/1,000 population) and green locality (No locally acquired infection but receptive and vulnerable)[9].

Special spraying was implemented in localities classified as green but receptive and vulnerable. The target was 100% coverage and implemented six (6) monthly for premises with complete walls and three (3) monthly for premises with incomplete walls. Special spraying was to be continued until the localities were no longer at risk of malaria.

**Elimination Phase, 2016-2020**

In the elimination phase, the programme shifted from disease burden-based to foci-based stratification system. Guidelines for Prevention of Malaria Re-Introduction was published in 2016 which describes the methods of measuring risk of re-introduction (receptivity and vulnerability) in malaria foci.

In this phase, the core interventions for malaria vector control in Malaysia remains as IRS and ITN/ LLIN. IRS and ITN/ LLIN are implemented for six (6) cycles or three years in Active Foci/ Residual Non Active Foci. For Cleared Foci with high or medium RV index, only one (1) core vector control intervention need to be implemented for a minimum of two (2) cycles or one (1) year. All the interventions

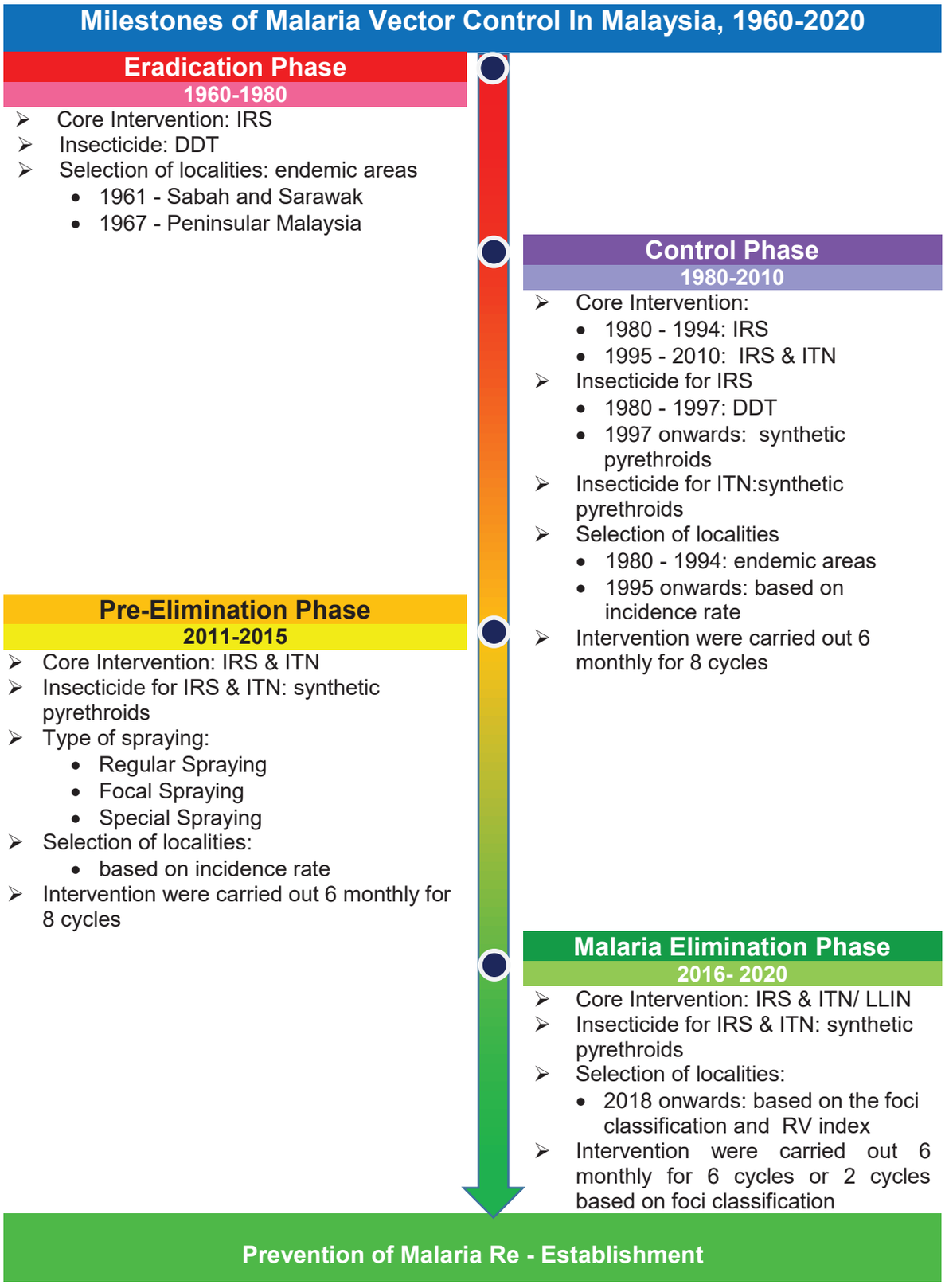
should be carried out regularly at six (6) month interval, except in special situations or condition. A set of interventions based on foci classification and foci stratification were designed to outline the intervention prescriptions across foci classification and RV index (**Table 3**).

**Table 3: Intervention/ Response based on foci classification and foci stratification**

| FOCI CLASSIFICATION | RV INDEX | INTERVENTION PRESCRIPTIONS |
|---|---|---|
| **Pseudofoci** | | • Case Management (Imported, Relapse)<br>• PCD |
| **Active Foci** | | • Epidemiological Investigation<br>• Reactive Case Detection - (contact follow-up 2 years for *P. vivax*, 1 year for others species)<br>• Active Case Detection<br>• ± Mass Drug Administration (MDA)<br>• Outbreak Control<br>• IRS or ITN/LLIN (Minimum 6 cycles or 3 years)<br>• Entomological Investigation (EI)<br>• Bioassay implemented two (2) weeks after 1st cycle of IRS /ITN/LLIN is completed<br>• Community Engagement & Mobilization |
| **Residual Non-active Foci** | | • Epidemiological Surveillance<br>• Consider ACD<br>• IRS or ITN/LLIN (continuation)<br>• RV assessment after 6 cycles of vector control |
| **Cleared Foci** | High | • Epidemiological Surveillance<br>• IRS or ITN/LLIN (Minimum 2 cycles or 1 year).<br>• RV assessment after 2 cycles of vector control |
| | Medium | |
| | Low | • Case Management (Imported, Relapse) |
| | | • PCD |

Focal spraying and special spraying are no more applicable in the elimination phase of the programme. The important milestones of malaria vector control in Malaysia is summarized in **Figure 1.**

**Figure 1 : Milestones of Malaria Vector Control In Malaysia, 1960-2020**



## 1.2 CURRENT POLICY OF MALARIA VECTOR CONTROL IN MALAYSIA

Effective planning of vector control intervention requires the National Malaria Programme to stratify localities using malaria foci classification and their malariogenic potential in order to identify ongoing transmission of malaria and determine risk of malaria reintroduction in Cleared Foci. Vector control for malaria must be implemented in all Active Malaria Foci, Residual Non-Active and Cleared Foci with high and medium RV index. However, vector control in Cleared Foci with medium RV index could be given the lower priority if resources were limited.

Malaria vector control for is conducted by health personnel from the MOH to ensure optimum implementation coverage and effectiveness. Insecticides and ITN/LLIN are provided by MOH. However, private company or other non-MOH agencies can purchase insecticides, spray equipment and ITN/ LLIN that comply with specifications from MOH. In Malaysia, malaria health volunteers assist in dissemination of information about vector control to improve public acceptance.

## 1.3 PRINCIPLE OF MALARIA VECTOR CONTROL IN MALAYSIA

The principle of malaria vector control is to protect the population at risk from mosquito bites that could cause malaria infection. This could be achieved through reduction of the vector population or using barriers protection from mosquito bites.

**Note:**

In the context of malaria elimination, population at risk refers to people residing in Active Malaria Foci, Residual Non Active Foci and Cleared Foci with high and medium RV index.

## 1.4 OBJECTIVE

The general objective of this guideline is to guide programme managers, vector control team, health physician and other health professionals in the implementation of malaria vector control.

### 1.4.1 Specific Objectives

i. To guide vector control team on the effective implementation of core and supplementary interventions.
ii. To inform stakeholders on current National Malaria Programme policy on vector control.

## 1.5 CORE INTERVENTIONS

There are two (2) available core interventions for malaria vector control; IRS and ITN/LLIN[1].

## 1.6 SELECTION OF CORE INTERVENTIONS

For Malaysia, IRS or ITN/LLIN is implemented in Active Foci, Residual Non Active Foci and Cleared Foci with high or medium RV index to ensure total protection of population at risk of malaria.

However, combination of IRS and ITN/LLIN can still be considered in localities with unfavourable house wall structure.

Selection of core intervention depends on operational factors such as operational cost, insecticides availability and resources.

**Note:**
LLIN is highly recommended in isolated or remote area such as the nterior aboriginal settlements in peninsular Malaysia and in the interior of Sabah/Sarawak due to the challenging communication system and type of houses with incomplete walls or unsuitable for IRS.

## 1.7 SUPPLEMENTARY INTERVENTIONS

### 1.7.1 Larva Source Management (LSM)

LSM is management of aquatic habitats (water bodies) that are potential larval habitats for mosquitoes in order to prevent the completion development of the immature stages (eggs, larvae adn pupae) and hence the production of adult mosquitoes. There are four (4) types of LSM[1]:

i. Habitat modification: a permanent alteration to the environment, e.g. land reclamation;
ii. Habitat manipulation: a recurrent activity, e.g. flushing of streams;
iii. Larviciding: regular application of biological or chemical insecticides to water bodies; and
iv. Biological control: introduction of natural predators into water bodies

The most common method of LSM in Malaysia is larviciding. Larviciding is most likely to be cost-effective where the breeding sites are few, fixed and found near the house[1].

Larviciding must be conducted at potential breeding sites in Active Foci with or without Entomological Investigation.

### 1.7.2 Space Spraying

Space spraying refers to the release of fast-acting insecticides into the air as fog or as fine droplets as a method to reduce the number of adult mosquitoes in dwellings and also outdoors. Application methods include thermal fogging, cold aerosol distribution by handheld or backpack sprayers, ground vehicles or aerial means and repetitious spraying by two or more sprays in quick succession. It is most often deployed in response to epidemics or outbreaks of mosquito-borne disease[1].

Effectiveness of space spraying is unclear due to lack of evidences on its effectiveness in reducing malaria incidence[1]. However, space spraying can be considered as supplementary intervention in Active Foci and report of human malaria cases with gametocyctes except in pseudo foci.

The procedure for implementation of space spraying as a supplementary intervention are provided in **APPENDIX 1.**

## 1.8 IMPLEMENTATION OF CORE INTERVENTIONS

In Active Malaria Foci, IRS or ITN/ LLIN should be implemented within seven (7) days from notification of an introduced/indigenous malaria case. Implementation of IRS or ITN /LLIN is at six (6) monthly intervals for a total of six (6) cycles or in three (3) years regardless of foci reclassification in the next calender year. In Cleared Foci with high or medium RV index, IRS or ITN/ LLIN need to be implemented for a minimum of two (2) cycles or one (1) year.

All the interventions should be carried out regularly at **6 monthly** but could be shorten in places where the wall type has less insecticide retention capacity. Malaria Vector Control Interventions by Malaria Foci Classification and RV index is summarized in **Table 4.**

**Table 4: Malaria Vector Control Interventions by Malaria Foci Classification and RV index**

| Foci Classification | RV Index | Vector Control Interventions |
|---|---|---|
| Pseudofoci | | No vector control intervention |
| Active Foci | | IRS or ITN/ LLIN for Minimum 6 cycles or 3 years. |
| Residual Non-active Foci | | • IRS or ITN/ LLIN (continuation)<br>• RV assessment after 6 cycles of vector control |
| Cleared Foci | High | • IRS or ITN/LLIN (Minimum 2 cycles or 1 year). |
| | Medium | |

| Foci Classification | RV Index | Vector Control Interventions |
|---|---|---|
| | | • RV assessment every 2 cycles of vector control* |
| | Low | No vector control intervention |

**Note:**

*Select at least one (1) foci per district as proxy.

## 1.9 STOPPING MALARIA VECTOR CONTROL ACTIVITIES

The decision to stop vector control intervention should be based on a detailed analysis that includes assessment of receptivity and vulnerability. If the RV index in the foci remained high or medium, vector control activities should be continued.

## 1.10 VECTOR CONTROL PERFOMANCE INDICATORS

There are six (6) indicators used to monitor malaria vector control performance in Malaysia (**Table 5**).

**Table 5: Operational Perfomance Indicators for IRS and ITN/LLIN**

| No | Indicator | Formula | Target |
|---|---|---|---|
| **A** | **IRS** | | |
| i | IRS Implementation coverage (%) | $\frac{\text{No. of localities covered}}{\text{No. of localities planned}} \times 100\%$ | 100% |
| ii | Proportion of premises covered with IRS (%) | $\frac{\text{No. of premises sprayed}}{\text{No. of targeted premises in planned localities}} \times 100\%$ | 90% |
| iii | Proportion of population protected with IRS (%) | $\frac{\text{Total population protected}}{\text{Total population in planned localities}} \times 100\%$ | 90% |
| **B** | **ITN/LLIN** | | |
| i | ITN/LLIN Implementation coverage (%) | $\frac{\text{No. of localities covered}}{\text{No. of localities planned}} \times 100\%$ | 100% |

| No | Indicator | Formula | Target |
|---|---|---|---|
| ii | Proportion of ITN treated with insecticide (%) | $\frac{\text{Total conventional net treated}}{\text{Total conventional net on the ground}} \times 100\%$ | 90% |
| iii | Proportion of population protected with ITN/LLIN (%) | $\frac{\text{Total population protected}}{\text{Total population in planned localities}} \times 100\%$ | 95% |

## 1.11 PLANNING OF MALARIA VECTOR CONTROL

Planning of malaria vector control activities should be done in December (for activities need to be implemented in the first half of the following year) and June (for activities need to be implemented in 2nd half of the year) by the vector control team based on the foci classification and RV index. Therefore, malaria foci registry needs to be updated in the myFoci system annually or at any time of the year when there is a change in the foci information.

Based on the foci registration, the vector control team can determine the number of foci that need to be covered with malaria vector control activities and plan the activities accordingly.

The process of planning and implementation of IRS and ITN/LLIN is described in **APPENDIX 2.**

## 1.12 REPORTING AND DATA MANAGEMENT

Planning and implementation of malaria vector control activities involve compilation of data into paper-based templates (forms) which are subsequently entered into the Vekpro Online System in the following manner:

i. IRS and ITN/LLIN activities planned for the first cycle of the year (Jan – June) should be entered in the Vekpro Online System from 15 - 31 December the previous year.
ii. Activities planned for 2nd cycle of the current year (July - December) should be entered in the Vekpro Online System from 15 - 30 June of the sama year.

iii. Subsequently, IRS and ITN/LLIN implementation coverage must be recorded in the respective paper-based forms and entered into Vekpro Online System within a week from the implementation date.

The details of planning, reporting dan data management for IRS and ITN/LLIN operation are described in Guidelines for Malaria Vector Control Data Management for Planning, Implementation and Analysis of Malaria Vector Control Operation Coverage (Panduan Pengurusan Data bagi Perancangan, Pelaksanaan dan Analisa Pencapaian Aktiviti Kawalan Vektor Malaria. 2022).

## 1.13 STORAGE AND MANAGEMENT OF INSECTICIDE

Proper storage of insecticides is important to maintain their efficacy. Insecticides must be kept in a safe, free from moisture, no direct exposure to sunlight and well ventilated storeroom. The insecticides should be placed on a platform to avoid direct contact with the floor surfaces. Insecticides must be kept in the original packaging or containers and only taken out from the packaging or container when in use.

Detailed management of store can be referred to Treasury Circular, *Pekeliling Perbendaharaan Malaysia AM 6.4* and Guidelines for Storage and Management of insecticide (Garis Panduan Penyimpanan dan Pengendalian Racun Serangga. 2004).

## 1.14 DISPOSAL OF INSECTICIDE PACKAGING AND UNUSED ITN/LLIN

Insecticides packaging may include plastic container, sachet and plastic bag. All insecticide packaging should be collected by the supervisor and brought back to the office for proper disposal.

Insecticide container is categorized as Scheduled Waste under the Environmental Quality Act 1974 and must be disposed at a licensed landfill approved by the Department of Environment (DOE). However, the Department of Agriculture provides an alternative method for disposal of insecticide container through recycling programme. Insecticide containers must be rinsed three (3) times and dried before sending to designated collection center for recycling. Instruction on disposal of insecticide packaging as described in **APPENDIX 3**.

Recipients of ITN/LLIN should be advised not to dispose ITN/LLIN in any water body and should not be burnt in the open air. The best option for disposal of damaged ITN/LLIN and their packaging is high temperature incineration. Another option is to bury in non-permeable soil and away from water source [1].

**Note:**

Non-permeable soil refers to soil with low water transmissibility, e.g. clay textured soil.

# CHAPTER 2:

# INDOOR RESIDUAL SPRAYING (IRS)

## 2.1 DEFINITION OF IRS

IRS is the application of a residual insecticide to potential malaria vector resting surfaces, such as internal walls, eaves and ceilings of houses or structures (including domestic animal shelters), where such vectors might come into contact with the insecticide [1].

## 2.2 TYPES OF SPRAYING

### 2.2.1 Regular Spraying

Regular IRS should be initiated and completed within seven (7) days from notification of an introduced/ indigenous malaria case in Active Foci. It is carried out at six monthly intervals for a total of six (6) cycles or three (3) years regardless of foci reclassification in the next calender year. For Cleared Foci with high or medium re-introduction index regular IRS is carried out for a minimun of two (2) cycles or in one (1) year. However, the decision to stop IRS should be based on detailed analysis of RV index.

**Note:**

**Focal** and **special spraying is no more applicable** in the current phase of the elimination programme.

### 2.2.2 Follow-up Spraying/ Mopping up

Follow-up Spraying/ Mopping up is carried out if the premise coverage did not achieve the target of 90% which could be due to locked houses or refusal from the house's owner.

## 2.3 PLANNING AND SCHEDULING IRS

IRS must be carried out regularly at six monthly intervals for all types of wall surface materials. However, the interval could be shorten for surfaces with low insecticide retention capacity which is commonly found in urban or semi-urban housing area.

Regular IRS should be planned in a manner that the duration of implementation does not exceed five (5) days to ensure immediate protection to the population.

**Note:**

In Active Foci, the first cycle of IRS must be initiated and completed within seven (7) days from the notification of the first case.

## 2.4 CHOICES OF INSECTICIDE AND DOSAGE

MOH has been using synthetic pyrethroids insecticide for IRS since 1997. The choice and selection of insecticides and the application dosages are based on recommendations by the WHO. .

The insecticide currently used for IRS in Malaysia is K-Othrine WG 250 which contains deltamethrin 25.0% w/w (250g/kg) as active ingredient (a.i). The application dosage is 20-25 mg a.i/ $m^2$.

## 2.5 MANAGING IRS OPERATION FOR VECTOR CONTROL

### 2.5.1 Before Spray Operation

Before implementation of IRS in a locality, health staffs need to update the locality profile, estimate the amount of insecticide needed, carry out public engagement, ensure adequate supply of PPE and spray equipment and organize spray team.

The checklist for IRS operation is listed in **APPENDIX 4.**

#### 2.5.1.1 Locality Profile

Locality profile should be updated, which include the followings:

i. Locality map (GR);
ii. Demography of the locality [PEM:SEM107a(2021)];
iii. Number of houses or premises to be covered with IRS in the locality;
iv. Types of wall materials and ceilings (e.g. bamboo, wood, brick, metal/ zink);
v. Average sprayable surface size (in square meter), which include living room, bedroom, kitchen, dining room, bathroom, toilet etc.)

#### 2.5.1.2 Estimation of Insecticide Need

The estimation of insecticide needed for spraying operation is based on the followings:

i. Number of premises to be sprayed in the locality.
ii. Average sprayable surface size per premises (in square meter).
iii. Concentration of the a.i in the insecticide (% a.i)

iv. Target dosage of the insecticide to be used according to WHO recommendations.

The amount of insecticde in weight and pre-packed insecticide in sachets/ bottles needed for IRS operation is described in **APPENDIX 5.**

#### 2.5.1.3 Public Engagement

Public notice or messaging must be issued before the spraying operation and repeated during the operation to improve public acceptance and cooperation in implementation of the activities. Public Notice or messaging should include the following instructions:

i. To allow spray teams to enter the houses.
ii. To move all pets including cats, dogs, birds and others to outdoor.
iii. To cover aquarium with plastic sheets to protect from insecticide droplets.
iv. To move personal items to the center of the house and cover with plastic sheets.
v. To remain outdoor throughout the spraying operation.

Public notice or messaging for IRS operation can refer to **APPENDIX 6.**

#### 2.5.1.4 PPE

A suitable PPE must be used by spray operator when conducting IRS (refer **APPENDIX 7**). PPE for IRS operation include the followings:

i. Face mask
ii. Face shield/ goggles
iii. Hat
iv. Safety boots
v. Coverall/ overall
vi. Rubber gloves

#### 2.5.1.5 Spray Equipment

i. Hand Operated Compression Sprayers (refer **APPENDIX 8** for example of sprayer)

   **Note:**

   All sprayers must be maintained and calibrated regulary (refer para 2.6 of this guidelines).

ii. Water bucket and scoop
iii. Sprayer repair tools

#### 2.5.1.6 Organizing Spray Team

The team leader/ supervisor is responsible to plan the spraying operation and organize spray team to ensure the spraying operation achieved the desired target.

In order to acheive this, the team leader/ supervisors need to estimate the number of spray operators required to complete the spraying operation, identify the spray team/ operators and drivers required for the planned localitiy.

**Note:**

On average one (1) spray operator is capable of spraying ten (10) premises a day depends on the household sizes and house to house distance.

### 2.5.2 During Spray Operation

#### 2.5.2.1 Spray Team Preparation

On the day of operation, GR, locality profile and paper based forms to record the coverage of the spraying activitiy must be brought to the field.

The spray operators must also bring along adequate supply of insecticide, PPE and all other equipments to the field. Proper PPE must be worn during IRS operation.

#### 2.5.2.2 Household Preparation

Public notice or messaging described in para 2.5.1.3 should be repeated during spraying operation. Spray team must ensure all household members compliance to the followings:

i. Protect water containers, food utensils, toys and other item from insecticide contamination.
ii. All loose decorations on wall should be removed.
iii. Items that cannot be removed should be covered with plastic sheets.
iv. All furniture should be placed at the centre of the room and covered with plastic sheets.

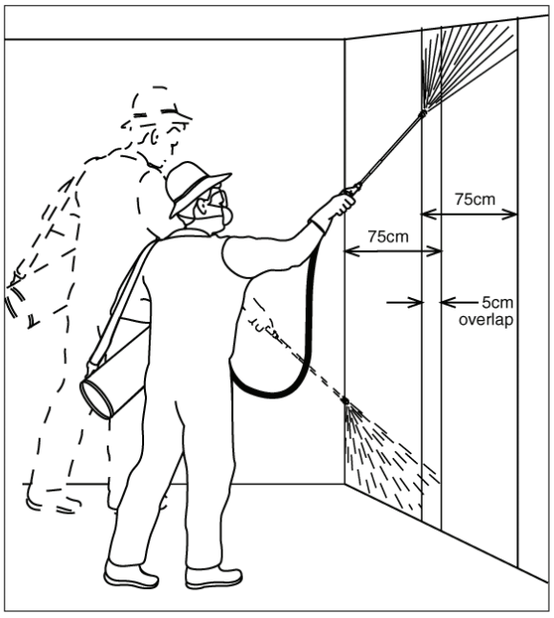
#### 2.5.2.3 Insecticide Preparation

i. Insecticide preparation for IRS must follow the manufacturer's instruction in order to ensure safe and correct mixing.
ii. Generally, insecticide could be added directly into spray tank and mix with the desired quantity of water. However, if water quality is unsatisfactory, mixing should be done in a separate container and poured into the tank through a filter.
iii. The insecticide should be mixed outdoor.
iv. Shake the sprayer tank few times to ensure proper mixing.

Example: to prepared for dosage of 25mg/$m^2$ deltamethrin, mix a sachet of 20g K-Othrine WG250 (5g Deltamethrin) with 7.5 L of water.

### 2.5.2.4 Preparation to Spray and Spraying Technique

i. Pump the sprayer until the pressure gauge indicate pressure about 55 psi (3.8 bar)
ii. Adjust and maintain the distance from the nozzle tip to the surface being spray at approximately 45 cm to achieve the recommended spray swath of 75 cm width (**Figure 2**).
iii. Conduct the spraying in top-bottom sequence. The correct timing for spraying one (1) swath of 75 cm width and three (3) meter high is within 6-7 seconds. To maintain rhythm and speed of spraying, spray operators can do mental counting "1001 (one-zero-zero-one), 1002, 1003".
iv. Spraying should be applied to at least three (3) m height from the floor.
v. There should be at least five (5) cm overlap between edges of spray patterns to acheive an even coverage .
vi. Release pressure when sprayer is not in use.




Source: World Health Organization. Manual for Indoor Residual Spraying. Application of Residual Sprays for Vector Control,. 2000

**Figure 2: Spraying techique**

**Note :**

To ensure that the optimun flow rate is maintained, spray operators should maintain the operation pressure range between 25 to 55 psi especially for sprayer without CFV. Monitoring of the operation pressure could be done by closely observing the pressure gauge (manometer).

#### 2.5.2.5 Spraying Procedure

i. Find and spray every single sprayable structure where people may sleep or gather.
ii. In households with multiple rooms, spraying should commence in the innermost rooms and work outwards.
iii. All sprayable surfaces must be sprayed.
iv. Wall spraying requires vertical spraying by moving in a clockwise direction.
v. Ceiling spraying requires horizontal spraying and should spray after walls have been sprayed from the furthest point inside the room. Stay in front of the spray swath to minimize exposure to insecticide that may drift down and maintain a distance of 45 cm from the surface.
vi. On completion, exit the room, close the door and spray the door from outside.
vii. All doors, windows and frames must be sprayed. When windows open inwards, both sides need to be sprayed.
viii. Eaves and other sprayable surfaces must be sprayed. Spray operators can start spraying the inside of the eaves from above a door as the starting point.
ix. Other structure outside the house such as toilet, poultry and animal shelter must be sprayed.

### 2.5.3 After Spray Operation

Spray operators/ team must advise house occupants on the followings after each spraying:

i. Remain outdoor until the sprayed walls have dried, usually one (1) hour.
ii. Wash all food containers before use.
iii. Wash animal food containers after spraying.
iv. Occupants must do hand washing before food preparation.
v. Wash any fruits or vegetables that have been grown around the house before consumption.

Spray operation records should be updated in household card [PEM:SEM 104(2021)] and respective forms by spray operators before submitting to the team leader/ supervisor. Subsequently, team leader/ supervisor should check the acheivement/ coverage of the spraying operation which include proportion of premises sprayed (complete or partial sprayed) and proportion of population protected by IRS.

All the empty insecticide packaging, unused insecticides must be counted and returned back to the team leader/ supervisors for usage and dosage verification.

Finally, spray operators can remove the PPE and take shower before going home. PPE must be washed using detergent and done separately from household washing.

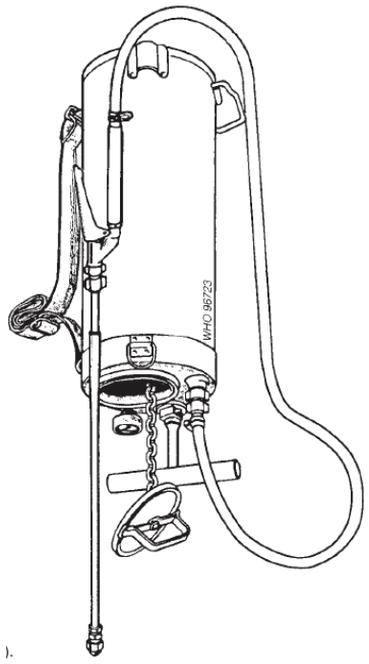
## 2.6 MAINTENANCE AND CALIBRATION OF SPRAYER

### 2.6.1 Daily Maintenance and Major Maintenance

#### 2.6.1.1 Daily Maintenance

Sprayer must be cleaned at the end of the day using the following steps [2]:

i. Empty the tank from insecticide spray mix.
ii. Fill the tank with approximately two (2) liter of clean water, close the lid, pressurize and agitate the sprayer.
iii. Spray some of the water through the nozzle to ensure the hose lance and nozzle are cleaned.
iv. Release the pressure and discharge the water in a container or dispose of appropriately.
v. Repeat the process for at least twice with clean water.
vi. Remove the nozzle and clean its components in a bucket of water. Do not blow into nozzle
vii. Clean the outside of the sprayer including the straps.
viii. Keep cloths or sponges that are to be used only for this purpose
ix. Remove lid and store sprayer hung upside down for drainage (**Figure 3**).




Source: World Health Organization 1997. Vector Control Methods for Use by Individuals and Communities

**Figure 3: Store the tank dry and upside Down**

#### 2.6.1.2 Major Maintenance

Major maintenance must be done yearly which included cleaning and replacement of worn rubber/ pastic parts.

### 2.6.2 Checking and Calibrating the sprayer nozzle

Nozzle should be checked after spraying every 300 houses by observing the spray pattern [2]. The nozzle should be changed when a uniform spray pattern is not achieved.

Spray operators must calibrate the nozzle with water in the tank using the following procedure [2]:

i. Pressurize the sprayer to ensure working pressure is reached (55 psi or 3.8 bar). This could vary depending on sprayer model;
ii. Open the trigger or on/off valve for one (1) minute, collect the discharge and measure the amount in a measuring cylinder;
iii. Repeat step i and ii three times and calculate the average discharge per minute. If the flow rate exceeds the suggested rate of by 10% means the nozzle should be discarded and replaced.

**Note:**

If there is no spray coming out of the nozzle, it is likely to indicate clogging and the nozzle needs cleaning.

The procedure for maintenance and calibration of sprayer is described in **APPENDIX 9.**

## 2.7 IRS IN SPECIAL CONDITION

In areas where the housing types are less suitable for IRS, such as concrete house, use of metal sheets or other materials with low insecticide retention capacity, the interval between IRS cycles should be shorter, i.e. three (3) monthly. However, the total duration of IRS implementation should remain three (3) years in Active Foci and minimum one (1) year in Cleared Foci with high/medium RV.

The decision to stop vector control intervention should be based on a detailed analysis that includes assessment of the receptivity and vulnerability. If the RV index in the foci remains high or medium, vector control activities must be continued.

## 2.8 MONITORING AND EVALUATION

### 2.8.1 "TOCOSURE'

i. TO (TOTAL): All the houses/ structures in the locality must be sprayed with insecticide and recorded in the appropriate form [PEM:SEM105(2021)].
ii. CO (COMPLETE): All sprayable surfaces in all houses/ structure must be properly sprayed and recorded in the appropriate form [PEM:SEM105(2021)].
iii. SU (SUFFICIENT): An adequate dosage of insecticides deposit on the sprayable surface must be achieved and recorded in the appropriate form [PEM:SEM105(2021)]..
iv. RE (REGULAR): Spray cycle must be conducted REGULARLY at six (6) months interval in order to maintain the insecticide efficacy.

**Note:**

The calculation of insecticide dosage for IRS is described in **APPENDIX 5**

### 2.8.2 IRS Operational Performance Indicators

The IRS operational indicators include proportion of premises covered with IRS, proportion of population protected with IRS and insecticide dosage. They should be calculated immediately after each spray operation. Mopping up should be carried out if the proportion of premises covered with IRS did not acheived the desired target. The IRS operational performance indicators are listed in **Table 6**.

**Table 6: IRS Operational Performance Indicators**

| No | Indicator | Target | Frequency |
|---|---|---|---|
| i | IRS Implementation coverage (%) | 100% | • Monthly<br>• 6 montly (each cycle)<br>• Annually |
| ii | Proportion of premises covered with IRS (%) | 90% | • Every spray operation<br>• 6 monthly (each cycle)<br>• Annual |
| iii | Proportion of population protected with IRS (%) | 90% | • Every spray operation<br>• 6 monthly (each cycle)<br>• Annual |
| iv | Insecticide dosage | Refer to WHO dosage recommendation. | • Every spray operation |

### 2.8.3 Supervision

Spray operators and teams should be supervised to ensure that spray operations are on schedule, achieve high quality of spraying and cabove the desired overage. Supervision can be carried out onsite or review of records.

### 2.8.4 Quality of spraying

The quality of IRS applications, insecticide dosage and residual on sprayed surface (bio-efficacy) is qualitatively measured using WHO cone bioassay[2]. In Malaysia, wall bioassay is conducted in Active Foci two (2) weeks after the 1st cycle of IRS is completed. If resources are available, wall bioassay can be conducted to assess the quality of spraying in other foci. Procedure for bioassay can be referred to standard procedure provided by WHO[25]

## 2.9 TRAINING

All new spray operators must be trained before taking part in spray operation. Spray operators must undergo regular/ refresher training once in every two (2) years to ensure that their technical skills and competence well maintained.

For training purposes, a wall of three (3) meter high & 6.35 meter long is required to provide nine (9) vertical swaths of 75 cm each, with 5 cm overlap **(Figure 4).** This gives an area of approximately 19 $m^2$. The spray operators should be trained to cover these 9 swaths in one (1) minute (60 seconds). Each swath will be sprayed in 60/9 = 6.7 seconds [9].

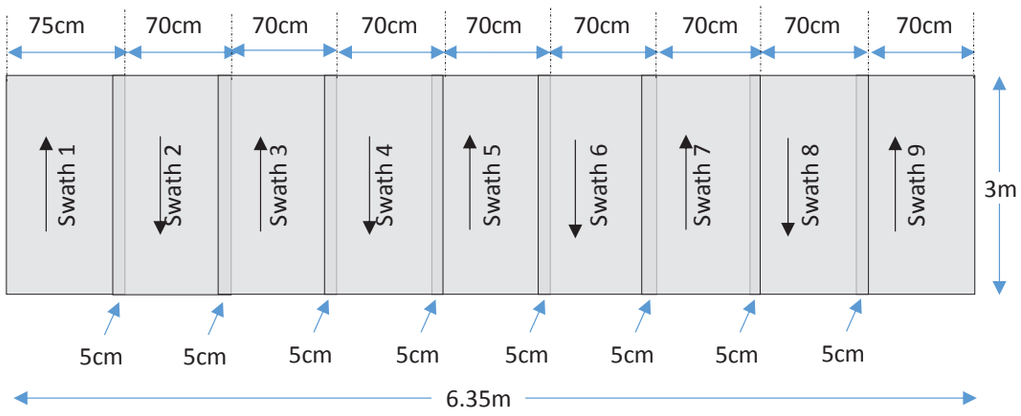



**Figure 4: Wall measuremet for IRS training**

# CHAPTER 3:

# INSECTICIDE-TREATED NET (ITN)/ LONG-LASTING INSECTICIDAL NET (LLIN)

## 3.1 DEFINITION OF ITN

ITN refers to mosquito net that repels, disables or kills mosquitoes that come into contact with the insecticide on the netting material. The types of ITN include [1]:

i. Conventionally treated net: a mosquito net that has been treated by dipping it into a WHO-recommended insecticide. To ensure its continued insecticidal effect, the net should be re-treated periodically [1].
ii. Long-lasting insecticidal net (LLIN): a factory-treated mosquito net made of netting material with insecticide incorporated within or bound around the fibers. The net must retain its effective biological activity for at least 20 WHO standard washes under laboratory conditions and three years of recommended use under field conditions [1].
iii. Pyrethroid-PBO net: a mosquito net that includes both a pyrethroid insecticide and the synergist piperonyl butoxide. To date, pyrethroid-PBO nets have not met required thresholds to qualify as LLIN [1].

For the purpose of these guidelines, ITN refers to conventionally treated bednet and LLIN is referred to factory-treated bednet.

## 3.2 PLANNING AND SCHEDULING ITN/ LLIN OPERATION

Distribution of ITN/LLIN should be initiated and completed within seven (7) days from notification of an introduced/ indigenous malaria case(s) in Active Foci.

Implementation of malaria vector control using ITN/LLIN must be carried out regularly at six (6) monthly interval. ITN need to be re-treated regularly at six monthly interval.

Both ITN/LLIN need to be inspected six monthly to monitor usage and integrity of the net.

Full Implementation of ITN/LLIN in a locality should be planned and completed within five (5) days duration to ensure immediate total protection to the population.

## 3.3 CHOICES OF INSECTICIDE AND DOSAGE FOR ITN

The selection of insecticides and the application dosages are based on WHO recommendation **(Table 7)**. The insecticide product currently used for treatment of ITN in Malaysia is Icon 2.5 CS which contains 25 grams of lambda-cyhalothnn per litre (25g/L) as the active ingredient (a.i). The dosage for Icon 2.5 CS used for bednet treatment in Malaysia is 10-15 mg a.i/ square meter [4].

**Table 7: Example of insecticide use for ITN and dosage recommendation.**

| Active Ingredient | Insecticide | Dosage Recommendation |
|---|---|---|
| Lambdacyhalothrin | Icon 2.5CS | 10-15 mg a.i/$m^2$ |
| Deltametrin | K-Othrine moustiquaire 1%SC | 15-25 mg a.i/$m^2$ |
| | K- O Tab 25 WT | 15-25 mg a.i/$m^2$ |

(Source : Extracted from Word Health Organization. Pesticides and Their Application for the Control of Vectors and Pests of Public Health Importance. 6th Edition, 2006)

## 3.4 MANAGING MASS DISTRIBUTION OF ITN/ LLIN

### 3.4.1 Before distribution of ITN/ LLIN

#### 3.4.1.1 Estimation of ITN/ LLIN Needed for a locality

The number of ITN/ LLIN needed is calculated based on the total population and the sizes of ITN/ LLIN available. The proposed ITN/ LLIN to occupant(s) ratio is shown in **Table 8**:

**Table 8: Proposed ITN/ LLIN to occupant(s) ratio**

| ITN/ LLIN Sizes | Number of Occupant (s) |
|---|---|
| Single (S) | 1 |
| Double (D) | 2 |
| Family (F) | 3 |
| Extra Family (XF) | 4 |

First time introduction of ITN/LLIN in a locality required pre-distribution household survey to estimate the quantity of ITN/LLIN required.

Estimation of ITN/LLIN to be distributed for a locality should cover 100% of the population. However, the actual number of ITN/ LLIN required needs to be adjusted at the locality. Additional 10% from the quantity (or based on previous activities) should be brought to the field to cater for replacement of damaged ITN/ LLIN or

additional ITN/ LLIN need during mass distribution. Planning of ITN/LLIN activities need to be recorded into the designated form [PEM : KEM 101(2021)].

### 3.4.1.2 Estimation of Insecticide need for ITN Treatment

The amount of insecticide required for ITN treatment is calculated base on number and sizes of ITN to ensure sufficient dosage of insecticide as recommendation (example 10-15 mg of a.i. per square meter).

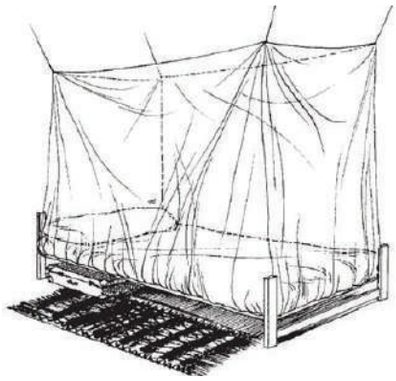
Estimation of insecticide for net treatment is described in **APPENDIX 10.**

### 3.4.1.3 Public Engagement

Public Notice and messaging must be issued before and repeated during ITN/ LLIN distribution to improve public acceptance and cooperation. The key messages should include the following:

i. ITN/LLIN is safe to use.
ii. Hang and tie the ITN/ LLIN using a sting to prevent the ITN/LLIN from tearing.
iii. Sleep under the net every night, all year round, even if you don't see or hear mosquito.
iv. The lower edges of the net should be tucked under the mattress or at least touch the floor to avoid mosquito from passing through (**Firgure 5**).
v. Wash your hands after handling ITN/ LLIN
vi. If develop skin irritation after contact with ITN/ LLIN, wash with water and soap.
vii. Avoid frequent washing of ITN/ LLIN to prevent excessive loss of insecticide.
viii. Only wash the ITN/ LLIN with clean water and mild soap gently when necessary.
ix. Do not wash and rinse the ITN/ LLIN in rivers, lakes or ponds.
x. Bring ITN/ LLIN along and sleep under it if needed to stay overnight in the jungle.
xi. If the ITN/LLIN is torn, repairing by sewing or tying with a string.
xii. Continue using the ITN/LLIN (even with holes) until it is replaced with a new ITN/LLIN
xiii. While not in use, the ITN/LLIN need to be neatly folded and kept in a safe place.

The checklist for mass distribution of ITN/LLIN Operation is listed in **APPENDIX 11** and notice used for ITN/LLIN Operation is provided in **APPENDIX 12.**



Source: World Health Organization. Vector Control Methods for use by individuals and communities.1997

**Figure 5 : Tuck the net under the mattress**

### 3.4.2 Distribution of ITN/ LLIN

#### 3.4.2.1 PPE for treatment and distribution of ITN/ LLIN

When conducting insecticide treatment of ITN, plastic hand gloves and plastic apron have to be worn.

Health Personnel handling the distribution of ITN/LLIN should wear plastic hand gloves.

#### 3.4.2.2 Equipment for ITN treatment

The necessary equipments for insecticide treatment of ITN consist of:

i. Measuring jar
ii. Basin/ Pail/ Plastic bag
iii. Plastic sheets
iv. Insecticide
v. Soap (For handwashing)

#### 3.4.2.3 Preparing for ITN treatment

It is best to treat the ITN outdoors under the shade. Steps for insecticide treatment of ITN are described below**:**

i. Prepare the necessary equipments: nets, insecticide, basin/ plastic bag, measuring jar, plastic sheets, gloves and plastic apron.
ii. Collect all nets from the household and put on the plastic sheet.
iii. Put on protective gloves and plastic apron before treating the nets.

iv. Measure the correct amount of insecticide and water based on the number and sizes of nets.
v. Mix the water and insecticide thoroughly in the basin/ pail/ plastic bag.
vi. Put the nets in the basin/ pail/ plastic bag containing water and insecticide.
vii. Soak the nets long enough to ensure that all parts of the nets are treated.
viii. Take out the nets one by one and wring gently.
ix. Let the nets dry flat in the shade on the plastic sheeting.
x. Hang the treated nets to finish the drying.
xi. Wash the basin while wearing the gloves.
xii. Wash hands with soap and lots of water.

**Note:**

It is recommended to pool the ITN by each household for treatment.

### 3.4.2.4 Labelling of ITN/ LLIN

Labeling of ITN/LLIN is important to track the age, bio-efficacy of LLIN and re-treatment record of ITN. The minimum labelling information should include the followings:

i. Batch Number of the ITN/LLIN
ii. Distribution date
iii. Household number

Refer to **Table 9** for description of ITN/LLIN labelling. Labeling need to be done to all new ITN/LLIN for distribution and anytime when additional ITN/LLIN are distributed.

**Table 9: Description of ITN/ LLIN labelling**

| Label | Explanation | Recording Method |
|---|---|---|
| Batch Number | Batch Number from the manufacturer. | Use the batch number provided by the manufacturer (refer to net the tagging or the net packaging) |
| Distribution Date (DD) | Record the date of ITN/ LLIN received by user | DD/MM/YYYY |
| Household number | Refer to house number or number assigned by DHO. | Using house number or any number assigned by DHO. |

### 3.4.2.5 ITN/LLIN Distribution Strategies

In Malaysia, ITN/LLIN distribution is implemented through mass free net distribution either by house to house or at one stop center by health personnel from MOH.

Community representatives such as Primary Healthcare Volunteer (Sukarelawan Penjagaan Kesihatan Asas), Village Health Representative (Wakil Kesihatan Kampung), Malaria Ambassador, managers/ supervisors from lodging camp or plantations may assist in the distribution of the ITN/LLIN.

Other non-MOH ministries may distribute ITN/LLIN for their personnel involved with forest related activities on case-to-case basis.

In addition, distribution of ITN/LLIN can be given to individuals involved in forest related activities such as hunting, recreation and collecting forest produce.

### 3.4.2.6 Procedure for ITN distribution

i. Dry ITN is distributed from house to house or at one stop center.
ii. Label the ITN distributed to the household members and record it in the related form.
iii. Give them the health advices (refer to 3.4.1.3)

### 3.4.2.7 Procedure for LLIN Distribution

i. LLIN is distributed from house to house or one stop center.
ii. Take out the LLIN from the plastic cover at the house, label the LLIN. And record it in the related form.
iii. Give them the health advices (refer to 3.4.1.3)
iv. LLIN plastic cover is collected and brought back to office for proper disposable.

**Note:**

For effective distribution of ITN/LLIN at one-stop distribution center, DHO must have adequate information of household and household census (Head of Household and list of household member).

### 3.4.3 After Distribution of ITN/LLIN

#### 3.4.3.1 Calculation of population coverage

After every ITN/LLIN operation, supervisor at field must calculate the population coverage for the locality. At least 95% of the population at risk in the locality must be protected with ITN/LLIN. If the coverage below 90%, mopping up activities should be carried out.

The formula below can be used to calculate the coverage of population with ITN/LLIN in a locality:

Proportion of population protected with ITN/LLIN (%) =

$$\frac{\text{(No. of ITN/LLIN size S x 1)+ (No. of ITN/LLIN size D x 2) + (No. of ITN/LLIN size F x 3) + (No. of ITN/LLIN size XF x 4)}}{\text{Total Population at the locality}} \times 100\%$$

S : small size
D : double size
F : Family size
XF : Extra-family size

#### 3.4.3.2 Reporting of ITN/LLIN operation coverage

Achievement of ITN/LLIN operation need to be recorded in related form [PEM: KEM 101(2021), PEM: KEM 102(2021), PEM:KEM103(2021)].

## 3.5 ASSESSMENT OF FABRIC INTEGRITY FOR ITN/LLIN

Assessment of fabric integrity is required to assist in the decision making for ITN/LLIN replacement. ITN/LLIN of physical or fabric integrity assessment must be conducted every cycle before replacement is done. ITN/LLIN physical integrity is assessed by counting the number of holes in four hole size categories in **Table 10**. A single measureof damage per net is calculated using Proportionate Hole Index (pHI)[7].

**Table 10: Hole size category and weightage**

| Hole size categories | Hole Size (cm) | weightage |
|---|---|---|
| A | 0.5 – 2.0 | 1 |
| B | 2.0 – 10.0 | 23 |
| C | 10.0 – 25.0 | 196 |
| D | > 25.0 | 578 |

pHI is calculated using the equation below :

$$pHI = (1 \times N_A) + (23 \times N_B) + (196 \times N_C) + (578 \times N_D)$$

$N_A$ refers to number of holes with size A
$N_B$ refers to number of holes with size B
$N_C$ refers to number of holes with size C
$N_D$ refers to number of holes with size D

pHI is categorized as good, acceptable or torn as described in the **Table 11**. Any ITN/LLIN with pHI of 643 or more are considered doubtful with regards to protective efficacy for user [6]. The procedure for measurement of fabric integrity and ITN/LLIN fabric Integrity assessment tool is described in **APPENDIX 13** and **APPENDIX 14.**

**Table 11: Grading of Fabric Integrity**

| pHI | LLIN/ITN Grading | Corrective Action |
|---|---|---|
| 0 - 64 | Good | Continue to use the existing ITN/LLIN |
| 65 - 642 | Acceptable | Continue to use the existing ITN/LLIN |
| 643 + | Torn | Replaced with new ITN/LLIN |

## 3.6 CRITERIA FOR ITN/ LLIN REPLACEMENT

### 3.6.1 Criteria For ITN Replacement

The decision to replace ITN is based on the fabric integrity assessment. Any ITN with pHI of 643 or more should be replace urgently.

### 3.6.2 Criteria For LLIN Replacement

The decision to replace LLIN is based on the following criteria:

i. Age of LLIN

LLIN that has been used in field conditions for three (3) years or more should be replace if the localities remained at risk of malaria re-introduction regardless of insecticidal activity at the net and fabric integrity.

**Note:**

However, if supply of LLIN is insufficient, the LLIN should be continued in use until replacement can be made.

ii. Insecticidal Activity

The presence of effective insecticide on the LLIN is primarily measured by its effects on susceptible Anopheline vectors through bioassays such as cone tests with the coresponding knock down and mortality rate. The presence of insecticide is also captured by chemical analysis, measuring the concentration of insecticide in g/kg or mg/$m^2$ [7].

LLIN with bioassay result and content of analysis that does not comply with the standards are to be replaced regardless of age and fabric integrity. However, the final decision is to be made at the programme level.

iii. Fabric integrity

Any LLIN with pHI of 643 or more should be replaced regardless of age and insecticidal activity.

## 3.7 MONITORING AND EVALUATION OF ITN/LLIN OPERATION

### 3.7.1 ITN/ LLIN Operational Performance Indicators

The ITN/ LLIN operational indicators include ITN/ LLIN Implementation coverage, proportion of ITN treated with insecticide, proportion of population protected with ITN/ LLIN and insecticide dosage for treated ITN. It should be calculated immediately after each ITN/LLIN operation. Mopping up should be carried out if proportion of population protected with ITN/ LLIN did not acheived the 90%. The ITN/ LLIN operational performance indicators are summarized in **Table 12**.

**Table 12: ITN/LLIN Operational Performance Indicators**

| No | Indicator Name | Target | Frequency |
|---|---|---|---|
| i | ITN/ LLIN | 100% | • Monthly |
| | Implementation coverage (%) | | • 6 montly (each cycle)<br>• Annual |
| ii | Proportion of ITN treated with insecticide (%) | 90% | • Every ITN operation<br>• 6 monthly (each cycle)<br>• Annual |
| iii | Proportion of population protected with ITN/ LLIN (%) | 95% | • Every ITN/LLIN operation<br>• 6 monthly (each cycle)<br>• Annual |
| iv | Insecticide dosage for treated ITN | Refer to WHO dosage recommendation. | Every ITN operation |

### 3.7.2 Bio-Efficacy of ITN/ LLIN

Bio-efficacy test is conducted in Active Foci two (2) weeks after the 1st cycle of ITN /LLIN operation. This is to ensure the insecticide dosage is sufficient.

If resources are available, bio-efficacy test can be conducted in other foci.

Procedure for bioassay can be referred to standard procedure provided by WHO[25].

## 3.8 DISPOSAL OF ITN/LLIN

ITN/ LLIN and their packaging should be collected by the health staff for disposal. Detailed description on disposal of insecticide packaging refer to **paragraph 14**.

## REFERENCES


1. World Health Organization, 2019. Guidelines for Malaria Vector Control
2. World Health Organization, 2015. Indoor Residual Spray: An Operation manual for indoor residual spraying (IRS) for malaria transmission control and elimination. 2nd Edition, June 2015. http://apps.who.int/iris/bitstream/10665/177242/1/9789241508940_eng.pdf?ua=1&ua=1http://www.who.int/malaria/publications/atoz/9789241508940/en/
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## GLOSSARY

| | |
|---|---|
| Bioassay | In applied entomology, experimental testing of the biological effectiveness of a treatment (e.g. infection, insecticide, pathogen, predator, repellent) by deliberately exposing insects to the treatment[1]<br><br>Note: When bioassays are used for the periodic monitoring of the continued efficacy of residual insecticide deposits on sprayed surfaces in houses (as in indoor residual spraying), attention should be paid to the environmental conditions and possible adverse factors (e.g. washing, re-plastering, soot) that affect the deposits on treated surfaces; these factors may reduce the effectiveness of treatment in a way that differs from the intrinsic rate of decay of the insecticide |
| Core Intervention | Effective vector control methods to interrupt malaria transmission and recommended for large-scale deployment for population at risk. Two (2) core intervention for malaria vector control are IRS and ITN/LLIN. |
| Foci, Active | A Focus with ongoing transmission.<br>Operational Criteria: Locally accquired case(s) have been detected wihin the currenct calendar year.[24] |
| Foci, Residual non-active | A Focus with transmission interrupted 1-3 years ago.<br>Operational Criteria: The last locally acquired case(s) was detected in the previous calender year or up to 3 years earlier.[24] |
| Foci, Cleared | A Focus with no local transmission for more than 3 years.<br>Operational Criteria: There has no locally acquired case for more than 3 years and only imported or. Relapsing or/ and recrudescent or/ and induced cases may occur during the current calender year. [24] |
| Integrated vector management (IVM) | Rational decision-making for optimal use of resources for vector control[1]<br><br>Note: The aim is to improve the efficacy, cost-effectiveness, ecological soundness and sustainability of vector control activities against vector-borne diseases. |
| Insecticide | Chemical product (natural or synthetic) that kills insects: Ovicides kill eggs; larvicides (larvacides) kill larvae; pupacides kill pupae; adulticides kill adult mosquitoes. Residual insecticides remain active for an extended period[1].<br><br>Note: WHO maintains a prequalification listing of vector control products[1]. |
| Indoor Residual Spraying (IRS) | Application of a residual insecticide to potential malaria vector resting surfaces, such as internal walls, eaves and ceilings of houses or structures (including domestic animal shelters), where such vectors might come into contact with the insecticide[1] |

| | |
|---|---|
| Larval Source Management | Management of aquatic habitats (water bodies) that are potential habitats for mosquito larvae in order to prevent completion of development of the immature stages.[1] |
| Malariogenic potential | Potential level of transmission in a given area arising from the combination of malaria receptivity, importation rate of malaria parasites and infectivity [1].<br><br>Note: The concept of malariogenic potential is most relevant for elimination and prevention of reestablishment when indigenous transmission is mostly or entirely eliminated. |
| Net, insecticide treated (ITN) | Mosquito net that repels, disables or kills mosquitoes that come into contact with the insecticide on the netting material. The three categories of insecticide treated net are[1]:<br><br>• Co*nventionally treated net:* a mosquito net that has been treated by dipping it into a WHO-recommended insecticide. To ensure its continued insecticidal effect, the net should be re-treated periodically.<br><br>• *Long-lasting insecticidal net:* a factory-treated mosquito net made of netting material with insecticide incorporated within or bound around the fibres. The net must retain its effective biological activity for at least 20 WHO standard washes under laboratory conditions and three years of recommended use under field conditions.<br><br>• *Pyrethroid-PBO net:* a mosquito net that includes both a pyrethroid insecticide and the synergist piperonyl butoxide. To date, pyrethroid-PBO nets have not met required thresholds to qualify as longlasting insecticidal nets.<br><br>For the purpose of these guidelines, ITN refers to conventionally treated bednet and LLIN is referred to factory-treated bednet. |
| Population at risk | People residing in Active Malaria Foci, Residual Non Active Foci and Cleared Foci with high and medium RV index. |
| Space Spraying | Release of fast-acting insecticides into the air as fog or as fine droplets as a method to reduce the numbers of adult mosquitoes in dwellings and also outdoors. Application methods include thermal fogging, cold aerosol distribution by handheld or backpack sprayers, ground vehicles or aerial means and repetitious spraying by two or more sprays in quick succession. It is most often deployed in response to epidemics or outbreaks of mosquito-borne disease[1] |
| Sprayable surfaces | Sprayable included all internal wall surfaces, the insides of roofs and under eaves, verandas, rafters and beams. Sprayable surfaces also include the undersides of beds, tables, chairs, shelves, and the backs of cupboards and wardrobes [2]. |

| | |
|---|---|
| Spraying, Regular | Regular IRS should be completed within seven (7) days from notification of an introduced/ indigenous malaria case in Active Foci. It is carried out at six (6) month intervals for six (6) cycles regardless of foci reclassification in the next calender year. For Cleared Foci with high or medium re-introduction index regular IRS is carried out for a minimun of two (2) cycles. However, the decision to stop IRS should be based on details analysis of RV index. |
| Spraying, Focal | The terms Focal Spraying was introduced in the pre-elimination phase of the programme. Focal spraying was implemented in yellow (Incidence < 1/1,000 population) and green locality (No locally acquired infection but receptive and vulnerable) [12].<br><br>Note: No more applicable in the elimination phase of the programme. |
| Spraying, Special | The terms Special Spraying was introduced in the pre-elimination phase of the programme. Special spraying was implemented in localities classified as green but is receptive and vulnerable, with the target of 100% coverage and is implemented six (6) monthly for premises with complete walls and 3 monthly for premises with incomplete walls. Special sprayings is to be continued until the localities no longer at risk of malaria[12].<br><br>Note: No more applicable in the elimination phase of the programme. |
| Supplementary Intervention | Additional intervention for preventing malaria in areas where the mosquito vectors bite or rest outdoor. Does not have the same potential impact as ITN and IRS due to lack of evidence for its effectiveness.<br><br>Supplementary intervention may be considered for deployment in specific settings. |
| Vector | In malaria, adult females of any mosquito species in which Plasmodium undergoes its sexual cycle (whereby the mosquito is the definitive host of the parasite) to the infective sporozoite stage (completion of extrinsic development), ready for transmission when a vertebrate host is bitten.<br><br>Note: Malaria vector species are usually implicated (incriminated) after field collection and dissection indicates that the salivary glands are infected with sporozoites; specific assays can be used to detect and identify circumsporozoite protein, especially where infection rates are low. |
| Vector, primary | The species of *Anopheles* mainly responsible for transmitting malaria in any particular circumstance [1].<br><br>Note: Primary vectors may overlap seasonally or alternate in importance. |

| | |
|---|---|
| Vector Control | Measures of any kind against malaria-transmitting mosquitoes, intended to limit their ability to transmit the disease.<br><br>Note: Ideally, malaria vector control results in the reduction of malaria transmission rates by reducing the vectorial capacity to a point at which transmission is interrupted.<br>Note: vector control interventions include tools, technologies and approaches. |

## APPENDIX 1: IMPLEMENTATION OF SPACE SPRAYING AS SUPPLEMENTARY INTERVENTION IN MALARIA VECTOR CONTROL

### A. Introduction

Space spraying refers to the release of fast-acting insecticides into the air as fog or as fine droplets as a method to reduce the number of adult mosquitoes in dwellings and also outdoors. Application methods include thermal fogging, cold aerosol distribution by handheld or backpack sprayers, ground vehicles or aerial means and repetitious spraying by two or more sprays in quick succession[1].

The objective of space spraying is to immediately kill all infective adult *Anopheles* to interrupt futher local transmission. Therefore, space spraying can be considered as supplementary intervention in Active Foci or whenever human malaria cases with gametocyctes were reported except in pseudo foci but not as a routine intervention. Space spraying must be conducted during the peak biting times of *Anopheles* mosquito. The commonly known peak biting times of *Anopheles* mosquito in Malaysia are shown in **Table 1** [15]. However, the peak biting times of *Anopheles* varies by species and location. Ideally, implementation of space spraying should be guided by the local peak biting times of *Anopheles*.

**Table 1: Peak Biting Time of Primary Human Malaria Vectors in Malaysia**

| Species | Peak Biting Time | Region/ Area |
|---|---|---|
| *An. maculatus* | 2100 – 2200 hrs | Peninsular Malaysia |
| *An. campestris* | 2100 - 2200 hrs | Peninsular Malaysia |
| *An. donaldi* | 1900 – 2100 hrs | Sarawak |
| *An. balabacencis* | 2200 – 2300 hrs | Sabah |
| *An. sundaicus (epiroticus)* | 2300 – 2400 hrs | Coastal area |
| *An. flavirostris* | 2300 – 2400 hrs | Sabah |
| *An. letifer* | 1900 – 2100 hrs<br>2100 - 2200 hrs | Sarawak<br>Peninsular Malaysia |
| *An. latens* | 1900 – 2100 hrs | Sarawak |

### B. General Principle and Standard Operating Procedure for Space Spraying In Malaria Vector Control

1. IRS or ITN/ LLIN remains the mainstay of malaria vector control.
2. Space spraying can be considered as supplementary intervention in Active Foci or whenever human malaria cases with gametocyctes were reported except in pseudo foci.

3. If IRS or ITN/ LLIN can be completed within seven (7) days from notification of a human malaria indigenous or introduced case(s), space spraying can be omitted.
4. There must be entomological evidence to support space spraying.
5. Rapid Entomological Assessment including peak biting time, density of *Anopheles*, larva survey etc should be conducted within three (3) days after declaration of outbreak to assists in identification of source of infection before spraying.
6. If Rapid Entomological Assessment was inconclusive, space spraying can be conducted based on the peak biting time of previously known *Anopheles* species in that locality or commonly known vector in that region or area.
7. The whole locality should be cover with space spraying or 200m radius from the index case's house, whichever is larger. Space spraying should be conducted Indoor and Outdoor.
8. Space spraying must be conducted for three (3) consecutive nights.[21]

**Note:**

The report format for Rapid Entomological Assessment is in **APPENDIX 1A.**

## APPENDIX 1A: RAPID ENTOMOLOGICAL ASSESSMENT

ENTO/RA01

### PENILAIAN PANTAS KAJIAN VEKTOR (RAPID ENTOMOLOGICAL ASSESSMENT

Bulan:
Negeri:
Lokaliti: Koordinat Lokaliti :
Masa:
Suhu : min: max:
Kelembapan (RH):
Taburan hujan:
Tarikh Kajian :

| **Bil. Penangkap :** | | | | | | | | | | | | | | | | | | | **Keadaan Cuaca / Bulan** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Masa** | **Dalam Rumah** | | | | | | | | | **Luar Rumah** | | | | | | | | | |
| | **Spesies dan Bilangan nyamuk ditangkap** | | | | | | | | | **Spesies dan Bilangan nyamuk ditangkap** | | | | | | | | | |
| | ***An maculatus*** | ***An donaldi*** | ***An letifer*** | ***An balabacensis*** | ***An flavirostris*** | ***An sundaicus*** | | | | ***An maculatus*** | ***An donaldi*** | ***An letifer*** | ***An balabacensis*** | ***An flavirostris*** | ***An sundaicus*** | | | | |
| **1800 - 1900** | | | | | | | | | | | | | | | | | | | |
| **1900 - 2000** | | | | | | | | | | | | | | | | | | | |
| **2000 - 2100** | | | | | | | | | | | | | | | | | | | |
| **2100 - 2200** | | | | | | | | | | | | | | | | | | | |
| **2200 - 2300** | | | | | | | | | | | | | | | | | | | |
| **2300 - 2400** | | | | | | | | | | | | | | | | | | | |

| Bil. Penangkap : | | | | | | | | | | | | | | | | | | | Keadaan Cuaca / Bulan |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Masa | Dalam Rumah | | | | | | | | | Luar Rumah | | | | | | | | | |
| | Spesies dan Bilangan nyamuk ditangkap | | | | | | | | | Spesies dan Bilangan nyamuk ditangkap | | | | | | | | | |
| | *An maculatus* | *An donaldi* | *An letifer* | *An balabacensis* | *An flavirostris* | *An sundaicus* | | | | *An maculatus* | *An donaldi* | *An letifer* | *An balabacensis* | *An flavirostris* | *An sundaicus* | | | | |
| 2400 - 0100 | | | | | | | | | | | | | | | | | | | |
| 0100 - 0200 | | | | | | | | | | | | | | | | | | | |
| 0200 - 0300 | | | | | | | | | | | | | | | | | | | |
| 0300 - 0400 | | | | | | | | | | | | | | | | | | | |
| 0400 - 0500 | | | | | | | | | | | | | | | | | | | |
| 0500 - 0600 | | | | | | | | | | | | | | | | | | | |
| JUMLAH KESELURUHAN | | | | | | | | | | | | | | | | | | | |
| PMH | | | | | | | | | | | | | | | | | | | |
| Bil Larva dipungut | | | | | | | | | | | | | | | | | | | |

**CATATAN:**
**Keadaan Cuaca** :Hujan, Angin
**Bulan** :Terang, gelap
**PMH** :Per Man Hour

## APPENDIX 2: PLANNING AND IMPLEMENTATION PROCESS FOR IRS AND ITN/ LLIN OPERATION

### Carta Alir Proses Perancangan & Pelaksanaan Kawalan IRS dan ITN/LLIN

| NO | PROSES | AKTIVITI | PIC | TEMPOH MASA |
|---|---|---|---|---|
| **A** | **PERANCANGAN** | | | |
| 1 | Mengemaskini data foci malaria | Kemaskini maklumat foci dalam sistem myFoci | PPKP/ PKP/ AKS | Sepanjang tahun |
| 2 | Mengenalpasti dan menyenaraikan lokaliti yang perlu kawalan IRS/ITN: | **Cara mengenalpasti lokaliti:**<br>i. klasifikasi foci dan tahap re-introduction (RV) stratifikasi tahun sebelum melalui sistem myfoci<br><br>**Pilihan lokaliti**:<br>i. Wajib di lokaliti Active Foci, *Residual Non Active* dan *Cleared Foci* dengan RV tinggi.<br>ii. Pilihan: *Cleared Foci* dengan RV sederhana. | PPKP/ PKP/AKS | Disember/ Jun |
| 3 | Menentukan jenis kawalan vektor (IRS atau ITN/LLIN) & bilangan pusingan yang diperlukan | **Jenis kawalan vektor:**<br>i. IRS/ITN/LLIN: *Active Foci*, *Residual Non Active Foci, Cleared Foci*<br><br>**Bilangan Pusingan kawalan yang diperlukan**:<br>i. *Active Foci/ Residual Non Active Foci*: 6 cycles (3 tahun)<br>ii. *Cleared Foci*: 2 cycles (1 tahun)<br>iii. IRS/ITN/LLIN dijalankan 6 | PPKP/ PKP/AKS | Disember/ Jun |

| NO | PROSES | AKTIVITI | PIC | TEMPOH MASA |
|---|---|---|---|---|
| | | bulan sekali kecuali keadaan tertentu | | |
| 4 | Membuat jadual perancangan aktiviti IRS & ITN/LLIN | i. Menyediakan jadual aktiviti berdasarkan bilangan lokaliti kawalan & bilangan pasukan kawalan.<br>ii. Mengetahui norma kerja pasukan kawalan<br>iii. Mengenalpasti pegawai yang bertanggungjawab bagi setiap kawalan<br>iv. Memasukkan data perancangan kawalan dalam borang:<br>• PEM:SEM 101 (2021)<br>• PEM:KEM 101 (2021) | PPKP/ PKP/PKA | Disember/ Jun |
| | | v. Memasukkan data perancangan kawalan dalam sistem Vekpro bagi ITN/LLIN<br>• IRS : Vekpro (6I)*<br>• ITN/LLIN : Vekpro (6J) | PPKP/ /PKA | P1:15 – 31 Dis<br>P2: 15 – 30 Jun |
| 5 | Mengemaskini profil lokaliti kawalan | i. Melengkapkan Profil Lokaliti [PEM: SEM 107a(2021)]<br>ii. Mengemaskini *Geographical Renaissance* (GR) | PKA/PPKP | Sebelum aktitiviti |
| **B** | **PELAKSANAAN** | | | |
| 6 | Sebelum Pelaksanaan Aktiviti | i. Menyemak keperluan kawalan vektor, logistik, sumber tenaga manusia (Senarai semak)<br>ii. Membuat pengagihan tugasan aktiviti IRS & ITN/LLIN<br>• IRS: Pembahagian | PPKP/PKA | Sehari sebelum dan di lapangan |

| NO | PROSES | AKTIVITI | PIC | TEMPOH MASA |
|---|---|---|---|---|
| | | Tugasan Harian Penyembur & Liputan Semburan Residu Mengikut Rumah Di Lokaliti [PEM:SEM 105(2021)]<br>• ITN/ LLIN: Rekod Pembekalan Dan Pencelupan Kelambu (ITN/LLIN) Bagi Setiap Rumah [PEM: KEM102(2021)]<br>iii. Mengenalpasti ketua pasukan & pasukan<br>iv. Menjelaskan TOR ketua pasukan dan penyembur/ anggota<br>v. Memberi notis pemberitahuan/ makluman awal<br>vi. Menentukan jenis racun dan keperluan racun | | |
| 7 | Semasa Pelaksanaan kawalan | i. Memastikan kehadiran ketua pasukan & pasukan kawalan<br>ii. Pembahagian tugasan:<br>• IRS: [PEM: SEM 105(2021)]<br>• ITN/ LLIN: [PEM: KEM 102(2021)] | PPKP/PKA | Semasa aktiviti |
| 8 | Melaksanakan aktiviti IRS & ITN/LLIN | i. Melaksanakan aktviti kawalan di lapangan | PPKP/PKA | |

| NO | PROSES | AKTIVITI | PIC | TEMPOH MASA |
|---|---|---|---|---|
| 9 | Selepas Pelaksanaan kawalan | i. Mengisi kad rumah PEM:SEM 104(2021)<br>ii. Membuat penilaian awal di lapangan untuk megetahui liputan kawalan<br>iii. Merekod liputan kawalan dalam borang:<br>• PEM:SEM 105 (2021),<br>• PEM:KEM 102 (2021) | PPKP/PKA | Serta-merta |
| | | iv. Mengisi liputan kawalan dalam borang:<br>• PEM:SEM 101(2021)<br>• PEM: KEM 103(2021), PEM:KEM101(2021) | PPKP/PKA | Dalam sehari selepas kawalan |
| | | v. Kemasukkan data pencapaian dalam vekpro online bagi ITN/LLIN:<br>• IRS : Vekpro (6I)*<br>• ITN/LLIN : Vekpro (6J) | | Dalam seminggu kawalan selesai |
| **C** | ***MONITORING & EVALUATION* (M&E)** | | | |
| 10 | Menganalisa keberkesanan & pencapaian kawalan IRS/ITN/LLIN | i. Menganalisa keberkesanan aktiviti secara TOCOSURE (IRS) | PPKP/PKP | Serta-merta |
| | | ii. Memantau KPI kawalan vektor malaria | PPKP/PKP | Bulanan/ s |
| | | iii. Menjalankan *bioassays* di *Active Foci* (lain-lain foci bergantung kepada kemampuan sumber) | AKS | 2 minggu dari tarikh kawalan tamat |

| NO | PROSES | AKTIVITI | PIC | TEMPOH MASA |
|---|---|---|---|---|
| 11 | Tindakan susulan/ penambahbaikan | i. Mencadangkan tindakan susulan<br>ii. Melaksanakan tindakan susulan (Mopping up) jika perlu | AKS/PKP/ Peg Epid<br>PPKP/PKA | Serta - merta<br>Serta - merta |
| **D** | **MEMBERHENTIKAN IRS/ITN/LLIN (SELEPAS LENGKAP KAWALAN REGULAR)** | | | |
| 12 | Menjalankan penilaian *receptivity* dan *vulnerability selepas* lengkap IRS/ITN/LLIN regular | i. Menjalankan penilaian *receptivity* dan *vulnerability* untuk menentukan keperluan kawalan vektor seterusnya. | AKS/ PPKP | selepas lengkap IRS/ITN/LLIN regular |
| 13 | Membuat keputusan sama ada IRS/ITN/LLIN perlu diteruskan. | ii. Membuat keputusan sama ada IRS/ITN/LLIN perlu diteruskan | AKS/ PPKP<br>Peg Epid | Selepas mendapat indeks RV |

**Nota :**
PIC : *Person in Charge*
P1 : Pusingan Pertama (Jan - Jun)
P2 : Pusingan Kedua (Julai - Disember)
Kawalan regular bermaksud IRS/ITN/LLIN yang telah dilaksanakan 6 pusingan (3 tahun) di Active Foci/ RNA atau 2 Pusingan di Cleared Foci (Setahun).

*Pengisian dalam Sistem Vekpro apabila Modul IRS dibaikpulih

## APPENDIX 3: DIRECTIVE FOR DISPOSAL OF INSECTICIDE PACKAGING

BAHAGIAN KAWALAN PENYAKIT
KEMENTERIAN KESIHATAN MALAYSIA
*DISEASE CONTROL DIVISION*
*MINISTRY OF HEALTH, MALAYSIA*
ARAS 3, 4 DAN 6 , BLOK E10, PARCEL E, PRESINT 1,
PUSAT PENTADBIRAN KERAJAAN PERSEKUTUAN
62590, PUTRAJAYA

Tel : 03-88834527
Faks : 03-88886270

Ruj. Tuan :
Ruj. Kami : KKM.600-32/5/3 Jld 3 (89)
Tarikh : 29 Januari 2019

**SENARAI EDARAN**

YBhg. Datuk/ Dato' Indera/ Dato'/ Tuan/ Puan,

**PELUPUSAN BEKAS RACUN SERANGGA BAGI AKTIVITI KAWALAN VEKTOR**

Dengan segala hormatnya perkara di atas adalah dirujuk.

2. Sebagaimana pihak YBhg. Datuk/ Dato' Indera/ Dato'/ Tuan/ Puan sedia maklum, pelupusan bekas racun serangga adalah sebahagian daripada tatacara pengurusan stor. Bekas racun serangga boleh menjadi punca pencemaran alam sekitar dan memudaratkan kesihatan manusia, haiwan dan organisma bukan sasaran jika tidak diuruskan secara berhemah. Mengikut peruntukan Akta Kualiti Alam Sekeliling 1974, bekas racun serangga adalah Bahan Buangan Terjadual dan mesti dilupuskan di pusat pelupusan yang telah dilesenkan oleh Jabatan Alam Sekitar (JAS).

3. Sehubungan itu, disertakan alamat Pusat Kitar Semula Bekas Racun Serangga di Semenanjung, Sabah dan Sarawak di Lampiran 1. Bekas-bekas racun serangga perlu dibilas sebanyak tiga kali dengan sempurna sebagai syarat boleh diterima untuk kitar semula sebelum dikumpulkan di pusat pengumpulan yang ditetapkan dan seterusnya dikitar semula.

4. Berikut adalah prosedur bilas tiga kali (Rujuk Lampiran) :

i. Tuang sehingga habis sisa racun perosak ke dalam tong penyembur/ bekas bancuhan racun dan tunggu kira – kira 30 saat.
ii. Isikan suku air bersih ke dalam bekas kosong
iii. Tutupkan bekas dengan penutup dan goncang selama 30 saat
iv. Tuang air bilasan ke dalam tong penyembur/ bekas bancuhan racun
v. Ulang langkah ii sehingga iv untuk bilasan kedua dan ketiga
vi. Cuci bahagian luar bekas dengan bersih dan tebuk
vii. Keringkan bekas secara terbalik dan hantar ke Pusat pengumpulan

5. Sebarang pertanyaan mengenai perkara ini, pihak YBhg. Datuk/ Dato' Indera/ Dato'/ Tuan/ Puan boleh merujuk kepada Pegawai Sains (Kaji Serangga) Negeri masing-masing. Kerjasama pihak YBhg. Datuk/ Dato' Indera/ Dato'/ Tuan/ Puan dalam hal ini sangat dihargai.

Sekian. Terima Kasih

**"BERKHIDMAT UNTUK NEGARA"**

Saya yang menjalankan amanah,

**(DR. NORHAYATI BT RUSLI)**
Pengarah Kawalan Penyakit
Kementerian Kesihatan Malaysia.

DR. ROHANI BT. JAHIS
No. MPM: 28729
Pakar Perubatan Kesihatan Awam
Ketua Sektor Zoonosis
Bahagian Kawalan Penyakit
Kementerian Kesihatan Malaysia

s.k

i. Ketua Sektor Penyakit Bawaan Vektor, BKP KKM
ii. Pegawai Sains (Kaji Serangga) Negeri, Jabatan Kesihatan Negeri

**Lampiran 1**

## PUSAT KITAR SEMULA BEKAS RACUN SERANGGA DI SEMENANJUNG MALAYSIA, SABAH DAN SARAWAK

| NEGERI | BAHAGIAN/ KAWASAN/ DAERAH | PUSAT KITAR SEMULA |
|---|---|---|
| Semenanjung Malaysia | Seluruh Semenanjung Malaysia | **AGR SMART PLASTIC**<br>No. 57, Jalan Suasa,<br>Taman Perindustrian Kulai,<br>81000 Kulai, Johor<br>NO. TEL:+607-662 1660 |
| Sabah | Seluruh Sabah | **NEW GATES**<br>Ground Floor, Lot 10,<br>Wisma Ever Right Light,<br>Industrial Estate, Mile 7½ Jalan Tuaran,<br>88450 Kota Kinabalu, Sabah<br>NO. TEL: 088-792008<br>EMAIL: info@newgates.net<br><br>**NEW GATES (Cawangan Tawau)**<br>MR MURUGES<br>H/P NO: 016-886 0142 |
| Sarawak | Bintulu | **FONSEN ENTERPRISE**<br>No. 941 Tanjung Kidurong Industrial Estate,<br>97007 Bintulu, Sarawak<br>NO. TEL/FAX: 086-252 997 |
| | Sibu/Sarikei | **BORNEO METAL AND PLASTIC RECYCLE SND. BHD.**<br>Lot 861, Block 1, Menyan Land District<br>96000 Sibu, Sarawak<br>NO. TEL: 014-8781919 (En Radja)/<br>016-3712095<br>NO. FAKS: 084-235 004 |
| | Kuching/ Samarahan/ Serian | **DINKARGO RECYCLE SDN BHD**<br>Lot 915, Blok 4 Sentah Segu Land District,<br>14th Miles, Kuching Serian Road,<br>93250 Kuching, Sarawak<br>NO. TEL: 082-618 257/ 082-619 257<br>NO. FAKS: 082-628 275 |


JABATAN PERTANIAN

# MULAKAN SEKARANG JUGA!

**KITAR SEMULA DEMI MEMELIHARA DIRI, KELUARGA, RAKYAT DAN ALAM SEKITAR DARIPADA PENCEMARAN**

**KERJASAMA ANDA AMAT DIPERLUKAN**

**APPENDIX 4: CHECKLIST FOR IRS OPERATION**

**SENARAI SEMAK UNTUK IRS AKTIVITI**

| Bil | Item | Keperluan (Unit) | Ada (/) Tiada (X) |
|---|---|---|---|
| 1 | Racun serangga | | |
| | i. K-Othrine WG250 | | |
| | ii. Lain- Lain : | | |
| 2 | Compression sprayer | | |
| | i. Hudson X-Pert Spraycan | | |
| | ii. Semco | | |
| | iii. Lain- Lain : | | |
| 3 | Peralatan untuk baiki sprayer | | |
| 4 | PPE | | |
| | i. Face mask | | |
| | ii. Face Shield/ Goggles | | |
| | iii. Hat | | |
| | iv. Safety Boots | | |
| | v. Coverall/ Overall | | |
| | vi. Rubber gloves | | |
| 5 | Fail kampung/ Profil lokaliti/ GR | | |
| 6 | Kad rumah | | |
| 7 | Buku catatan dan reten IRS | | |
| 8 | Sabun (untuk cuci tangan) | | |
| 9 | Baldi dan gayung | | |
| 10 | | | |

Disediakan oleh

Nama :
Jawatan :
Tarikh :

Disemak oleh

Nama :
Jawatan :
Tarikh :

## APPENDIX 5: ESTIMATING INSECTICIDE REQUIREMENT FOR IRS OPERATION

**A. Sebelum pengiraan keperluan Kuantiti Racun Serangga, perkara berikut perlu diketahui:**

i. Tangki 8L hanya perlu isi air setakat 7.5L (7500 mL) sahaja.

**B. Pengiraan Keperluan Kuantiti Racun Serangga untuk satu (1) lokaliti bagi semburan residu (IRS) boleh dikira menggunakan formula berikut:**

S = Purata keluasan permukaan rumah di satu lokaliti
N = Bilangan rumah untuk disembur
C = Kepekatan a.i (Perlu rujuk kepada pembungkusan racun serangga)
Y = Sasaran dosej dalam g/$m^2$ (Perlu merujuk kepada saranan WHO)

Maka, jumlah racun yang digunakan dalam g (Q) dikira melalui formula berikut:

$$Q = \frac{S \times Y \times 100 \times N}{C}$$

**Contoh pengiraan keperluan kuantiti K-Othrine WG250 (25.0%w/w) yang diperlukan untuk satu (1) lokaliti adalah seperi berikut:**

S = Purata keluasan permukaan rumah di satu lokaliti = 160$m^2$
N = Bilangan rumah untuk disembur = 30
C = Kepekatan a.i (25%)
Y = Sasaran dosej dalam g/$m^2$ (0.025 g/$m^2$)

Maka, kuantiti racun serangga yang diperlukan dalam g (Q) adalah

$$Q = \frac{S \times Y \times 100 \times N}{C}$$

$$= \frac{160 \times 0.025 \times 100 \times 30}{25}$$

$$= 480 \text{ g}$$

Namun, untuk mengambil ketirisan semasa semburan, penyembur boleh membawa lebihan 10% racun serangga ke lapangan daripada kuantiti sebenar racun serangga yang diperlukan.

Contoh kuantiti racun serangga yang diperlukan adalah 480g, dengan mengambilkira tambahan 10%, kuantiti racun serangga yang perlu dibawa ke lapangan adalah :

= 480 g + (480 g x 10%)
= 528 g

Buat masa ini, pembungkusan 1 sachet K-Othrine WG250 (25.0%w/w) adalah 20g.

Maka, Bilangan sachet diperlukan untuk dibawa ke lapangan adalah
= 528g/20g
= 26 sachet K-Othrine WG250

## C. Penyediaan Bancuhan Racun Serangga di Lapangan

Bagi penyediaan bancuhan racun serangga di lapangan, 1 sachet K-Othrine WG250 perlu dicampur dengan 7.5 L air.

**Nota:**

Bagi memudahkan penyembur membuat bancuhan di lapangan, Kementerian Kesihatan Malaysia (KKM) telah membuat pengiraan 1 sachet K-Othrine WG250 dengan berat 20g dibancuh dengan 7.5L untuk mendapatkan sasaran dosej 25mg/$m^2$ (Bahagian E).

Dengan kadar aplikasi semburan yang dicadangkan (application rate), **40ml/$m^2$.** Keluasan permukaan yang boleh disembur dengan campuran 7.5 L air boleh dikira dengan formula berikut:

$$= \frac{\text{Kuantiti air untuk bancuhan}}{\text{Kadar aplikasi}}$$

$$= \frac{7500\ ml}{40\ ml/m^2}$$

$$= 187.5m^2$$

## D. Pengiraan Pencapaian Purata Dosage (mg/$m^2$) untuk 1 rumah dalam lokaliti tersebut (SUFFICIENT):

S = Purata keluasan permukaan rumah di satu lokaliti
N = Bilangan rumah disembur
C = Kepekatan a.i
Q = Jumlah racun yang digunakan dalam gram (g)

Maka,dosej dalam g/$m^2$ , Y adalah

$$Y = \frac{Q \times C}{S \times 100 \times N}$$

**Contoh Pengiraan Pencapaian Purata Dosage (g/$m^2$) untuk 1 rumah dalam lokaliti tersebut (SUFFICIENT) menggunakan K-Othrine WG250**

S = Purata keluasan permukaan rumah di satu lokaliti = 160$m^2$
N = 30 buah rumah disembur
C = Kepekatan a.i (25%)
Q = Jumlah racun yang digunakan dalam g, 480 g

Maka,dosej dalam g/$m^2$ , Y adalah

$$Y = \frac{Q \times C}{S \times 100 \times N}$$

$$= \frac{480 \times 25}{160 \times 100 \times 30}$$

$$= 0.026\ g/m^2$$

**APPENDIX 6: NOTICE FOR IRS OPERATION**

**KEMENTERIAN KESIHATAN MALAYSIA (KKM)**

# NOTIS PEMBERITAHUAN

## AKTIVITI SEMBURAN RESIDU UNTUK PENCEGAHAN DAN KAWALAN MALARIA

Anggota KKM akan menjalankan semburan residu ke atas rumah Tuan/Puan pada _____

Tuan/Puan diminta untuk mengambil tindakan seperti berikut:

1. Membenarkan pasukan kawalan vektor untuk memasuki rumah bagi melaksanakan semburan residu
2. Pindahkan semua haiwan peliharaan termasuk kucing, anjing, burung dan lain-lain ke luar rumah.
3. Tutup akuarium dengan plastik untuk melindungi dari titisan racun serangga.
4. Pindahkan barang peribadi ke bahagian tengah rumah dan tutup dengan plastik.
5. Memastikan semua ahli keluarga/ penghuni perlu berada di luar rumah sepanjang aktiviti penyemburan dinding dijalankan.
6. Kekal di luar rumah sekurang-kurangnya 30 minit – 1 jam sebelum masuk semula ke rumah.
7. Basuh semua bekas makanan sebelum digunakan.
8. Basuh bekas makanan haiwan peliharaan selepas penyemburan.
9. Penghuni mesti mencuci tangan sebelum menyediakan makanan.
10. Basuh buah atau sayur yang ditanam di sekitar rumah sebelum dimakan.

Unit Kawalan Penyakit Bawaan Vektor

Pejabat Kesihatan Daerah _____

Jabatan Kesihatan Negeri _____

Tarikh :

## APPENDIX 7: PPE FOR IRS OPERATION

**List of PPE for IRS:**

vii. Face mask
viii. Face Shield/ Goggles
ix. Hat
x. Safety Boots
xi. Coverall/ Overall
xii. Rubber gloves

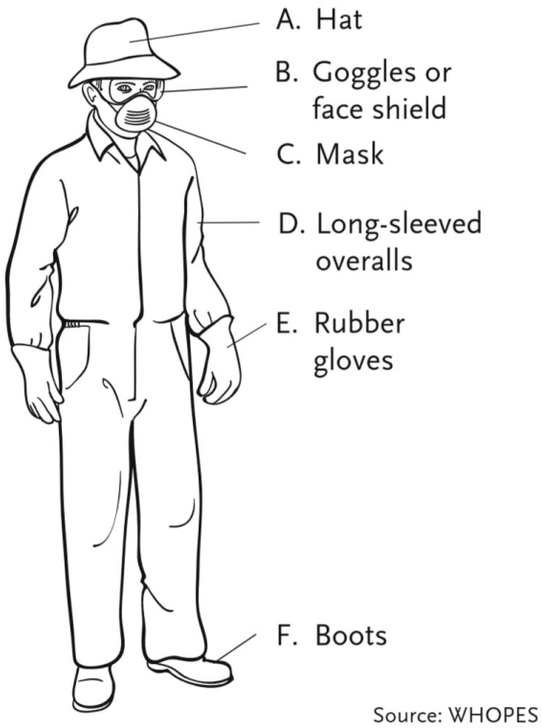



**Figure 3: PPE for IRS**

## APPENDIX 8: EXAMPLE OF COMPRESSION SPRAYER THAT COMPLY WITH WHO SPECIFICATION

Compression sprayer is an equipment that consists of a container that can be pressurized by a pump and a means of delivering spray liquid through a hydraulic nozzle. Example of sprayer used for IRS in Malaysia as below:


Hudson X-pert Sprayer Semco

**Figure 4*: Compression Spray Can***

## APPENDIX 9: MAINTENANCE AND CALIBRATION OF SPRAYER

1. **Prosedur Kalibrasi**

   i. Masukkan air bersih ke dalam tangki.
   ii. Tutup penutup dan pusing pemegang penutup supaya ia berada dalam keadaan terkunci.
   iii. Pam tangki sehingga tolok tekanan menunjukkan tekanan yang sesuai iaitu 55 psi (3.8 bar).
   iv. Arahkan nozel ke dalam baldi/ bekas yang besar.
   v. Tekan *trigger* selama 1 minit
   vi. Kemudian ukur isipadu air yang dikeluarkan oleh pam dengan menggunakan silinder penyukat.
   vii. Bandingkan dengan *discharge volume* yang dicadangkan oleh pengeluar *Compression Sprayer* seperti dalam **Jadual 1**.

**Jadual 1: Jenis Sprayer dan Kadar Pengaliran Isipadu semasa kalibrasi**

| Type of Sprayer (Brand) | Nozzle size | Standard Flow Rate (ml/ minute) | When to change nozzle (exceeds 10% more than standard flow rate) |
|---|---|---|---|
| Hudson X-Pert | 8002E | 757 ml/ minute at 276 kPa (40 psi) | >830 ml/min |
| Semco Hand Sprayer | 8002E | 750 ml/ minute at 275 kPa (40 psi) | >820 ml/min |
| Gloria 142T/510T | 8002E | *850 ml/min at 6 bar (87psi) | >940 ml/min |

**Nota:**
* Berdasarkan kepada panduan kalibrasi yang pernah dilaksanakan di Sabah.

Sekiranya purata air yang dikeluarkan melebihi 10% daripada isipadu yang dicadangkan oleh pengeluar Compression Sprayer. Nozzle perlu ditukar.

2. **Prosedur Pembersihan Tangki**

   i. Tangki perlu dibersihkan serta merta selepas digunakan.
   ii. Keluarkan lebihan racun serangga daripada tangki.
   iii. Masukkan air bersih (2 liter) ke dalam tangki, pam sehingga tekanan yang mencukupi.
   iv. Kemudian tekan injap penekan untuk membersihkan batang penyembur dan nozel
   v. Lakukan beberapa kali dan pastikan nozel tidak tersumbat
   vi. Gantungkan tangki dalam keadaan terbalik untuk mengeringkannya.

**Catatan:**
Sila rujuk *Safety Data Sheet* K-Othrine *WG25* Version 1/EU (102000002830) dan *Safety Data Sheet* K-Othrine *Polyzone* untuk langkah-langkah keselamatan sekiranya terkena semburan.

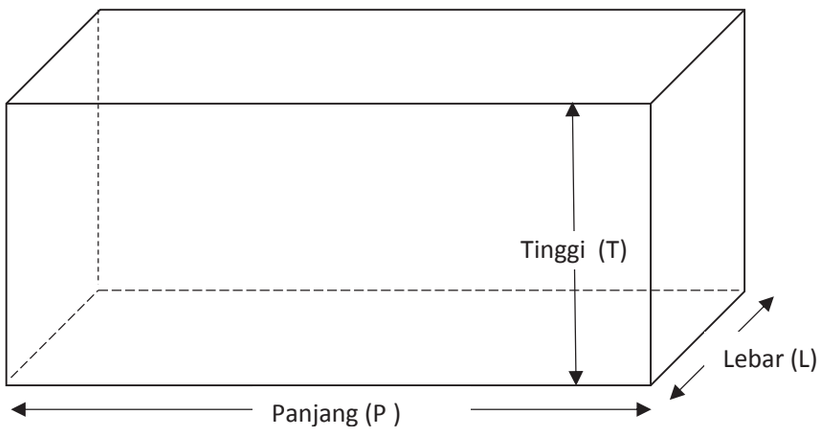
## APPENDIX 10: ESTIMATING INSECTICIDE REQUIREMENT FOR TREATMENT OF ITN

Maklumat yang perlu diketahui untuk pengiraan keperluan racun serangga dan air untuk pencelupan kelambu:

1. Saiz kelambu untuk menentukan keluasan permukaan
2. Jenis dan dosej racun serangga yang diperlukan untuk menentukan keperluan racun
3. Kadar penyerapan kelambu untuk menentukan air yang diperlukan untuk bancuhan racun.

### Langkah 1: Pengiraan Keluasan Kelambu

Kelambu konventional yang digunakan di Malaysia sekarang adalah berbentuk segi empat sama seperti gambar rajah di bawah:




Bagi mendapatkan keluasan kelambu, formula berikut digunakan:

**Luas permukaan kelambu** = 2 (P x T) + 2 (T x L)+ (P x L)

Luas permukaan kelambu dikira berdasarkan ukuran panjang, lebar dan tinggi kelambu seperti berikut:

| Saiz | Lebar (L) (cm) | Panjang (P) (cm) | Tinggi (T) (cm) | Luas Permukaan ($cm^2$) | Luas Permukaan ($m^2$) |
|---|---|---|---|---|---|
| Single | 100 | 180 | 150 | 102000 | 10.2 |
| Double | 150 | 180 | 150 | 126000 | 12.6 |
| Family | 180 | 180 | 150 | 140400 | 14.0 |

**Langkah 2: Pengiraan Keperluan Bahan Aktif**

Keperluan bahan aktif yang diperlukan adalah berdasarkan luas permukaan kelambu dan keperluan dosej adalah mengikut saranan WHO dengan formula berikut:

**Keperluan Bahan Aktif** = keluasan kelambu x dosej yang disarankan.

Contoh dosej racun yang diperlukan di pencelupan kelambu adalah seperti berikut[4]:

| A.I. | Nama Racun | Dosej |
|---|---|---|
| Lamdacyhalothrin | Icon 2.5CS | 0.010-0.015 g a.i/$m^2$ |
| Deltametrin | K-Othrine moustiquaire 1%SC | 0.015-0.025 g a.i/$m^2$ |
| | K-Otab 25 WT | 0.015-0.025 g a.i/$m^2$ |

Buat masa sekarang, racun serangga yang digunakan di Malaysia untuk pencelupan kelambu adalah Icon 2.5 CS dengan sasaran dosej 15 mg a.i/ $m^2$.

Maka, keperluan bahan aktif bagi 1 kelambu mengikut keluasan kelambu yang terdapat pada masa sekarang adalah sepeti berikut :

| Saiz Kelambu | Luas Permukaan ($m^2$) | Dosej yang disarankan ($g/m^2$) | Keperluan bahan aktif (g) |
|---|---|---|---|
| Single | 10.2 | 0.015 | 0.153 |
| Double | 12.6 | 0.015 | 0.189 |
| Family | 14.0 | 0.015 | 0.210 |

**Langkah 3: Pengiraan Keperluan Racun untuk 1 kelambu (dalam mL)**

Bagi mendapatkan keperluan racun untuk 1 kelambu, formula berikut digunakan:

$$= \frac{\text{Jum. Bahan Aktif diperlukan}}{\text{\% Kepekatan racun}} \times 100 \text{ mL}$$

Maka, keperluan racun bagi 1 kelambu mengikut keperluan bahan aktif dan peratus kepekatan racuns serangga yang digunakan iaitu Icin 2.5 CS adalah sepeti berikut :

| Saiz Kelambu | Keperluan bahan Aktif (g) | % kepekatan Icon 2.5 CS | Jumlah racun (mL) |
|---|---|---|---|
| Single | 0.153 | 2.5 | 6.12 |
| Double | 0.189 | 2.5 | 7.56 |
| Family | 0.210 | 2.5 | 8.4 |

**Langkah 4: Pengiraan Keperluan Amaun Air Untuk Bancuhan 1 kelambu**

Bagi mendapatkan keperluan air untuk bancuhan kelambu. Kadar Penyerapan Kelambu perlu diketahui. Kadar penyerapan kelambu adalah berdasarkan jenis fabirk kelambu seperti berikut[11] :

| Jenis Fabrik | Kadar Penyerapan per $m^2$ keluasan |
|---|---|
| Nylon | 14-15 mL |
| Poliester | 20mL |
| Kapas | 30-90 mL |

Berdasarkan rekod pembelian kelambu di Malaysia, fabrik kelambu yang digunakan di Malaysia adalah jenis **poliester** dengan kadar penyerapan **20 mL/$m^2$** keluasan.

Bagi mendapatkan jumlah bancuhan larutan (air dan racun), formula berikut digunakan.

= Jumlah Keluasan kelambu x kadar serapan kelambu

Manakala, jumlah air yang diperlukan dikira daripada formula berikut:

= Jumlah Larutan (Air + Racun) – keperluan racun

Maka, keperluan air untuk bancuhan kelambu yang digunakan di Malaysia adalah seperti berikut :

| Saiz Kelambu | Luas Permukaan ($m^2$) | Kadar Penyerapan (Polyester) (ml/$m^2$) | Jum. Larutan (Air + Racun) (ml) | Keperluan Racun diperlukan (mL) | Keperluan Air (mL) |
|---|---|---|---|---|---|
| | a | b | c = (a x b) | d | e = (c – d) |
| Single (S) | 10.2 | 20 | 204 | 6.12 | 198 |
| Double (D) | 12.6 | 20 | 252 | 7.56 | 244 |
| Family (F) | 14.0 | 20 | 280 | 8.4 | 272 |

**<u>Langkah 5: Pengiraan Keperluan Amaun Racun dan Air untuk kegunaan satu (1) lokaliti</u>**

Bagi mendapatkan anggaran keperluan racun serangga dan air untuk pencelupan di lapangan, formula berikut digunakan:

**Jumlah racun serangga, mL**

= (Bil kelambu Size S x keperluan racun untuk kelambu Size S) + (Bil kelambu Size D x keperluan racun untuk kelambu size D) + (Bil. Kelambu Size F x keperluan racun kelambu size F)

**Jumlah keperluan air, mL**

= (Bil kelambu Size S x keperluan Air untuk kelambu size S) + (Bil kelambu Size D x keperluan Air untuk kelambu size D) + (Jum Kelambu Size F x keperluan Air untuk kelambu size F.

**Contoh bagi pencelupan 10 Kelambu size S, 10 Kelambu size D, 10 Kelambu size F**

| Saiz Kelambu | Keperluan Icon 2.5 CS diperlukan per kelambu (mL) | Keperluan Air diperlukan per kelambu (mL) | Bil Kelambu perlu dicelup | Jum. Icon 2.5 CS diperlukan (mL) | Jum Air diperlukan (mL) |
|---|---|---|---|---|---|
| | a | b | c | d = (a x c) | e = (b x c) |
| Single (S) | 6.12 | 198 | 10 | 61.2 | 1980 |
| Double (D) | 7.56 | 244 | 10 | 75.6 | 2440 |
| Family (F) | 8.4 | 272 | 10 | 84 | 2720 |
| **Amaun (mL)** | | | | **220.8** | **7140** |

Amaun Icon 2.5 CS dalam Liter = 220.8 ml/1000

= 0.22

Amaun Air dalam Liter = 7140ml/1000

=7.1 L

**APPENDIX 11: CHECKLIST FOR MASS DISTRIBUTION OF ITN/ LLIN**

**SENARAI SEMAKAN UNTUK AKTIVITI ITN/LLIN**

| Bil | Item | Keperluan (Unit) | Ada ( / )<br>Tiada ( X ) |
|---|---|---|---|
| 1 | Jenis Kelambu | | |
| | i. Konventional | | |
| | ii. LLIN) | | |
| 2 | Racun serangga | | |
| | i. Jenis Racun:Icon 2.5CS | | |
| | ii. Lain-Lain:<br>_____<br>__ | | |
| 3 | Bilangan kelambu | | |
| | i. Single | | |
| | ii. Double | | |
| | iii. Family | | |
| | iv. Extra Family | | |
| 4 | *PPE* | | |
| | *i. Goggles* | | |
| | *ii. Mask* | | |
| | *iii. Long sleeved overall* | | |
| | *iv. Rubber gloves* | | |
| | v. Boots/ kasut | | |
| 5 | Baldi | | |
| 6 | Alat Bancuhan Racun (Silinder) | | |
| 7 | *Plastik Sheet* | | |
| 8 | Fail kampung/ Profil lokaliti (GR) | | |
| 9 | Buku catatan dan reten | | |
| 10 | Kad Rumah | | |
| 11 | Sabun (untuk Cuci Tangan) | | |
| | | | |
| | | | |

Disediakan oleh

Nama :

Jawatan :

Tarikh :

Disemak oleh

Nama :

Jawatan :

Tarikh :

## APPENDIX 12: NOTICE FOR MASS DISTRIBUTION OF ITN/ LLIN

**KEMENTERIAN KESIHATAN MALAYSIA (KKM)**

**NOTIS PEMBERITAHUAN**

**AKTIVITI PENGEDARAN DAN PENCELUPAN KELAMBU/ PENGEDARAN KELAMBU UNTUK PENCEGAHAN DAN KAWALAN MALARIA**

Anggota Kementerian Kesihatan Malaysia (KKM) akan menjalankan aktiviti pengedaran dan pencelupan kelambu/ pengedaran kelambu pada _____.
Untuk makluman, kelambu yang diedarkan adalah selamat untuk digunakan. Tuan/Puan diminta untuk mengikut cara penggunaan kelambu seperti berikut:

1. Gantung dan ikat kelambu menggunakan tali untuk mengelakkan kelambu daripada koyak.
2. Tidur dalam kelambu setiap malam, sepanjang tahun, walaupun anda tidak melihat atau mendengar bunyi nyamuk.
3. Kelambu harus diselip di bawah tilam atau menyentuh lantai untuk mengelakkan nyamuk masuk ke dalam kelambu.
4. Basuh tangan anda selepas mengendali kelambu.
5. Jika berasa gatal setelah tersentuh dengan kelambu, basuh bahagian badan terdedah dengan air dan sabun.
6. Elakkan mencuci kelambu dengan kerap untuk mengelakkan kehilangan racun serangga yang terdapat dalam kelambu.
7. Hanya bilas kelambu dengan sabun dan air bersih dengan lembut bila terdapat keperluan. Contoh: terdapat habuk/ lapisan minyak pada kelambu.
8. Jangan bilas kelambu di sungai, tasik atau kolam.
9. Bawa bersama dan menggunakan kelambu jika perlu bermalam di hutan.
10. Jahit atau ikat bahagian kelambu yang didapati koyak.
11. Terus menggunakan kelambu yang ada walaupun kelambu tersebut mempunyai lubang/ rosak sehingga diganti dengan kelambu baru.
12. Gulung/ simpan kelambu pada waktu siang atau semasa tidak diigunakan untuk mengurangkan risiko dikoyak oleh kanak-kanak/ haiwan.

Unit Kawalan Penyakit Bawaan Vektor

Pejabat Kesihatan Daerah : _____

Jabatan Kesihatan Negeri : _____

Tarikh : _____

## APPENDIX 13: PROCEDURE FOR ASSESSMENT OF ITN/ LLIN FABRIC INTEGRITY

### Frequency of Assessment:

Fabric integrity assessment need to be done for all ITN/LLIN used in the field one year after distribution and anually thereafter. Hoewever LLIN used on the field for 3 years or more need to be replaced regardless of fabric integrity assessment.

### Fabric Integrity Assessment Tool

Print out the fabric integrity assessment tool on A4 Paper with the accurate measurement **(APPENDIX 14)** to bring to the field.

### Method to used Fabric Integrity Assessment Tool

Make sure the LLIN/ITN is hanging properly with all sides are easily visible in a place with sufficient sunlight.

1. Start the fabric integrity assessment using the Fabric Integrity Assessment Tool (**APPENDIX 14**) by searching for the biggest hole on the ITN/LLIN including the roof of ITN/LLIN.

   **Note:**
   Open seam are treated as holes. However, a hole that is fully repaired is not counted as hole.

2. Shade the number of holes size found on the Hole Measurement Tool.

3. As a quick guide, LLIN/ITN should be replaced when one of the holes sizes combination in **Table 3** is fulfilled. Holes size less than 2cm (size A) can be ignored. Once any of the holes combination fulfilled, discontinue the fabric integrity assessment and replace the ITN/LLIN immediately.

**Table 3: Quick Guide for ITN/LLIN replacement**

| No. | Holes sizes Combination | | | | pHI |
|---|---|---|---|---|---|
| | D | C | B | A | |
| | > 25.0 cm | 10.0 – 25.0 cm | 2.0 – 10.0 cm | 0.5 – 2.0 cm | |
| i | 2 | | | | 1156 |
| ii | 1 | 1 | | | 774 |
| iii | 1 | | 3 | | 647 |
| iv | | 4 | | | 784 |
| v | | 3 | 3 | | 657 |
| vi | | 2 | 11 | | 645 |
| vii | | 1 | 20 | | 656 |
| viii | | | 28 | | 644 |

## APPENDIX 14: ITN/ LLIN FABRIC INTEGRITY ASSESSMENT TOOL

**KEMENTERIAN KESIHATAN MALAYSIA**

**PENILAIAN INTEGRITI ITN/LLIN BAGI TUJUAN PENGGANTIAN**
(Gunakan satu borang untuk satu kelambu)

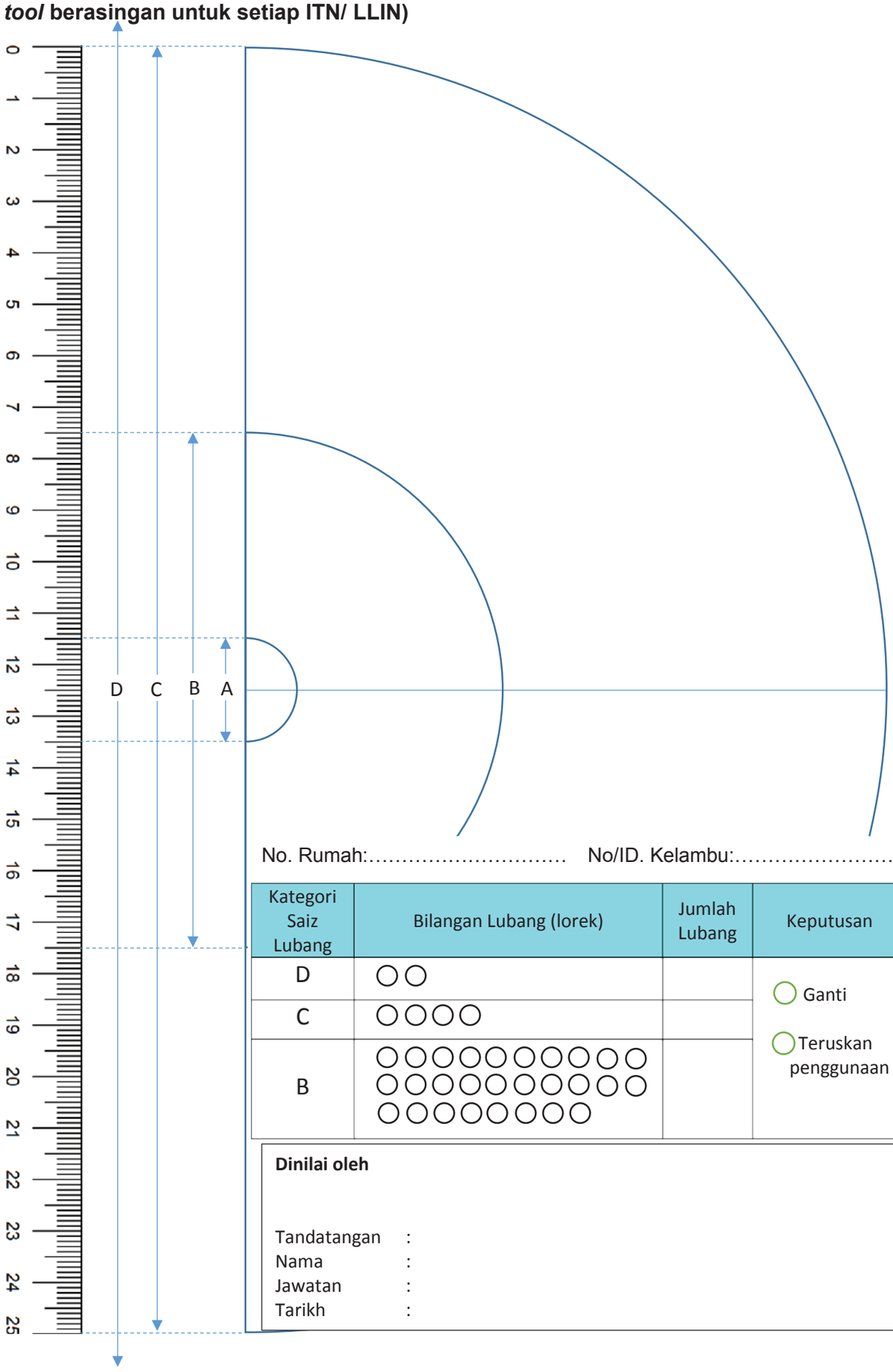
### A. Panduan Penilailan Integriti ITN/LLIN

i. Penilaian integriti dijalankan ke atas semua ITN/LLIN dijumpai di lapangan.
ii. Pastikan ITN/LLIN digantung dengan baik dengan setiap sisi ITN/LLIN dapat dilihat dengan jelas.
iii. Mula dengan mencari lubang terbesar yang dapat dijumpai pada ITN/LLIN termasuk bumbung ITN diikuti dengan saiz lubang yang lebih kecil menggunakan ITN/LLIN *Fabric Integrity Assessment Tool*.
Catatan: Jahitan terbuka pada ITN dianggap sebagai lubang. Namun, lubang yang telah dijahit/ dibaiki sepenuhnya tidak dianggap sebagai lubang.
iv. Lorekkan bilangan lubang yang dijumpai pada setiap ITN/LLIN pada *ITN/LLIN Fabric Integrity Assessment Tool*.
v. Sebagai panduan, ITN/LLIN perlu diganti apabila salah satu daripada kombinasi size lubang seperti dalam Jadual 1 dipatuhi. Size lubang kurang daripada 2cm (Size A) boleh diabaikan.
vi. Tiada keperluan untuk meneruskan penilailan integriti ITN/LLIN sekiranya kombinasi size lubang telah dipatuhi.

**Jadual 1: Kombinasi Saiz Lubang IT/LLIN untuk Tujuan Penggantian**

| No. | Kombinasi Size Lubang | | | |
|---|---|---|---|---|
| | D | C | B | A |
| | > 25.0 cm | 10.0 – 25.0 cm | 2.0 – 10.0 cm | 0.5 – 2.0 cm |
| i | 2 | | | |
| ii | 1 | 1 | | |
| iii | 1 | | 3 | |
| iv | | 4 | | |
| v | | 3 | 3 | |
| vi | | 2 | 11 | |
| vii | | 1 | 20 | |
| viii | | | 28 | |

**B. PENILAIAN INTEGRITI ITN/LLIN (gunakan ITN/ LLIN *fabric integrity assessment tool* berasingan untuk setiap ITN/ LLIN)**




No. Rumah:…… No/ID. Kelambu:……

| Kategori Saiz Lubang | Bilangan Lubang (lorek) | Jumlah Lubang | Keputusan |
|---|---|---|---|
| D | ○ ○ | | ○ Ganti<br>○ Teruskan penggunaan |
| C | ○ ○ ○ ○ | | |
| B | ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ | | |

**Dinilai oleh**

Tandatangan :
Nama :
Jawatan :
Tarikh :