



PRESIDENT'S MALARIA INITIATIVE



INDOOR RESIDUAL SPRAYING  
FOR MALARIA CONTROL

# Indoor Residual Spraying (IRS) for Malaria Control Indefinite Quantity Contract (IQC) Task Order 1

IRS Training Guide for Spray  
Operations

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# **Indoor Residual Spraying (IRS) for Malaria Control Indefinite Quantity Contract (IQC) Task Order 1**

IRS Training Guide for Spray Operations

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Prepared for  
United States Agency for International Development

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## Abbreviations

CD com	compact disc
CDS	Communicable Diseases Surveillance and Response
CFR	Code of Federal Regulations
cm	centimeter
COP	chief of party
DDT	dichloro-diphenyl-trichloroethane
DHMT	district health management team
ESD emp	empty sachets disposed
FAO	Food and Agriculture Organization
GCDPP	Global Collaboration for Development of Pesticides for Public Health
HH hous	hold
IEC	information, education, and communication
IPC Inter	personal communication
IQC	indefinite quantity contract
IRS	indoor residual spraying
ITN in	insecticide-treated net
IVM	Integrated Vector Management
km	kilometer
kg	kilogram
kPa	kilopascal
L I	liter
LCD	liquid crystal display
LLIN	long-lasting insecticidal net
M m	meter
M&E	monitoring and evaluation
ml m	milliliter
MOH	Ministry of Health
MOP M	Malaria Operational Plan
MSDS	Material Safety Data Sheet
NMCP	National Malaria Control Program
PEA	programmatic environmental assessment
PMI	United States President's Malaria Initiative
PPE	personal protective equipment
psi	pressure per square inch
PVC pol	polyvinyl chloride
SAE	Society of Automotive Engineers
SEA suppl	supplemental environmental assessment
SIS	sachets in stock
SOP	standard operating procedure
SR stor	storekeeper's report
TA technic	technical assistance
TOT	training of trainers
USAID	United States Agency for International Development
WHO	World Health Organization
WHOPES	WHO Pesticide Evaluation Scheme
WP w	wettable powder

## Using This Manual

This training manual concentrates on essential indoor residual spraying (IRS) concepts and applications. Elements of the manual may vary by location according to your participants' needs, country requirements, and other factors.

The training relies on lectures, demonstrations, exercises, and group discussions. It covers:

- General concepts of IRS
- Practical application sessions, including the use of tanks to spray walls with water
- Capacity strengthening and program management processes and reporting needs
- Malaria prevention and control interventions that emphasize IRS methodologies and equipment

### **A. Training Duration**

The time required depends on participants' knowledge of and experience with IRS. In general, it requires 5–12 full working days. However, a class with participants who are more familiar with IRS may involve only 3–4 days of training.

### **B. Participants**

The target cadre of this training is public health workers at national and sub-national levels and community level staff selected to participate in the IRS Project. **Annex 1** provides an illustrative list of trainees and trainers. The training is designed, in particular, for trainers of spray operators.

Other cadres with an interest and background in public health and malaria prevention may also benefit from this training. Participants are selected on the basis of their current work in health or involvement in community activities that enable them to successfully implement an IRS operation. Literacy and numeracy are key prerequisites for this training. Participants should ideally be members of the communities selected for the IRS implementation.

The ideal number of participants per class section is 25–30, with a minimum of two experienced trainers. Larger groups may be divided among more trainers, or multiple sessions may be held. **Annex 2** offers an example of a five-day training schedule. **Annex 3** provides instructional guidance and examples of practical activities.

### **C. Pre- and Post-training Assessment**

The same instrument, provided in **Annex 4**, is used for pre- and post-training measurements. The specific purposes of the pre-course assessment are to

- Evaluate participants' current level of knowledge of malaria and IRS.
- Enable trainers to tailor the materials according to participants' knowledge and the overall training objectives.

Trainers should carefully review the pre- and post-training assessment. Trainers of trainers (TOTs) are required to complete the assessment to determine their

knowledge and competency, and the scores form part of the training evaluation. The assessment is not a threshold examination or certification instrument. It is used to measure trainees' IRS knowledge before and after the training. It can also assist in the selection of team leaders and supervisors from the operators who are trained.

Based on the pre-course assessments, trainers will

- Adapt this guide to fit each group of trainees according to their gaps in knowledge and skills.
- Set clear learning objectives for each session, in concert with the objectives provided in the manual, with participatory and practice sessions based on adult learning techniques.
- Develop session plans and certificates of attendance.

Trainers will rate spray operator participants on performance and compliance with IRS and other standards, such as community relations, hygiene, safety awareness, and adherence to safety requirements.

#### **D. Training Documents**

- *IRS Training Guide for Spray Operations* (this document).
- Material Safety Data Sheets (MSDS). An MSDS provides information about a chemical and the potential hazards or dangers that may occur when using it. An MSDS accompanies each pesticide used for IRS. Trainers should provide an up-to-date MSDS for the product that will be used in an actual spray round. MSDSs are available on vendor Web sites and from insecticide vendors.
- National pesticide storage and transport guidelines (as available). Most countries have national guidelines on pesticide import, storage, use, and disposal.
- Food and Agriculture Organization (FAO) *Pesticide Storage and Stock Control Manual*. Available on the Internet,<sup>a</sup> the FAO manual is a valuable training resource. Ensure that a printed copy is available at all training sessions.
- Pesticide Exposure Treatment Guidance (from national guidelines or RTI). Clinicians train separately to prepare for IRS spray rounds. Trainers need to have the guidance used in clinicians' training to ensure consistency of first aid and other information.

#### **E. Preparing Materials**

Prepare all materials before the training begins. Supplies, equipment, and instructional materials used during the training are listed below, with quantities based on a class size of 30 participants. **Annex 5** offers a categorized list of items to assist with budgeting and procurement.

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<sup>a</sup> <http://www.fao.org/docrep/V8966E/V8966e00.htm>

## Requirements for a Class of 30 Trainer Participants

For lecture sessions:

- Ballpoint pen (30)
- Pencil with eraser (30)
- Black marker (30)
- Blank flip chart (3 with 20 sheets each)

For exercise sessions:

- Compression sprayer (30)
- Box of chalk (1)
- 10-liter (L) Bucket (30)
- Measuring cylinder (30)
- Set of personal protective equipment (PPE) (30)
- 1-meter (M) rule (1)
- Nylon string (100 M)
- 6-inch nails (1 kg)

For participants:

- Training guide (30)
- Handouts; e.g., spray round-related materials in local language; forms for spray operators, team leaders, supervisors (30 copies of each)
- Notepad (30)
- Course schedule (30)
- Pre-test assessment for trainers (30)
- Post-test assessment for trainers (30)

For trainers:

- Training guide (2)
- Course schedule with roles
- Projector
- Laptop computer
- Printer/copier
- Large training room
- Blank wall 2½ to 3 meters high and 20 meters long

### **F. Customizing This Training**

Trainers, carefully assess this manual for its application to your training needs so you can ensure that participants reach the highest level of mastery of IRS knowledge and skills. You may adapt this training according to your country's laws and regulations for pesticides, participant experience, culture, local housing types and conditions, and other factors. You will need to

- Review all materials provided with the training, including annexes.

- Study the overall training objectives and the section objectives. Decide how you will apply them to the training in your context. Based on your assessment, adapt the materials in this manual and prepare practices, activities, and supplements, if needed, to develop participants' knowledge and skills.
- Re-assess your instructional strategies during the training. You may need to repeat some material, provide additional practice opportunities, identify and work with participants who need individual assistance.

Remember: Time invested in training pays dividends later. It costs more to address problems when operators are in the field than to help prevent them through training.

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# 1. Introduction

This training guide is funded under the Indoor Residual Spraying (IRS) 1 agreement, a five-year, 15-country malaria vector control project implemented by RTI International since 2006. The contract includes extensive in-country training for IRS implementers. This manual responds to the need to have a consistent set of IRS training modules for field teams.

The IRS project is funded by the United States President's Malaria Initiative (PMI) through the United States Agency for International Development (USAID).

The purpose of the IRS program is to support PMI-supported countries in planning and implementing IRS programs, with the overall goal of reducing the burden of malaria in Africa. The overall objectives of IRS are to

- Procure insecticides and equipment necessary for the IRS programs.
- Provide operational management support for the programs.
- Ensure compliance with environmental regulations in accordance with Title 22 Code of Federal Regulations 216 (22 CFR 216).
- Provide short- and long-term technical assistance for IRS activities.
- Provide training and capacity building for safe and effective spraying in accordance with World Health Organization (WHO) guidelines.

## 1.1 *About This Training Guide*

This training was prepared by RTI to strengthen the knowledge and skills of the following health workers and community volunteers involved in delivering IRS to their communities:

- Spray operators
- Program staff
- Supervisors
- Team leaders
- Chiefs of party
- Logisticians

## 1.2 *Training Goal and Objectives*

The goal of this training is to build the capabilities of participants from affected communities, Ministries of Health, National Malaria Control Programs, and other partners to plan for and implement safe and effective IRS operations.

Participants in the training are expected to develop a command of national malaria prevention and control policies, the principles of IRS, community mobilization and advocacy techniques, logistics, and monitoring and evaluation needs. Most importantly, the course introduces trainees to the practical aspects of delivering IRS.

### Overall Training Objectives

- Review the history of IRS, insecticide-treated nets (ITNs), and other vector control measures.
- Review the World Health Organization (WHO) principles for the safe applications of residual insecticides.
- Given scenarios, develop specified elements of plans for a spray operation.
- Differentiate spraying requirements according to type of structure.
- Given scenarios, calculate the amount of insecticide required to safely spray structures.
- Name all items required for IRS personal protective equipment.
- In practice sessions, correctly apply WHO IRS hygiene standards.
- In a practice session using a compression sprayer, demonstrate correct and safe application for residual insecticides, according to WHO principles.
- In a practice session, demonstrate correct maintenance of a compression sprayer.
- Name the steps of a progressive rinse.
- Given scenarios, specify the steps required to dispose of liquid and solid insecticide wastes.
- Given scenarios, explain how to safely transport IRS insecticides.
- Given scenarios, explain how to safely store IRS insecticides.
- Discuss the supervisory roles of IRS operations.

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## 2. History of Indoor Residual Spraying

### Objectives

- Define indoor residual spraying.
- Define integrated vector management.
- Review the history of IRS.

**IRS** is “the application of residual insecticides (to which *Anopheles* female mosquitoes have been demonstrated to be susceptible), to the interior walls of houses and other structures”<sup>1</sup> where people sleep and where the vector mosquitoes rest after taking a blood meal. IRS interrupts the cycle before the female mosquito can further transmit the infection.

A **vector** is an insect or animal that transmits disease. The female *Anopheles* mosquito is a vector that transmits malaria to humans and animals. There are approximately 460 species of *Anopheles* mosquitoes, but only 30–40<sup>2</sup> of them carry malaria. Most malaria transmission in Africa is transmitted by a few mosquitoes, especially *A. gambiae*, *A. funestus*, and *A. arabiensis*.

The history and benefits of IRS are well documented. In Asia and the Americas, IRS is a widely used malaria vector control method that quickly reduces transmission in endemic areas and prevents transmission in areas of seasonal malaria. If properly timed, IRS can prevent epidemic malaria.

“IRS has been used for decades and has helped to greatly reduce or eliminate malaria from many areas of the world, particularly where mosquito vectors are indoor-resting and where malaria is seasonally transmitted. In sub-Saharan Africa, the best data supporting the use of IRS comes from the 1970s Garki Project in the Nigerian savanna, where 25 to 30 percent reductions in infant mortality rates were documented in sprayed villages as compared to unsprayed villages. More recently, a large-scale multi-country project in the Republic of South Africa, Swaziland, and Mozambique and another project on Bioko Island, Equatorial Guinea, have demonstrated the feasibility and impact of IRS on malaria in sub-Saharan African settings.”<sup>3</sup>

“The key constraint to implementing IRS programs is the need for long-term human and financial resources for regular spray campaigns. This constraint is especially difficult where the level of transmission is so low that it is difficult to justify funds for this purpose.”<sup>4</sup> The famous case demonstrating the need for continued resources for IRS is in Sri Lanka, where IRS reduced malaria cases from 1.3 million in 1945 to only 17 in 1963. However, DDT spraying was halted in 1964, and there was an epidemic in 1968. By 1971, approximately 600,000 cases per year were reported.<sup>5</sup>

In addition to the challenge of sustained funding, “IRS is demanding in terms of planning, logistics, infrastructure, skills required and coverage levels that are needed for a successful intervention. Reaching areas without roads, particularly during the rainy season, may be exceedingly difficult. Other major constraints are mosquito resistance to insecticides and the reluctance of the home owners to have their houses sprayed,”<sup>6</sup> or in some situations, their washing of the walls or replastering

after insecticide has been applied. Faced with these financial and operational constraints, many of the large malaria eradication programs began to decrease.

By the mid-1970s, the eradication strategy had shifted to a longer-term control strategy. Many of the vertical programs in Africa were disbanded and malaria control was integrated into district environmental health officers' functions. Although early attempts in the 1940s to treat mosquito nets with DDT were unsuccessful, pyrethroid insecticides were developed and successfully applied to nets in the 1980s. As **insecticide-treated net** (ITN) technology evolved into **long-lasting insecticidal nets** (LLINs), the function of nets shifted from the protection of vulnerable individuals, such as pregnant women and children under age five, to community-wide coverage and real mass effect impact on the size and longevity of the local vector population.

IRS programs in some countries—especially South Africa and Swaziland—continued to be successful during this period. In the late 1990s and early part of this century, we began to see further resurgence of successful IRS programs, notably among the private sector with interests in oil (Equatorial Guinea), gold (Ghana), aluminum (Mozambique), and copper and sugar (Zambia). This model sparked a renewed interest in the power of IRS, which is now being expanded throughout many countries with funding from PMI, the World Bank, Global Fund, and other donors.

There are many similarities in the way IRS is currently implemented and the strategy adopted in the 1950s and 1960s, including the use of the same basic equipment and tactics, but there are also significant strategic differences. IRS is currently implemented in the context of **integrated vector management** (IVM)—a rational decision making process for the optimal use of resources for vector control. The IVM approach entails a set of malaria control interventions that countries can choose to work optimally toward control of the malaria vector. The most common malaria control strategies include IRS, use of larvicides (insecticides) to control specific species, administration of a new generation of antimalarial drugs, treatment of new cases of malaria, and the use of ITNs. In the 1950s there were no ITNs, and in areas where larval control was not effective—such as in large parts of rural Africa—only IRS was available. With ITNs, programs have options to use IRS and ITNs in combination, so that IRS quickly knocks down transmission and ITNs supplement and sustain the effect.

### 2.1 *IRS and Insecticide-treated Nets*<sup>7</sup>

ITNs and LLINs are highly effective in preventing malaria infection and reducing malaria transmission. Consistently sleeping under an ITN decreases severe malaria by 45%, reduces premature births by 42%, and reduces overall child mortality by 17 to 63%. ITNs not only offer a degree of personal protection to those sleeping under the net, but also to residents who are not sleeping under ITNs when community-wide coverage rates reach 80% or more. This “mass effect” or “community effect” suggests that the use of ITNs in an area of intense malaria transmission may reduce the overall mosquito population in addition to reducing human-vector contact.

WHO and PMI support the use of both IRS and ITNs as part of an appropriate cost-effective IVM program for malaria control. Both IRS and ITNs are effective tools to prevent malaria. The method used should be based on local epidemiological characteristics, acceptability to residents, and timely access to communities. Where IRS is deemed to be appropriate, the insecticide of choice for IRS should be based

on the registration status by the national regulatory authorities, the length of the malaria transmission season, the materials with which local buildings are constructed, acceptance by residents, and the insecticide susceptibility profile of the mosquito vector populations. The selection should be part of a long-range pesticide management plan. A total of 12 insecticides, including DDT, have been approved for use in IRS programs by the *WHO Pesticide Evaluation Scheme* (WHOPES). Because adverse environmental impacts have not been associated when DDT is used correctly in IRS for malaria control, PMI supports the use of DDT where the mosquito vector populations are susceptible to DDT, and where there is a need for a long-effective insecticide.

Based on studies to date, IRS and ITNs appear to be equally effective when implemented with high coverage. Both interventions have been shown to have a community effect on vector populations when implemented at high coverage levels. In addition, unlike IRS, ITNs offer a degree of personal protection at lower coverage levels. The cost-effectiveness for each intervention varies by country, with IRS being more cost-effective in some countries, and ITNs more cost-effective in others. However, cost only one criterion, and other factors—including acceptance and appropriate use of ITNs, practicality, speed of impact, and other cultural and entomological factors—must be considered. The choice between IRS and ITNs depends not only on short-term epidemiological impact, but also on feasibility and sustainability in the long term and at a large scale, and on the availability of appropriate delivery systems.

## **2.2 Guidelines on the Use of IRS and ITNs for PMI Countries**

Universal community coverage of all residents with either ITNs or IRS offers significant protection for high-risk and vulnerable target groups, such as pregnant women and children, through the mass killing of mosquitoes when all community members sleep under an ITN or all structures are sprayed. In the context of IVM and the rationalization and optimization of vector control, all strategies should include, at a minimum, entomological monitoring to determine the presence and seasonality of the vectors, insecticide susceptibility tests to determine the efficacy of the chemical, and the bioassays of either the sprayed surfaces or netting to determine the effectiveness of the application. Additional entomological or epidemiological monitoring may be included on a case-by-case basis.

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### 3. Principles of IRS

#### Objective

- Review the WHO principles for the safe application of residual insecticides.

IRS is sometimes compared to a military exercise because of the level of planning, discipline, and execution necessary for success. A successful IRS program requires:

1. Precise planning, preparation, and logistics
2. Dedicated and disciplined spray operators, well-organized and diligent supervisors, and good data recording, communications, and community relations
3. Staff for payroll, procurement, environmental compliance, and other tasks

Supervision is essential. The most important and difficult to control part of an IRS program is the performance of spray operators in applying the appropriate dose of insecticide on a wall, handling insecticides properly, establishing good communications with structure owners, and properly recording data.

The following WHO principles<sup>8</sup> underlie a successful IRS program:

- Evaluate pesticide application routinely to determine effectiveness.
- Distribute training and resource manuals in the local language to staff, based on WHO documents or an equivalent source.
- Require certification and refresher or update activities at all management and supervisory levels.
- Provide protective clothing and other personal protective equipment to minimize worker exposure to pesticides; and use should be enforced.
- Maintain pesticide application equipment properly (including calibration). Staff should apply pesticides safely and effectively according to best management practices as outlined by WHO.
- Ensure that the application of pesticides is selective and targeted in space and time.
- Keep accurate records of application sites, amounts, and dosages of pesticides used and of worker exposures.
- Put procedures in place to prevent unauthorized applications and to monitor exposure and poisoning incidents and the misuse of pesticides.
- Apply pesticides as instructed on the label to ensure safety and efficacy and in a manner that prevents environmental contamination.
- Monitor community participation in control activities (e.g., treatment of mosquito nets) to ensure safe and effective practices.

Public health pesticide application equipment and other products require routine maintenance and calibration. Dedicated human and financial resources should be available for this purpose. Adequate inventories of pesticides, equipment, and replacement parts must be maintained. Inadequacies in any of these areas could

make it impossible to correctly apply the necessary materials at the appropriate times for disease intervention.

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## 4. Planning for IRS

### Objectives

- Given a scenario, create specified elements of an operational plan.
- Name the administrative level at which an IRS operational plan should be developed.
- Describe data collected during geographic reconnaissance of target IRS areas.
- Explain how existing demographic data can be combined with target area data for IRS planning.
- Specify the cadres of human resources required for IRS.
- State the general timing requirements for conducting environmental assessments for IRS.
- Describe logistic factors that are involved in the IRS cycle.
- Describe the best time to conduct IRS.
- Given a list, select surfaces that should and should not be sprayed.
- Given scenarios, estimate the average surface area of sprayable structures.
- Given scenarios, calculate the total surface area of all structures to be sprayed in an IRS target area.

### 4.1 *Estimating IRS Target Area Demographics*

Estimate the population of a target area by using the most recent national census adjusted for growth, and other data such as head counts, voter or taxation records, public health records, and/or school records. Determine the epidemiology of malaria in the proposed spray area based on existing national policy and strategic frameworks, including the endemicity, and morbidity and mortality burden; economic and social implications for the communities; the history of malaria prevention and control; and the most common vector and parasite species.

Other parameters described in the logistics plan include the following:

- Organizational structure through which malaria is managed in the country, how malaria control fits into national frameworks, and whether malaria control is part of a set of integrated interventions or a vertical stand-alone program
- Resources already available including personnel, infrastructure, policies, and previous plans, or lack of resources
- Media and communications plan
- Training plan
- Storage, staging, and transportation plans
- Data management plan
- Structure types and sprayable structures/surfaces
- Daily spray schedules

### 4.2 *Developing a Timeline*

IRS is a time-sensitive intervention, and the timing and synchronization of activities are critical success factors. Table 4-1 shows the actions required before, during, and

after IRS. This information enables all parties to prepare for implementing actions and deliverables on time. **Annex 6** provides the IRS monitoring and evaluation (M&E) indicators.

Refer to this table and discuss its components during spray operator training.

**Table 4-1: Generic Timeline for IRS Program Activities**

Activity	Months Before and After IRS Operations									
	-6	-5	-4	-3	-2	-1	Spray Operations		+1	+2
							1	2		
<b>Partner/IRS Strategy Meetings</b>	X			X		X	X	X		X
Conduct bimonthly meetings (strategy, pesticide selection, spray location, timing of operations, etc.)	X	X	X	X	X	X	X	X	X	X
Establish country technical IRS committee (involve relevant ministries and partners)				X						
<b>Needs Assessment (Field Visit)</b>										
Environmental assessment	X									
Logistics, financial, and administrative assessment	X									
Entomological and epidemiological data collection	X									
Draft environmental assessment	X	X								
Draft budget	X	X								
<b>Environmental Compliance</b>										
Revise and approve environmental assessment and budget		X	X	X						
Environmental monitoring						X	X	X	X	X
Environmental compliance inspections						X	X			
<b>Entomological Surveillance</b>										
Identify/train technicians				X						
Baseline survey					X					
Periodic surveillance						X	X	X	X	X



Activity	Months Before and After IRS Operations									
	-6	-5	-4	-3	-2	-1	Spray Operations		+1	+2
							1	2		
<b>Logistics and Procurement</b>										
Issue requisitions	X									
Pesticide and equipment delivered					X					
Detailed planning and geographic reconnaissance		X	X	X						
Quality control/product delivery		X								
Logistics arrangements			X	X	X	X				
<b>Information, Education, Communication (IEC) Activities</b>										
Formative research/develop IEC materials		X	X							
Produce IEC materials				X	X					
Supervisor and implementer training						X				
IEC in coordination with IRS operations						X	X	X		
Post-spray survey									X	
<b>IRS Operations</b>										
Geographical reconnaissance/mapping			X	X	X					
Development of guideline for spraying operators (local language)			X	X	X					
Administrative and data management team training				X	X					
Supervisor and operator training						X				
Physician training (pesticide management)						X				
Medical checkup for sprayers						X				
IRS launch day setup						X				
Spraying operations							X	X		
Inventory and operational assessment									X	

Activity	Months Before and After IRS Operations										
	-6	-5	-4	-3	-2	-1	Spray Operations		+1	+2	
							1	2			
<b>Post-operation Plan</b>											
Closing ceremony										X	
Prepare preliminary/complete activity description form										X	
Maintenance of equipment										X	
Incineration of sachets (if required)										X	X
Medical check up for sprayers										X	
District meeting (open forum with community)											X
Debrief meeting with Ministry of Health (MOH) and USAID										X	X
<b>IRS Review and Report</b>										X	X

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### 4.3 Preparing an Operational Plan

After stakeholders reach consensus on the target sites and state the objective of the campaign, an effective IRS program requires a sound **operations plan** that defines the geographic area, the methods and procedures of spraying, duration of the program, personnel requirements, supplies, equipment, estimated cost, and the amount of insecticide needed.

#### Sample Campaign Objectives

- Preventing epidemics
- Reducing disease due to malaria
- Safeguarding economic development
- Protecting high-density population situations

Develop an operational plan at the lowest administrative level possible, such as at sub-district or district level, depending on available capacity. Include both logistic and operational components in the plan.

An operational plan needs to

- Consider when to spray and when to end spraying. Plan to complete IRS before rains are expected to start.
- Consider the efficacy of insecticides.
- Quantify insecticides (calculated on the basis of the number, size, and construction materials of sprayable surfaces), spray pumps, spare parts, and PPE according to the number of operators to be deployed per day and the duration of the operation. Include the expected breakdown rates of equipment.
- Estimate transportation needs according to distances to be covered and where the spray teams are based.
- Calculate the financial expenditure for the entire spray operation, including transportation.
- Determine how to recruit and train permanent and temporary spray staff, such as spray operators, team leaders, supervisors, field officers, logisticians, warehouse managers/storekeepers, washers, guards, and drivers.
- Prepare clear terms of reference for all staff who will be involved in the spraying program.
- Include baseline data collection, M&E, and training for operators, supervisors, drivers, health facility staff, store clerks and washers.
- Prepare reporting system and forms.
- Determine a management plan by preparing supervision programs and a supervision checklist. **Annex 7** offers an example of a checklist for supervisors of spray operators.
- Plan for safety. Prepare guidelines for safe handling of insecticides, and depending on the insecticide selected, include either evaporation tanks or soak pits and ablution facilities.
- Include contingency measures for anticipated problems.

#### 4.3.1 Timing of Operations

The timing for spraying is determined by information from the MOH and partners, and by meteorological data.

Local factors that influence malaria transmission determine the best timing for IRS. Generally, it is most effective to conduct IRS when the ability of vectors to survive is lowest—just before conditions are best for vectors to breed. Examples of local conditions that increase vectors are

- Rainfall
- Temperature
- Humidity

The International Research Institute for Climate and Society hosts an interactive Web-based program that graphically displays the index of these factors.<sup>a</sup> IRS program staff routinely use the site to plan and schedule the optimal period for spray operations; i.e., when IRS operations will have the greatest impact in reducing malaria transmission.

### **4.3.2 Planning for Human Resource Requirements**

A variety of personnel, including support and administrative, are necessary to complete a successful spray operation.

To estimate the number of spray operators required to undertake the campaign: Divide the number of structures to be sprayed by the average estimated structures per day per spray operator by the proposed period of spraying. For example: 50,000 structures to be sprayed; 8 structures can be sprayed by one operator each day; 6 weeks for operations; 6 day work week would equal around 175 spray operators.

Other cadres of personnel, such as team leaders, supervisors, and sub-district managers, can be estimated on the basis of the size of the spray teams, number of teams in a sub-district, and number of sub-districts in a target site such as a district. A spray team usually consists of no more than eight operators with one team leader. A supervisor supports about five spray teams and works from one location or sub-district.

Other support staff at the sub-district level include washpersons responsible for cleaning PPE; security guards to look after the facility, especially at night; and a storekeeper responsible for all equipment, insecticide, and other items. The sub-district usually has an MOH sub-district manager who is the overall responsible officer for the sub-district and recruits and selects spray operators and team leaders. This approach aims to build capacity at the sub-district level to sustain future IRS campaigns. Approximately one information, education, and communication (IEC) mobilizer is necessary for every 10 spray operators.

The RTI chief of party (COP) is responsible for selecting and hiring district and sub-district managers. These individuals are selected in consultation with the NMCP and the MOH. The district and sub-district coordinators plan IRS activities jointly with their respective government counterparts and political leaders at the district and sub-district levels.

Table 4-2 summarizes human resources needed for a round of IRS.

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<sup>a</sup> <http://ingrid.ldgo.columbia.edu/maproom/.Health/.Regional/.Africa/.Malaria/.CSMT>

**Table 4-2: Human Resources Requirements for an IRS Round**

Category	Number
Chief of party	1
Logistics manager	1
Finance manager	1
Monitoring and evaluation/Technical officer	1
Data manager	1 per 100,000 pop.
Spray operators	5–8 per spray team
Team leaders	1 per spray team
Team supervisors	1 for 3-5 spray teams
District/field coordinators	1 or 2 per district
Storekeepers	2 per store
Administrative support	as needed
Security	sufficient to guard stores around the clock when insecticides are present
IEC personnel	sufficient number to visit each household to be sprayed

#### 4.4 Recruiting and Training Spray Operators

Selection and recruitment of IRS and IEC personnel occurs at the district and sub-district levels. Community and health officials conduct selection of candidate spray operators. RTI community and district-based coordinators and their health counterparts work with these personnel and build the teams for IRS and IEC.

Training proceeds in two phases. The first phase is for TOTs, involving team leaders, supervisors, sub-district managers, and government counterparts for approximately five days. Then, these TOTs will in turn train their teams for 5–14 days upon return to their respective sub-districts.

Selection of spray operators should consider the following criteria:

- Age—observe legal age for employment
- Pregnancy status—females must not be pregnant or breastfeeding (pregnancy tests are conducted during medical exams)
- Level of education—junior secondary school education or better

- Literacy/numeracy—able to read, write, and count
- Physical fitness
- Allergy—not allergic to insecticides and no respiratory problems
- Level of motivation—strong interest in IRS and capable of working under minimal supervision

### **4.5 Conducting Environmental Assessments**

Insecticides in PMI-supported IRS operations are used in accordance with both national and USAID-specific environmental regulations. Environmental assessments used in the IRS program are the

- Programmatic Environmental Assessment (PEA)
- Supplemental Environmental Assessment (SEA)
- Country-specific environmental assessments, as required

#### **4.5.1 Assessment Team**

The assessment team comprises environmental scientists, logistics specialists, technical officers, and representatives from each of the key local government stakeholders.

Following preliminary discussions with key stakeholders and before the start of operations, the team visits the IRS target sites. Additional meetings should also be held at the local level to engage local leaders and enable them to participate in the assessment. This team will arrange meetings with district officials to gather detailed information about the following:

- At-risk population
- Field conditions in the proposed spraying sites
- Infrastructure, such as available storage sites
- Security conditions
- Potential insecticide disposal sites
- Availability of water and vehicles
- Human and other resources

Next, the assessment team makes scoping and reconnaissance visits to villages in IRS target areas to determine variables such as average sleeping structure size, construction types, distance between structures, and road access.

#### **4.5.2 Assessment Requirements**

Within the USAID regulations, the overall PEA describes the 12 insecticides that are recommended for use in IRS. Figure 4-1 lists these 12 insecticides, which have been approved by WHO.

Figure 4-1: IRS Insecticides Recommended by WHO<sup>9</sup>

WHO recommended insecticides for indoor residual spraying against malaria vectors

Insecticide compounds and formulations (1)	Class group (2)	Dosage (g a.i./m <sup>2</sup> )	Mode of action	Duration of effective action (months)
DDT WP	OC	1-2	contact	>6
Malathion WP	OP	2	contact	2-3
Fenitrothion WP	OP	2	contact & airborne	3-6
Pirimiphos-methyl WP & EC	OP	1-2	contact & airborne	2-3
Bendiocarb WP	C	0.1-0.4	contact & airborne	2-6
Propoxur WP	C	1-2	contact & airborne	3-6
Alpha-cypermethrin WP & SC	P	0.02-0.03	contact	4-6
Bifenthrin	P	0.025-0.05	contact	3-6
Cyfluthrin WP	P	0.02-0.05	contact	3-6
Deltamethrin WP, WG	P	0.02-0.025	contact	3-6
Etofenprox WP	P	0.1-0.3	contact	3-6
Lambda-cyhalothrin WP, CS	P	0.02-0.03	contact	3-6

(1) CS: capsule suspension; EC = emulsifiable concentrate; WP = wettable powder.  
 (2) OC= Organochlorines; OP= Organophosphates; C= Carbamates; P= Pyrethroids.

Note: WHO recommendations on the use of pesticides in public health are valid ONLY if linked to WHO specifications for their quality control. WHO specifications for public health pesticides are available on the WHO homepage on the Internet at <http://www.who.int/whopes/quality/en/>.

Countries in which USAID supports IRS must prepare an SEA. This assessment specifies classes of insecticides that can be used in the program (such as organophosphates, carbamates, pyrethroids, or organochlorines). It also states the steps, called the Safer Use Action Plan, that ensure the safe transport, use, and disposal of the insecticides. **Annex 8** provides a general checklist for environmental monitoring. In addition, a national government might require an environmental impact assessment before implementing a spray campaign.

A logistics needs assessment determines the material, logistic, and human resources, and the financial support required for the IRS program and its operational plan. All of these assessments should be completed at least four months before the scheduled start date of spray operations.

Procurement requirements for the campaign should also be determined several months in advance (depending on each country’s unique procurement process) to allow time for tender, bidding, and manufacture and shipment of the insecticide to meet the target start date.

#### 4.6 Performing IRS Geographic Reconnaissance

Team leaders, supervisors, sub-district leaders, and logisticians perform sites visits called **geographic reconnaissance** to update maps of existing structures and records. Community leaders should play a role in ensuring that all eligible communities take part.

IRS workers in the field must have up-to-date sub-district maps that show the positions of **sprayable structures**—buildings where people sleep. As they conduct a census to update the sub-district maps, a field team becomes familiar with the area of operation and prepares for pitfalls.

During reconnaissance, structures that no longer exist are crossed off the record, and new structures are added. The reconnaissance should note the following:

- Total population, including number of pregnant women and children under age five, which can be obtained from MOH reports and census data
- Number, construction type, and size of sprayable structures
- Clinics, schools, and religious structures that are used as sleeping places
- Physical features such as roads, and the best means of transportation to gain access to the area, sub-district, and structures to be sprayed
- Availability of water, such as rivers, wells, taps, springs, swamps, reservoirs

After data are updated in the field, technicians with mapping skills revise the maps. Print new maps in sufficient numbers to ensure that all team leaders, supervisors, sub-districts leaders, and district officers have up-to-date information.

### **4.7 Measuring Surfaces of Sprayable Structures**

The average size of the surface structure to be sprayed has to be calculated to determine all of the following:

- Amount of insecticide required
- Number of structures that can be sprayed by an individual spray operator in one day
- Amount of insecticide required per day
- Accurate dosage, by equating the quantity of insecticide actually used against the estimated amounts

#### **4.7.1 Estimating the Total Sprayable Surfaces in a Target Area**

The range of structure types in target spray areas can be classified based on construction materials and the size of the structures to be sprayed.

To estimate the total sprayable surface area in a geographic target area, measure a representative random sample of sleeping structures that were identified during reconnaissance.

Identify the common structure construction types and include them in the sample measurements. For instance, plastered and painted structures may represent 20% of the total sleeping structures in a target area district. Structures with mud walls and floors may represent 70%, and structures of half-wooden poles or straw with thatch roofs may make up the remaining 10%. Room sizes and sprayable surfaces should be estimated for each structure type. For the total, estimate the average number of rooms, along with the average sprayable area of the sleeping structures, in square meters.

Table 4-3 provides an example of sprayable structures in Rwanda.



**Table 4-3: Typical Sprayable Structure Types in Rwanda**

Description of Walls	Roof Type	Sprayable Rooms	Area (square meters)
Plastered and painted	Tile/metal	5–6	200–250
Mud surface	Metal	4–5	180–200
Rough mud surface	Metal thatch	1–3	120–150

Figure 4-2 shows examples of sleeping structures.

**Figure 4-2: Examples of Sprayable Structures**



*Structures with round thatched roofs, common in Uganda  
[Photo: RTI]*



*Structures in Tanzania [Photo: RTI]*





*Structures in Rwanda (Photos: RTI)*



*Structures in Angola [Photo: RTI]*

#### **4.7.2 Calculating the Sprayable Surfaces of a Sleeping Structure**

Table 4-4 is a job aid that describes the surfaces within sleeping structures that should be sprayed and those that should not be sprayed. These instructions are essential for calculating the amount of insecticide needed for the operation, and for spray operator training and supervision.

**Table 4-4: Surfaces That Should and Should Not Be Sprayed (Job Aid)**

Spray	Do Not Spray
<input checked="" type="checkbox"/> Structures—including all sleeping quarters	<input checked="" type="checkbox"/> Floor
<input checked="" type="checkbox"/> Non-metal ceilings	<input checked="" type="checkbox"/> Metal roof
<input checked="" type="checkbox"/> Outdoor eaves	<input checked="" type="checkbox"/> Metal door
<input checked="" type="checkbox"/> Wooden or straw doors	<input checked="" type="checkbox"/> Glass
<input checked="" type="checkbox"/> Underside of furniture	<input checked="" type="checkbox"/> Seating side of furniture (should be covered)
<input checked="" type="checkbox"/> Behind heavy furniture not taken outside	<input checked="" type="checkbox"/> Insides of cupboards
<input checked="" type="checkbox"/> Behind picture frames	<input checked="" type="checkbox"/> Newsprint wallpaper
<input checked="" type="checkbox"/> Both sides of the main door	<input checked="" type="checkbox"/> Beddings and cushions
	<input checked="" type="checkbox"/> Food stores/granaries
	<input checked="" type="checkbox"/> Curtains
	<input checked="" type="checkbox"/> Kitchens that are separate from the main living quarters
	<input checked="" type="checkbox"/> Latrines
	<input checked="" type="checkbox"/> Animal pens (depending on vector species)
	<input checked="" type="checkbox"/> Offices or commercial structures
	<input checked="" type="checkbox"/> Structures with people inside
	<input checked="" type="checkbox"/> People

Measure all dimensions with the tape in centimeters as accurately as possible. Measure the structure and the sprayable surfaces within it as shown in the example in Table 4-3, according to your local housing conditions. The sprayable surface area of partition walls and doors must be multiplied by two because both sides need to be sprayed. All sprayable surfaces within a structure must be measured and added to determine the total sprayable surface area per structure. Additions must also be made for non-metal ceilings, wooden or straw doors, and the undersides of immovable furniture. When all measurements are complete, calculate 10% of the total area, and add it to the total in square meters.

Use the following formulas to calculate the sprayable surface of a structure:

- **Rectangular structures:** Measure the length and width of the ceiling, walls, and eaves. If a structure has no ceiling, calculate the area of the roof by the formula of the area of two rectangles and obtain the area of the shorter sides by doubling the area of the triangle.
- **Round houses without partitioning walls:** Measure the radius of the house and use the formula Pi multiplied by the radius, multiplied by the height of the wall to the eaves, multiplied by 2 (or  $2\pi rh$ )<sup>b</sup>. Then add the area of the roof, which is obtained by the formula of the cone (radius of the house multiplied by Pi, multiplied by the length of the roof from the eaves to the center, or  $\pi rs$ ); or estimate the area using the area of a circle to represent the ceiling (Pi multiplied by the radius squared, or  $\pi r^2$ ).

### 4.8 *Calculating the Amount of Insecticide*

The choice of insecticide class for use in IRS depends on factors such as efficacy against local vectors, residual properties, safety parameters, acceptance by the population, cost implications, substrate to be sprayed, and approval by WHOPES. After applicable factors have been evaluated, qualified products are presented to the local authorities, including the MOH and the WHO-led Roll Back Malaria partnership, who select the class of insecticide. Determine the quantity of the proposed insecticide based on the estimates of the total sprayable surface in the average house. Figure 4-3 is an example of how to use the information collected to determine the amount of insecticide required and the costs.

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<sup>b</sup>  $\Pi=3.1415$

**Figure 4-3: Calculating the Required Insecticide**

Include all sprayable space within structures to avoid underestimation

Average Sprayable Area per Structure

Dosage Needed (per WHO recommendations)

Conversion Factor

$$\text{Number of Structures} \times \frac{\text{m}^2}{\text{Structure}} \times \frac{\text{Grams active ingredient}}{\text{m}^2} \times \frac{\text{Sachet}}{\text{Grams active ingredient}} \times \frac{\text{Grams formulation}}{\text{Sachet}} \times \frac{1 \text{ Kilogram}}{1000 \text{ Grams}} = \text{Total Kilograms Needed for Campaign}$$

$$\text{Total Kilograms Needed for Campaign} \times \frac{\text{Cost}}{\text{Kilogram Formulation}} = \text{Total Cost of Insecticide}$$

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## 5. Following IRS Safety Requirements

This section reviews safety requirements that operators and other IRS program staff must follow in the field. Personnel need to have thorough knowledge of these requirements before spraying operations begin. TOTs for spray operators should use this training guide in combination with WHO training materials.

### Objectives

- Identify each item of required personal protective equipment for IRS.
- In question-and-answer sessions, respond correctly when asked about WHO IRS personal hygiene standards.
- In practice sessions, correctly apply WHO IRS personal hygiene standards.
- Given scenarios, discuss appropriate responses to IRS-related emergencies.

### 5.1 Using Personal Protective Equipment Correctly

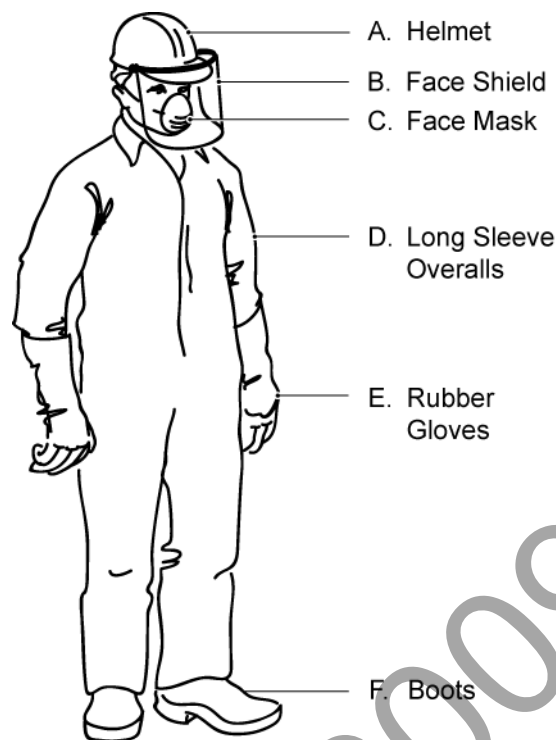
Absorption of insecticide occurs mainly through the skin, lungs, and mouth. It may occur when opening a package of insecticide, mixing and preparing spray, or spraying the insecticide, especially in high places. Therefore, it is essential that specific protective clothing be worn in accordance with the safety instructions on the product label.<sup>10</sup>

Based on WHO<sup>11</sup> and FAO<sup>12</sup> specifications, personal protective equipment (PPE) for IRS should include the following:

- Dust mask or filtered mask
- Helm et
- Face shield or goggles
- Rubber boots
- Three cotton long-sleeved overalls per spray operator; overalls are always worn outside of boots.
- Nitrile rubber, neoprene, polyvinyl chloride (PVC), or butyl rubber gloves without inside lining and long enough to cover forearms; gloves are always worn outside of overall sleeves.

Figure 5-1 illustrates the PPE that spray operators should always wear.

**Figure 5-1: Required Personal Protective Equipment**



[Illustration: RTI]

### **5.2 Screening for Pregnant and Nursing Women**

Pregnant women and nursing mothers should not handle pesticides as spray staff. Recruiters of spray operators ensure that pregnancy tests are conducted during the medical exam so that pregnant women do not join spray teams. If pregnancy testing is not an acceptable practice, women are to be advised of the risks to pregnancy of participating on the spray team and provided with a consent form. Nursing mothers should not participate on spray teams.

### **5.3 Attending Carefully to Personal Hygiene**

During operations, scrupulous attention to personal hygiene is essential for the safe use of pesticides. At each central meeting area for spray teams (both temporary and permanent storage facilities), the following items and facilities should be available:

- Containers for progressive rinsing of spray cans, and area to use them
- Soak pit, evaporation tank, or water container for transporting liquid pesticide waste for disposal elsewhere
- Basins for face and hand washing, materials to construct temporary bathing facilities, or materials to renovate existing facilities to accommodate the size and number of spray teams meeting for daily clean up
- Separate basins for washing: (1) hands, necks, and faces; and (2) overalls
- Detergent for washing overalls



For spray staff, safety precautions depend largely on personal hygiene, including the washing and changing of clothes.<sup>13</sup> During this training, you will take part in a drill to carry out and supervise personal hygiene, and regular washing of PPE. The following WHO standards will be followed:

- Washing facilities with sufficient water and soap should be available at spray locations.
- It is forbidden to eat, drink, or smoke while working.<sup>14</sup>
- Wash your hands, face, and neck with soap and water after spraying and before eating, smoking, or drinking.<sup>15</sup>
- You should have three uniforms to allow for frequent changes.
- Change your clothes immediately if they become contaminated with insecticides. Remove all work clothes at the end of each day's operations, and take a shower or bath in a designated bathing area.<sup>16 17</sup> If a full-body shower or bath facilities is not feasible, wash your face, neck, and hands with soap and water, using basins designated for this purpose.
- Wear clean clothes after bathing.
- Never wash yourself, your clothing, or your equipment in any water other than that designated for cleaning pesticides. Do not use streams, rivers, or public tap stands.
- Wash work clothes daily. You must know how to wash your own clothes with soap and water and keep them separate from your regular clothing. Your team's washperson may not always be available, or you may need to remain in the field overnight.
- Pay particular attention to washing your gloves. It is unsafe to wear contaminated gloves.
- Containers used for laundry, progressive rinse, and wash up must be permanently labeled and used only for those specific tasks so that sprayers will not use a contaminated container when they wash their faces, necks, and hands. (Progressive rinse is explained later in this training.)
- You must clean your spray equipment daily.
- Dispose of all washwater in a concrete evaporation tank covered with a locked grate or a soak pit.
- In case of a reaction from skin contact with insecticide which does not clear up with washing, go to a health facility. If ingestion occurs, report it immediately to your supervisor, and go to a health facility.
- Inform your supervisor immediately if you do not feel well.<sup>18</sup>

If washpersons are hired for the team, as recommended, they are responsible for washing their own protective gear. Washpersons wash overalls at a central location in tubs used exclusively for this purpose.

#### **5.4 Preparing in Advance for Emergencies**

All personnel participating in an IRS program should be trained to recognize emergencies and to know how to respond in situations such as a crash or fire, or an insecticide spillage. Also, all IRS program staff must be provided with emergency telephone numbers that they keep with them at all times when they are on the job.

Personnel must also be informed where to locate the nearest source of emergency assistance.

All IRS program transport vehicles and storage facilities should stock a first aid kit that is readily available.

The primary objective in an emergency is to safeguard the life of the affected person(s) and the public. Health workers within the catchment area should receive training, according to their needs, and the necessary equipment and medication to support the spray teams and the population.

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## 6. Using and Maintaining IRS Equipment

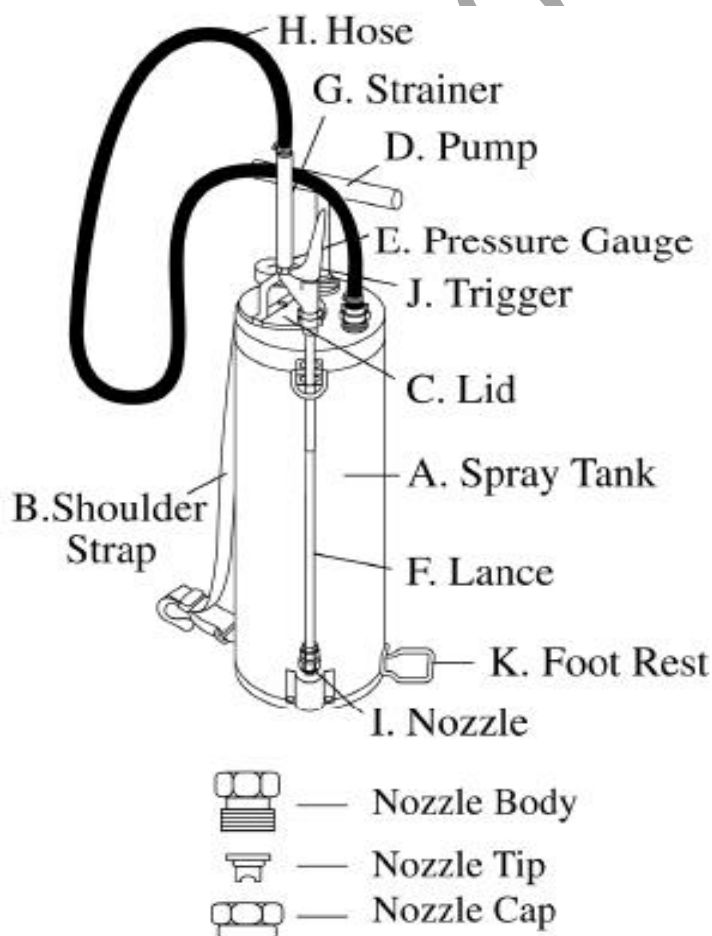
### Objectives

- Identify the parts of an IRS compression sprayer.
- In practice sessions, perform the correct steps to test a spray tank according to manufacturer's specifications.
- Identify a sprayer nozzle, and determine if it is the correct nozzle for a specified pesticide.
- In practice sessions, perform the correct steps to calibrate a sprayer nozzle.
- Demonstrate proper positioning of a sprayer that is not in use.

### 6.1 Identifying the Parts of Compression Sprayer Tanks

Figure 6-1 shows the parts of a WHOPES-approved compression sprayer and its nozzle.

Figure 6-1: Parts of a Compression Sprayer



[Illustration: WHO (2000.3). *Manual for Indoor Residual Spraying: Application of Residual Sprays for Vector Control*, p. 14. (WHO/CDS/WHOPES/GCDPP/2000.3); used with permission]

### 6.2 Testing the Sprayer Tank

Before using an insecticide, confirm that the spray can tank is not leaking, the pump mechanism is working correctly, and the pressure rises correctly when the tank is pumped. To calibrate the sprayer, follow these steps, based on WHO guidelines:<sup>19 20</sup>

- Pour clean water into the tank. Never fill the tank more than three-fourths full.
- Fit the lid. Turn the handle to lock the lid in position.
- Operate the pump using both hands and with a foot on the footrest. Pump to the working pressure of 55 psi<sup>a</sup> (3.8 bar). Every full pump stroke gives about 1 psi (1 bar = 1000 millibar = 14.5 psi = 100 kPa<sup>b</sup>).
- Check that the tank is holding pressure. Listen for a hissing sound of escaping air, which indicates a tank is losing pressure.
- The pressure gauge should show an increase in pressure as you pump.
- Make sure there are no leaks along the lance and hose, especially where the hose joins the tank and around the on/off valve.
- Operate the trigger around the on/off valve to make sure spray is emitted from the nozzle.
- Check the spray pattern from the nozzle by spraying a dry wall surface. The pattern should be even and without streaks.
- Ensure the nozzle does not drip when the trigger on/off valve is released.
- Calibrate the nozzle with water in the tank. Pump to 55 psi (3.8 bar).
- Open the trigger on/off valve for one minute. Collect the discharge and measure the amount in a measuring jug. Empty the jug.
- Discharge again for one minute and measure the amount.
- Repeat for a third discharge.
- Calculate the average of the three one-minute discharges. The average discharge of an 8002 nozzle is about 757 ml<sup>c</sup> per minute. If the discharge is incorrect (15 ml per minute more or less than 757), check the nozzle and the screen filters to ensure they are not clogged.
- If necessary, replace the nozzle. Repeat the calibration.
- Adding a constant flow valve set on the lance will ensure that the flow rate does not decrease as the pressure in the tank falls.

#### Identifying the Parts and Characteristics of Nozzles

Most compression sprayers use nozzles that can be changed. Nozzle types vary by output capacity, spray pattern, and operating pressure. Nozzles are provided with the sprayers and are calibrated to the insecticide in use.

Nozzles are used to

- Meter the amount of spray delivered (the nozzle output).
- Break liquid into droplets.
- Spread droplets in a pattern.

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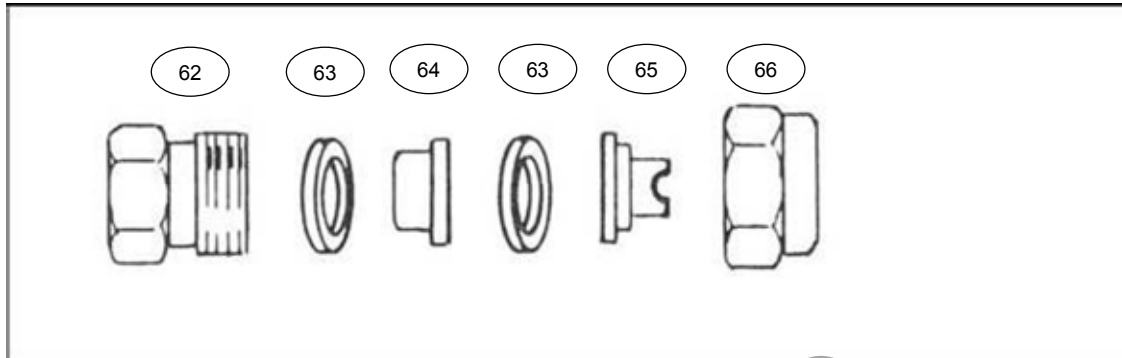
<sup>a</sup> pressure per square inch

<sup>b</sup> kilopascal

<sup>c</sup> milliliter

In general, nozzle assemblies comprise four main parts: the nozzle body, the flow regulator, the tip, and the cap (Figure 6-2). Some nozzle assemblies include strainers.

**Figure 6-2: Nozzle Flow Regulator**



**Legend:**

- 62 nozzle body
- 63 nozzle gasket, polyethylene
- 64 nozzle flow regulator
- 65 hardened stainless steel nozzle tip
- 66 nozzle body cap

*[Illustration: H.D. Hudson Manufacturing Company, used with permission]*

The **cap** of the nozzle is used to secure the nozzle assembly to the body.

The **tip** of the nozzle creates the pesticide spray pattern. For IRS, only the flat fan nozzle 8001 and 8002 TeeJets® are used. Generally, tips can be interchanged among nozzle bodies made by the same manufacturer.

Nozzle tips are made from a variety of materials. Choice of material often depends on the abrasiveness of the spray mixture used in the tank. Wettable powders are more abrasive than emulsions.<sup>21</sup> Nozzle materials that wear faster tend to cost less. Table 6-1 shows nozzle materials in order of decreasing rate of wear and increasing cost. The initial cost of nozzle replacement might seem high; however, worn nozzles can affect effective distribution of insecticide. Nozzles should be checked regularly for spray pattern and output to ensure label rate and on-target application.

**Table 6-1: Characteristics of Nozzle Types**

Material	Characteristics
Brass	Poor wear life; susceptible to corrosion (more so with fertilizers)
Polymer	Good wear life; good chemical resistance; orifice can be damaged if not properly cleaned
Stainless steel	Good wear life; excellent chemical resistance, durable orifice
Hardened stainless steel	Very good wear life; good durability and chemical resistance
Ceramic	Superior wear life; highly resistant to abrasive and corrosive chemicals

### 6.3 Nozzle Output

Nozzle output is based on the size of the nozzle opening and the spray pressure. With most nozzles, output increases as pressure increases. It takes a large increase in pressure to get a small increase in nozzle output. Manufacturers often supply tables that show the nozzle output at a number of pressures. Pressure must be increased four times to double the nozzle output.<sup>22</sup>

### 6.4 Calibrating the Nozzle

The nozzle is critical for maintaining the quality and uniform application of insecticide. An application must be uniform to be effective. During the spraying cycle, it is important that you calibrate the nozzle at least once a week to be certain it is performing properly. Also, calibrate the nozzle at the end of an IRS round, before the equipment is stored. The best way to extend the usefulness of nozzles is to clean them properly and to agitate the pump often during spraying.

There must be no leaking of the nozzle tip, shut-off lever, or other sprayer parts. Follow these steps to calibrate the nozzle:

- Fill the sprayer to its capacity.
- Use a 1 L graduated cylinder to measure the nozzle discharge per minute, using a stopwatch. The ideal discharge rate is 757 ml per minute, but considering the wear and tear of the nozzle, the rate could be allowed to rise to approximately 800 ml per minute.
- If the discharge rate exceeds 800 ml per minute, replace the nozzle.
- If the rate is below 720 ml per minute, replace the nozzle.
- Record and return a dysfunctional nozzle to the storekeeper to get a replacement.

**If Water Is Not Readily Available**

Reuse water among sprayers.

### 6.5 Maintaining Spray Equipment When It Is Not in Use

When you are not using the sprayer, place it upside down in an upright position with the strap in front. When spraying, the sprayer hangs under the left or right shoulder with the upper part of the sprayer pointing forward so you can easily see the pressure gauge and check it regularly. This method makes for easy handling in narrow and low passages or rooms; the sprayer will not interfere with protective headgear, and it is easily unloaded for re-pressuring the sprayer.

Routine maintenance, cleaning, and checking of spray equipment are critical to any spray program. Each day, check the hose for wear; the hose connections for tightness; the trigger for smooth operation; and the condition of seals and washers, the tank, trigger valve, pressure release valve, filters, and strap.

### 6.6 Estimating Quantities of Pumps and Pump Parts

The number of pumps is estimated from the structures to be sprayed over a specified period of time and the average number of structures that can be sprayed by one operator in a day. It may be necessary to estimate an additional 10–15% more sprayers, depending on the accuracy of the estimate of houses. An additional 10%

cost should be added for spray pump spare parts. Correct pump estimates and timely orders of pumps and parts are essential to avoid idle staff time.

Experienced suppliers of spraying equipment know which items often break and have developed standard spare part kits. Each spray team gets a set of tools for field pump maintenance. The tool kits include a pair of pliers, an adjustable wrench, a screw driver, and a knife.

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## 7. Conducting Indoor Residual Spraying

### Objectives

- Given scenarios, discuss safe removal of objects from sleeping structures that will be sprayed.
- In practice sessions, demonstrate the correct method to agitate a spray can while on the job.
- In practice sessions, demonstrate safe and effective methods for spraying walls and ceilings in different types of structures, according to WHO principles.

### 7.1 Respecting People and Property

You must demonstrate respect for the people and property in the homes you are allowed to enter. Team leaders provide direction on houses to be sprayed, but you should not enter any house without the permission of homeowners or their representative.

Use good judgment, and keep in mind that your conduct in the community will affect the success of field operations.

### 7.2 Preparing Households for IRS

IEC team members and spray operators have brochures with instructions for household preparation, and they provide these brochures to residents. Mobilizers will visit communities once before spray operations begin, to explain IRS and build community support, and return during operations.

During operations make sure all people and animals are outside a structure before spraying begins inside the structure, and for the entire time of the spraying. They should stay outside for *at least two hours* after spraying is completed. If someone, such as a sick person, cannot leave the structure for an extended time, the team leader or supervisor should work with neighbors to negotiate moving the person to a neighbor's home so spraying can be completed. If someone is unable to move from the structure at all, it must not be sprayed.

Before you start to spray, remove all household goods, except those that are immovable (Figure 7-1). Examples of items to remove include, but are not limited to, the following:

- Items hanging on walls
- Clothing
- Agricultural implements
- Food, food containers, and water jars
- Cooking utensils and dishes

Handle food and all fragile materials carefully, and place them where they will be safe from breakage and spray. Put them where they will not receive any insecticide spray. For example, do not put household items under eaves that will be sprayed.

Heavy furniture or immovable items that cannot be taken outside should be turned upside down and covered with material provided by the IRS program to protect them from the spray.

**Figure 7-1: Working in a Ugandan Community**



[Photos: RTI]

### **7.3 Handling Pesticides Safely**

Insecticides in pre-mixed sachets are added to water in the spray can and pumped to the correct pressure reading.

Sprayers: Check the pressure and test the nozzle for leakages or blockages while you are *outside* a structure. Clean blocked nozzles with water. An alternative is to blow out an obstruction with compressed air from the pump. Never clean nozzles with a piece of wire or a pin, because this will widen the nozzle opening and make the nozzle release incorrect amounts of insecticide.<sup>23</sup>

### **7.4 Agitating the Spray Can to Prevent Sedimentation**

Insecticide that forms a paste in the bottom of a spray can affects the concentration of a mixture and may cause serious underdosing when the spray is applied. To keep this from happening, **agitate the pressurized sprayer** before you enter a structure and every two to three minutes while spraying. Follow these steps:

- Turn off the nozzle.
- Hold the sprayer on your shoulder.
- Keep your knees straight and bend so that the can is at a 90-degree angle with the floor.

This movement ensures that the contents of the pump move up and down, which prevents sedimentation of the insecticide inside the can.

## 7.5 Using Correct Spraying Techniques

Follow these steps to spray each house:

1. Spray the outside of the front door.
2. Enter the house and close the front door. Spray the inside of the front door. Spray all of the edges and frame of the door. This usually requires two swaths. Open the door again to allow light into the room.
3. Next, start spraying at the bottom corner of the wall to the right of the door. If you are right-handed, go to the right. If you are left-handed, go to the left.
  - a. Start spraying by moving the lance steadily from the floor up to the ceiling. "To ensure the correct swath width, keep the spray tip about 45 cm<sup>a</sup> from the wall. . . . Time your spray speed to cover one meter every 2.2 seconds, or 4.5 seconds for a 2-meter-high wall. Timing may be aided by mentally counting 'One thousand and one, one thousand and two, one thousand and three...' Adjust the mental counting procedure according to the local language."<sup>24</sup>
  - b. Move a step to the right equal to the width of the spray swath or 75 cm, and spray from the ceiling to the floor. Lean forward as you spray the top of the wall and move back as you bring the nozzle downward. Continue this procedure,<sup>25</sup> moving the nozzle side to side, until you reach the starting point at the front door.
  - c. If the room is circular, follow the same clockwise pattern. If you are left-handed, move to the left. If you are right-handed, move to the right. Agitate the spray pump every two to three minutes.
4. Take care to spray all edges and corners of windows. Spray all niches and cracks.
5. Spray the remaining interior rooms in the same manner.
6. Spray both sides of partition walls.
7. Spray the backs and undersides of immovable furniture. To spray the underside of furniture, place the spray pump on the floor to help you handle the spray lance. Always maintain a distance of 45 cm and speed of 19 square meters per minute.
8. After finishing all interior surfaces, spray the ceiling, unless it is metallic. Do not spray a metallic ceiling. The insecticide does not work properly on metal. Adjust the spraying technique according to

### How to Use an Extension Lance

- Remove the nozzle assembly from the end of the lance.
- Screw in the spare lance or bamboo, and re-attach the nozzle to the end of the extended lance.

<sup>a</sup> centimeters

the rectangular or conical shape of the structure. You can use an extension lance on high ceilings in both types of structures to help in reaching high places and maintaining the distance of 45 cm.

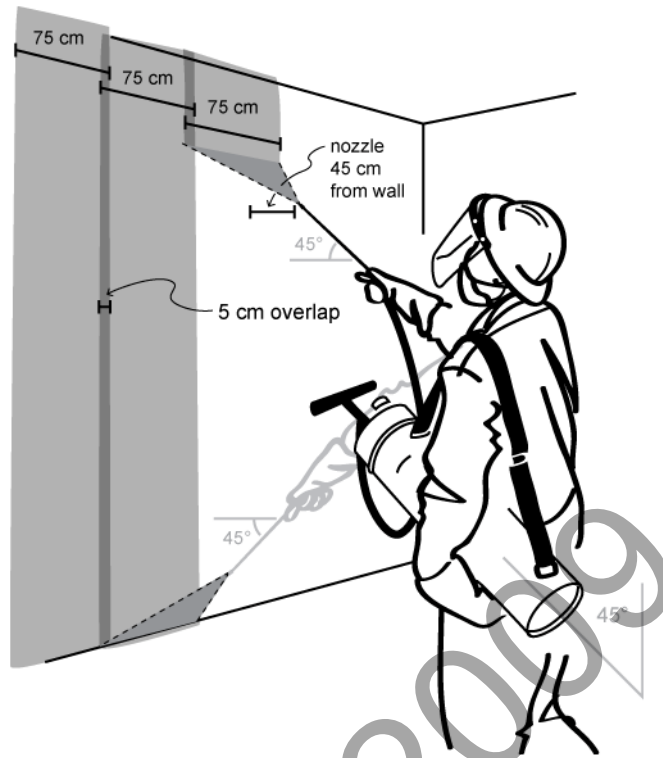
- a. In a *rectangular* house, use the same spraying motion that is used for walls, up and down, keeping the proper distance and speed, allowing 5 cm overlap with the previously sprayed swath.
  - b. For a *conical* house, spray the ceiling either as a continuation of the wall, or spray it separately: up and down, from the top of the wall/eave to the top of the conical ceiling and back to the walls.
9. Spray the under part of the eaves from left to right. Usually this area can be sprayed by holding the lance at a slight angle and making lateral successive swaths. Spray the outer wall of a structure with large eaves where the roof line protects the wall from rain. This area may be a mosquito entry or resting point.
  10. When spraying is complete, make a final inspection to see that no unsprayed surfaces remain on which mosquitoes might find a sheltered resting place. The team leader provides the final inspection of the structure and then assigns the spray operator to another one.

When the spraying of a structure is completed, the operator, team leader, or supervisor informs the residents to

- Stay outside the structure for *at least two hours* after spraying.
- Keep all animals outside the home for *at least two hours* after spraying.
- Sweep floors free of residual insecticide and insects killed by the spraying and drop them into latrines or pits, or dig a narrow hole one foot deep, and bury the swept material. Pack the loose dirt tightly back into the hole, on top of the waste. Place a heavy rock on top. This prevents chickens and livestock from getting to the waste, which usually contains insects that could attract animals.
- Do not replaster or paint over the sprayed walls after spraying.
- Keep using mosquito nets for protection against malaria.<sup>26</sup>
- For eye irritation, flush the eyes with water. For respiratory irritation, leave the structure immediately for fresh air. In case of a reaction from skin contact with insecticide that does not clear up with washing, go to a health facility. If ingestion occurs, report it immediately to your supervisor, and go to a health facility.
- Spray operators fill in daily spray cards. Team leaders use the spray operators' cards to complete their own daily records, and supervisors compile the data in the supervisors' daily card. Then, data managers enter data into the project database so it is available for analysis and reporting. **Annex 9** provides card forms.

Figure 7-2 illustrates spray angle and swath width and overlap.

Figure 7-2: Spray Swath Width and Overlap



[Illustration: RT!]

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## 8. Managing Insecticide Waste

### Objectives

- Specify the steps required for accurately recording the storage and distribution of insecticides.
- Define these terms: progressive rinsing, ablution block, soak pit, and evaporation tank.
- Name the steps of a progressive rinse.
- Given scenarios, explain the steps for disposing of liquid and solid wastes.

### 8.1 *Tracking Sachets and Ensuring Accurate Records*

Well-kept records are a sign of a properly run store and are essential to minimize waste of stock or damage caused by accidents. Storekeepers should be trained in the use of the records system and must be responsible for its upkeep.

Conduct the distribution of insecticide sachets as described below:

- On reception at the district office, count all sachets and stamp them with the district stamp, if appropriate, and register the count in the stock book.
- The storekeeper issues only enough refills for the day's operations to each spray operator. Each spray operator's code is written on the sachets issued. The spray operator must sign for these sachets in the log book.
- At the end of each spray day, all spray operators sign the logbook for their empty and full sachets. Both the storekeeper and the supervisor compare the number of sachets returned with the number issued. Stock remaining should equal the stock issued in the morning, minus the number of sachets used during the day. The number of sachets used should be equal to the number of can refills.
- The storekeeper submits insecticide stock balances and sign-in/sign-out logs to the data manager.
- The supervisor submits the number of structures sprayed by each spray operator to the data manager.
- The data manager uses this information to identify spray operators and teams needing additional training and correction, and to determine the supervision needed to ensure that stealing does not occur.
- Spray operator performance—the number of structures sprayed versus can refills used—is calculated by the data manager to see if there is an over- or under-application.

### 8.2 *Handling Spray at the End of a Day's Operations*

At the end of the day, spray teams should go to the last structure (or two) in order to empty their cans. Operators should try to use all of the insecticide in their cans each day. If a single spray operator has spray remaining in a can, he or she should spray another structure. However, where the distance between structures makes it difficult to empty sprayers, leftover insecticide must be brought back to the staging site.

When wettable powder is used, residue or white powder may gather at the bottom of pumps when teams rinse the equipment. In this case, the spray operator was not sufficiently agitating the pump while in the field. A good supervisor or a senior operator can easily correct this poor practice by informing the operator that less insecticide is deposited on the wall when the operator does not agitate the sprayer. By the end of the first week of operations, this practice should be almost completely eradicated.

The amount of insecticide brought back from the field should be minimal—much less than half of the first container used for the progressive rinsing. Even in uncommon situations when the spray operators cannot empty their sprayers, the amount of liquid coming back should be less than a full drum (220 L).

### 8.3 *Clean-up Facilities*

For each central meeting area for spray teams (usually storage facilities, either temporary or permanent), there should be:

- Basins for face and hand washing—materials to construct temporary bathing facilities, or materials to renovate existing facilities to accommodate the size and number of spray teams meeting for daily clean up
- Basins for washing overalls—separate from the basins for face and hand washing
- Detergent for washing overalls
- Materials for wash area demarcation (hard coal/charcoal, saw dust, stone aggregates/gravel, fencing and wire mesh), construction/renovation of ablution facility, or construction/renovation of evaporation tank with locked grate and roof, as needed
- Seven barrels or drums for progressive rinse (enough to triple rinse), preferably wide enough or deep enough to submerge an entire spray can
- Three plastic cups to pour rinse water into spray can

For each washperson, PPE should consist of a chemical apron; nitrile rubber, neoprene, PVC, or butyl rubber gloves without inside lining and long enough to cover forearm; rubber boots, face shield or goggles; and mouth dust mask.

### 8.4 *Daily Clean Up and Progressive Rinse*

Cleaning of spray equipment can easily become messy. If clean-up processes are not planned ahead of time, they can result in environmental contamination and potentially adverse human health effects. Follow these instructions for the safest and most responsible clean up that minimizes water usage.

Water used to rinse out sprayers at the end of each day can be reused at the beginning of the next day's work to save water and reduce the potential for pollution from contaminated rinse water. The best practice for rinse water reuse is called **progressive rinse**.

With this method, seven containers of approximately 200 L each are placed in a line. Container one, three, five, and seven are sequentially filled with water. During the end-of-day clean up, the remnants of a pump charge from the field are emptied into the first container. Operators should follow these steps:



- Use a cup or other vessel to take water from the *second* container and pour it into the pump, filling it to less than half of its capacity for rinsing; as it can be difficult to shake and rinse a full pump.
- Close and shake the pump, dumping the remnants into the *third* container.
- Use a cup to fill the pump to half its capacity with water from the *fourth* container.
- Clean the sprayer, the spraying system, the pipes, the in-line filter, and nozzles by pressurizing the pump and spraying the resulting fluid into the *fifth* container.
- Use a cup to take water from the *sixth* container.
- Rinse the strainer, nozzle, and outside of the pump at the *seventh* container. Washing the outside of the pump is required to ensure there are no spillages remaining outside the pump—not necessarily because pumps are soiled.

A well-trained operator handling the pump correctly will return with a relatively clean pump. Spray operators should be trained to keep the pump under the arm while working and to transport the pump in a vertical position in the vehicles.

The next day, spray pumps are filled with liquid from containers in the same sequential order: container one, then containers three, five, and seven. Any liquid remaining in the fifth or seventh containers is dilute and can be disposed in an evaporation tank or a soak pit. Also, all water from laundering of overalls should be disposed in one of these areas (see Managing Liquid Waste). Never pour insecticide-contaminated water into rivers, pools, or drinking or bathing water sources. The only acceptable disposal method for DDT-contaminated water is an evaporation tank.

## 8.5 Managing Liquid Waste

### *Evaporation Tank*

An **evaporation tank** is a sealed tank for the disposal of non-biodegradable liquid insecticide waste—especially DDT.

An impervious evaporation tank (Figure 8-1) should be repaired or constructed and covered by a locked grate so animals can not access the waste. The tank allows liquid insecticide to settle and the water to evaporate, which leaves a solid residue that is scraped and removed for safe disposal. A tank should be protected from rainfall so it does not fill with rainwater, which could cause overflow.

Evaporation tanks should be constructed according to the following specifications:

- Located downhill from the progressive rinse area.
- Constructed with concrete.
- Sunk into the ground, with sides raised about 20 to 30 cm.
- Measured to be 3 M long, 2 M wide, and 20 to 30 cm deep.
- Covered with chicken or fencing wire mesh.
- Fitted with a drain that can be opened after the water has evaporated from the tank and residues have been collected for disposal, to allow rain drainage and to clean the tank.

- Constructed as an extension of the progressive rinse arrangement so that runoff and soil can be pushed into the tank.
- Protected from rainfall in places where spraying will occur in the rainy season. A roof can be constructed over an evaporation tank to prevent rain from filling it, or it must be covered daily. Protect all equipment/PPE clean-up and general wash areas from rainfall.

Remember that minimal water should reach an evaporation tank, because sprayer rinse water is used to fill spray cans, which prevents contaminated water that requires disposal from exceeding the capacity of an evaporation tank. After a spray round, all of the sand, sludge, and insecticide residue remaining in an evaporation tank should be scooped out, placed into a sealed container, placed with empty sachets, and returned with the sachets to the insecticide manufacturer.

**Figure 8-1: Evaporation Tank in Zambia**



[Photo: RTI]

### *Ablution Facility*

An **ablution facility** is a place or a structure where people can wash. The cleaning area should include a facility for the privacy of all field personnel to wash at the end of a day's work. The most important elements of an ablution facility are sufficient water (at least 2 L per person) and soap. In most programs, repair or construction of an ablution facility that drains to a pit latrine is practical, although pouring water directly into a pit latrine works as well. An ablution facility decreases the risk of human exposure to insecticide.

### *Soak Pit*

A **soak pit** is a hole in the ground for disposing of biodegradable waste. A well-constructed and properly sited soak pit protects the environment from contamination while insecticide(s) degrade.

The environmental authority may select the site for the soak pit. Soak pits are usually sited at the highest point near the IRS depot or storage site and away from the natural path of water runoff.

Usually, an area of 3 M by 3 M (or 9 square M) is excavated to a depth of 1 M. The bottom of the pit is packed with hard coal or charcoal, followed by sawdust (where feasible) and stone aggregates. These materials absorb liquid waste and prevent access to waste by animals that might try to drink them. The area is fenced off to keep out domestic animals and children. Because there is no loose soil, a soak pit serves as a good area for washing overalls. The soak pit is also a good place for drying overalls: They can be placed on top of the stones or over the fencing, or hung on a line that is strung around a soak pit.

Figure 8-2 below shows examples of soak pit constructions.

**Figure 8-2: Examples of Soak Pits**



*A soak pit that is guarded to prevent the entry of unauthorized persons or domestic animals [Photo: RTI]*



*Overalls drying around a soak pit [Photo: RTI]*



Worker building wooden and mesh fencing for a soak pit [Photo: RTI]

### 8.6 Managing Solid Waste

Follow these rules to manage IRS solid waste:

- For DDT wastes, disposal requires appropriate incineration facilities with capacity to reach a high temperature range between 1,562°F and 2,372°F (850°C and 1,300°C) as recommended by the Basel Convention. If this is not possible, consult the relevant national authority (usually the national environmental authority) to plan for IRS waste disposal.
- For all other wastes, find an appropriate incinerator that is accredited and licensed by the host government to dispose toxic wastes. According to the international standards,<sup>a</sup> the incinerator should be capable of maintaining extremely high temperatures (typically ranging from 1,562°F to 2,372°F).
- Never burn empty sachets or contaminated waste in the open.
- Never burn empty sachets or contaminated waste in an incinerator unless the incinerator is approved by the relevant national authority for the purpose of burning plastics.
- Any spray equipment that is no longer serviceable should be removed from inventory, decontaminated, and disassembled to ensure that it will not be subsequently diverted to other uses,<sup>27</sup> and disposed based on recommendations of the relevant national authority.

The Basel Convention Secretariat<sup>b</sup> and Stockholm Convention Secretariat<sup>c</sup> can provide guidance on requirements for disposal of pesticide-contaminated waste, and requirements for the international transport of waste for disposal in another country.

The IRS program wants to handle solid waste in an environmentally responsible manner, and also seeks to prevent accumulation of unused insecticide that could

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<sup>a</sup> Basel Convention Technical Guidelines on Incineration on Land No. 4

<sup>b</sup> <http://www.basel.int/index.html>

<sup>c</sup> <http://www.pops.int/>

become obsolete. Thus each country program should take the following measures to avoid accumulation of obsolete pesticides:<sup>28</sup>

- Order only as much insecticide as will be used in one round of spraying.
- Never accept donations of insecticide in excess of the requirement for the program.
- Train staff in stock management, good storage practices, and proper handling of pesticides during transport.
- Distribute insecticide on a first-in, first-out system, so the insecticide that arrived first is distributed first.
- In tender documents or direct procurement orders, include
  - Need for compliance with WHO pesticide specifications
  - Submission of certificate of analysis (see WHO/SIT/1.R8)<sup>29</sup>
  - Request for water-soluble sachets
  - Requirement of sachet recapture by the vendor
  - Requirement of unique sachet number requested for tracking purposes
  - Preferred packaging (sealed barrels are most secure for in-country transport, but cardboard can be used)
  - Compliance with host-country and international requirements (import, labeling, etc.) and use of a long-life label
  - Proof of country registration.

It may also be useful to procure a funnel with a strainer for each operator to easily rid debris from water used in pump charge. In addition, identification cards with the names and a picture of all program staff (including supervisors, team leaders and spray operators) may be needed.

### 8.7 Storage

The following are requirements for each storage site, regardless of size:

- Training for storekeepers (see sections in this training guide on IRS Safety Requirements and Managing Insecticide Wastes, and refer to the FAO Guidelines)
- Physical maintenance
  - Materials and labor for storehouse renovation
  - Locks and keys for storage facilities
  - Pallets for stacking insecticide and other equipment
  - Construction of securable boxes for pesticide if storehouses cannot be properly secured
- Emergency kit
  - 2 bags sawdust or sand
  - Empty container to contain spillage residues
  - Spade
  - Brush
  - Fire extinguisher

- Health kit
  - Container of water or inside faucet
  - Bar of soap
  - Eyewash set (ensure instructions are in host-country language)
  - Medical or first aid kit (ensure instructions are in host-country language)
- Stock management kit
  - Stock book
  - Bin cards
  - Thermometer
  - Pens
- Storekeeper PPE
  - Nitrile rubber, neoprene, PVC, or butyl rubber gloves without inside lining and long enough to cover forearm
  - Rubber boots
  - Overalls
  - Face shield or goggles
  - Vapor masks for half-face respirators with organic vapor cartridges

### 8.8 Health Centers

Following are the requirements<sup>d</sup> for health centers in IRS areas, which should be provided by the MOH if possible.

- Health worker training in pesticide poisoning
- Poisoning treatment medication (ensure instructions are in host-country language)
- Pregnancy test kits (ensure instructions are in host-country language)

### 8.9 Transport

Following are the requirements for transportation:

- Training for drivers (see IRS Safety Requirements section).
- For vehicle washing, use nitrile rubber, neoprene, PVC, or butyl rubber gloves without inside lining and that are long enough to cover forearm.

Spray operators should never use any form of public transportation while wearing PPE that has been exposed to pesticide.

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<sup>d</sup> The requirements must be met according to 22 CFR 216, the U.S. law governing IRS.

## 9. Supervision

### Objectives

- Name the levels of supervision in an IRS campaign.
- In question and answer sessions, discuss the responsibilities of spray operator supervisors and team leaders in daily operations.

Routine supportive supervision of IRS activities needs to be carried out consistently throughout the spray campaign. Use the appropriate forms and checklists for each cadre—spray operator, team leaders, and supervisors—to ensure spray quality, accuracy, and completeness. Three levels of supervision are included in a campaign:

- The National Malaria Control Program staff supervise the entire effort at the national level.
- District staff supervise all activity within a district.
- Sub-district staff supervise all activity at the sub-district level and below.

### 9.1 *Daily Preparations*

Each morning before spray operators leave the depot or staging site, the supervisor and team leaders inspect all pumps and make sure each is in perfect working condition. If a pump is not working properly, repair or replace it with a reserve pump. If a spray pump cannot be repaired in the field and no reserve pump is available, place the spray operator on temporary leave until the pump is available.

The supervisor or team leaders work with the storekeeper to ensure that each operator is carrying enough insecticide sachets for the day and that each operator has all the necessary spray equipment, such as forms, pencils, PPE, tools, and extension rod. The supervisor should have standard tools: spare pump parts or replacements (especially nozzles and gaskets) in case of loss or damage, extra cards for new structures, the daily work schedule, area maps, spray forms, and the supervisory notebook. The supervisor also carries a flashlight and a spray inspection form.

In the event that teams need to change field sites or bases, the supervisor and sub-district manager must ensure that all necessary equipment is safely packed and loaded. At the spray site, the supervisor and team leader inspect structures to ensure they are ready for spraying before allowing spray operators to enter. The team leader and supervisor assigns each spray operator to a structure. During the spraying, the team leader supervises the work of each spray operator from time to time to ensure that all operators follow the correct procedure of mixing, spraying, coverage, and shaking of spray cans.

The team leader and supervisor assist the sub-district manager to update the area map by numbering new houses, registering them, and adding them to the map; and by deleting destroyed or demolished ones. The reports of the operators are the basis for all reporting and data collection, so team leaders and supervisors must ensure that they are completed accurately and promptly at the end of a spray day.

## **9.2 Supervision Roles**

### **9.2.1 NMCP and MOH**

The NMCP and MOH develop IRS-related standards and guidelines, IEC materials and messages, and tools for M&E related to IRS. They provide technical assistance, conduct basic technical training, M&E, and quality assurance of IRS, and also coordinate and conduct operational research on IRS. Standard policy and strategic guidelines should already be in place by the time an IRS is underway.

### **9.2.2 District Health Office (DHO)**

The DHO is involved in planning, implementing, managing, coordinating, monitoring, and evaluating of IRS activities, as well as social mobilization and IEC. The office is responsible for estimates for operational requirements and equipment. The DHO recruits and manages appropriate personnel, identifies training needs, and conducts training in collaboration with NMCP. The DHO also reports progress to the district council and to the NMCP/MOH.

### **9.2.3 Supervisor**

Each supervisor reports to the sub-district manager or field coordinator where he or she is based. The supervisor's main responsibility is to supervise spray teams in the sub-district and ensure the quality of spraying. The supervisors work with existing community-based structures (such as village health teams, development councils, religious groups) to maximize community mobilization and sensitization, and to ensure participation and ownership that will lead to the success of IRS. Each supervisor participates in the recruitment of spray operators and ensures proper storage and distribution of insecticides and spray pumps. Supervisors arrange for the security of insecticides and spray pumps and assist spray operators with minor spray pump repairs and maintenance.

Supervisors also ensure compliance with safety, security, and environmental compliance procedures, proper work distribution, and completion of spray-related records. Following an IRS application, supervisors randomly select structures where they check residents' knowledge and the quality of spraying.

### **9.2.4 Team Leader**

Team leaders, who report to the supervisors, manage and supervise each spraying unit, with a maximum of eight spray operators. Team leaders complete spray reports, including records of the type and amount of insecticide used for each structure sprayed, per spray operator, and other data as indicated in the team leader's daily record form. The team leader enforces health and environmental safety mitigation measures (as described in these guidelines and the environmental assessment) and discipline among spray operators.

### **9.2.5 Spray Operator**

The backbone of an IRS program is a well-trained spray operator. The responsibilities of an operator include:

- Respect ing household residents



- Recording the essential data on the appropriate form
- Mixing and applying insecticides at the right dosage
- Passing on relevant health information to residents
- Accounting for both full and empty sachets to team leaders and supervisors

**9.2.6 Storekeeper**

The storekeeper ensures that the store is safe, secure, orderly, and clean, and that store inventory records are up to date, accurate, and organized. Most importantly, the storekeeper tracks daily insecticide use.

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## 10. Transporting and Storing Insecticides Safely

### Objectives

- Given scenarios, explain safely transporting IRS insecticides.
- Given scenarios, explain requirements for safely storing IRS insecticides.

Handling of public health pesticides and equipment for storage and transport may affect product efficacy or cause contamination of the surroundings. For protection against adverse events and accidental poisonings, there are specific rules and conditions for safe storage and transport. The governmental agency that is responsible for managing pesticides must make known and enforce rules and regulations for safe, responsible storage and transport. Storekeepers should adhere to these guidelines, as well as recommendations in FAO's *Pesticide Storage and Stock Control Manual*.<sup>30</sup> **Annex 10** provides a Sample Pesticide Store Stock Record form that storekeepers can use to track a specific pesticide.

### 10.1 Transporting Pesticides

Train drivers before they transport insecticides from the customs warehouse or central storage facility to the local storage facility. Ensure that drivers are thoroughly knowledgeable about all of the following features of insecticides, and that training includes opportunities for drivers to respond to scenarios related to the transport of specified insecticides:<sup>31</sup>

- Intended use of insecticide
- Toxicity of insecticide
- Security issues and implications of unauthorized persons having access to the insecticide
- Handling an accident or emergency, according to national guidelines and the FAO *Pesticide Storage and Stock Control Manual*
- Combustibility and combustion by-products of insecticide
- Training provided to spray operators (with the exception of sprayer operation and spray practice)
- Vehicle contamination

It is important for drivers to prevent pesticide contamination in vehicles rented for the project in order to avoid negative consequences when the vehicles are used for other purposes, such as food transport. To prevent pesticide runoff from vehicle washing, drivers are responsible for wiping the vehicle bed with a damp cloth before washing the exterior of the vehicle. Finally, at the end of a spray campaign, drivers are responsible for cleaning and decontaminating the interior and exterior bed of the vehicles. Drivers will be provided with gloves to wear for cleaning the vehicle. All cloths used in wiping down the interior and bed of the vehicle should be washed with spray operators' overalls.

## 10.2 *Storing Insecticides*

IRS requires local or district storage facilities where a small amount of insecticide, PPE, and other materials can be stored and where spray operators can meet at the beginning and end of the day. Small, seasonal storage facilities should follow these minimum standards:

- Have a guard who allows access only to authorized persons.
- Ensure physical security, including bars on windows, sound structure, a solid door that can't be broken, and a double-padlocked door.
- Facility should not be located where people or animals are housed, in a floodplain, or near water sources, wells, or canals.
- Easy access for pesticide delivery vehicles.
- Access on at least three sides of the building for firefighting purposes.<sup>32</sup>
- Ensure that a fire extinguisher or other appropriate equipment is available in the facility in case of emergency (see the insecticide's MSDS for appropriate fire-fighting methods).
- The facility should have a solid roof that does not allow rain leakage.
- Store insecticides right-side-up on pallets with a maximum of five boxes stacked on top of each other; never use a step stool or ladder to retrieve a box.
- Store insecticide separately from food and medicine.
- A trained storekeeper assigned to the position should be present.
- Use one comprehensive stock book with records of receipt, dispensation, and balance for insecticides, empty sachets, pumps, spare PPE items, and all other equipment stored in the facility.
- Install a thermometer in the facility, and record the temperature twice a day in the stock book. Take one of these measurements during the hottest part of the day.
- Use bin cards that are located with stock items and reflect the receipt, dispensation, and balance of the items.
- Stock records should always be up-to-date.
- Store all insecticides, empty packaging, barrels, and tubs inside storage facilities.<sup>33</sup>
- Inspect stocks regularly for signs of deterioration.
- Make soap and clean water available at all times.
- Make shower or bathing facilities, or at least designated wash basins, available for spray operators.

## 11. Information, Education, and Communication for Community Mobilization and Empowerment

- Empower the community to derive maximum benefit from the indoor application of insecticides in their dwellings and communities.
- Ensure that spray operators understand and can communicate basic IEC mobilizer messages.
- Ensure that communication thoroughly addresses prevention of insecticide exposure.

The IRS program coordinates efforts with the central government and district governments to agree on effective communication strategies and to mobilize media resources, if appropriate, to promote the effort.

Development of information, education, and communication (IEC) material—along with coordination, recruiting, training, and assignment of areas of operation—should take place three months before the start up of spraying. **Annex 11** describes activities for conducting IEC and provides examples of IEC brochures.

Key messages for the residents must include, but are not limited to, the following<sup>34</sup>:

- Clear homes of mats or rugs, furniture, cooking implements, and food before spraying.
- If furniture cannot be moved out of the home, move it to the center of the room if possible.
- Stay outside the home during spraying, and for *at least two hours* after spraying.
- Move and keep all animals outside the home during spraying, and for *at least two hours* after spraying.
- Sweep floors free of residual insecticide and insects killed from the spraying, and drop them in latrine pits. If there is no latrine pit, dig a hole and bury them in it. Wash hands well after disposing of insecticides.
- Do not replaster or paint over walls that have been sprayed.
- Keep using mosquito nets for protection against malaria.

Instruct residents that if they have a reaction when re-entering the structure, follow the instructions in Table 11-1.

**Table 11-1: How to Respond to a Reaction to Insecticides**

Symptom	Response
Skin itches	Go to a health facility if reaction doesn't clear up with washing.
Eye irritation	Flush eyes with water. Go to a health facility if irritation persists.
Respiratory irritation	Leave home for fresh air.
Ingestion	Report immediately to your supervisor, and go to a health facility.

It may also be useful to inform communities that spraying is not for killing cockroaches or bedbugs.

The only way to ensure that each structure properly receives IEC messages is through interpersonal communication. Recruit teams of mobilizers to work with the spray teams, and introduce the teams to each structure in a target community. Include six mobilizers, plus a team leader. Mobilizers fan out through villages or suburbs for door-to-door communication. They provide the residents of each structure a leaflet that explains IRS and how the residents should conduct themselves before, during, and after the spraying of their structure. Posters and banners may be placed in key locations in each district. See **Annex 12** for essential activities for conducting effective community mobilization.

### **Official Opening or Launch**

The government will organize the official opening ceremony to give high profile visibility to IRS, increasing the acceptability of the campaign to the community. The National Malaria Control Program (NMCP), working with the central Ministry of Health (MOH), will invite the chief guest. During the official opening, participants will be encouraged to pay attention during their training, as what they learn will have an impact on the quality of the IRS operations, and diligence and professionalism of trainers, supervisors, and spray operators will ensure success of IRS programs. The NMCP will reiterate the government's commitment to controlling malaria, outline the policy and strategic frameworks for malaria, and acknowledge and thank all who are making resources available for IRS.

## Annex 1: Illustrative List of Trainees and Trainers

The *IRS Training Guide for Spray Operations* is designed for the following cadres of personnel.

### Trainees from national level

RTI chief of party	1
RTI logistics officer	1
RTI environment officer	1
NMCP vector control officer	1
National environmental officer/inspector	1
Partner representatives	1

### Trainees from regional or district level

RTI district coordinator	1
RTI logistics officer	1
District health management team (DHMT) representative	1
District vector control officer	1
Transport coordinator	1
Warehouse manager	1

### Trainees from sub-district level

Site managers	1 per site
Logistics officer	1 per site
Team leader	1 team leader per team (5–8 operators per team depending on circumstances)
Spray operators	5–8 operators per team (number of teams depends on size and duration of operation) <sup>a</sup>

### Other trainees

Washers	2 per site
Drivers	1 per site
Storekeepers	1 per site

### Trainers

National Malaria Control Program

### RTI

Training consultant  
Supplier of insecticide  
Supplier of pumps

<sup>a</sup> See formula in section 4.3.2 *Planning for Human Resource Requirements*

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## Annex 2: Example of a 5-day Training Schedule

Time	Subject	Facilitator	Notes
<b>Day 1</b>			
08.30	Arrival and registration	RTI	
<b>Session 1: Opening Ceremony</b>			
08.30 – 08.40	Welcome and statement of objectives	NMCP	
08.40 – 08.45	Introduction	NMCP	
08.45 – 10.00	Opening ceremony	NMCP	
<b>10.00 – 10.30</b>	<b>Tea Break</b>		
10.30 – 10.40	Review of the course program	RTI	
<b>Session 2: Basic Principles</b>			
10.40 – 10.50	Daily objectives	RTI	
10.50 – 11.00	Pre-course assessment	RTI	
11.00 – 12.00	Introduction to indoor residual spraying	NMCP	
12.00 – 13.00	National policy and strategic frameworks	NMCP	
<b>13.00 – 14.00</b>	<b>Lunch</b>		
14.00 – 16.00	Introduction to malariology		
16.00 – 17.05	Mood meter & closing	RTI	
<b>Day 2</b>			
<b>Session 3: Safety of IRS</b>			
08.00 – 08.10	Reporter's summary	Participants	
08.10 – 09.00	Safety of the population		
09.00 – 10.00	Safety of the environment		
<b>10.00 – 10.30</b>	<b>Tea</b>		
10.30 – 11.30	Personal protection		
11.30 – 12.30	Preparing the household for IRS		
12.30 – 13.00	Emergency preparedness		
<b>13.00 – 14.00</b>	<b>Lunch</b>		
<b>Session 4: Practical Session</b>			
14.00 – 15.00	Introduction to IRS equipment		
<b>15.00 – 15.30</b>	<b>Tea</b>		
15.30 – 17.00	Introduction to the spraying surface		
17.00 – 17.05	Mood meter		
<b>Day 3</b>			
<b>Session 5: Quality Control</b>			
08.00 – 09.00	Choice of insecticides		
09.00 – 10.00	Knowing your sprayer parts		
<b>10.00 – 10.30</b>	<b>Tea</b>		
10.30 – 11.30	IEC for community mobilization		
11.30 – 12.30	IRS <i>pro forma</i> invoice		
12.30 – 13.30	Supervision in IRS		
<b>13.30 – 14.00</b>	<b>Lunch</b>		
<b>Session 6: Practical Session</b>			
14.00 – 15.00	Using the compression sprayer		
<b>15.00 – 15.30</b>	<b>Tea</b>		
15.30 – 17.00	Spraying techniques		
17.00 – 17.05	Mood meter		

## Annex 2: Example of a 5-day Training Schedule

Time	Subject	Facilitator	Notes
<b>Day 4</b>			
<b>Session 7: IRS Application Techniques</b>			
08.00 – 09.00	Community mobilization preparations		
09.00 – 13.00	Community work practice		
<b>10.00 – 10.30</b>	<b>Lunch</b>		
14.00 – 15.00	Debrief on field practice		
15.00 – 16.00	Logistics monitoring and stores		
16.00 – 17.00	Cleansing depot		
17.00 – 18.00	IRS application practice		
17.00 – 17.05	Mood meter		
<b>Day 5</b>			
<b>Training Planning Session</b>			
08.00-08:30	Opening session		
08:30-09:00	PMI update		
09:00-10:00	Report on homework		
<b>10:00-10:30</b>	<b>Tea Break</b>		
10:30-11:30	Personnel contracts		
11:30-12:00	Next steps: Training teams		
12:30-13:00	Distribution of the training compact disc (CD)		
<b>13:00-14:00</b>	<b>Lunch</b>		
14.00 – 15.00	Post-course test		
15.30	Closing ceremony		

## Annex 3 Instructional Guidance and Examples<sup>a</sup>

Instructors may use the information in this annex to assist with customizing training modules, in conjunction with their objectives.

### A: Planning for Indoor Residual Spraying

IRS is the spraying of the inside surfaces of a sleeping structure to deliver a targeted dosage ( $\text{g/m}^2$ )<sup>b</sup> of a chemical that sustains its effects on disease vectors for a given duration.

Introduce the insecticides recommended that WHO recommends for IRS. It is expected that spray coverage (target) in an IRS campaign should be at least 85% of sleeping structures. This coverage increases the chances of vectors picking the chemical and of providing village-wide protection. The following key components for a successful IRS campaign will be discussed in the training:

- The planning process, involving all stakeholders in defining the area to be sprayed, logistics, budgets, timing, and post-campaign evaluation
- Spray technique and training of spray teams
- Assembling of spray teams and considerations
- Understanding the role of the community in the IRS campaign—needs for engaging and having dialogue with communities to foster ownership and acceptance of the program
- Understanding the target area/coverage—spray campaigns should aim to cover more than 85% of all structures.
- The role of supervision—emphasizing that during spraying, supervisors must continually check that operators spray correctly; ensure recording; and rectify mistakes

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<sup>a</sup> References for this annex:

National AIDS Control Council, Kenya (2008). *Facilitators' Guide for the Trainers of Community Based HIV and AIDS Program Activities Implementers*, version 2.

National AIDS Control Council, Kenya (2008). *Users' Guide for Reporting of Community Based HIV and AIDS Program Activities in Kenya*, version 2.

Kenya Ministry of Health, Division of Malaria Control (2008). *Manual for Indoor Residual Spraying for Malaria Vector Control*.

<sup>b</sup> gram per meter squared

**Group Activities**

- Assign participants to small groups and have them discuss their overall understanding of IRS and factors that are critical for its success. The participants will develop a table listing relevant insecticides approved for IRS by WHO and dosages to be applied. Each group will present outcomes of their discussion in a plenary session. Allow 10 minutes for each group to present its findings.
- Invite one participant to summarize in 5 minutes the IRS knowledge developed in this session and to review the progress toward module objectives.

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## **B: Storage, Safe Handling, and Safety Issues Related to the Use of insecticides in IRS**

The session on the use of insecticides and safety stresses that insecticides should be seen in light of their benefits and the dangers they pose to animals and the environment. It is imperative that all personnel involved in IRS have to observe a strict code of conduct to minimize accidental introduction of the chemicals into the environment. Environmental safety is therefore extremely critical in IRS. Safety procedures have to be observed at all levels and include transportation, storage, handling during the IRS campaign, and disposal. The participants will be taken through key outlines in insecticide safety aimed at ensuring minimum leakage of the insecticides into the environment as a result of use in IRS:

- Environmental compliance in IRS
- Criteria for choice of insecticides
- Environmental precautions and best practices of IRS
- Personal protection and facilities for sprayers
- Transport of insecticides
- Storage of insecticides: storage best practices
- Pesticide application procedures
- Disposal of insecticides: progressive rinse, management of sachets
- Symptoms and treatment of insecticide poisoning<sup>c</sup>
- WHO-recommended drugs for insecticide poisoning
- Emergency plan in the event of poisoning
- Health monitoring plans

Discuss the importance of environmental and personal safety and of adhering to safety protocols. Supervision of the spray campaign includes a thorough audit of insecticide disposal.

### **Group Activities**

- Assign participants to new small groups and discuss issues of environmental compliance and safety, and why it is critical to ensure minimal insecticide leakage into the environment. Ask one participant in each group to summarize outcomes of their discussions on each of the topics listed above.

<sup>c</sup> Pesticide exposure (poisoning) will be covered by a representative of the District Health Office, local health facility or other clinician as well as IRS trainers.

## **C: The Compression Pump: Components, Function, and Maintenance**

### **Group and Individual Activities**

- Describe the functioning and assembly of a compression pump.
- Describe how to handle spray pumps and calibrate the nozzle tip for uniform insecticide dosage delivery.
- Describe the planning process of an IRS campaign.
- Disassemble and assemble a spray pump.
- Apply the right dosages of insecticides on wall surfaces by maintaining a uniform swath width and spraying speed.

### ***Topic 1: Components and Assembly of the Spray Pump***

An underlying key component of the training is the understanding of the compression pump. It is imperative for each participant to understand the function, handling, and maintenance of the compression spray pump.

Show participants and discuss with them the components and function of the compression pumps. Explain the function and maintenance of the following parts in detail: cylindrical stainless steel tank, hand-operated air pump, locking device, tank lid, pressure release safety device, hose, trigger valve with locking-off device, lance, control flow valve, nozzle, plunger cup, supply tube, strainer/sieve and housing, shoulder strap, pressure gauge, plunger shaft, and T-handle.

The handling of the pump is critical to ensure its durability. It is recommended that spray operators partially disassemble an empty spray pump (i.e., detach the hose and spray extension [lance]) when transporting it for long distance. When carrying an empty spray pump for a short distance, place the lance in the loop and cup, and always carry the pump with a strap over the shoulder. The pump should be positioned at the back of the spray operator when not spraying, and in front of the operator when spraying, so the operator can see the pressure gauge. Always pressurize the pump with even strokes from top to bottom.

Regular and proper cleaning of a pump are critical to ensure its efficient function. Demonstrate the cleaning process. Impress on the participants that each member of their spray teams should have sufficient skill in all processes of maintenance of the spray pumps to ensure quality work. When a pump is not in use, it is recommended that the critical parts be lubricated (with oil grade SAE 30) when dry, before storing the partially disassembled pump in a raised dry cool place with the tank upside down, hose hanging, and lance position upright.

TOTs should ensure that each spray operator under their supervision is able to disassemble and assemble a spray pump through repeated exercises in practical sessions.

### ***Topic 2: Nozzle Calibration***

X-Pert<sup>®</sup> spray pump nozzles are available in two identification numbers: UNIJET 8002E and TeeJet<sup>®</sup> 8002. The nozzle is the most important part of the sprayer, and neglecting it would lead to imprecise delivery of insecticide on wall surfaces because the volume of liquid per

unit time at a given pressure would not be standard. It is important to maintain a uniform spray pattern and swath width; hence the need to calibrate the nozzle. The use of wettable powder (WP) insecticides will inevitably lead to abrasion and wear of nozzle aperture, and worn nozzles will lead to increased flow rate and overdosing. It is therefore necessary to check nozzle flow rate (or calibrate the nozzle) on a regular basis to ensure economical and effective application.

The nozzle calibration procedure will be explained: Fill a standard sprayer with water and pump up to 40 psi. Spray into a measuring cylinder for 30 seconds and measure the amount discharged into the measuring cylinder. Spray tips are considered excessively worn if the flow rate exceeds the flow rate of a new tip by 10%. A normal nozzle would give a discharge of 380 ml at 40 psi for 30 seconds. Any discharge in excess of 418 ml would require a new nozzle to be fitted.

### Group Activities

Divide participants into groups of five. Have each participant

- Disassemble and reassemble a spray pump while taking necessary care.
- Draw and label the parts of a spray pump, and state the function of each part.
- Pressurize the spray pump after filling it with water to the required level.
- Carry out, in pairs, nozzle calibration.

### *Topic 3. IRS Field Operation: Planning an IRS Campaign*

Describe the planning process for a successful IRS program. The training will highlight the following key items:

- Working at the community level (cooperation, mapping, education, and validation)
- Planning of the spray team, with consideration of requirements: personal protective equipment (PPE), insecticides to cover targeted structures, pump spares
- Determining what and where you intend to spray—document the number of target structures, kinds of structures to be sprayed, distance between structures to be sprayed, terrain, readiness of community for the IRS campaign
- Recruiting criteria for spray operators and their training needs
- Defining the operational program for spray teams
- Evaluating infrastructure needs—warehouses, operation bases, bathrooms, road network, health facilities, waste disposal infrastructure, roles of stakeholders
- Assessing all logistical arrangements needed—water supply, vehicles, protective garments, washing soap, basins, reporting tools, etc.
- Assessing how logistics can be managed to minimize inconveniences and resource wasting

### Group Activities

- In groups of 5 participants, discuss the process of IRS planning and logistical management.

## D. Spraying Techniques

The success of an IRS program relies on the efficient and uniform application of recommended insecticides on wall surfaces. The technical skills of spray operators are a critical requirement.

### Group and Individual Activities

- Describe the safety issues related to use of the spray pump.
- Demonstrate skill in pressurizing and handling of the spray pump.
- Carry out nozzle calibration.
- Demonstrate skill in spraying techniques through maintaining uniform swath width and speed.
- Demonstrate the triple rinse technique.

TOTs will go through practical demonstrations and hands-on practical sessions including:

- Safety issues
- Pressurizing the spray pumps and use of pressure gauge (55–25 psi)
- Handling of pump while spraying
- Nozzle calibration (380 ml/30 seconds at 40 psi)
- Swath width and practice on the wall surfaces (75 cm swath at 45 cm nozzle distance from the wall)
- Spraying speed (2 ml per 4.5 seconds)
- Cleaning of the spray pumps

Give each participant an opportunity to practice the spraying techniques as demonstrated by the facilitators. At the end of the session, give a practical test to the participants to evaluate their skills in handling the spray pump, pressurizing the spray pumps, and maintaining uniform swath width and speed.



*Training participants practice spraying a wall. [Photo: RTI]*



**Group and Individual Activities**

- Divide participants into groups of 4 under a facilitator who will take them through demonstrations on pressurizing the pump, nozzle calibration, and spraying technique.
- Involve each participant in practical sessions covering the same topics. Up to 12 hours per participant will be spent on these practical skills.

**E: Data Management, Monitoring, and Supervision*****Topic 1: Introduction—Purpose and Objectives of Data Management, Monitoring, and Supervision*****Individual Activities**

The participants will

- Explain the meaning of data management, monitoring, and supervision.
- Describe the purpose and objectives of IRS monitoring, supervision, and data collection.

**Content/instructions**

- Discuss the meaning of data management, monitoring, and supervision
- Explain the purpose and objectives of data management, monitoring, and supervision.
- Ask for questions or comments.

**Definitions**

- **Data Management**—the process of data sorting, verification, entry into database, and secure storage in order to analyze data to enable quality program decisions and reports.
- **Monitoring**—the process of determining whether what was planned is being implemented, and if not, why. The purpose is to ensure efficiency, effectiveness, and sustainability through continuous improvement to meet program goals and objectives.
- **Supervision**—directing and overseeing performance of others while transmitting skills, knowledge, and attitudes for good program performance practice.

**Purpose of IRS Data Management, Monitoring, and Supervision**

- To provide strategic information and technical and capacity support to the Division of Malaria Control (DOMC), District Health Management Team (DHMT), and district teams for tracking IRS activities and collecting quality data to inform and report on the program. The aim is to ensure that IRS activities are implemented and reported per the relevant standard operating procedures and timelines.

**Objectives**

- IRS team appreciates the value of data management, monitoring, and supervision in IRS activities to control malaria.
- Complete IRS tools accurately and send to the right levels in the data flow structures.
- Enhance capacity of IRS team members to track and inform IRS activities.

- Support and undertake supervision and quality assurance for results.

### ***Topic 2: Tools for IRS and Data Flow***

#### **Group and Individual Activities**

- Identify the forms to be completed for each of activity.
- Review all the questions/indicators in each of the cards/forms.
- State data flow levels.
- Asked questions to clarify any issues pertaining to the data to be provided.

#### **Content/instructions**

- Review session objectives.
- Give a brief overview of the session activities.
- Decide whether to go through the forms in plenary or to divide participants into small groups and give tasks.
- Select a team leader to review the forms.
- Distribute and/or display the actual IRS cards and/or forms and database to the participants.
- Explain the use of each of the cards and/or forms and database.
- Explain that these forms and the database have been approved by USAID/PMI and the NMCP to capture the information that will be collected, and no changes will be made at this stage of the process.
- Read through each question and make sure participants understand
  - The meaning of each indicator
  - The information that each question requires
  - The purpose of each question
- Discuss the data sources to be used to complete the cards/form

Ask if there are questions and discuss them with participants.

- Distribute the IRS data flow chart to the participants.
- Explain how to chart the levels of data flow from the first source to the last point of data transmission
- Ask if there are any questions and discuss them with participants

Refer to *Annex 9* for the cards and forms listed below:

- Daily report card of IRS operations (for mobilizer)
- Daily summary report of IRS mobilization activities (for team leaders/supervisors)
- Evaluation form of mobilizer activities (for IEC coordinator /supervisor)
- Daily spray operator's card
- Daily summary report form of IRS daily\_spray operator's activities (for team leaders/supervisors)
- District mobilizer database
- District spray operator database

### ***Topic 3: Reporting on Spraying Activities***

#### **Group and Individual Activities**

- Ask participants to state the roles of various members of the spray team in operationalization of the cards/forms and the responsibilities of each in the data flow levels.

#### **Content/instructions**

- Explain that this session will guide participants to know where operator and mobilizer cards will be sent after they are completed.
- Explain the roles of mobilizer, spray operator, team leader, supervisor, IEC and district coordinators, data clerks, and the central office.
- Stress the fact that the completed forms have to be handed over within one day for review and data entry.
- Discuss what challenges are expected in data collection.
- Discuss the levels of review a spray operator's card goes through and that delay at any point affects the 24-hour timeline for submission.
- Emphasize the importance of data analysis and use of data at levels other than at the national office.
- Explain the importance of reviewing mobilizer and operator cards and team leader forms for accuracy, legibility, consistency, and completeness and of giving feedback to ensure quality of information generated.
- Stress the importance of quality control and supervision.
- Ask if there are any questions and discuss responses with participants.

#### **Role of Mobilizer**

- Record accurately daily activities/indicator achievements on the card.
- Hand over the card to the team leader.
- Keep cards and data in a secure manner.
- Demand feedback from the team leader.

#### **Role of Spray Operator**

- Record accurately daily activities/indicator achievements on the card.
- Hand over the card to the team leader.
- Keep cards/data in a secure manner.
- Demand feedback from the team leader.

#### **Role of Team Leader**

- Coordinate the distribution of cards to spray operators and mobilizers.
- Summarize and record accurately data for daily activities and indicator achievements on the appropriate forms.
- Receive the cards from spray operators and mobilizers, and review them for accuracy and completeness.
- Carry out supervision and data auditing for quality control.
- Hand over the cards/summary forms to supervisor.
- Keep cards and data secure.
- Discuss challenges that are encountered in reporting.

- Demand feedback from the supervisor.

### **Role of Supervisor**

- Coordinate the distribution of cards/forms to spray operators, mobilizers, and team leaders.
- Summarize and accurately record data for daily activities and indicator achievements from team leaders.
- Receive the cards/summary forms from team leaders and review for accuracy and completeness.
- Carry out supervision and data auditing for quality control.
- Hand over the cards/summary forms to IEC/district coordinators.
- Keep cards and data secure.
- Discuss challenges that are encountered in reporting.
- Demand feedback from the coordinator.

### **Role of Data Clerks**

- Check the responses in data cards/forms for accuracy and completeness.
- Review and analyze cards/forms for consistency and advise coordinator/supervisors of gaps for correction.
- Enter data into data entry screens in the database.
- Ensure data security.
- Ensure backups are kept of the database.
- Demand feedback from the coordinator

### **Role of IEC District Coordinator**

- Coordinate the distribution of cards to mobilizers, team leaders, supervisors.
- Receive the cards from spray operators and mobilizers, and review them for accuracy and completeness.
- Summarize and accurately record data daily activities/indicator achievements on the appropriate forms.
- Carry out supervision and data auditing for quality control.
- Provide technical assistance (TA) to team leaders, supervisors, and data clerks.
- Hand over the cards/summary forms to supervisor.
- Ensure cards and data are secure.
- Provide challenges that are encountered in reporting.
- Demand feedback from IEC specialist, M&E officer.

### **Role of District Coordinator**

- Coordinate the distribution of forms to spray operators and mobilizers.
- Receive the cards from spray operators and mobilizers, and review for accuracy and completeness.
- Summarize and record accurately data daily activities/indicator achievements on the spray operator and mobilizer cards.
- Carry out supervision and data auditing for quality control.
- Provide technical assistance to team leaders, supervisors, and data clerks.
- Hand over the cards/summary forms to supervisor.
- Ensure cards and data are secure.

- Provide challenges that are encountered in reporting.
- Demand feedback from IEC specialist and M&E officer.

### **Role of Central Office**

- Supervise and coordinate the M&E system.
- Provide technical assistance and capacity building for all levels.
- Generate information for internal and external reporting.
- Support field teams in data collection, entry, and analysis.
- Receive comments and suggestions for the improvement of reporting system.
- Provide feedback to the RTI district teams.

### ***Topic 4: Quality Assurance: Supervision and Data Auditing***

#### **Group and Individual Activities**

Participants will define supervision, explain what data auditing, list activities geared toward quality control, and ask questions to clarify any issues pertaining to supervision and data auditing.

#### **Content/Instructions**

- Review session objectives.
- Explain that this session aims to assist participants in planning for supervision and data auditing.
- Define supervision.
- Highlight what happens during supervision.
- Explain that one should plan supervision so there are predefined times and a schedule for supervising mobilizers/spray operators/team leaders, supervisors, and coordinators.
- Ask if there are any questions and discuss responses with participants.
- Define data auditing.
- Highlight the activities that occur during data auditing.
- Stress the importance of data auditing.
- Ask if there are any questions and discuss with participants.

#### **Supervision**

- Directing and overseeing performance of others while transmitting skills, knowledge, and attitudes for good M&E practice.
- Conduct field visits to selected homes and villages.
- Discuss team leader, spray operator, mobilizer reports and forms by giving feedback and, where appropriate, guidance on improvement.

#### **Data Auditing**

- Data auditing is done during supervision visit.
- Verify completeness and accuracy of cards/reports.
- Examine actual cards/forms and refer to summary reports.
- Compare raw data and district monthly reports.

**Topic 5: Group Exercise on Completion of Cards/Data Forms****Group and Individual Activities**

- Participants should accurately fill out the cards/forms accurately and asked questions to clarify any questions about the forms.

**Instructions and Group Work**

- Review session objectives.
- Give a brief overview of the session activities.
- Have a team leader review the mobilizer and/or spray operator cards/forms and how to complete them.
- Divide the participants into small groups for a role play activity. In each group, one participant takes the role of mobilizer or spray operator; and the remaining participants in each group take the role of household members. Have the mobilizer/spray operator participants complete the cards and review them within their groups.
- In plenary, have teams discuss their experience in completing the forms.
- Ask if there are any questions and discuss responses with participants.

**Exercise 1: Example of a Completed Mobilizer Card**

No.	Name of Owner of the Household	Adults Living in the Household	No. of Children under 5	Parents Present during Sensitization	Grandparents Present	Brochures Issued
1	Zainabu Lily	5	6	3	1	2
2	Maimuna Ali	4	5	4	-	1
3	Hassan Rasa	3	3	4	1	2
4	James Mbayeye	2	2	2	-	1
5	Titi Taitu	2	4	3	-	1

**Exercise 2: Example of a Completed Spray Operator Card**

A spray operator used three sachets of the five he carried for the day. The Spray Operator's Card shows the following details:

Sprayed:

No.	Name of Owner of the Home	Structures Sprayed	Number of Children under 5 Years	No. of Occupants	Pregnant Women	Pregnant Women Sleeping under Nets	Under 5 Years Sleeping under Nets
1	Lekool L	5	6	3	1	1	2
2 T	erasa Q	4	5	4	-	-	1
3	Jasmin Yamin	3	3	4	1	1	2
4	Katule Munli	2	2	2	-	-	1
5	Amin Amir	2	4	3	-	-	1

Unsprayed:

No.	Name of Owner of the Household	House Structures	Number of Children under 5 Years	No. of Occupants	Pregnant Women	Reasons for not Spraying
1	Willis Dani	3	1	3	1	funeral
2	Kimutai Letu	2	2	4		Sick
3	Kantai Kansai	1	2	4	2	Locked

**F: IEC and Social Mobilization in IRS****Group and Individual Activities**

- Describe the role of IEC and social mobilization in an IRS campaign.
- Describe the process of planning an IRS campaign.

Introduce participants to the concept of communication and social mobilization through a participatory learning approach. Discuss the role of clear communication channels in IRS and involvement of stakeholders at all levels of the spray operation.

Social mobilization involves planned actions and processes to reach, influence, and involve all relevant segments of a society from national to community levels, and it aims to create an enabling environment to effect positive behavior change.

Review the key information to be communicated to stakeholders for a successful IRS campaign. Include the timing of the campaign, the areas earmarked for IRS, the people doing the spraying, the requirements for getting a structure sprayed, and the important role of homeowners during the campaign period and what they should do after a home has been sprayed. Inform participants of the significance of providing encouraging messages to homeowners and of outlining the benefits to them in order to win their involvement and participation in the IRS campaign. Apart from the heads of households, the IRS messages should be targeted for the local administration, health workers, and other relevant government departments; religious, traditional, political, and opinion leaders; teachers and schoolchildren, civil society, and the general public.

Point out the following channels for social mobilization:

- Community meetings
- Dramas and road shows
- Songs and traditional entertainments
- Health talks
- Radio and television
- Leaflets, posters, banners, brochures

Participants would take advantage of available entry points such as churches and mosques, schools, market places, public gatherings, ceremonies, and homes in delivering the IRS messages.

#### **Instructions and Group Work**

- Identify effective channels of communication with communities in the group's districts and how well this communication can be achieved.
- Describe in detail the advantages and disadvantages of each method of communication.
- Identify methods of engaging different segments of the community in dissemination of key messages and appealing to their involvement in the IRS campaign.
- In a role play among small groups, have the participants take on roles of spray operators and household members. Spray operators should practice completing the cards and discuss them within their groups.
- In plenary, have teams discuss their experience in completing the forms.
- Ask if there are any questions and discuss responses with participants.



## Annex 4: Pre- and Post-training Assessment

### IRS Training Evaluation Tool

Attempt to answer all questions. For multiple choice questions, select only one response unless instructed otherwise.

Name \_\_\_\_\_  
Center \_\_\_\_\_  
Designation \_\_\_\_\_

Date \_\_\_\_\_  
Gender \_\_\_\_\_

1. Name 2 mosquito species that spread malaria.
  - a.
  - b.
2. Do all mosquito bites result in malaria?  
Yes / No
3. Where are *Anopheles* mosquitoes likely to rest to digest their blood meal?
  - a. Structures where humans sleep
  - b. Animal shelters
  - c. Kitchens
  - d. Latrines
  - e. Food stores
4. Which of the following is the most appropriate strategy for malaria control?
  - a. Prevention
  - b. Early diagnosis
  - c. Early treatment
5. What is the pesticide hazard classification to which pyrethroids belong?
  - a. I
  - b. II
  - c. III
  - d. IV
  - e. Other
6. Which of the following is not a mode through which pesticides can poison a person?
  - a. Oral ingestion
  - b. Inhalation
  - c. Spillage
  - d. Dermal route
7. Which of the following is a best practice for spray operators? (Circle all that apply)
  - a. Do not eat, smoke, or drink during spraying operations.
  - b. Wash your personal protective equipment (PPE).
  - c. Do not touch your face or other bare skin with contaminated hands.
  - d. Always keep PPE on during spraying.

8. If you feel a burning sensation when spraying an insecticide, what should you do?
  - a. Nothing
  - b. Visit the herbalist
  - c. Wash face with soap and hot water
  - d. Report to team leader or supervisor
  - e. Report to the health center
  
9. Name any of the 5 parts of a compression sprayer.
  - a.
  - b.
  - c.
  - d.
  - e.
  
10. How often do you shake the pump during one pump charge?
  
11. What is the application rate for alpha-cypermethrin<sup>a</sup> in IRS?
  
12. What is the recommended swath width for the X-pert<sup>®</sup> compression sprayer nozzle?
  
13. What is the correct distance of the nozzle to the target when spraying?
  
14. What are the 3 most important qualities of a good IRS supervisor?
  - a.
  - b.
  - c.
  
15. Name 4 of the most effective interventions against malaria.
  - a.
  - b.
  - c.
  - d.

---

<sup>a</sup> Insert type of pesticide being used in this training.

16. Why do you think the X-pert® is suitable for IRS?
17. What is the recommended safety period after a dwelling has been sprayed?
- 30 minutes
  - 1 hour
  - 2 hours
  - 4 hours
18. What is the relationship between bars and pressure per square inch (PSI) in pump pressure?
19. \_\_\_\_\_ bar is equal to \_\_\_\_\_ psi.
20. Is 55 psi = 4 bars?  
Yes / No
21. What are the 2 most important parts of a pump to clean daily in an IRS program?
- -
22. What is the approximate length of the lance of an X-pert® compression sprayer?
23. Name 4 classes of public health insecticides recommended for IRS by the World Health Organization (WHO).
- - 
  - 
  -
24. What is the most effective element of IRS IEC mobilization?
- Radio
  - Television
  - Posters
  - Billboards
  - Door-to-door
25. List at least 3 reasons for conducting information, education, and communication (IEC) in IRS:
-

- b.
  - c.
26. What indicates the pressure in the compression sprayer?
27. What is the role of the control flow valve in the functioning of the sprayer?
28. What elements of the environment are sensitive to alpha-cypermethrin?
29. What are the 3 factors involved in a pesticide exposure risk?
- a.
  - b.
  - c.
30. How do you secure pesticide for transportation?
31. Name 3 conditions for storage of pesticides which respect the environment.
- a.
  - b.
  - c.

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## Annex 5: Budgeting and Procurement

### Training

- Room to accommodate at least 50 people
- Copies of training schedule
- Chalk
- Copies of training assessment
- Data forms
- Flip chart and stand
- IEC materials
- Insecticide sachet
- LCD projector
- Markers
- Meter rules
- Tape measure
- Notepads
- Pens
- PPE (1/2 per person; i.e., two trainees can share one set)
- Sprayer (1/2 per person)
- Tools (adjustable spanner)
- Wall (10 M long)
- Tea
- Lunch
- Transport

### Storage

- Training for storekeepers
- Physical maintenance
  - Materials and labor for storehouse renovation
  - Locks and keys for storage facilities
  - Pallets for stacking insecticide and other equipment
  - Construction of securable boxes for pesticide if storehouses cannot be properly secured
- Emergency kit
  - 2 bags of sawdust or sand
  - Empty container to contain spillage residues
  - Spade
  - Brush
  - Fire extinguisher
- Health kit

- Container of water or inside faucet
- Bar of soap
- Eyewash set (ensure instructions are in host-country language)
- Medical or first aid kit (Ensure instructions are in host-country language)
- Stock management kit
  - Stock book
  - Bin cards
  - Thermometer
  - Pens
- Storekeeper PPE
  - Nitrile rubber, neoprene, PVC, or butyl rubber gloves without inside lining and long enough to cover forearm
  - Rubber boots
  - Overalls
  - Face shield or goggles
  - Vapor masks for half-face respirators with organic vapor cartridges

### **Health Centers (should be provided by MOH if possible)**

- Health worker training in pesticide poisoning
- Poisoning treatment medication (ensure instructions are in host-country language)
- Pregnancy test kits (ensure instructions are in host-country language)

### **Transport**

- Training for drivers
- For vehicle washing: nitrile rubber, neoprene, PVC, or butyl rubber gloves without inside lining and long enough to cover forearm. Use rags or cloths to wipe a truck bed. Wash the rags or cloths with the PPE and return them to the storehouse at the end of the spray day.

### **Washing**

At each central meeting area for spray teams (usually storage facilities, either temporary or permanent), the following should be available:

- Basins for face and hand washing, materials to construct temporary bathing facilities, or materials to renovate existing facilities to accommodate the size and number of spray teams meeting for daily clean up
- Basins for washing overalls that are separate from basins for face and hand washing
- Materials for wash area demarcation (hard coal/charcoal, sawdust, stone aggregates/gravel, fencing, and wire mesh); budget for construction or renovation of ablution facility; or budget for construction or renovation of evaporation tank with locked grate

- 7 barrels or drums for progressive rinse (it is often helpful if they are wide enough or deep enough for submerging the entire spray can)
- 3 plastic cups for pouring rinse water into spray can
- Detergent for washing overalls

For each washperson, the following PPE should be provided:

- Chemical apron
- Nitrile rubber, neoprene, PVC, or butyl rubber gloves without inside lining and long enough to cover forearm
- Rubber boots
- Face shield or goggles
- Dust mask

### Operations

For each spray operator, PPE should include:

- Helmet
- Face shield or goggles
- Dust mask or filtered mask
- 3 pairs of cotton overalls
- Nitrile rubber, neoprene, PVC, or butyl rubber gloves without inside lining and long enough to cover the forearm
- Rubber boots in appropriate sizes that don't cause blisters. (Keep in mind that in some countries, women make up 50% of the spray teams, so smaller boot sizes may be warranted. Non-rubber will absorb the chemical and are not safe.)
- Extra PPE to replace torn gloves, broken face shields, or contaminated dust masks.

Each spray operator should also be equipped with

- a drop cloth to cover household furniture
- a plastic cover or small handbag to prevent the spray card from becoming contaminated in the field

It may also be useful to procure a funnel with strainer—so an operator can easily rid debris from water used in pump charge, and identification cards with name and a picture for all program staff, including supervisors, team leaders and spray operators.

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## Annex 6: IRS Monitoring Indicators

Purpose	Indicator	Data Source and Method	Frequency and Aggregation	Baseline or Target
<i>Core IRS Indicators for PMI Annual Report</i>				
Measures IRS coverage	<p>“IRS Coverage” = percentage of sprayable structures found (F) in the target area that were sprayed (S).</p> <p><i>Key Definition:</i> a “sprayable structure” is a free-standing building in which people sleep.</p>	<p>Daily spray cards, as summarized in the program database. Spray operator is the original source of information.</p> <p><math>F = \#</math> sprayable structures found  <math>S = \#</math> sprayable structures sprayed  <math>IRS\ Coverage\ (C) = S/F \times 100</math></p>	<ul style="list-style-type: none"> <li>Report C calculated at the national level for each year. <i>This is used in the PMI Annual Report.</i></li> <li>Report C for each spray round, calculated at the national level.</li> <li>Report C for each spray round, calculated at the most relevant sub-national level (e.g., by province or district).</li> </ul>	<p>85% of the sprayable structures in the area(s) to be sprayed.</p> <p><i>Comment:</i> The annual Malaria Operational Plan (MOP) usually includes a target number of households to be sprayed. This number may be less than or greater than the number of households in the area(s) to be sprayed. The program target is always 85% of the actual number of sprayable structures found in the area(s) to be sprayed.</p>
Estimates the number of people protected by IRS	Number of residents of sprayed structures	<p>Daily spray cards, as summarized in the program database. Head of household or other adult is the original source of information. Spray operator records response during post-spray interview.</p> <p><math>T =</math> total # of residents  <math>P = \#</math> pregnant women  <math>U5 = \#</math> children under 5 yrs</p>	<ul style="list-style-type: none"> <li>Report T for each year at national level. <i>This is used in the PMI Annual Report.</i></li> <li>Report T for each spray round at the national level.</li> <li>Report T at other levels of aggregation if requested by mission or NMCP.</li> <li>Report P and U5 if requested by mission or NMCP, at requested frequency and aggregation</li> </ul>	<p>N/A</p> <p><i>Comment:</i> Targets in the annual MOP are usually expressed as the number of households to be sprayed. The number of the population of the spray area often differs from government population estimates.</p>
Reflects effort to increase the capacity of host country	Number of people trained to deliver IRS	Training records prepared by program administrative staff.	<ul style="list-style-type: none"> <li>Report the total number of people trained each year at all IRS locations. <i>This is used in the PMI Annual Report.</i></li> <li>Report the number of people trained</li> </ul>	N/A

## Annex 6: IRS Monitoring Indicators

Purpose	Indicator	Data Source and Method	Frequency and Aggregation	Baseline or Target
institutions to implement IRS			for each function (supervisors, team leaders, spray operators, implementers, storekeepers, drivers, logisticians, etc.) for each spray round. Include health care providers and environmental inspectors.	
<b>Quality Management Indicators</b>				
Reflects the quality of IRS communications and community awareness	Average time the family/goods remain outdoors following IRS application	Supervisor's Checklist. Original data are recorded by supervisors based on direct observation or an interview with the head of household or other adult resident, at a sample (approximately 5%) of households sprayed each day. Indicators are calculated for the sample of households that the supervisor visits.	<ul style="list-style-type: none"> <li>Summarize results each week in the Supervisor's Weekly Report for each team under the supervisor's authority.</li> <li>Summarize results for the full spray round, for each team under the supervisor's authority, in the Supervisor's End-of-Spray Report.</li> </ul>	2-4 hours
	Percentage of households in which residents sweep the floor upon reentry following IRS			100%
	Percentage of households in which a respondent reports accurate knowledge of IRS messages			100%
Reflects the quality of IRS training and implementation, and the effectiveness of supervision	Percentage of operators who fully implement best practices (% FC). Face the surface/wall 45 cm from nozzle to wall. 2.5 seconds/M spraying rate. Hold the pump correctly. Shake the pump frequently. Wear PPE properly. Fill out spray card correctly.	Supervisor's Checklist. Original data are recorded by supervisors based on direct observation of operators. Supervisors should observe 100% of spray operators under their authority during each 1-2 week period.  $N = \#$ operators under supervisor $O = \#$ operators observed $C = \#$ operators given a correction	<ul style="list-style-type: none"> <li>Report results for all variables in the Supervisor's Weekly Report.</li> <li>List results for all variables, by week, in the table in the Supervisor's End-of-Spray Report</li> </ul>	% FC = 100%

Purpose	Indicator	Data Source and Method	Frequency and Aggregation	Baseline or Target
	Courteous to residents. Reinforce key IRS messages.	$B = \#$ operators fully compliant <i>Note: B + C must = O</i> $\% FC = B/O \times 100$		
	Supervisory Ratio (SR) describes the number of team leaders and spray operators reporting to each supervisor.	Supervisor's Weekly Report. Original data are recorded by supervisors.  $S = \#$ supervisors (=1) $L = \#$ team leaders under supervisor $N = \#$ operators under supervisor  $SR = S:L:N$	<ul style="list-style-type: none"> <li>Report SR each week in the Supervisor's Weekly Report.</li> <li>List SR by week in the table in the Supervisor's End-of-Spray Report.</li> </ul>	SR should not exceed 1:5:30
Reflects compliance with stock management and record keeping requirements	Number of storage facilities from which the Logistics Manager has received a current Storekeeper's Weekly Report. (SR/X)	Storekeeper's Weekly Reports. Original data are entered and reported by storekeepers, who submit weekly reports to the Logistics Manager. The Logistics Manager prepares a summary Insecticide Inventory Report each week.  $SF =$ number of storage facilities $SR/X =$ number of reports received for week X  $SIS =$ actual count of sachets remaining in stock $REQ =$ estimated number of sachets required to spray remaining households $AVL = SIS/REQ \times 100$	<p>Storekeepers:</p> <ul style="list-style-type: none"> <li>Report all variables each week on the Storekeeper's Weekly Report, for an individual storage facility.</li> </ul> <p>Logistics Managers:</p> <ul style="list-style-type: none"> <li>Summarize data each week in the Insecticide Inventory Report.</li> <li>Note the number of storage facilities (SF) and reports received (SR/X), and follow up to obtain outstanding reports.</li> <li>Report SIS, AVL, MIS, ESR, and ESD as totals calculated across all storage facilities.</li> </ul>	All storekeepers should submit a weekly report reflecting up-to-date stock records for the storage facility they direct.

## Annex 6: IRS Monitoring Indicators

Purpose	Indicator	Data Source and Method	Frequency and Aggregation	Baseline or Target
	Number of insecticide sachets in stock. ( <i>SIS</i> )			N/A
	Percentage of remaining insecticide requirement available ( <i>AVL</i> )			N/A
	Percentage of empty sachets returned ( <i>ESR</i> )			100% of empty sachets should be returned
	Percentage of empty sachets disposed ( <i>ESD</i> )			N/A
Reflects safety in IRS operations	Proportion of health facilities with adequate stocks of insecticide antidotes and treatment medications in target communities	Pre-launch Environmental Compliance Inspection Report. Original data is provided by the designated Medical Officer to the Environmental Compliance Inspector.	<ul style="list-style-type: none"> <li>Reported once at the beginning of spray operations</li> </ul>	100%
	Proportion of health facilities at which health workers have been trained to treat cases of pesticide poisoning and exposure	Pre-launch Environmental Compliance Inspection Report. Original data are provided by the designated Medical Officer to the Environmental Compliance Inspector.	<ul style="list-style-type: none"> <li>Reported once at the beginning of spray operations</li> </ul>	100%
	Percentage of female spray operators tested for pregnancy during spray operations	Monthly report provided by designated nurse or Medical Officer	<ul style="list-style-type: none"> <li>Reported each month</li> </ul>	100%
	Percentage of spray operators who reported adverse health events attributable to pesticide exposure	Monthly report provided by designated nurse or Medical Officer	<ul style="list-style-type: none"> <li>Reported each month</li> </ul>	N/A

# Annex 7: IRS Spray Operator Supervisor's Checklist

**DISTRICT**

Sector: \_\_\_\_\_ Village: \_\_\_\_\_

Supervisor: \_\_\_\_\_ Spray Operator Number: \_\_\_\_\_

Name of responsible adult at structure to be sprayed:.....

Name of Team Leader:.....

What was the Team Leader doing when you arrived?.....

**USE OF PERSONAL PROTECTIVE EQUIPMENT (PPE)**

Overalls \_\_\_\_\_ Rubber Boots \_\_\_\_\_ Mouth/Nose Mask \_\_\_\_\_  
 Face Shield or Other Eye Protection \_\_\_\_\_ Gloves \_\_\_\_\_ Helmet \_\_\_\_\_

**DOES THE SPRAY OPERATOR . . .**

Inform occupants about spraying?		Yes	No
Thoroughly inspect the structure?		Yes	No
Ensure that food items, water containers, and cooking utensils are covered and taken outside?	Ye	s	No
Ensure that the structure's occupants are outside during spraying and 2-3 hours 2:30 after?	Ye	s	No
Ensure that domestic animal(s) are outside during spraying and 2:30 after?		Yes	No
Agitate the sprayer periodically before and during spraying?		Yes	No
Hold the nozzle at a constant distance (45 cm) from the target?		Yes	No
Overlap adjacent swaths for uniform spray coverage?		Yes	No
Maintain the right spray speed and consistency?		Yes	No
Check the operational spray pressure regularly?		Yes	No
Release the pressure trigger when the sprayer is not in use?		Yes	No
Distribute insecticide on wall	Poor	Good	Very good
Distribute Insecticide on ceiling	Poor	Good	Very good
Spray behind the doors?		Yes	No
Spray behind immovable furniture?		Yes	No
Avoid environmental pollution?		Yes	No
Eat or drink during the spray activity?		Yes	No
Eat or drink without first washing?		Yes	No
Properly fill out the daily record form??		Yes	No

**OTHER OBSERVATIONS (e.g., spillage, information to the community, discipline):**

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## Annex 8: General IRS Checklist

Activity	Source of Information	Response	Comment
<b>Spray Operations</b>			
Distance from nozzle to the wall should be 45 cm during up and down movements			
Use of shoulder strap to lift sprayer			
Gauge is easily visible			
Sprayer is carried on opposite shoulder to the spraying arm			
Sprayer is upright for transportation			
Addressing concerns of structure's occupants			
Both hands on plunger rod handle during pressuring			
Check for air leaks			
Agitate sprayer to keep insecticide in suspension			
Sprayer is pressured up to 55 psi			
Maintains 75 cm wide spray swath during downward and upward movements			
Walks in the same direction of the hand holding sprayer trigger			
Rhythm: The speed should allow adequate coverage, about 2.6 seconds of spray for each vertical surface linear meter			
Length of time before occupants return to the structure after spraying			
Fills sprayer three-fourths full and pressure to 35 psi, and sprays for a minute into a container			
Removes in-line strainer and clean in water			
Removes nozzle tip and cleans with water			
Reassembles sprayer and hangs it upside down to dry			
Collects empty sachets to store and dispose			
Fills in the spray card for each structure and checks at the end of the day			
Participates properly in progressive rinse			
<b>Environmental Compliance</b>			
Stores orderly with no spills or leaks			
Separation of pesticides and food			
Stock records are up to date			
Stores and stock locked and guarded			
Operators trained in accordance with WHO guidelines			
Empty sachets collected and counted			
Whole wall covered in spraying			
Reports of insecticide poisoning			
Operator to supervisor ratio is high			
Soap and water available at wash site			
Health facility workers trained			
Health facilities stocked with poisoning drugs			
Drivers and other ancillary workers trained			
PPE in good condition			
All necessary PPE worn during operations			
Watch for eating, drinking, or smoking during operations			
Screen out women who are lactating or pregnant			
Availability of shower facilities and daily wash			
Urine and blood samples to measure exposure levels			
People and goods outside during spray operation			

**Annex 8: General IRS Checklist**

Activity	Source of Information	Response	Comment
Occupants sweeps structure floor following spraying			
Spray operator observes 45 cm distance from the wall during spraying			
Operator maintains rhythm of 2.5 seconds per meter covered			
Operator observes a 75 cm swath width and 5 cm overlap			
Calibrate sprayers to 790 ml/minute discharge			
Stores have temperature monitoring and records of temperatures at regular intervals			
<b>National Program</b>			
Existence of policy and strategy on vector control?			
What is the IRS objective?			
Any concerns about IRS from government?			
What is government policy on the DDT issue?			
Who should be engaged on the ground?			
Targeted districts/area chosen; criteria for choice?			
What is the existing capability in government and counterparts at different levels?			
What do other sectors think about IRS?			
Where does capacity building have to be concentrated?			
Demographics for national and target areas?			
Into what existing M&E framework should IRS be incorporated?			
What are the long-term rainfall patterns and recent observations?			
What are the registered insecticides in the country—or who should know this information?			
Who is responsible for registration, and how do you reach them?			
Any existing baselines on resistance, cases, infection rates, entomological data?			
Existing insectary capability in the country?			
When is the best time to carry out IRS?			
Selection of operators: What should be the criteria?			
<b>Partners</b>			
What is the objective of IRS in the country?			
Existing capability in IRS in both government and partners?			
What are partner's views on insecticides, and especially DDT?			
Existing data on resistance to common insecticide classes, research, etc.?			
Who should be engaged?			
Long-term role of IRS?			
What will be the roles of each partner?			
When should IRS be conducted in the year?			
What is the type of transmission in the country and target site(s)?			
<b>RTI Staff</b>			
Who trained operators and for how long?			
Supervision: Who does what?			
M&E records baselines, structures sprayed, structures where spraying was refused			



Activity	Source of Information	Response	Comment
Count operators, team leaders, and supervisors per site			
Background information on populations, housing, geographical reconnaissance			
M&E to comply with technical standards for both IRS operations and environmental assessments			
Study of susceptibility testing to selected insecticides			
IEC, and determine if Mission and government are satisfied with provider			
Incentives to field staff, operators, team leaders, supervisors, logisticians			
Government engagement at all levels?			
Health facility training and readiness for emergencies?			
How are M&E cards (work flow) and card monitoring handled?			
What is the government providing (staff, transport, supervision, political, etc.)?			
How are stores organized? Who is the storekeeper? How are storekeepers trained?			
Are store records up to date, or not?			
Is there a defined process for project data entry?			
Movement of materials: insecticides, empties, sprayers, spares, transport, tools, PPE			
IEC: Who is responsible? Is RTI satisfied with the work?			
What is the refusal rate per day, and where is the record?			
What is the role of community leaders in IRS?			
IRS team size?			
Length of transmission season and seasonality?			
Strengthening general entomologic and vector control capabilities: Is RTI envisaged to undertake these?			
Strengthening districts and provincial officials and other partners in district level in collaboration with local partners			
Terrain of the area: Easy or hard to reach?			
Proposal for reporting needs: Monthly coordination meetings, monthly one-page report, <i>ad hoc</i> emergency types of meetings, other contractual obligations, presence on the ground to participate in all local activities to ensure coordination with NMCP.			
<b>Community/Sleeping Structure Level</b>			
Provision of water where necessary			
Taking care of property outside the house			
Sweep the floor after spraying			
Stay outside the house for two hours			
Support completion of post-operation card			
Provide information about side effects			
Occupants should be informed early about effects of insecticides, people who can't be moved, general precautions following spraying			
Consequences for bad behavior to an individual?			

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# Indoor Residual Spraying Program Supervisor's Daily Record

DISTRICT \_\_\_\_\_ HEALTH CENTER \_\_\_\_\_ VILLAGE \_\_\_\_\_ DATE \_\_\_\_\_

SUPERVISOR'S NAME \_\_\_\_\_ SIGNATURE \_\_\_\_\_

SACHETS RECEIVED \_\_\_\_\_ FULL SACHETS RETURNED \_\_\_\_\_ EMPTY SACHETS RETURNED \_\_\_\_\_

Team Leader's Name	No. HHs	Eligible Structures									Rooms		Mosquito Nets		
		No. Found	Sprayed				Unsprayed				Found	Sprayed	Total	Pregnant	< 5
			No.	No. Pop.	<5	Pregnant	No. Pop.	<5	Pregnant						
Total															

Most common reasons for not spraying: 1.....

2.....

3.....

Supervisor's comments:

12-23-2009

## Annex 10: Sample Pesticide Store Stock Record Sheet

**Pesticide Group** \_\_\_\_\_  
**Ref. No.** \_\_\_\_\_  
**Common Name** \_\_\_\_\_  
**Trade Name** \_\_\_\_\_  
**Formulation/concentration** \_\_\_\_\_  
**Manufacturer/supplier** \_\_\_\_\_  
**Quantity (agreed issuing quantity/package)** \_\_\_\_\_  
**Primary packaging quantity** \_\_\_\_\_  
**Date received** \_\_\_\_\_  
**Use-by date** \_\_\_\_\_  
**Notes (shelf life; special storage conditions; inspection frequency)** \_\_\_\_\_

Date	Quantity Issued (L)	Balance in Stock (L)	Notes and Initials (stock inspection)
Record of disposal of outdated stock:			

### Notes on the Sample Record Sheet

Meticulously record the details of receipts and issues, and records of periodic stock inspections. Careful notes should be made on the state of containers and contents at the time of inspection.

**Reference number:** Make a cross-reference to the invoice or delivery note and location of the pesticide in the store (bin, shelf, or row number).

**Identification of the pesticide:** Record group, common, and trade names with details of formulation and concentration.

**Source of the pesticide:** When possible, record information on primary manufacturer or formulator, as well as local source (with local telephone number when available, in case of emergency). Also, record where the pesticide came from, (central warehouse, other warehouse, customs, etc) because many stocks get shifted.

**Packaging and issuing units:** These units may differ. The pesticide may be in 200 L metal drums or in 1 L cans packed in boxes of 20 with sales or issues being made in units of the 1 L can.

**Date received:** Possibly the most important item of information: It is essential to document date the pesticide is received. The date must be recorded on the actual pesticide containers along with the use-by date.

**Notes:** Information should be obtained from the supplier on shelf life (use-by date), special storage requirements, specific hazards, and other details that should be incorporated as instructions to the storekeeper on the record form.

12-23-2009



## Annex 11: IRS Information, Education, and Communication Strategy

### Background

The Indoor Residual Spraying (IRS) campaign is a joint United States Government and recipient government initiative and is part of the United States President's Malaria Initiative (PMI) to reduce the impact of Malaria in sub-Saharan African countries. RTI International is implementing IRS in 15 countries. The IRS intervention aims to significantly reduce rates of malaria transmission among populations in areas that are sprayed.

At the national level, the National Malaria Control Program (NMCP) and the government's communication department are the lead partner agencies. The NMCP is responsible for policy and programs for malaria control and prevention. IRS is implemented within the framework of existing national policy and priorities that include the use of treated nets, early diagnosis of malaria, and treatment of and special attention to pregnant women and children affected by malaria. The NMCP, in consultation with relevant partners, determines the sites to be included in a spray round.

The first part of this document provides an overview of the communications strategies through which the target communities are informed and mobilized with respect to key issues aspects of malaria control using IRS, environmental safety and what is expected of them before, during, and after the spraying. Then, the document discusses the communications plan, and includes a detailed outline of the rationale for the media selected for the communications strategy, content development, media buying, and all other aspects of the management of the information, education, and communication (IEC) campaign.

### Introduction to Indoor Residual Spraying

IRS is a commonly used malaria vector control method that is particularly effective in interrupting malaria transmission and in preventing death—and in mitigating malaria epidemics. IRS is implemented by the application of residual insecticides, to which *Anopheles* female mosquitoes have been demonstrated to be susceptible, to the interior walls of houses and other structures. The insecticide remains on the treated surfaces upon which the mosquitoes rest before or after taking a blood meal from a person. The residual effect of the insecticide is sufficient to kill resting mosquitoes for a specified period of time. The choice of insecticide to apply is based on efficacy, residual life, and acceptability by the community. Insecticide selection is also governed by World Health Organization Pesticide Evaluation Scheme (WHOPES) approval.

Through IEC, residents where IRS will occur learn that they are obliged to take certain precautions before, during, and after the spray operations. These precautions include those described below.

#### ***Pre-spraying activity***

- Inform all households of the spraying schedule and the purpose of the spraying to give them adequate time to prepare and take their belongings outside and to vacate the house.

- Secure all food items, cover them, and take them outside the house.
- Remove all water from the house and properly cover it.
- Remove all utensils, kitchenware, and toys from the house.
- Remove furniture to allow the spray operator easy access to the walls in each room. Cover any remaining furniture that cannot be moved.
- Cage or tether pets and domestic animals away from the structure.
- Each household should provide at least 10 L of water to spray operators where possible.

***During spraying***

- Spray operators may not eat, drink, or smoke while applying the chemical. Instruct community members that if they see any spray operator eating, drinking, or smoking, they should discourage the spray operator from doing so, for the safety of the spray operator. If the spray operator has no alternative but to drink water, s/he should wash his or her hands several times with soap and water, according to training received.
- Residents must leave the house during spraying.
- Structures that are occupied by sick and/or old people who cannot be moved may not be sprayed. Instead, operators should note and report these structures to the team leader for mop-up operations later.
- Pregnant women and babies should remain well away from the structure during the spray procedure and for two hours after a structure has been sprayed.

***Post-spraying activities***

- Residents must remain outside the structure for at least two hours while the spray dries. Openings to the structure, such as doors and windows, should remain closed for the two-hour waiting period.
- Sweep floors free of any residual insecticide that may remain from the spraying. Sweep any dead insects found on the floor. Use a dust bin, leaf, or other item to dispose of the insects in a pit latrine, or bury them in a hole in the ground to avoid contaminating other animals. The sweeping should be done before children or pets are allowed to enter the structure.

Do not paint, replaster, or wash walls after insecticide has been applied in order to increase the time that the insecticide remains active in killing mosquitoes.

**IRS Objectives**

The NMCP/PMI IRS program concentrates on providing immediate information about malaria prevention and IRS to its primary audiences and strives to create long-term sustainability through its secondary and tertiary audiences.

The specific objectives of the IRS IEC campaign are to

- Create long-term sustainability of the program by involving and engaging key stakeholders.
- Inform the beneficiaries about the positive benefits of IRS in controlling and preventing malaria and malaria related deaths.

- Inform the beneficiaries about their role before, during, and after the spray operations.
- Inform the key stakeholders and beneficiaries about the safety issues related to environmental and health effects of using insecticides.

### **IEC Tasks**

The RTI IEC team develops and implements the IEC campaign and is responsible for the following key tasks:

- Develop a comprehensive demand generation strategy for the IRS program that includes
  - A creative strategy
  - A dissemination strategy
  - Communication channels and media selection
  - Standard guidelines and operating procedures for implementation
- Provide capacity building of local IEC implementing partners in dissemination of high-impact/low-cost communication materials.
- Mobilize the community to ensure community support for the IRS program and to manage concerns related to environmental compliance.
- Provide supply-side communication to ensure that promises made through communication are delivered and to ensure service provider motivation.
- Demonstrate the IRS program as an effective means of controlling malaria, saving lives, and promoting health.

Some of the prerequisites for performing the above tasks are to

- Recognize and evaluate existing capacity.
- Learn from what has and has not worked.
- Build the capacity of people who implement IEC—development, media planning, monitoring and evaluation (M&E).
- Use local community resources and existing community structures to implement IEC.

### **Target Audiences**

#### ***Who are the audiences?***

IRS IEC campaign aim to reach the following audiences:

- Primary target groups—the beneficiaries of the program: all individuals whose sleeping structures will be sprayed, including men, women, and children who are residents of the target districts in which spraying will take place.
- Secondary target groups—include opinion leaders, local government officials, community health workers, and environmentalists.

#### ***Motivators and hurdles***

Communication is about people, and it is critical to understand what people want. What are their needs, desires, and fears? What motivates them and what discourages them from doing what we expect them to? The following list identifies some motivators and barriers for the primary target audience:

Motivators: Why will they cooperate?

- Rational motivators
  - Health of the family
  - Malaria is the number one killer in communities (especially for children)
  - There is no direct cost involved in getting your house sprayed (and for protecting your family)
  - Protection of livelihood and reduced medical burden
  - Get rid of mosquitoes and reduce other household insect pests
- Emotional Motivators
  - Be a good provider for the family
  - Be a good mother
  - Freedom from fear of malaria
  - Happy and healthy children free of illness

The barriers: Why might they not cooperate?

- Health and safety issues
- Resource and inconvenience issues
- Misconceptions or rumors
- Privacy of female members of the household

The IEC campaign will highlight the motivating factors and address concerns and barriers to ensure that people are motivated to get their houses sprayed and comply with the pre- and post-spray requirements.

### **Key Issues**

The following key issues will be addressed through the IEC campaign, according to the needs of the target audience and the IRS program:

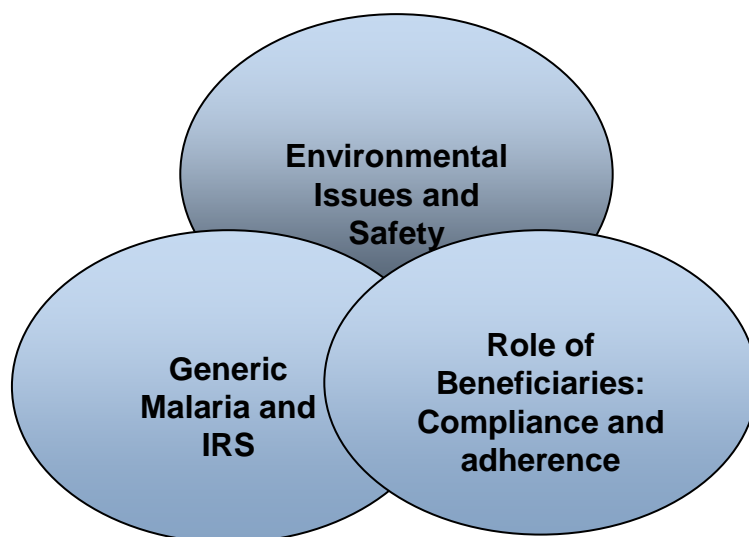
- Role of beneficiaries in the program success (such as clearing the house before the team arrives)
- Beneficiary satisfaction (eliminate misconceptions, demonstrate effectiveness, address health and environmental concerns)
- Simple, low-literacy messages
- Thematic (general about IRS) or tactical (related to a specific spray round)

### **Overall Message Strategy**

The IRS program requires significant participation, cooperation, compliance, and adherence on the part of the program beneficiaries. It is therefore necessary that messages developed for the IEC campaign meet the beneficiary criteria discussed above and, at the same time, address concerns of other stakeholders, such as environmental groups and opinion leaders.

Conduct assessments, focus group discussions, and meetings to gather input from stakeholders such as United States Agency for International Development (USAID), NMCP, and health communication experts in the field to develop messages.

Messages for the campaign will be developed in the three focus areas shown in the following diagram:



Messages developed in other countries where RTI has already conducted spray operations will be used as the primary building blocks for developing country-specific messages. Messages will also reflect continuity and synergy with other malaria programs implemented by USAID and the Ministry of Health (MOH).

### ***Key messages***

The main IEC program includes messages such as those listed below, along with others that can be proven effective in the field:

- IRS is part of the government's comprehensive program to fight malaria.
- Indoor spraying will kill the mosquitoes that transmit malaria.
- You must continue to use treated nets and other means of preventing malaria even when your house has been sprayed.
- If you or your children show signs or symptoms of malaria, seek help at the local clinic as soon as you see signs of illness.
- IRS does not cost the family anything. It is free and voluntary.
- IRS operators will apply a small quantity of insecticide on the walls of each structure.
- IRS is safe for you, your family, and domestic animals.
- Please remove all articles from your home before the spray team arrives, and allow at least two hours after completion of spraying before you re-enter the home.
- After your house is sprayed, do not wash, replaster, or paint the walls for at least three months or until the malaria season is over.

### ***Messages related to role of beneficiaries***

What is your responsibility as a resident in making this activity a success?

- Cooperate fully with the spray team member by allowing him or her entry into the house to spray.
- Provide one pail of water for mixing the insecticide or any other assistance when requested.

- Take all household items (food items, utensils, clothing) and domesticated animals, such as chickens, out of the house before spraying to ensure they do not come into contact with the insecticide.
- Make sure all walls of the house are accessible.
- After a house is sprayed, dispose of all dead insects by sweeping and dropping them into a pit latrine, or by burying them in the ground to protect your domesticated animals. *Wash your hands after doing this.*

### ***Environmental safety messages***

- The insecticide to be applied has been approved by WHOPES and the national government. It has been tested and selected by the NMCP, which is responsible for malaria control in the country.
- The insecticide used in this spraying activity is safe to human beings and animals when precautions are taken, and it continues to kill mosquitoes for six months or more (depending on the insecticide and wall surface).
- Only trained operators may apply the insecticide used for IRS.

### ***Language***

Materials developed for print and radio should be primarily in the language in which the target audience is literate.

Materials need to communicate simply, clearly, and effectively in the accepted local idioms, which often include borrowed terms from other languages. Demographic data indicate that although urban dwellers generally have higher education levels than rural populations, the average level of educational attainment is basic. Pretesting at the community level will ensure that print and radio messages meet the requirements of technical accuracy and clarity.

### **Inputs from Other IRS Programs**

Since IRS on a large scale is relatively undeveloped in most countries, there are few existing materials available on which to base a new strategy. However, RTI's strategy is strongly informed by the experience that has been shared by other countries already involved in spraying. For example, Tanzania/Zanzibar and Uganda provided copies of their most-used print materials and their thoughts on what worked and did not work in their respective cases. The print materials were adapted into a template form for adaptation into local context, literacy levels, culture, and language, to stimulate discussion and inputs for the materials to be used in the country.

Final designs are re-evaluated by RTI, USAID, and the NMCP.

### **Sample Mobilization Plan**

The mobilization plan for the IEC campaign is based on all information gathered by the communication team through IEC assessments and discussions with various stakeholders in the country. The following information provides the rationale and guidelines for the use of different media, channels, and materials, and a time line of activities. The dates have to be set to fit into the general time line spelled out in the IRS Malaria Operational Plan (MOP), which may be found on the Internet at [www.fightingmalaria.gov](http://www.fightingmalaria.gov).

### **Leaflets and Brochures**

Leaflets and brochures are the only tool available (and the cheapest one) within the media mix that can contain all of the details that need to be communicated to beneficiaries. It is required that mobilizers distribute at least one leaflet or brochure to the residents of each household that will be sprayed, and that a mobilizer personally explains it to the household residents. It is critical to note that IEC mobilizers may often not find anyone at home during working hours or may find domestic workers who do not allow the IEC mobilizers to enter. In such situations, an IEC mobilizer should leave a copy of the leaflet at the structure and try to contact the residents at another time.

IEC mobilizers also distribute leaflets or brochures at schools, religious buildings, and congregation points such as community centers.

### **Media selection**

- Radio—Highest reach based on listenership survey
- Printed materials—Essential for one-on-one communication
- Outdoor—Advertising
- Television (limited use)—Lower reach
- Team branding—Immediate recognition and acceptance

### **Radio implementation**

Determine the reach of this medium of communication through listenership estimates. Conduct a survey of existing radio stations and the target audience's best listening times, including a look at programming that combines education and entertainment. To determine the use of radio, consult stakeholders during the IEC assessment.

The table below is an example of a possible broad plan for the use of radio. It specifies the number of spots for each item per radio channel. Exact placements of ads will be based on a daily media schedule that the selected ad agency will develop. Radio would be especially useful during the week leading to commencement of IRS.

<b>Item</b>	<b>Quantity and Frequency</b>	<b>Usage</b>
3-minute radio drama on IRS	1 per day over 2-week period (3 minutes x 14 spots)	Explains IRS and what listeners need to do before, during, and after spraying
60-second radio spot	3 per day over 8 weeks (60 seconds x 180 spots)	Malaria prevention, environmental safety, and family health
10-second radio spot (1 for each district)	3 times per day over 4 weeks in each target districts (10 seconds x 84 spots per district)	District-specific announcements
10-second promotion/trailer for radio drama	6 per week over 2-week period	Promotion of radio drama (at no additional cost)

**Newspaper and public relations implementation**

The newspaper and public relations component is designed to reach out to key opinion leaders and environmentalists. Based on media assessments, newspapers are selected in the media mix.

Place one full-page advertisement in each local newspaper to announce the launch of IRS operations and one to address environmental issues. The content of the ads will be provided by RTI's IEC team, and the ads will be written by a designated journalist from the newspaper and composed and designed by the selected ad agency. As part of the package, the newspaper should provide two free articles related to IRS and provide a roving journalist and photographer to cover some of the spray operations.

In addition, plan a press conference to announce the launch of IRS program immediately after approval of the project by USAID and the government. Also, consider having a plan to counter negative press that may come from competitors or other negative elements.

Item	Purpose
Full-page advertisement	2 full pages; aimed at policy makers, national language readers
Environmental advertorial feature	1 page; aimed at public to inform them that IRS is safe
Full-page advertisement	2 full pages; aimed at government, stakeholders, and all local language readers

**Print materials and interpersonal communication (IPC)**

Interpersonal communication (one-to-one and one-to-many communication) is the mainstay of the communication strategy and is critical to the success of the IRS program. The spray operation requires people to remove all household goods and cover the items that cannot be easily taken out of the structure, such as heavy furniture and beds. After spraying, residents and their items remain outside the house for two hours, and then residents sweep the floors immediately when they return to their homes.

In addition, feedback from focus groups indicates that communities are likely to be concerned about a range of other issues. The following concerns may be addressed through communication before spraying. Information at this level of detail can be provided most effectively and cost efficiently through a door-to-door IPC approach.

- Allowing an unknown person to enter the structure when residents are not present
- Difficulty of moving possessions out of the home for a long period of time
- Not having bags or boxes to contain all belongings
- Safety of the insecticide, especially for women and children



- Confusion about how IRS fits in with other malaria control strategies
- Accidental entry to the structure too soon after spraying
- Contamination of food stored in the structures
- The timing of spray operations, which may conflict with work obligations
- Responsibility for breakage, damage, and/or theft

### ***Government leadership channels***

Governments have established systems through which public health campaign messages are frequently communicated. The effectiveness of this system depends in part on authority of the offices that are critically important in the success of a new intervention such as IRS. RTI traditionally engages these channels as part of the partnership building process with government.

To mobilize the IPC component of the campaign, RTI works with the local authorities to

- Sensitize local leaders and government functionaries.
- Make arrangements for discussions at district and sub-district levels for facilitation of IEC activities.
- Facilitate the selection and use of community-based health workers as IEC implementers.

### **Health Facilities**

With the assistance of the NMCP, health workers at key health facilities in target communities should be briefed specifically on the IRS project and urged to support the intervention. They should also be alerted to the need for care and support in managing any possible instances of accidental exposure or side effects from the insecticide. It is well known that totally unrelated illnesses can sometimes be attributed to IRS, an occurrence that has the potential to damage the credibility of the program.

### **IEC Mobilizers**

IEC mobilizers are the key grassroots individuals who conduct door-to-door dissemination of IEC messages on the day before spray operators visit the area.

IEC mobilizers are recruited to conduct the IEC activity during the IRS period. They are deployed a week before the spray operations commence and are divided into several teams based on the grouping of sub-districts within each district. Each IEC mobilizer has a target of 20 structures per day. Each IEC team is supervised by a team leader or supervisor who reports to the IEC coordinator and is responsible for the scheduling, route planning, and monitoring of the activities of the IEC mobilizers in collaboration with the IRS logistic officers. Team leaders and supervisors will hold meetings each day to plan and coordinate mobilizer activities and ensure adequate and timely coverage by mobilizers.

### ***Recruitment of IEC mobilizers***

Community agents of some kind should be considered for IEC mobilizer roles. Mobilizers should be recruited with the assistance of the NMCP and other health sector or community-based entities. Recruitment should take place at the district or

sub-district level, where community-based health workers will assign the mobilizers to the communities where spray operations will take place. Using agents already familiar with a target community ensures that we

- Use a well-established mechanism
- Include people who are well-versed in malaria communication and social mobilization (If health workers are already part of the home-based malaria management program)
- Include people who are trusted by the communities

### ***Management of IEC Mobilizers***

The IEC supervisors and/or a coordinator manage the IEC mobilizers and will

- Arrange a two-day training session for the IEC mobilizers on issues related to the IRS and IEC campaigns.
- Oversee the implementation of the IPC component of the campaign.
- Monitor the activities of the mobilizers.

### ***Training of IEC Mobilizers***

Training for the IEC mobilizers is based on RTI guidelines. In view of the importance of person-to-person communications, deployment of the IEC mobilizers is scheduled a week in advance of the arrival of the spray team. Mobilizers will continue working in each target area up until the day of the spray team's arrival. This level of planning depends on the COP's finalization of the implementation plan for the spray teams.

### ***Stickers***

IEC mobilizers should mark each structure visited before the arrival of the spray team with a small sticker as a simple way to identify structures that have been visited in a sub-district. When a structure has been sprayed, it will be marked by a larger sticker that covers the earlier IEC sticker. The larger sticker is a marker that a structure has been sprayed, and it communicates to others in the area that the structure has been sprayed. It will be designed to carry a message that reaffirms the value of the IRS, such as: This house is protected by IRS.

**IEC Implementation Plan Example**

<b>Channel</b>	<b>Item</b>	<b>Use</b>	<b>Role of Communication Material</b>
Radio	3-minute drama	Once a day on 3 channels	Discuss role of beneficiaries in compliance and adherence
Radio	60-second spot	Based on media plan	Generic malaria and IRS
Radio	10-second spot	Based on media plan	Promote 3-minute drama
Radio	10-second spot	Based on media plan	One for each district: “Be prepared,” when and where
Television	60-second spot	Based on media plan	Generic malaria and IRS
Radio and television	2-hour town-style meeting broadcast	Event	Cover all issues, call-in program
Team branding	T-shirts and caps	IEC team and spray operators	Immediate recognition and acceptance
Home branding	Stickers	Pasted in front of the house after spraying	Peer-to-peer, monitoring tool
Press	3 articles	Based on public relations plan	One on each issue: IRS, role of beneficiaries, environment
Press	Press conference	Event	Announce launch of IRS campaign
Press	Full-page ad	Based on public relations plan	Announce launch of IRS campaign
Press	Full-page ad	Based on public relations plan	Address environmental concerns
Print	Leaflets	Households, churches, schools, health centers	Discuss IRS and the role of beneficiaries
Print	Posters	Health centers, congregation points	Discuss IRS and the role of beneficiaries
Outdoor	Banners	Congregation points	One for each district: “Be prepared,” when and where

### Household Brochure Examples<sup>a</sup>

**INDOOR RESIDUAL SPRAYING (IRS) PROTECTS YOU FROM MALARIA-CARRYING MOSQUITOES FOR FOUR TO SIX MONTHS**



Family come back inside the house 2 hours after spraying.

**OTHER IMPORTANT DETAILS TO REMEMBER AND OBSERVE**



Always sleep under insecticide treated net.



Continue to keep your environment and surroundings clean.



Always visit a health centre when you have malaria.

**For more information:**  
Contact your nearest Health Facility.



## Allow the Sprayer in PREVENT MALARIA



**INDOOR RESIDUAL SPRAYING (IRS)  
KILLS MOSQUITOES AND  
PREVENTS MALARIA**







DAWA HII NI YA KUUUA MBU NI SALAMA NA HET HIBITISHWA NA WIZARA YA AFYA NA USTAWI WAJAJAMI KUWA HAINA MADHARA KWA BINADAMU, WANYAMA NA MAZINGIRA.

KWA TATIZO LOLOTE ONANA NA WASIMAMIZI WA WAPIGA DAWA.

**ENDELEA KUTUMIA MIKAKATI MBALI MBALI INAYO SHAURIWA KATIKA KUPAMBANA NA MALARIA**



DAIMA TUMIA VYANADARUA VILIVYOWEKWA DAWA NA RUDIA KULIWEKA DAWA HILA BARDA YA ANEZI LITO.



MPELEKE MAPEMA MIONJWA WA MALARIA KWENYE KITUO CHA AFYA.



TUMIA DAWA MCHINGANYIKO NI TIBA SAHINI YA MALARIA.



HAKIKISHA UNATUMI TIBA YA TRHADHARI KWA YIPINDI KWA AKINA AMAMA WAJAJAZITO.





## KAMPENI YA KUPIGA DAWA YA KUUUA MBU MAJUMBANI KWA KUKINGA NA MALARIA



**WAJIBU WA MWANANCHI  
KATIKA KUFANIKISHA  
KAMPENI YA KUPIGA DAWA  
MAJUMBANI**

**TOA USHIRIKIANO WAKO KUFANIKISHA ZOEZI HILI**




<sup>a</sup> USAID, *Indoor Residual Spraying (IRS) for Malaria Control Indefinite Quantity Contract (IQC) Task Order 1*, U.S. Agency for International Development. Research Triangle Park, NC: RTI.

## Mwananchi unatakiwa kufanya nini wakati wa kampeni hii?

Ugonjwa wa malaria ni tatizo kubwa linalosumbua wananchi hapa visiwani Zanzibar. Ili kukabiliana na janga hili Wizara ya Afya na Ustawi wa Jamii imeandaa mpango maalum wa upigaji dawa majumbani kwa lengo la kuua mbu waenezo malaria. Dawa itakayotumka katika zoezi hili inaua mbu na wadudu wengine.

Dawa hii inapigwa katika ukuta wa ndani ya nyumba na inadumu kwa muda wa miezi sita.



### Kabla ya kupigwa Dawa

- Fungua madirisha na milango kuruhusu hewa safi kupita.



- Weka vizuri vyombo na nguo visifikiwe na dawa. (k.m. weka kwenye sanduku au kabati au vifunikwe.)

- Hakikisha unahifadhi vizuri



aina zote za vyakula na mazao visifikiwe na dawa. (k.m. kuweka nje ya nyumba kwa muda wa zoezi hili)

- Hakikisha kuta zote za ndani ya nyumba zinafikika kirahisi ili ziweze kupigwa dawa. (Weka vifaa vyote katikati ya chumba)



- Taarisha ndoo moja ya maji safi kwa ajili ya kufanikisha zoezi
- Jibu vizuri maswali yanayoitwa na mpiga dawa

### Wakati wa kupigwa Dawa

- Mruhusu mpiga dawa kuingia ndani ya nyumba

- Mpatie mpiga dawa msaada atakaohitajia

- Toa ushirikiano mzuri kwa kufanikisha zoezi

- Mwananchi unatakiwa uwe nje ya nyumba yako wakati zoezi likiendelea

### Baada ya kupigwa Dawa



- Usingie ndani ya nyumba kwa muda wa saa mbili baada ya kupigwa dawa.

- Fagia wadudu wote waliokufa na kuwachoma moto au kuwafukia

12-23-2009

## Annex 12: Community Mobilization

For the IRS program to be successful, communities need to accept the program and support its implementation. This community support requires effective information, education, and communication (IEC) interventions. IEC is particularly important to

- Increase levels of knowledge about malaria and IRS
- Build approval of IRS as an effective intervention
- Develop positive attitudes toward IRS
- Develop skills and calls for action with regard to what residents should do before and after a structure is sprayed

### Key Messages

Information on the following typical questions should be included in an IEC campaign, especially at community and household levels. It is the key content of the communication strategy for IRS.

- What is the IRS program?
  - A government malaria control program supported by a number of partners (*include names*).
  - It is free and participation is voluntary.
  - The government selects the insecticide on the basis of scientific criteria.
- What are the target districts?
- What does the spray process occur?
- Where does the spraying occurring in the first phase, second phase, etc.?
- Why do we need IRS?
  - Gives long-term protection from malaria-carrying mosquitoes
- Is IRS safe?
  - Yes, IRS is safe when residents adhere to precautions explained by health workers.
  - The operations are supported by all stakeholders and supervised by environmental and human safety authorities.
- How can you contribute?
  - The IRS program depends on active participation (compliance and adherence) from community members before, during, and after the spraying. It is therefore necessary for you to be involved at the district, sub-district, and resident level.
  - Success of the IRS program depends on the active participation of local authorities and collaboration between government agencies.
- How will IRS be implemented?
  - All residents in target areas will be informed by radio and newspaper announcements.
  - A trained IEC implementer will visit each household prior to the beginning of spray operations and also at the time of operations to distribute pamphlets, answer questions, and inform residents of the spraying

schedule and the purpose of spraying, giving them time to prepare and vacate the house.

- Banners will be placed at high-visibility locations in all target districts.
- Posters will be placed at key locations—including schools, churches, markets, and government offices—informing residents of the dates on which their houses will be sprayed.
- On the advertised date, a spray team will arrive at the designated structures. It is expected that the following will be observed:
  - Residents MUST leave houses before spraying.
  - Rooms occupied by sick people who are too ill to be moved must NOT be sprayed. When sick people can be moved, they should be taken to a previously sprayed structure while their own houses are sprayed and kept away from sprayed structures for at least six hours.
  - Remove all household items, including water, food, cooking utensils, clothes, toys, rugs, and mats from the house.
  - Move and cover or remove furniture to allow easy access for spraying walls.
  - Cage or tether pets and domestic animals away from the house during spraying and afterward while the family is waiting outside.
- When the structure is ready for spraying, the spray operators will spray all of its walls and ceiling surfaces.
- Precautions will be taken with the handling of the insecticide, and the spray operator will follow the approved guidelines.
- Residue from the spray will stick to the walls and provide protection against malaria mosquitoes.
- After spraying:
  - Keep windows and doors closed.
  - Residents and domestic animals MUST stay outside the home for at least two hours.
  - Sweep floors free of any residual insecticide that may remain from the spraying before allowing children or animals inside.
  - Sweep up any insects killed from the spraying and either drop them in latrine pits or dig a shallow hole and bury them away from the water supply and domestic animals that may eat them.
  - Do not replaster or paint over the sprayed walls.
  - Continue to use bednets for extra protection against malaria.
- If the above steps are not followed and there is accidental exposure, it may lead to irritation of the eyes or skin. Residents will be advised to wash the affected area with water and to contact a health center immediately.



## Endnotes

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