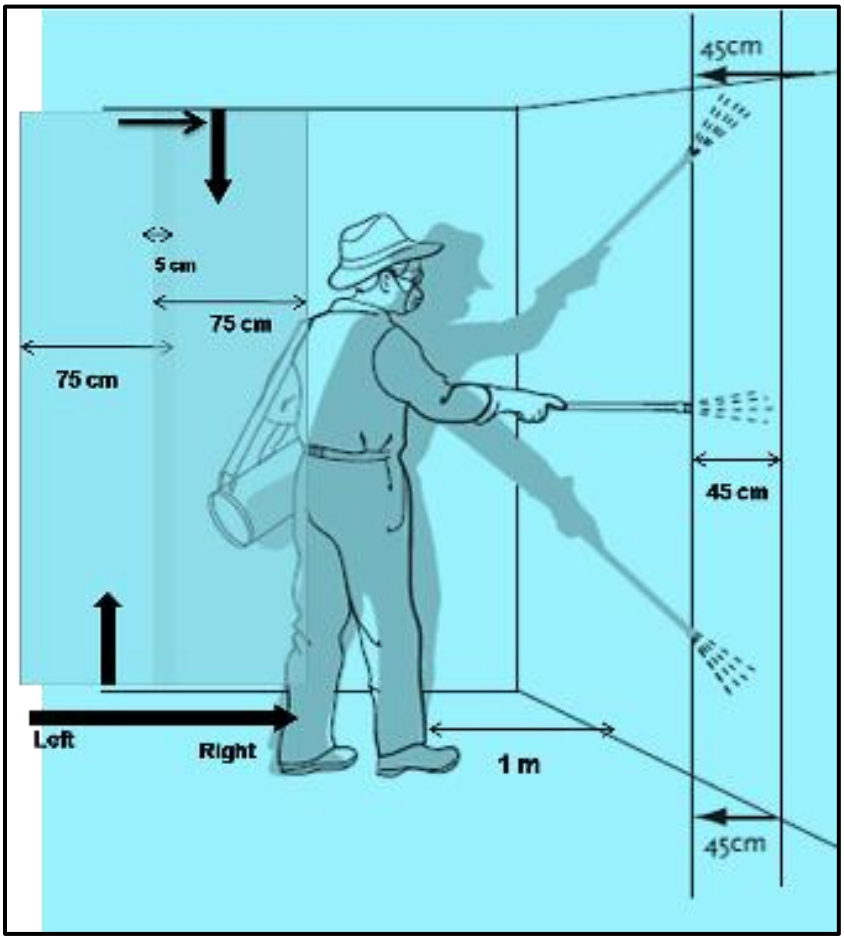
INDOOR RESIDUAL SPRAY (IRS)
OUTBREAK/EPIDEMIC RESPONSE STRATEGY



Directorate of Malaria Control (DoMC)-Pakistan

Save the Children

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OUTBREAK/ EPIDEMIC RESPONSE STRATEGY

Developed by:
Directorate of Malaria Control (DoMC)-Pakistan
Save the Children

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Ownership

Disclaimer

The Consultant Dr Nauman Safdar- MBBS, MSc, MBA, MMCH, PhD and Muhammad Mukhtar (contributing author) have made every effort to provide the most accurate information, data, facts, figures, drawings and descriptions in this document. The limitations of the accuracy of the information at the source, however, remain. The document may thus contain human or mechanical errors or omissions. No liability for such errors, or omissions, or un-intentional misrepresentations will be accepted. The Consultant and Contributing Author reserve the right to make corrections and changes in any information contained in this and in subsequent versions of this document.

ACRONYMS

API	Annual Parasite Incidence
DEWS	Disease Early Warning System
DoMC	Directorate of Malaria Control
DMU	Data Management Unit
EM	Environmental Management
FATA	Federally Administered Tribal Area
FGD	Focus Group Discussion
GFATM	Global Fund to Fight against AIDS, Tuberculosis and Malaria
GR	Geographical reconnaissance
IDP	Internally Displaced Population
IPC	Inter-Personal Communication
IRS	Indoor Residual Spraying
ITNs	Insecticide treated bednets
IVM	Integrated Vector Management
LLINs	Long Lasting Insecticidal Treated nets
LSM	Larval Source Management
MCP	Malaria Control Program
MEWS	Malaria Early Warning System
M&E	Monitoring and Evaluation
MIS	Malaria Information System
NFM	New Funding Model
PPE	Personal Protection Equipment
PY	Pyrethroids
SO	Spray Operator
TWG	Technical Working Group
UC	Union Council
WHO	World Health Organization
WHOPES	World Health Organization Pesticides Evaluation Scheme

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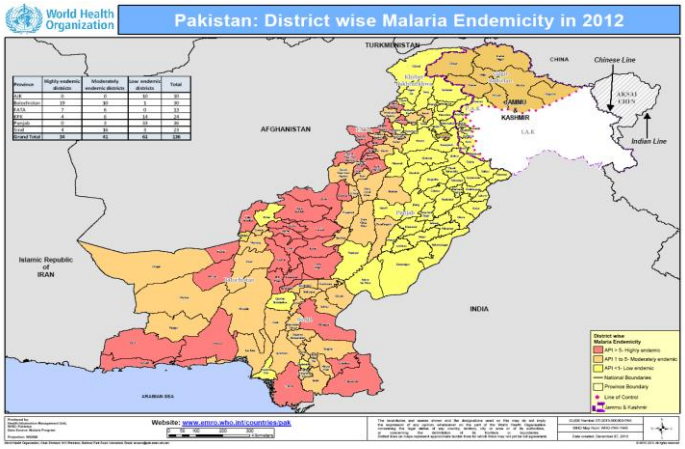
SECTION 1: INTRODUCTION

1.1. Malaria situation in Pakistan

Pakistan has a population of 180 million inhabitants of which 95 million are at risk of malaria. In 2013, there were 3.4 million presumed and confirmed malaria cases in Pakistan[1]. It is among the four countries in the world, which account for more than 80% of estimated cases of the *Plasmodium vivax (P.vivax)*. Epidemiologically, Pakistan is classified as a low to moderate (Group-III) malaria endemic country with a national API averaging at 1.69[2] per 100000 population and has diversity within and between the provinces and districts.

Two species of parasites present in the country include *Plasmodium vivax* and *P. falciparum,* of which former is most dominant and accounts for 61% of total infection while, the later is most dangerous because of the associated complications leading to death and contributes 39% of total caseload. Both species of parasites have specific distribution pattern. *P. vivax* is uniformly distributed across the country while, *P. falciparum* is limited to FATA and Balochistan and to some districts of Sindh. Of total 24 anopheline mosquitoes species in Pakistan, two species named *Anopheles culicifacies* and *An. stephensi* have been incriminated in disease transmission.



Epidemiology of the malaria varies in Pakistan due to different geo-environmental condition, as shown in the figure[3]. It is considered as a seasonal disease and major transmission season is post monsoon (September-November) each year. However, along the coastal areas and western international bordering areas of country with Iran and Afghanistan the disease prevails throughout the year. A short transmission season during spring months (March-April) is also evident. However, during spring most of the cases are delay expression of disease transmitted during post monsoon season or may be due to the second episode of the disease caused by relapsing vivax malaria.

The key underlying risk factors for malaria endemicity in Pakistan includes; a) unpredictable transmission patterns; b) low immune status of the population to diseases; c) poor socioeconomic conditions; d) mass population movements within the country and across international borders with Iran and Afghanistan; e) natural disasters including floods and heavy

[1] World Malaria Report, WHO, 2014.
[2] Malaria Information System, Directorate of Malaria Control, 2013
[3] World Malaria Report, WHO 2012

rain fall in few areas; f) low antenatal coverage; and g) internally displaced population (IDPs) in some districts due to conflict situation.

In 2013, 281,755 confirmed malaria cases were reported through national malaria disease surveillance system. However, during the same period, 3.1 million cases were clinically diagnosed and treated for malaria at public sector outpatient facilities. The number of reported malaria cases almost doubled from 2009 to 2012 with an equivalent rise in Annual Parasite Incidence (API).

In Pakistan, the malaria prevention greatly relies on the use of Long Last Insecticide Treated Nets (LLINs) and Insecticide Residual Spray (IRS). The use of focal IRS as vector control intervention has been more in practice however, resource constraints and sub optimal technical and operational understanding has affected the IRS operations in the country.

1.2. Malaria Control Strategic Plan 2015-2020, Pakistan

In 2014, the Directorate of Malaria Control Pakistan with the support of WHO, has developed a National Malaria Control Strategic Plan 2015-2020 . The plan has innovative strategies that will:

a. Improve the performance and impact of malaria control in Pakistan with maximizing public sector investment and accountability in malaria control activities

b. Reduce diagnostic delay related to malaria and improve the efficacy of treatment

c. Prevent malaria disease by effective vector control interventions through universal coverage of LLINs, IRS supported by LSM

d. Better surveillance and program management

e. Prioritize research that has the potential to change policy and practice in malaria care in the province

More than 90% of the malaria disease burden in the country is shared by 66 highly endemic stratums of districts, mostly located in province of Balochistan, Sindh, and Khyber Pakhtunkhwa and also in Federally Administered Tribal Areas (FATA). Universal coverage of targeted households through IRS is the proposed strategy for vector control in high endemic districts. However under New Funding Model (NFM), IRS will be applied in the areas where there is any outbreak.

1.3. Coverage with IRS

The MIS survey 2013 showed that overall 11% households in 38 high risk districts were sprayed with IRS. Maximum IRS coverage was found in FATA region (18% of households were sprayed) followed by Sindh (14%) with a lowest coverage in Balochistan (7%).

1.4. Rational: IRS Outbreak/Epidemic Response Strategy for GF

Historically, the use of IRS has been part of malaria control program intervention and also currently it is an important component of Malaria Control Strategic Plan 2014. However, the use of IRS from the recent grant of Global Fund is only restricted for outbreak/epidemic response. This make imperative to update the strategy related to IRS use in the outbreak/epidemic response in the 42 high malaria districts in the country to be supported by the Global Fund New Funding Period 2015-17.

1.5. National Technical Work Group Meeting

In March 2015, a National Technical Work Group (TWG) Meeting was organized by Directorate of Malaria Control (DOMC) and Save the Children. The participants of the meeting were Provincial/ Regional (FATA) malaria control programme managers, representative of World Health Organization (WHO), GF sub-recipients and malaria control experts. The following were the recommendations from the TWG.

Recommendation 1:

There will be no change in the national strategy regarding the use of IRS as documented in the Malaria Control National Strategic Plan 2015-2020 and National Vector Control guidelines 2007; 2011; 2013.

Recommendation 2:

The up-dated IRS document should include a complete strategy with operational details for using IRS in outbreak/epidemic situation.

Recommendation 3:

The document should describe the malaria epidemic in context of Pakistan and reporting channels.

Recommendation 4:

The document should describe the use of IRS in case there is no outbreak/ epidemic in the malaria high risk districts over a certain period of time.

Recommendation 5:

The document should include a clear spray plan with logistic arrangements and human resource requirements.

Recommendation 6:

The document should include the description of conducting IRS in a household.

1.6. Focus Group Discussion

A Focus Group Discussion (FGD) was organized in the district Bannu of province of Khyber Pakhtunkhwa to discuss the operational details of LLINs update strategy and implementing IRS

during outbreak/epidemic. The discussion was participated by malaria focal person of the district, doctor incharge of microscopy center and its microscopist, EPI community mobilize UNICEF, local elderlies and manager and field staff of Merlin. The suggestions provided by the group are incorporated in the document.

1.7. Indoor Residual Spraying (IRS)

The overall objective of IRS is to interrupts malaria disease transmission by reducing vector survivorship, density and human-vector contact. House spraying with residual insecticide is the most widely used and among the preferred method of public health vectors control around the globe. Indoor Residual Spraying (IRS) generally refers to the spraying of all stable surfaces inside human occupancy using an insecticide with long-lasting residual efficacy. These surfaces generally serve as potential resting places for vector mosquitoes. Therefore the proper understanding of *resting behavior* of local malaria vector(s) is extremely important for successful IRS program in local settings. The most preferred surfaces generally include the interiors of walls and roofs, both sides of doors, window frames, undersides of furniture, backsides of almarah, curtains, and other hanging cloths etc. Generally sprayed houses provide protection for 3-6 months, depending on the insecticide used and material used in construction of housing structure.

Table 1: Characteristics for effectiveness and sustainability of IRS use

Characteristics	Description
Total	All human dwellings should be sprayed systematically and thoroughly
Complete	All potential resting places including difficult areas/surfaces should be covered
Uniformity	All treated surfaces must have uniform application of the required dose of insecticide
Regular	Spraying should be repeated at regular intervals depending upon the length of transmission period to ensure that there is an effective deposit of insecticide particles in place during the entire transmission season
Standards	Using appropriate technique, insecticides, equipments through trained human resource and finally
Accountable	Followed by systematic supervision and M&E

World Health Organization (WHO) recommends IRS as one of the three primary methods of malaria control while others two are; use of insecticide treated bednets (LLINs/ITNs), and prompt treatment of confirmed cases. According to WHO all member states should;

i) Introduce and/or scale up coverage of targeted IRS as a primary malaria control intervention in countries where available data indicates that it can be efficient towards achieving malaria targets
ii) Take all necessary measures to ensure effective implementation of IRS through;
   - Selection of appropriate insecticides, areas and application time

- Giving full coverage (>80%) to target areas
- Preventing unauthorized or un-recommended use of insecticides
- Enhancing the community participation.
- Partnership building for sustainability
- Strengthen the managerial capacity of MCPs through improve human, technical and financial resources with adequate M&E system.

SECTION 2: STRATEGY FOR INDOOR RESIDUAL SPRAY (IRS) IN PAKISTAN

All stable structures, potential resting places and surfaces within human occupancy will be thoroughly sprayed using insecticides of long lasting efficacy, to which local vector species are 100% susceptible.

2.1. Structures to be sprayed

- ***Stable structures and potential resting places***: These include all sleeping rooms, general store rooms, animal sheds, bathrooms, verandas, pouches within a household.
- ***Sprayable surfaces*:** These include all interiors of walls and roofs, both sides of doors, window frames, undersides of furniture, behind picture frames, backsides of almarah, curtains, and other hanging cloths etc.

2.2. Selection of target areas

The target areas for IRS operation will be selected on the basis of;

- Epidemiological data
- Entomological data
- Access
- Security
- Outbreak or epidemic and complex emergency situation

2.3. Requirements

Primary requirements for a successful IRS operation in country will include;

- Availability of well defined strategy, policy and operational guidelines which include;
  - ➢national standardized specification for insecticides, equipments, and overall procurement guidelines
  - ➢criteria for selection of target areas under various epidemiological scenarios, time and frequency of application of residual insecticides
  - ➢community participation
  - ➢supervision, M&E framework and impact assessment mechanism
  - ➢training modules at all level

- reporting and feed mechanism etc.

- Updated epidemiological and entomological data of the country up-to union council level
- Up-dated Geographical Reconnaissance (GR) each year
- Up-dated reporting and recording tools
- Sharing of responsibilities among various stakeholders including partners
- Well equipped Data Management Units (DMUs) at all levels
- Well trained and motivated staff

2.4. Coverage level

100% coverage of all stable structures in target areas (minimum limit of coverage will be 80%). Similarly 100% coverage of sprayable surfaces as defined above including "*difficult to reach areas and surfaces*" within target structure.

2.5. Time of application

For optimal effectiveness, Indoor Residual Spraying (IRS) operation should be started and completed at least one (01) month before the peak transmission of disease.

2.6. Number of cycle or rounds

Timing of IRS operation is most critical and important, particularly when supposed to protect an area with short transmission season. To maintain effective coverage during the entire disease transmission season, ideally spraying schedule in target areas should be coincided with building up of vector densities and must be completed just before the peak transmission season. This will ensure the deposit of insecticide particles on all potential resting surfaces before and during peak vector densities and disease transmission periods. Similarly, a spray cycle is the time between two consecutive insecticide applications and each insecticide spraying in selected area is effective over a particular period of time called a *spray round*. Timing of spray rounds is very important and should depend on the seasonality of vector population and malaria disease transmission.

Pakistan has two well defined transmission pattern i.e. Seasonal transmission and year round transmission. Within seasonal transmission, there are two further epidemiological scenario i.e. short seasonal transmission (<4 months) and long seasonal transmission (5-6 months). The number of applications of insecticides in these epidemiological scenarios will be as under;

- Areas with "*Short Seasonal Transmission* (≤4 months)":- Single application starting at least one (01) month before the peak transmission. Note: In Pakistan where mostly malaria season lasts for 3-4 months and currently use insecticide (pyrethroids) also persists for almost same period of time, therefore one application (round) will be sufficient in a year, provided spraying campaign start at right time with correct application techniques, giving full coverage, using quality insecticide and appropriate formulation through well trained human resource.

- Areas with "*Long Seasonal Transmission* (5-6 months)":- Two (02) application/round coinciding each other. *Note: Covering of main peak will be considered 1st round or application.*

- Areas with "*Year-around Transmission"*:- Three (03) application of insecticides will be conducted applied to ensure the availability of required quantity of insecticides (dose) on all treated surfaces throughout the transmission period.

Note: Similarly, the number of spray rounds will also be determined upon the types of insecticide and formulation, type of material of targeted surfaces.

2.7. Selection of stratum

House spraying with residual insecticides will be applied in high and moderately endemic areas. However, choice of intervention (IRS or LLINs supported by LSM) will be determined by program in view of;

- Epidemiological pattern
- Housing structures and sleeping habits of communities
- Community's preferences
- Financial constrains

Note: In addition to these technical and operational requirements for determination of intervention, experts opinion will also be given due consideration.

2.8. Combination of IRS and LLINs

According to national insecticides resistance management strategy (inline of WHO's GPIRM), IRS and LLINs will not be used simultaneously in same area i.e. Union Council. However, both interventions can only be used simultaneously when pyrethroids origin insecticide has been used on nets and insecticides of other class (OP, Carbamates etc) has been used on in IRS campaign. Though both intervention can be used simultaneously only during epidemic or outbreak regardless the origin of insecticides. The aim of this approach

will be to enhance the coverage of effected population to break the transmission cycle as soon as possible.

2.9. Basic Implementation Unit and Coverage

Union Council (UC) will be the basic administrative unit for planning and implementation for all preventive and diagnosis services for malaria control. For preparation of operational plan, all estimations (insecticides, spray pumps, PPEs and human resources) and coverage for IRS operation will be based on population, and households of a union council.

Note: According to national census data each union council comprised of 10,000–25,000 population.

2.10.Standard of insecticides and equipments

Quality of insecticides and equipments for IRS is extremely essential to minimize the risks associated with their use, handling and also to ensure their effectiveness and stability during storage and transportation under local climatic condition. Poor quality insecticides and spraying equipment always results in enhance risk for human (spray operators, handlers etc) and environment and finally lead to ineffective control of malaria vectors and possible development of resistance. Only the ~~insecticides and~~insecticides and spraying equipment (particularly pumps) meet WHOPES specification and recommendation will be used and promoted in country. In case of locally manufactured/formulated insecticides “source/origin of active ingredient/technical material” must be required from manufacturer.

SECTION 3: MALARIA DISEASE OUTBREAK/EPIDEMIC

Doubling (two times or 100% increase) of malaria cases from routine at a particular point of time in any area is usually referred as an outbreak/epidemic. During acute stage of malaria outbreak, first recommended priority is the prompt and effective diagnosis and treatment of malaria-effected population. However, well-planned and prompt vector control intervention(s), applied well before the peak of epidemic can contribute significantly to control the epidemic and outbreak in a short time.

IRS and LLINs intervention can be used simultaneously only during epidemic or outbreak regardless the origin of insecticides.

In areas of high coverage with LLINs (>80%) if there is any outbreak (exceptionally possible), IRS will be applied as epidemic response. Possible reasons for outbreak in areas with high coverage with LLINs include;

a. Delay in distribution of LLINs
b. Sub-optimal use practices
c. Poor user compliance
d. Resistance to pyrethroids (currently used class of insecticides on LLINs) in local vector species
e. Low immunity level in local population

3.1. Mechanism to Detect an Outbreaks/Epidemic

The following systems can contribute in reliable prediction of epidemics and quick and effective response. The systems include:

i) Disease Early Warning System (DEWS/ MEWS). Globally, 38 countries use indoor residual spraying (IRS) to control malaria epidemics through well establish disease early warning system[4].

ii) All designated health facilities (both public and private) using standardized recording and reporting tools (FM-1 and FM-II) of Malaria Information System (MIS). In this regard Data Management Unit (DMU) at district level will have special significance where facility based surveillance tools (FM-I) from all health facilities (public and private) are compiled and analyzed.

iii) All sentinel sites using standardized recording and reporting tools (FM-1 and FM-II) of Malaria Information System (MIS). In this regard Data Management Unit (DMU) at

[4] World Health Organization, World Malaria Report 2014

federal, provincial and district level has special significance where data from sentinel sites are compiled and analyzed.

The sentinel sites fully equipped with appropriate human resource and other logistic arrangements will provide vital information including; any un-usual rise in overall disease incidence, monitoring of vector population dynamics such as changes in densities, species successions, and behavior of local malaria vectors, timely detection of any un-usual change in vector densities, monitoring the trend of insecticide resistance and timely response as a part of National Insecticide Resistance Management Strategy, monitoring of residual durability of applied insecticide (quality of IRS), tracking of insecticide usage, etc

3.2. Requirements to Respond to an Outbreaks/Epidemic

The following are the basic requirements which should be in place as part of the epidemic response plan with IRS;

i) Epidemic response plan through consensus of all stake holders

ii) Epidemic investigation teams

iii) Defined roles and responsibilities of various stakeholders and implementing partners

iv) Up-date recording and reporting tools

v) Systematic community awareness campaign for better understanding and acceptance of house spraying operation.

vi) Supervision and M&E plan for impact assessment of IRS used in epidemic

vii) Designated fleet of vehicle (from the pool of vehicles from malaria control at provincial/district level)

viii) Adequate insecticides, spraying equipments and funds for all operational activities related to IRS in epidemic situation

3.3. Data analysis for outbreak/epidemic detection

The regular analysis of FM-1 data, coming from microscopy and RDT centers, is currently the vital source of information to preempt a malaria outbreak in a district. A plot graph of malaria cases (both confirm and suspected cases) of each health facility on monthly basis should be developed.

Compare data with last year data of same period (ideally comparison should be among 3-5 years data for more accurate prediction and forecast.

i) Record any change (decline or rise) in malaria cases.

ii) In case of rise (almost 50%) in disease trend, generate an alert for preparation of potential epidemic preventive measures. Every alert should be investigated both on entomological and epidemiological parameters.

iii) When there is 100% increase (double in number) in malaria cases, declare an "Outbreak or Epidemic" and intimate all relevant department/sections and implementing partners for timely and appropriately response.

iv) Immediately deploy spray teams along with all necessary arrangement i.e. adequate insecticides, fully functional spray pumps and their spare parts and PPEs.

v) Analyze the entomological data in similar pattern using entomological surveillance tools. However, due to fluctuation in vector densities (most probably due to environmental conditions) entomological data will be given secondary priority for detection of outbreak. It is also recommended to strengthen the entomological surveillance for better and evidence-based decision making for epidemic response.

3.4. Role of Stakeholders in Outbreak/ Epidemic

District level

District level malaria focal persons i.e. Malaria Superintendent, Assistant Entomologist, CDC Officer, under the lead of district health officer, will be responsible for data analysis, interpretation and implementing the outbreak response activities. The activities can be supported by the implementing partners in the particular district or province. The overall role and responsibility includes:

- Compilation of epidemiological and entomological data of districts up to union council and sharing with provincial office
- Identification of high risk and epidemic prone union councils for IRS operations in consultation of provincial office
- Timely and adequate arrangement of financial resources for all operational and non-operational IRS activities.
- Timely detection of any un-usual rise in vector densities, composition, etc
- Coordinate with district level stakeholders, private sector health service providers, CBOs, NGOs and communities to secure their support for IRS operation in district
- Conduction of Geographical Reconnaissance (GR) on annual basis
- Selection and recruitment of daily wages spray operators and their capacity building
- Provision of required IRS, spray pumps and other necessary equipment
- Implement IRS in affected UCs

Provincial and Federal Directorate of Malaria Control in light of 18th constitutional amendment, has clear roles and responsibilities.

Provincial Directorate of Malaria Control

- Compilation and analysis of epidemiological and entomological data from districts including private health care providers, NGO's, CBOs
- Technical assistance and capacity building of districts for data analysis, interpretation and finally identification of high risk *union councils* and epidemic prone areas for IRS operation
- Establishment of Data Management Units(DMUs) at district level
- Provision of up-dated surveillance tools to districts
- Develop strategy, policy operational guidelines, safety standards and training manual for IRS operation under different epidemiological scenarios including, epidemic or outbreak and emergencies
- Technical assistance to provinces for; *macro-stratification, micro-stratification, and* capacity building
- Timely arrangements of all logistics and financial resources for IRS field operation
- Establishment/strengthening of Data Management Units (DMUs) at all levels for timely detection of epidemic and response (improved surveillance)
- Development of standardized/uniform surveillance tools and supervisor checklists through the consensus of all stakeholders
- Management of sentinel sites (surveillance sites) and district level DMUs
- Compilation of data of provinces of insecticides usage, susceptibility level, coverage and sharing with national and international partners e.g. World Malaria Report of WHO etc.

Federal Directorate of Malaria Control

- To develop and provide country-specific strategy, policy operational guidelines, safety standards and training manual for IRS operation under different epidemiological scenarios including epidemic or outbreak and emergencies
- Technical assistance to provinces for;
  - *macro-stratification*: Compilation and analysis of epidemiological and entomological data from all provinces to identify *high, moderate, low* and *malaria free districts* in country
  - *micro-stratification*: identification of *hot-spots* (target areas) within districts
  - capacity building of Epidemic Investigation Team and district level Data Management Units (DMUs)
- Coordination with provinces and other stakeholders for timely arrangements of all logistics and financial resources for IRS field operation
- Establishment/strengthening of Data Management Units (DMUs) at all levels for timely detection of epidemic and response (improved surveillance)

- Development of standardized/uniform surveillance tools and supervisor checklists through the consensus of all stakeholders
- Compilation of data of provinces of insecticides usage, susceptibility level, and coverage and sharing with national and international partners e.g. World Malaria Report of WHO etc.

Partners, Research & Development organizations

- Sharing of data
- Technical Assistance for development of strategic and implementation documents, development of surveillance sites and tools
- Timely detection of epidemic or outbreak
- Resource mobilization
- Capacity building

SECTION 4: EFFECTIVE RESPONSE AND CONTROL OF OUTBREAK

4.1. Coverage of target areas

Since health facilities in rural areas of Pakistan have no well defined catchment areas, therefore all households in a Union Council (UC) from which any health facility reports an outbreak will be covered (100% coverage) through IRS for timely curtailing the outbreak/epidemic.

NOTE: To address the IRS in adjacent UC, in case of patients coming from the neighboring UC, the analysis of the addresses is required to include the adjacent UC for IRS response.

4.2. Time of Response

Indoor Residual Spraying (IRS) will be conducted immediately after the detection and reporting of rising trend of disease (as early stage of outbreak as possible) and will be completed within shortest possible time by deploying additional spray teams and logistics.

4.3. Frequency of application or round of IRS during outbreak

In view of length of epidemic (1-2 weeks) and residual efficacy of WHOPES recommended (3-4 months), single round of IRS will be sufficient to cover entire length of transmission cycle, provided IRS operation will be started at earliest stage of outbreak or epidemic.

4.4. Response team (Spray operators, supervisor etc)

Malaria control program has very limited number of regular spray personal. Mostly spray operators and other supporting staff is hired on daily wages which are trained for 2-3 days for routine field operation of IRS. However, to respond to an epidemic or outbreak, regular and well experienced teams should be deputed for effective implementation. In this regard it is also recommended to call experienced spray operators from other districts. The operational details related to spraying are given in the training manual (appended to this document).

4.5. Insecticides and spraying equipments

For timely and effectively response to outbreak/epidemic, adequate quantity of insecticides and spraying equipment including PPEs will be made available at district level storage facilities having all required safety measures for safe and secured storage of insecticides and other equipments including PPEs.

4.6. Arrangement of transport and other logistics for spraying team

Based on the epidemiology of malaria in Pakistan, teams for IRS operation would have to be transported to far flung and remote rural areas which normally have poor road access. In order to timely respond to an epidemic, designated vehicle(s) at district level should be made available for rapid transportation of spray teams and equipment at the site of epidemic or outbreak. This vehicle must be equipped with Emergency Response Kit which include; fire

extinguisher, list of all emergency numbers, bandages, hammer, spade, spill cleaning cloths, sponges and all necessary PPEs.

4.7. Safe handling of insecticides:

Safe storage, transportation and disposal of insecticide waste should be ensured.

SECTION 5: SPRAY PLAN IN MALARIA DISEASE OUTBREAK

The implementation of spray operations requires a comprehensive plan which should be implemented as soon as an alert of malaria outbreak/epidemic gets reported from a particular Union Council in a district. The plan provided below lists the key responsibilities for each focal point that has a role in implementing IRS and their set of responsibilities.

The operational details required for effective spraying during an outbreak/epidemic are given in the training manual (appended with this document).

Table 2: Spray plan to respond outbreak/epidemic

S. No	Activities	Skills required	Responsibility	Duration of activity	Resource person
1.	1.1. Indoor Residual Spraying operation 1.2. Reporting & record keeping (Daily spray record forms) 1.3. Maintenance of spraying equipments at the end of days work	• Basic spraying techniques • Daily report writing • Maintenance of equipments	Spray Operators (Hired field worker) Team Leaders Supervisors	7-10 days	District Malaria Focal (responsibility of District level)
2.	2.1. Supervision of IRS operation 2.2. Breeding Sites Assessment Surveys 2.3. Larviciding 2.4. Assistance in preparation of GR maps 2.5. Vector densities monitoring (Adults & larvae)	• Preparation of maps by using GIS technique • Site Assessment Survey • Using of reporting and recording tools • Mosquito collection techniques (indoor and outdoor) • Field report writing • Data management	Ento. Technician, Insect Collector, CDC Supervisor	10 days	District Malaria Focal
3.	3.1. Number of structures/houses to be sprayed in the UC having an outbreak/epidemic 3.2. Support CDC Supervisor, Ento. Technicians, Insect Collectors, in routine and other emergency activities 3.3. Supervision of all field activities to ensure the reliability, accuracy and overall quality of work 3.4. Carry out insecticides susceptibility tests in the field 3.5. Coordination with communities for; ➢ awareness raising campaign ➢ vector control through EM	• General field entomology techniques • GR • Basic principles of management of field operation on IRS, Larviciding, LLINs distribution, EM etc • Maintenance of spraying equipments • Use of entomological tools for quality assurance • Conduction of insecticides susceptibility and bioassay tests • Maintenance of laboratory and Insectory	Malaria Supervisor, Assistant MS, CDC Inspector Malaria Superintendent/ Assistant Ento.	14 days	District Malaria Focal

S. No	Activities	Skills required	Responsibility	Duration of activity	Resource person
	➢ better acceptance of intervention and feed back	• Record Keeping • Field report writing			
4.	4.1. Maintenance of Entomology laboratory/Insectory 4.2. Mosquito identification in Laboratory (Adult and young ones) 4.3. Maintenance of reference colony and also collections or experimental strains of mosquitoes 4.4. Dissection of mosquitoes 4.5. Conduction of insecticides susceptibility and bioassay test in laboratories and re-confirmation of field trials 4.6. Data compilation of lab/Insectory work	• General field entomology techniques • General training on IRS, Larviciding, LLINs distribution, EM etc • Using of entomological tools for Quality Assurance • Maintenance of lab/Insectory • Susceptibility and bio-efficacy tests • Record keeping • Field report writing	Ento. Lab Technician	Regular activity	District Malaria Focal Point Provincial/ National Entomologist
5.	5.1. Coordination with provincial office 5.2. Supervision of field and lab staff in collaboration with CDC Officer/Malaria superintendent 5.3. Provision of technical guidance for all vector control interventions at district level. 5.4. Preparation, implementation, supervision and monitoring of vector control activities (spray plan, LLINs, EM, etc) 5.5. Preparation of demands for requirement of materials (insecticides, larvicides, LLINs, spray pumps, spare parts, PPEs etc) in light and justification of outbreak response 5.6. Ensure the appropriate availability of material resources at	• Advance entomological techniques • Skill development and team management • Data management using entomological tools for quality assurance • Management of sentinel sites, district entomological lab/Insectory • Susceptibility and bio-efficacy tests • Compilation of entomological data of the district • Principles for; ➢ communication with community and district level partners ➢ insecticides handling i.e. storage and transportation	District Entomologist, Malaria Superintendent/ CDC Officer	14 days	District Malaria Focal Point Provincial/ National Entomologist

S. No	Activities	Skills required	Responsibility	Duration of activity	Resource person
	right time and in adequate quantity 5.7. Community awareness and education 5.8. Supervision and M&E of malaria control activities 5.9. Preparation of reports.	➢ stock management			
6.	6.1. Coordination with district and federal malaria control unit 6.2. Provision of technical guidance to district with outbreak 6.3. Supervision and monitoring of vector control activities (spray plan, LLINs, EM, etc) at district level 6.4. Facilitate provision of insecticides, larvicides, LLINs, spray pumps, spare parts, PPEs, etc at provincial level 6.5. Technical assistance for provincial/ district level facilities	• Entomological surveillance • Principles of M&E and Impact assessment • Advance entomological techniques • Skill development and team management • Data management for quality assurance • Technical support for entomological reference lab/Insectory • Susceptibility and bio-efficacy tests • Principles for; ➢ development of work plan and M&E framework ➢ development of reporting and recording tools ➢ compilation of data management and interpretation ➢ communication with partners and districts partners	Provincial Entomologist/ Epidemiologist	14 days	Provincial Entomologist
7.	7.1. Development and sharing of national strategy, guidelines for vector control in epidemic 7.2. Development of guidelines and material	• Same as mentioned above in provincial level.	National Entomologist/ Epidemiologist	14 days	National Entomologist

S. No	Activities	Skills required	Responsibility	Duration of activity	Resource person
	7.3. Provision of technical guidance to the provinces 7.4. Coordination with donors and other partners, etc for resource mobilization 7.5. Preparation and also conduction of training programs for provincial nominees as Master Trainers				

SECTION 6: IRS RECORDING AND REPORTING TOOLS IN OUTBREAK SITUATION

Reporting tool for Indoor Residual Spraying (IRS) Activities

Spray Operator (SO) Daily Record Sheet

Directorate of Malaria Control (DoMC). Ministry of NHS, R&C-Islamabad.

Name of District:----------	Name of Union Council: ----------	Name of Village:----------	Name of H. Facility: ----------	Name of T. Leader: ----------	• Date of epidemic detection: • Date of response (IRS)
Total sachet Received: ----------	Date of receive: ----------	Un-used sachet returned: ----------	Date of return: ----------	Name of receiver: ----------	Office of receiver & signature:----------

Sr. No	Name of Households and adress	Time of operation	Target			Total Coverage				No of sachet used	Remarks
			Status		No of rooms						
			Sprayed	Not Sprayed		Sleeping	Stoes	A. Shed	Others		
1				Mention reason(s) in column "Remarks"							
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
	Totals	0	0		0	0	0	0	0		

Prepared by:	Designation:----------	Date:	Contact No:		
Counter-Signed by:	Designation:----------	Date:	Contact No:		

Note: This Report should be generated by each Spray Operator and should submitted to /Team Leader/Supervisor on SAME DAY (daily basis) after complition of all codal formalities.

Reporting tool for Indoor Residual Spraying Activities (IRS)

Supervisor Daily Record Sheet

Directorate of Malaria Control (DoMC). Ministry of NHS, R&C-Islamabad.

Name of District:----------	Name of Union Council:----------	Name of village:----------	Name of Health Facility:----------	Name of Superviso/Incharge:----------	• Date of epidemic detection: • Date of response (IRS)

Total sachet received :----------	Date of received :----------	Un-used sachet returned:--------	Date of return:----------	Name of reciever:----------	Office of reciever:----------	Signature of reciever:-------

Sr. No	Name of Team Leaders	No of sachet Issued	Target			Total Coverage						% Coverage (HH)	No of sachet used	Remarks
			Village to be sprayed	Population	No of HH	No of HH visited	HH actually sprayed	Total No of Rooms						
								Sleeping	*Stoes*	*A. Shed*	*Others*			
1		0												
2		0												
3		0												
4		0												
5		0												
6		0												
7		0												
8		0												
9		0												
10		0												
	Totals	0	0	0	0	0	0	0	0	0	0			

Prepared by:	Designation:----------	Date:	Contact No: .....
Counter-Signed by:	Designation:----------	Date:	Contact No: .....

Most Common Reasons for not spraying;

1. .....
2. .....
3. .....
4. .....
5. .....

Note: This Report should be generated by the designated Focal Person (IRS Supervisor) and should submitted to Office of Executive District Officer (EDO)-Health on weekly basis after complition of all codal formalities.

Reporting tool for Indoor Residual Spraying (IRS) Activities

Team Leader (TL) Daily Record Sheet

Directorate of Malaria Control (DoMC). Ministry of NHS, R&C-Islamabad.

Name of District:----------	Name of Union Council:----------	Name of village:----------	Name of Health Facility:----------	Name of Team Leader (TL):----------	Team Number:----------	Name of Spray Operators 1. …… 2. …… 4. …… 5. ……

Total sachet received :----------	Date of received :----------	Un-used sachet returned:-----	Date of return:----------	Name of reciever:----------	Office of reciever:----------	Signature of reciever:------

Sr. No	Name of Spray Operators	No of sachet Issued	Target			Total Coverage						% Coverage (HH)	No of sachet used	Remarks
			Village to be sprayed	Population	No of HH	No of HH visited	HH actually sprayed	Total No of Rooms						
								Sleeping	*Stoes*	*A. Shed*	*Others*			
1		0												
2		0												
3		0												
4		0												
5		0												
6		0												
7		0												
8		0												
9		0												
10		0												
11		0												
12		0												
13		0												
14		0												
15		0												
	Totals	0	0	0	0	0	0	0	0	0	0			

Prepared by: ……	Designation:----------	Date: ……	Contact No: ……	***Most Common Reasons for not spraying;***
Counter-Signed by: ……	Designation:----------	Date: ……	Contact No: ……	1. …… 2. …… 3. …… 4. …… 5. ……

Note: This Report should be generated by the designated Team Leader (TL) and should submitted to Supervisor on SAME DAY (daily basis) after complition of all codal formalities.

Use of insecticides and coverage of Target Areas with Indoor Residual Spray (IRS) - Outbreak/epidemic response

Directorate of Malaria Control (DoMC). Ministry of NHS, R&C-Islamabad.

			Epidemiology		Entomology			Spray Round			Date of		Insecticides used				Strength(%)
	District:	Tehsil	API (last 3y)	AFI (last 3y)	Density/room	Density/+room		1	2	3	Start	End	Py	OP	Carb	OCH	

No	Name of U/C covered	Detection of epidemic	Date of spraying	No of household targeted	No. of house sprayed	No. houses unsprayed	No. of rooms sprayed				No. of spraymen used		No of days spraying	Target population	Population covered	%coverage of target population	Amount of insecticides used
							Sleeping	Store	A. shed	Others	Regular	Hired					
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	

Prepared by: ……		**Designation:----------**			**Date: ……**		**Contact No: ……..**
Counter-Signed by: ……..……		**Designation:----------**			**Date: ……**		**Contact No: ……..**

Note: This Report should be generated by the designated Focal Person (Assistant Entomologist/M. Superintendent/M. Supervisor/CDC Officer etc) and should submitted to District Health Office with a copy to Provincial and Federal Directorate of Malaria Control

SECTION 7: LIST OF NATIONAL TECHNICAL WORK GROUP PARTICIPANTS

NAME	ORGANIZATION
Mr. Muhammad Aslam Khan (Director)	DOMC
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Mr. Jaipal	DOMC
Dr. Khalid Iqbal (Director)	KPK
Dr.Sadiq (Director)	FATA
Dr. Kamalan Gichki (Director)	Balochistan
Dr Mah Talat	SC
Mr. Ali Asghar Khan	SC
Mr.Alamgeer Khan	SC
Mr.Muhammad Ali	SC
Mr. Naeem Durrani	Merlin
Dr. Muhammad Arif Munir	PMRC
Dr. Qutbuddin Kakar	WHO
Dr. Iftikhar	ACD
Dr. Arshad Iqbal	ASD
Dr. Shahid Ujjan	NRSP
Dr. Nauman Safdar	Consultant