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Indoor Residual Spraying (IRS 2) Task Order Four

ZIMBABWE
END OF SPRAY REPORT
2014

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Prepared by: Abt Associates Inc.



Abt Associates Inc. | 4550 Montgomery Avenue | Suite 800 North
Bethesda, Maryland 20814 | T. 301.347.5000 | F. 301.913.9061
www.abtassociates.com

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ACRONYMS

AIRS	Africa Indoor Residual Spraying
BMP	Best Management Practices
DEHO	District Environmental Health Officer
DHIS2	District Health Information System 2
EHT	Environmental Health Technician
IEC	Information, Education and Communication
IRS	Indoor Residual Spraying
ITN	Insecticide-treated Nets
M&E	Monitoring and Evaluation
MOHCC	Ministry of Health and Child Care
NIHR	National Institute for Health Research
NMCP	National Malaria Control Program
OAA	Outline of Agreed Activities
OP	Organophosphates
PEHO	Provincial Environmental Health Officer
PMI	President's Malaria Initiative
PPE	Personal Protective Equipment
PSC	Pyrethrum Spray Catch
PSI	Population Services International
SBCC	Social and Behavior Change Communication
SOP	Spray Operator
TOT	Training of Trainers
USAID	United States Agency for International Development
WHO	World Health Organization

EXECUTIVE SUMMARY

In August 2011, Abt Associates was awarded the three-year Africa Indoor Residual Spraying project (AIRS), IRS 2 Task Order 4, funded by the United States Agency for International Development (USAID) under the President’s Malaria Initiative (PMI). During the first two years of implementation (2012 and 2013), AIRS Zimbabwe focused on improving the environmental compliance and safety of the country’s own IRS operations and on entomological surveillance. In the third year (2014), AIRS Zimbabwe conducted its first full PMI-funded IRS campaign. The key objective was to demonstrate best practices for IRS programming and implementation in selected high-burden districts of Manicaland province by:

- Covering at least 85 percent of eligible structures in four districts;
- Increasing capacity in IRS at the district, provincial and national level; and
- Continuing support with nation-wide entomological monitoring

Table I presents a summary of the key results of the 2014 spray campaign.

TABLE I: AIRS ZIMBABWE IRS CAMPAIGN SUMMARY, 2014

Number of districts covered by PMI-supported IRS	4 districts (Nyanga, Mutasa, Mutare and Chimanimani)
Insecticide	Pirimiphos-methyl CS (organophosphates)
Number of structures covered by PMI-supported IRS	147,949
Number of structures targeted by PMI-supported IRS	163,922
Spray coverage	90.3%
Population protected by PMI-supported IRS	334,746 (4,542 pregnant women; 54,553 children under 5 years)
Dates of PMI-supported IRS campaign	November 1- December 19, 2014
Length of campaign (operational days)	39
Number of people trained with US government funds to deliver IRS*	332

* Based on the PMI indicator definition for 5.1.1.,

An Outline of Agreed Activities (OAA) was developed and signed by the Permanent Secretary, Ministry of Health and Child Care (MOHCC) and Abt Associates Inc. Chief of Party on 24 August 2014. The OAA outlined the key activities to be implemented by AIRS Zimbabwe in collaboration with NMCP and MOHCC and Manicaland provincial and district health executives in the four districts. The OAA outlines the respective roles and responsibilities and support provided by both AIRS Zimbabwe project and NMCP/MOHCC during implementation of the 2014 IRS campaign in Manicaland province.

For the campaign, AIRS Zimbabwe used pirimiphos-methyl CS (Actellic 300CS), an organophosphate (OP) class insecticide in all four districts. The selection of an OP was based on evidence indicating vector resistance to other classes of insecticide in the spray area. In two districts, Mutasa and Mutare, the main malaria vector (*An. funestus*) is resistant to pyrethroid and carbamate class insecticides but susceptible to pirimiphos-methyl CS and DDT. Entomological surveillance data also indicated high resistance to lambda-cyhalothrin.

As part of the spray campaign (November–December, 2014), the project conducted comprehensive tests on spray quality and insecticide resistance using wild mosquitoes. The entomological results include the following:

- Mortality of wild mosquitoes was 100 percent in all 20 houses sampled one to five days after spraying in the two districts (Mutare and Chimanimani) that are under surveillance in Manicaland.
- The project tested susceptibility of the main vector to four World Health Organization-approved insecticides for IRS in six of the 10 sentinel sites (in the following provinces: Matebeleland North, Matebeleland South, Midlands, Masvingo, Mashonaland Central and Mashonaland West). No tests were carried out in Manicaland due to the difficulties with obtaining mosquitoes. The vector is susceptible to pirimiphos-methyl CS in all tested sites. The vector is resistant to lambda-cyhalothrin at three sites, and to bendiocarb at one site. The vector is possibly resistant to DDT at two sites and possibly to bendiocarb at one site.

CHALLENGES AND LESSONS LEARNED

- Rains slowed spray progress because roads became too slippery and unsafe for lorries to use. Spray operators (SOPs) had to walk 2-3 km to some spray sites. To address this, the team will try to start next year's campaign much earlier.
- Spray progress also was slowed because of malfunctioning of the newly introduced Goizper spray pump. Lack of SOPs' and supervisors familiarity and experience with the pump meant they were not able to address the issues quickly. To avoid this in the future, more intensive training on Goizper use and maintenance will be provided to the SOPs before the next campaign.
- SOPs who dropped out for unspecified reasons reduced spray coverage. In the future, the AIRS Zimbabwe team will add a buffer of trained SOPs, who can quickly replace any dropouts.
- SOPs each carry satchel with the OP bottles to meet their daily target of structures sprayed. Each SOP carries on average eight bottles, about eight liters, in addition to a 10 liter tank. This slows down SOP performance and tires the SOPs out faster. To address the issue of weight carried in the future, the team plans to assign one position (team leader or supervisor) to provide bottles for the spray operators at the pace of spraying.
- Storage space for IRS commodities and camping equipment and washing facilities for IRS campaign teams remain a major challenge. The team will look for local solutions to identify additional storage space and construct temporary washing areas.
- Weak baseline data on eligible structures to be sprayed and population to be protected resulted in mismatches between SOPs deployed and households warned. In the 2015 spray campaign, the team will use actual numbers for structures found in 2014 and will do a post-spray audit to assess the data quality. Both will help with better needs planning and targeting of the spray areas.
- There is need to strengthen community mobilization and social behavior change communication (SBCC) activities to enhance community acceptance and program coverage. To address this, the team will perform a beneficiary satisfaction assessment to investigate reasons for refusals and locked rooms. The assessment will also gather information on IRS and malaria knowledge among targeted households. The results will inform future planning for mobilization and SBCC.
- Susceptibility tests could not be done as planned at most sentinel sites particularly in Manicaland due to scarcity of mosquitoes. To address this in 2015, the team will more closely follow the rainy season pattern to identify the mosquito density peaks and establish a flexible schedule for the data collection trips.

I. INTRODUCTION

The President's Malaria Initiative (PMI) began supporting indoor residual spraying (IRS) in Zimbabwe in 2011. In August 2011, Abt Associates was awarded a three-year Africa-wide Indoor Residual Spraying project (AIRS), IRS 2 Task Order 4, funded by the United States Agency for International Development (USAID) under PMI. AIRS Zimbabwe's scope of work changed between the second and third years of the program. During the first two years of implementation (2012 and 2013), AIRS Zimbabwe focused on improving the environmental compliance and safety of the country's own IRS operations and on entomological surveillance. In the third year (2014), AIRS Zimbabwe conducted its first full PMI-funded IRS campaign.

1.1 SCOPE OF WORK FOR 2014

In the 2012 and 2013 spray rounds, AIRS Zimbabwe provided technical assistance to the National Malaria Control Program (NMCP) to improve spray operations and other technical aspects of its IRS program. AIRS Zimbabwe supported the NMCP with procurement of some IRS commodities, environmental compliance, entomological, and capacity building activities. In 2014, PMI and the NMCP revised AIRS Zimbabwe's scope of work, having it lead spray operations and cover 159,387 target structures in Manicaland province. AIRS Zimbabwe worked with provincial and district health officials in the province, to plan, manage, and implement the 2014 IRS campaign in four districts: Chimanimani, Mutare, Mutasa, and Nyanga. AIRS Zimbabwe introduced new IRS concepts, tools, and methods for improving the efficiency, safety, and effectiveness of IRS programming in its target areas in Manicaland as well as in other provinces – the NMCP adopted several of the AIRS tools for national implementation. AIRS Zimbabwe also continued its entomological surveillance work throughout Zimbabwe.

AIRS Zimbabwe also provided technical assistance to various national-level IRS campaign issues, as requested by the NMCP. These included:

- Introducing new IRS training materials, job-aids, IRS campaign monitoring and supervision checklists, and data collection and monitoring and evaluation (M&E) forms;
- Contributing to NMCP's national policy and decision making by providing feedback and technical expertise in three malaria technical working groups and sub committees (Vector Control; Surveillance, Monitoring and Evaluation and Operational Research; and Social Behaviour Change Communication subcommittee);
- Providing technical support to develop national insecticide resistance and waste management plans;
- Supporting the NMCP and Population Services International (PSI) in developing of IRS campaign and malaria control messages and communication activities; and
- Strengthening NMCP's M&E system.

1.2 PROJECT OBJECTIVES 2014

Together with PMI Zimbabwe and NMCP, AIRS Zimbabwe established the following objectives for the project.

Broad Objective:

To showcase best practices for planning, implementing, monitoring and evaluating an IRS program in selected high burdened districts of Manicaland province. These best practices should form a model IRS program for Zimbabwe within two years.

Specific Objectives:

1. Cover at least 85% of eligible structures found in the four targeted spray districts in Manicaland.
2. Protect at least 85% of the population living in eligible structures in the targeted spray districts.
3. Develop capacity for provincial- and district-level health staff to organize, plan, implement, monitor and evaluate IRS through joint planning meetings, joint supervision and evaluation activities during the IRS campaign, and involving local counterparts in IRS campaign data collection and analysis.
4. Complete high-level entomological surveillance nationally, to ensure data are available for future IRS campaign planning.

1.3 SELECTION OF IRS DISTRICTS

For the 2014 IRS campaign, the NMCP and PMI asked AIRS Zimbabwe to focus its operations in the four districts (Chimanimani, Mutare, Mutasa, and Nyanga) with the highest malaria endemicity in Manicaland. Table 2 shows the numbers of structures and populations in the districts in 2014. The number of structures per district was used to calculate the human resources and materials needed for the IRS campaign including number of seasonal staff, personal protective equipment (PPE), and insecticide.

TABLE 2. TARGET STRUCTURES AND POPULATION FOR 2014 IRS CAMPAIGN

District	Target Structures	Target Population		
		Males	Females	Total
Mutasa	43,103	42,926	44,349	87,275
Nyanga	45,144	44,453	45,868	90,321
Chimanimani	25,400	31,578	34,760	66,338
Mutare	48,617	63,523	65,901	129,424
TOTAL: 4 Districts	162,264	182,480	190,878	373,358

1.4 INSECTICIDE SELECTION

Susceptibility tests conducted in Mutare and Mutasa districts in early 2014 showed that the predominant vector, *An. funestus*, was resistant to pyrethroids and carbamates. It was, however, susceptible to DDT and pirimiphos-methyl CS. The NMCP and PMI decided to use an organophosphate (OP) insecticide for the 2014 IRS campaign in the four targeted districts.

2. PRE-SEASON ACTIVITIES

2.1 PROVINCIAL AND DISTRICT PLANNING MEETINGS

AIRS Zimbabwe in collaboration with the NMCP conducted several provincial IRS micro-planning meetings with provincial and district health officials in Manicaland. The first meeting was held in Mutare in July 2014 with NMCP officials, senior health executives from the province, the four PMI-supported districts, and the three Global Fund-supported districts, to reach a common understanding on the 2014 IRS campaign. District-level participants included District Environmental Health Officers (DEHOs), Health Promotion Officers, and Medical Officers. Other participants were Provincial Environmental Health Officers (PEHOs) and other provincial health officials, PSI, Plan International Zimbabwe, and the United Nations Development Program, for a total of 33 participants. Major discussion points included:

- National strategic plan for IRS 2014
- Manicaland IRS 2014 plan
- Partners' roles and responsibilities in the campaign
- Training and start dates
- Targets
- Length of spray period
- Modified IRS data collection tools
- Types of vehicles required for the campaign
- Servicing of motorcycles for warners

After that, a number of micro-planning meetings were held between AIRS staff and provincial personnel as a build up to the launch of the IRS campaign in the four districts. All four districts conducted similar meetings in their district hospitals. Participants included government health officials stationed at rural health centers (ward level), such as Environmental Health Technicians (EHTs). In addition, the EHTs held half-day meetings with local leaders (chiefs, kraal heads, village health workers, and school health coordinators) to develop IRS operational plans and clarify the roles and responsibilities of community members before and during IRS implementation.

2.2 LOGISTICS NEEDS AND PROCUREMENT

AIRS Zimbabwe rented a large private warehouse in Mutare, which was used as a main storage base before and during the IRS campaign. In addition, MOHCC provided additional storage facilities at district health centers at no cost. The project also rented smaller spaces from private businesses for proper storage of insecticides and PPE for the duration of the campaign.

To ensure daily supply of materials and insecticides at the campsites, which are the base for operations during spraying, the project rented small store rooms at the nearby rural centers. The project rented the store rooms for the same number of days the teams stayed at each campsite.

2.2.1 PROCUREMENT

Procurement of local IRS commodities took place from August through October, 2014. The team conducted procurement through an open competitive tendering process in which at least three quotations were sought. The bids were opened and vendors selected by the AIRS Zimbabwe procurement committee in Harare. The selection criteria focused on vendor ability to meet the specifications listed in the advertisement and to offer a competitive price. The major services/commodities locally procured included:

- Transportation for IRS planning, operations and supervision
- Vendors to service motorcycles for the warners
- PPE and tents
- Printing of information, education and communication (IEC) materials and M & E tools (IRS data collection tools, performance tracker)
- Refurbishment materials and screening of IRS commodities storerooms as well as materials and services of soak pits
- Food vendors to provide three meals a day to spray operators during Level Three training and breakfast only during spraying

Internationally procured commodities included 80,429 bottles of Actellic 300CS; 263 Goizper spray pumps and spare parts; and face shields, face masks and face brackets. Annex A provides additional information on IRS commodities procured locally and internationally for the 2014 campaign.

As part of MOHCC contribution, NMCP provided 605 overalls, 390 helmets, and 390 pairs of gumboots to the PMI AIRS spray campaign.

2.2.2 MATERIAL DISTRIBUTION TO THE DISTRICTS AND OPERATION SITES

Initially, all IRS commodities were stored at the central warehouse in Mutare. From there, items were distributed to the district stores and to the campsite store rooms well in advance of the spray launch. Table 3 shows distribution of main IRS items by district. The majority of the items were distributed to Mutare district which has highest number of structures and the least to Chimanimani district, which has the fewest structures.

TABLE 3. DISTRIBUTION OF MAIN IRS COMMODITIES, 2014

Item	Chimanimani	Mutare	Mutasa	Nyanga	Total
Overalls	110	173	153	152	588
Gumboots	62	140	90	103	395
Hard hats	55	101	89	86	331
Face shields	54	96	86	54	290
Brackets	54	96	86	54	290
Insecticide Carrier bags	48	91	80	78	297
Insecticide bottles	14,000	24,123	21,420	20,886	80,429
Tents	6	10	8	8	32
Mattresses	60	106	94	88	348
Spray pumps	39	75	66	64	244

2.3 HUMAN RESOURCE REQUIREMENTS

Of all IRS staff, only the spray operators (SOPs) were casual workers hired for a period of up to 40 days. The other IRS team members were government employees who received daily allowances from AIRS Zimbabwe. The distribution of staff by district and gender is shown in Table 4. Mutare had the most staff, while Chimanimani had the least. Nyanga was the only district that hired female SOPs.

TABLE 4. STAFF ENGAGED FOR 2014 CAMPAIGN, BY DISTRICT

Position	Chimanimani		Mutare		Mutasa		Nyanga		Total		% Females
	M	F	M	F	M	F	M	F	M	F	
District Coordinator	1	0	1	0	1	0	1	0	4	0	0
Team Leader	2	1	3	2	3	1	3	1	11	5	45.5
Field Supervisor	6	2	12	3	10	3	9	3	37	11	29.7
Spray Operator	38	0	73	0	65	0	63	2	239	2	1
Storekeeper	2	0	1	0	2	0	2	0	7	0	0
Guards	2	0	1	0	2	0	2	0	7	0	0
Warner	3	0	5	0	4	0	4	0	16	0	0
Data Managers	1	0	1	0	1	0	1	0	4	0	0

3. IRS TRAININGS

3.1 LEVEL ONE, TWO AND THREE TRAININGS

The NMCP already has an established system of IRS-related trainings, categorized as Level One, Two, and Three spray campaign trainings. AIRS Zimbabwe supported the Level One, a national training of trainers (ToT) held in Mutare in July 2014. Participants included senior health officials from Zimbabwe's eight rural provinces, Plan Zimbabwe, and PSI with the facilitators from AIRS Zimbabwe, the NMCP, the World Health Organization (WHO), the National Institute for Health Research (NIHR), and the private sector (Goizper and Arysta LifeScience). The training focused on presenting processes and procedures for IRS in order to standardize IRS operations in all provinces in Zimbabwe.

This training was followed by Level Two and Extended Level Two trainings. The Global Fund supported the Level Two training, conducted in August 2014 in Nyanga district. Because AIRS Zimbabwe had not received the new Goizper pumps and insecticide by then, the participants did not have a chance to learn about the pump and insecticide management.

Therefore, AIRS Zimbabwe organized the Extended Level Two training in Mutare in October 2014 for the same trainees to cover all aspects of pump use and maintenance and the insecticide. Participants were DEHOs, PMDs, PEDCOs, IRS Coordinators, and Data Managers. AIRS Zimbabwe staff, NMCP representatives, provincial health officials, and representatives of the Goizper pump manufacturer, and Arysta LifeScience, an insecticide supplier, facilitated the training. Specific issues discussed included:



Level Two training participants practicing use of Goizper pumps, Mutare

- Introduction, safe use, and management of OPs
- Environmental compliance
- Liquid and solid waste management in the field and at the IRS campsite
- Introduction to, use, and maintenance of the Goizper pump
- Practical exercises on spraying techniques and pump maintenance

During the Level Two training, AIRS country program staff worked with the government counterparts to introduce several new PMI AIRS tools (error eliminator; IRS performance tracker; and four checklists

to supervise a) morning mobilization; b) home owner preparation and SOP performance; c) storekeeper performance, and d) end of day close out) and concepts to the 2014 IRS campaign. The district health staff trained at Level Two became trainers/ facilitators for the Level Three training organized for SOPs, and facilitated by supervisors and spray pump technicians. During the training, all four spray pump technicians (one from each of the four districts) had a separate session to improve their skills on pump trouble shooting and maintenance.

As shown in Table 5, the project held four Level Three trainings, one per district, for 239 SOPs. Of the 239, two were female, both in Nyanga district. Training objectives were to:

- Impart technical skills on proper handling, mixing, and application of insecticides for IRS
- Build skills of SOPs in IRS data collection
- Enhance environmental compliance by explaining requirements for proper solid and liquid waste management at campsites
- Build knowledge of SOPs about malaria vectors, the vector life cycle, transmission, the disease picture, and prevention and control measures
- Introduce SOPs and supervisors to the new OP insecticide and to compression pumps, their components, how they function, troubleshooting, and proper maintenance.

Shortly before IRS activities began, the AIRS Zimbabwe team reviewed the IRS training manual and materials and provided RS brochures, data collection forms, and supervision checklists to the spray teams.

During the campaign, a number of SOPs dropped out for various reasons. The data exists only per district: Chimanimani 1; Mutare 1; Mutasa 5; Nyanga 3. It will be considered for a buffer calculation when recruiting and training SOPs for the next year campaign.

TABLE 5. SUMMARY OF LEVEL THREE TRAINING PARTICIPANTS AND FACILITATORS, 2014

District	SOP		Facilitators (Supervisors, Pump Technicians)		Training Venue	Training Dates
	Male	Female	Male	Female		
Chimanimani	38	0	17	3	Ngorima	25-30/10/14
Mutare	73	0	24	5	Chitakatira	25-30/10/14
Mutasa	65	0	23	4	Chisuko	25-30/10/14
Nyanga	61	2	22	6	Nyatate	25-30/10/14
Total	237	2	86	18	-	-

3.2 DATA COLLECTION TRAINING

As part of national capacity building, AIRS Zimbabwe held advanced data collection trainings included Level One and Two trainings. The trainings were geared toward the staff responsible for IRS data quality assurance in their provinces and took place from September 29 to October 3, 2014, in Masvingo

province. The trainees attended either the Level One or Level Two training for their primary IRS role and, therefore, are not counted in Table 6 under “Data Capture” to avoid duplication. A total of 70 participants (57 males and 13 females) participated from eight provinces. Facilitators were from MOHCC, AIRS Zimbabwe, PSI, the Clinton Health Access Initiative, and Research Triangle Institute. The training was supported by the Global Fund through the NMCP and PSI. Training objectives were to:

- Share experiences from 2013 IRS campaign on SMS frontline system for IRS.
- Discuss government policies and procedures on management of the allocated laptops, mobile modems, and cell phones
- Impart knowledge on the use of cell phones to send IRS data by SMS.
- Refresh participants on the use of District Health Information System 2 (DHIS2).
- Train participants on Quantum GIS.
- Strengthen knowledge on IRS data collection tools including Error Eliminator and IRS performance tracker.

The training was successful with attendees learning a lot about the new tools. After the training, participants made the following recommendations:

- Procure laptops for the data managers.
- Add more variables like percentage coverage for both rooms and population protected to the DHIS2.
- Give passwords to all IRS stakeholders so they can access DHIS2.
- Have provincial Field Officers, responsible for vector control work in the province, map IRS coverage by ward starting with the 2014 IRS campaign.
- Give teams adequate airtime to submit IRS data.
- Make sure all team leaders use Error Eliminator before completing daily summary forms.

3.3 GUARDS, DRIVERS, AND STOREKEEPER TRAINING

The project conducted a one-day comprehensive training for 29 guards, drivers, and storekeepers on securing commodities and storekeeping during IRS implementation. Participants were trained on the following topics:

- Individual roles and responsibilities in IRS logistics
- General warehouse and commodity management
- Store management record keeping
- Temperature and humidity monitoring
- Fire control and spills management
- Accident or incident reporting procedures
- IRS waste
- Environmental compliance

- Understanding and preparing for post IRS activities.

Table 6 presents complete data on people trained for all IRS positions for 2014 spray campaign. Women represented 5.6 percent of all trained people. Table 7 provides information on participants trained to deliver IRS with U.S. Government funds, a PMI indicator

TABLE 6: PEOPLE TRAINED TO DELIVER IRS

	Training on IRS Delivery								All other Trainings								
	National ToTs (LI)		Spraying Operations (L2&3)		Data Capture		IEC		Technical Maintenance		Entomologica I training		Storekeeping / Warehouse Mgmt Training		Driving + Guarding Secure		
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
National (NMCP)	2	1															3
PMD				1													1
PEDCO				1													1
PEHO	8																8
Provincial Field Officer	8																8
DEHOs	4																4
District IRS Coordinators			4														4
Field Supervisors			37	11													48
Insectary Managers											42						42
Spray Operators			237	2													239
Team Leaders			11	5													16
Pump Maintenance Technicians								4									4
Warehouse consultant													1				1
Storekeepers and Guards													19	1			20
Data Manager					4												4
Health Promotions Officers							2	2									4
Warners /Mobilisers							16										16
Drivers															8		8
Total M/F	22	1	289	20	4	0	18	2	4	0	42	0	20	1	8	0	431

TABLE 7. 2014 DATA FOR PMI INDICATOR “NUMBER OF PEOPLE TRAINED WITH USG FUNDS TO DELIVER IRS”

IRS delivery TOT	22	1	23
Spray operations	289	20	309
Total	311	21	332

4. INFORMATION, EDUCATION AND COMMUNICATION ACTIVITIES

AIRS Zimbabwe supported IEC activities for the 2014 IRS campaign. These activities included the printing of promotional t-shirts used for the Zimbabwe Racing Against Malaria Campaign (April 13-26, 2014); development of new messages together with NMCP and PSI to increase IRS uptake (i.e., a new brochure including information on covering heavy household goods in the middle of the room); conducting TOT on IRS mobilization; and door-to-door mobilization during the spray campaign.

4.1 DEVELOPMENT OF IRS MESSAGES

The project worked with the NMCP and PSI from July through to September 2014 to develop IRS messages, posters, and leaflets. This involved collaboration with malaria partners and community members. Messages and pictures were pretested with target audiences in Burma Valley, Mutare District, and discussed and agreed upon during the meetings. Various photos to promote IRS acceptance were taken with the agreement of the communities of Chishapa ward, Shamva district of Mashonaland Central province and used for IRS materials. AIRS Zimbabwe received over 15,000 copies of the IRS leaflets produced by PSI. The project distributed the materials to IRS beneficiaries through warners and SOPs.

4.2 TRAINING OF TRAINERS IN IEC

To improve IRS uptake by communities, a one-day provincial IEC and mobilization training was conducted in Mutare on September 23, 2014. The participants included DEHOs, District Health Promotion Officers, IRS Coordinators, warners, data managers, and team leaders. Table 8 shows the number of participants disaggregated by district and gender. The training was facilitated by AIRS Zimbabwe, PSI, and NMCP staff and provincial health officials.

TABLE 8. IRS IEC TOT PARTICIPANTS 2014

District	Participants		Total
	Male	Female	
Chimanimani	6	1	7
Mutare	5	3	8
Mutasa	5	2	7
Nyanga	5	2	7
Total	21	8	29

The main objective of the TOT was to strengthen participants' knowledge and skills to impart IRS messages to district health officials, who were to communicate with and mobilize the IRS beneficiaries at the ward level. The participants were trained in various topics including effective communication, resistance to change continuum, and roles of community before, during, and after IRS campaign. They received guidance on procedures to be followed in the event of adverse effects (e.g., insecticide poisoning). The training sessions included theory and practical demonstrations and mock exercises.

4.3 DOOR-TO-DOOR COMMUNITY MOBILIZATION

The warners who were the main IRS community mobilizers visited every household in targeted spray areas the day before the area was sprayed. The project hired a total of 16 warners and provided them with motorcycles to move quickly between the spray areas. Working in collaboration with community leaders, the warners informed each household about the IRS, the duties of the IRS beneficiaries, and the advantages of allowing spraying. The warners, using chalk or markers, checked all structures visited, writing on the wall or the door of a house the date of the visit, initials of the warner, and a mark if the structures were mobilized, refused mobilization, or locked. The household identity number was used as a record for the IRS beneficiary to note that their structures were reached during the mobilization. It was noted during the IRS campaign that the chalk marks could easily fade away before the end of the spraying campaign. Miner's chalk could not be obtained, hence these were ordinary chalk.

In addition to door-to-door community mobilization, the project communicated through channels such as meetings with traditional/community leaders, schools, churches, community malaria committees, Village Health Workers, and community gatherings and clubs. AIRS Zimbabwe procured 16 loud speakers used by warners on their daily operations to improve the IRS awareness campaign. The loud speakers were found to be effective and appreciated by most IRS campaign implementers.

Advocacy and social mobilization meetings were held at district and ward levels by EHTs to enhance community acceptance while 138 road shows were performed in the different wards prior to the IRS campaign with technical support from PSI.

5. IMPLEMENTATION OF IRS ACTIVITIES

5.1 IRS SUPERVISION

To strengthen the supervision of the campaign, AIRS Zimbabwe assigned one technical staff to each of the four districts. They worked with the provincial and district health staff almost every day throughout the campaign. Table 9 demonstrates organizations that actively participated in supervision in 2014. SOPs were grouped into teams, each with 15 members and three IRS field supervisors. Each supervisor directly supervised five SOPs. One team leader managed and supervised each team and reported to the district IRS Coordinator.

TABLE 9. SUPERVISION OF 2014 IRS CAMPAIGN

Level	Organization	Roles and Responsibilities
National	NMCP, USAID/PMI, AIRS Zimbabwe	General IRS support and supervision. On-the-spot solution of challenges when possible and referral to provincial officials challenges with no immediate solution.
Provincial	Provincial Medical Director, PEHO, Provincial Epidemiology Disease Control Officer, Provincial Health Services Administrator	Regular IRS support and supervision. On-the-spot solution of challenges where possible and referral to district officials challenges that required district interventions.
District	District Medical Officers, DEHO, District Health Promotions Officer;	Consistent and tight IRS support and supervision. On-the-spot solution of challenges where possible and referral to provincial and national officials challenges that required interventions at higher levels.

At the campsite, the IRS supervisors, team leaders, and IRS Coordinator conducted daily and weekly performance reviews and agreed on solutions and actions to address performance weaknesses.

The AIRS Zimbabwe technical team developed a supervisory plan that made one member responsible for overseeing IRS operations in one district; each week, the team members rotated to another district, though each member remained accountable for the allocated district AIRS team members addressed challenges on the spot and referred issues requiring district, provincial, and national level attention to the relevant MOHCC or NMCP officials. Joint support and supervision visits were carried out in collaboration with NMCP, provincial, and district officials.

During supervision, all observers documented all findings and made sure that corrective measures were taken as soon as possible – preferably immediately – when deviations from the set standards were identified.

The project continued using revised checklists that were introduced to the NMCP for 2013 IRS operations. The checklists were: Pre-Spray Environmental Compliance Inspection, Spray Operator Morning Mobilization, Homeowner Preparation, Storekeeper Performance, End of the Day Clean-Up, Post Spray Inspections, and Transport for spray operators and insecticide. Two other checklists were introduced during 2014 campaign:

- Error Eliminator: Identification of possible errors made by spray operators when entering IRS data in

the field

- IRS Performance Tracker: Observation of daily spray performance and insecticide use rates

AIRS supervisors had brief Monday morning meetings either at the AIRS Zimbabwe offices in Harare or in Mutare to share IRS updates and plan for the week's IRS supervision and implementation.

5.2 LOGISTICS

5.2.1 IRS STORAGE AND INSECTICIDE STOCK MANAGEMENT

District storage facilities served as distribution centers for IRS materials, equipment, and supplies. A storekeeper managed the facility to ensure distribution and close supervision of supplies and materials to the campsites. There were 18 storage facilities at the operation sites in the four districts; nine of them were provided at the health center level at no cost to the program as the MOHCCs' contribution to the IRS campaign. The other nine facilities were rented at locations near the IRS operational sites. AIRS Zimbabwe team closely monitored the performance of the storekeepers and provided guidance and coaching on the spot when required. All storekeepers and the Central Warehouse Manager (a temporary hire of AIRS Zimbabwe) ensured close tracking and management of insecticide, other materials, and equipment stocks from the provincial warehouse to the district storage facility and subsequently to the operation sites storage facilities. Empty insecticide bottles were tracked daily at the operational sites and district stores. They were accounted for by recording how many OP insecticide bottles each spray operator or team had received and used. All stock records were documented on stock cards.

5.2.2 IRS VEHICLES

AIRS Zimbabwe rented a variety of vehicles from private transport companies for use during the 2014 IRS campaign. The project rented eight lorries from the private sector and serviced and fueled 16 motorcycles provided by the MOHCCs (Table 10). The project used the lorries to dispatch PPE, insecticide, and IRS equipment from Harare to the main warehouse in Mutare and to the district campsites. Lorries also transported spray teams from the campsites to the field and back. Warners used motorcycles for their mobilization work.

Four-by-four trucks were also hired to transport AIRS Zimbabwe staff, NMCP, provincial and district spray campaign supervisors to monitor IRS operations throughout the campaign. Transport vendors were required to modify their vehicles and assure the program that safety components were in place for the safe transportation of spray teams, IRS equipment, and insecticide. AIRS Zimbabwe provided fuel support to district teams to facilitate routine supervision and regular monitoring of the campaign. The MOHCC provided vehicles and fuel for supervisory teams from the provincial office.

TABLE 10.DISTRICT DISTRIBUTION OF IRS OPERATIONAL TRANSPORT

District	Lorries	Motorcycles
Chimanimani	2	3
Mutare	2	5
Mutasa	2	4
Nyanga	2	4
Total	8	16

5.3 IRS PAYMENTS

In 2014, AIRS Zimbabwe team managed the following activities to ensure financial issues did not delay the spray campaign:

- The team ensured that all the seasonal staff (SOPs, storekeepers, security guards, and breakfast caterers) have contracts and the project has signed copies for the records.
- The project established and maintained log sheets for the IRS lorries.
- Daily registers were maintained and approved by the IRS Coordinators for the SOPs, lorry drivers, and breakfast caterers.
- The AIRS team verified and collected the daily registers for the breakfast caterers and IRS spraying teams before preparing payrolls.
- An agreement was reached with an e-mobile banking system through the ECOCASH service provider used to pay the nongovernment personnel.
- Per diem expenses to government employees were made through their respective bank accounts.
- Some of the breakfast service providers were paid through their bank accounts while others were paid in cash because they could not meet the minimum bank requirements.
- Lorry service providers were paid through their bank accounts after their log sheets had been verified and reconciled.
- Fixed price contracts were signed with the 4x4 truck service providers. These were paid through their bank accounts after the invoices had been verified and reconciled.
- All payments were approved by finance and administration staff and the Chief of Party.

6. ENVIRONMENTAL COMPLIANCE

6.1 LETTER REPORT

In 2014, AIRS Zimbabwe continued operating under the supplemental environmental assessment that the project conducted in 2012 for 2012-2016. Two months prior to the initiation of spray activities, the project submitted a letter report that summarized the most current environmental compliance information with regard to the AIRS Zimbabwe program.

The report included information on intended environmental trainings for the IRS campaign; the condition, organization, and schedule for repair or upgrades of district warehouses and operation sites (storerooms and soak pits); and the proposed disposition of all IRS wastes. The following were the major changes highlighted in the letter report for 2014:

- AIRS Zimbabwe would be responsible for implementing a full IRS campaign in four districts
- The NMCP and PMI agreed to switch insecticide class from 2013's pyrethroids to OP.
- AIRS Zimbabwe would recycle all empty OP bottles at an approved firm in Harare.

6.2 PRE-SEASON ENVIRONMENTAL ASSESSMENT

Pre-IRS assessment of storerooms and soak pits is the first preparatory steps in IRS. It should be done at least two months before the start of the spraying season. The 2014 Pre-IRS assessment was done from August 5-8 and 19-21, 2014, by two teams, each covering two districts. The assessment teams comprised a Vector Control Officer, Provincial Field Officer, and DEHOs from the four PMI-supported districts.

During the assessments, the teams used smart phones to capture information on the state of the soak pits and storage facilities. In some areas, a weak Internet signal prevented the teams' two-year old smart phones from getting a level of accuracy that was acceptable to the system or made the process unacceptably slow – taking more than an hour to pick the coordinates. The project therefore decided to procure Samsung smartphones and successfully used them during the second phase of the assessment. Going forward, even when this becomes a problem, which we do not expect to happen, the user will be able to accept the “less than ideal” level of accuracy.

The following sites were visited:

- Chimanimani: Chakowa, Nyanyadzi, Biriwiri, Rusitu, Chimanimani District Medical Offices
- Mutare: Chitakatira, Mushunje, Mutare district storeroom, Marange, Bezel Bridge, St Andrews, Dora, Nyagundi, Provincial Warehouse
- Mutasa: Chisuko, Hauna District Hospital, Mupotedzi, Manica Bridge, Sherukuru
- Nyanga: Elim, Nyamaropa, Tombo, Matize, Fombe, Avira, Gotekote, Nyautare, Nyatate, Nyanga District Hospital.

The teams assessed the need for repair of existing soak pits, checked on areas requiring additional soak pits, and checked on availability of storerooms and their need of repair. The major findings were that none of the four districts had a stand-alone storeroom for storage of IRS commodities; the soak pit

fencing poles and hanging lines supporting the poles had been damaged by white ants; and danger warning signs at soak pits had been damaged by prolonged exposure to sunlight. Three campsites in Nyanga District and one in Mutare had no soak pits. The project identified private storerooms for renting and refurbishments. The identified store rooms had no screens on doors and windows, and appropriate refurbishments were made to comply with BMP manual. The Provincial Medical Directorate was asked to support the provision of storerooms at health centers. Table 11 provides a summary of soak pits and camp storerooms refurbished in 2014.

TABLE 11. REFURBISHMENTS AT IRS CAMPSITES

District	Number of Campsites	Site Refurbished (soak pit, storeroom, fence, etc.)
Chimanimani	4	2 storage facilities were provided by MOHCC after upgrading 2 storage facilities were rented
Mutare	6	5 soak pits were refurbished 1 new soakpit was constructed at Dora Rural Health Center 3 storage facilities were provided by MoHCC after upgrading 1 storage facility rented The district later decided to use only four camping sites
Mutasa	4	4 soak pits were refurbished 3 storage facilities were provided at health centres by MOHCC. 2 private storage facilities were rented
Nyanga	9	5 soak pits were refurbished 3 storage facilities were provided at health centres by MOHCC. 3 private storerooms were rented.

6.3 CONSTRUCTION OF SOAK PITS

As agreed with the provincial health offices, AIRS Zimbabwe built four new soak pits at the proposed campsite areas in Nyanga (three) and Mutare (one) districts. To do the work, the project contracted local community builders, who worked under the supervision of the project Environmental Compliance Officer, Environmental Compliance Assistant, and the DEHOs.

6.4 SAFETY AND ENVIRONMENTAL COMPLIANCE DURING THE

In September 2014, prior to the start of spray operations, all SOPs had a medical examination to assess their health and fitness to participate in the IRS campaign (Table 12). The examinations were done by local District Medical Officers in liaison with the DEHOs. The tests comprised a routine physical check-up, a pregnancy test for all females including storekeepers and IRS supervisors. Anyone who was found unfit could not participate in the operations. Six SOPs (all in Mutasa) were found unfit for general physical reasons or because of a history of allergy to OPs, and they were replaced immediately, before IRS training and operations.

TABLE 12: MEDICAL CHECKUP FOR IRS STAFF

District	SOPs, supervisors, and storekeepers examined		SOPs, supervisors and storekeepers found unfit	
	Male	Female	Male	Female
Chimanimani	54	4	0	0
Mutare	86	5	0	0

Mutasa	76	8	6	0
Nyanga	80	4	0	0
Total	296	21	6	0

During IRS operations, all implementation staff had to adhere to environmental and human safety requirements for IRS. Appropriate PPE were issued to all spray personnel and others who might be exposed to insecticide. PPE included coveralls, gloves, boots, helmets, face shields, and dust masks. Supervision by AIRS staff and government inspectors ensured the continuous use of PPE by all affected personnel.

As noted earlier, transportation of insecticides from the provincial warehouse to the district stores was done using eight covered lorries. Distribution from the district warehouse to the operations sites was done using lorries covered with tarpaulins. Each of the lorries was equipped with kits for spill management and first aid, Material Safety Data Sheets, and accident/emergency procedures sheets. SOPs were transported from the operational sites to the field using lorries that were retrofitted with railings on the periphery and seating benches. Prior to their engagement, all vehicles were inspected against the PMI Best Management Practices (BMP) Manual to ensure compliance with safety and environmental requirements.

The Environmental Compliance Officer and his assistant monitored the soak pits throughout operations. The soak pits and wash areas were fenced and gated to ensure that non-authorized entities did not access the premises. The progressive (triple) rinsing system was used at each soak pit for washing spray pumps. All empty OP bottles were triple rinsed by SOPs while they were still in the field. SOPs and supervisors washed the PPE over the soak pits at the end of each spray day. Mid-spray environmental compliance inspections were carried out during the spray operations to ensure that mitigation measures were adhered to. AIRS Zimbabwe staff in conjunction with the DEHOs conducted regular inspections using smartphones and paper checklists.

The following standard environmental compliance checklists were administered by the AIRS staff using smartphones to ensure compliance with BMP requirements:

- Morning mobilization
- Home owner preparation and SOP performance
- Storekeeper performance
- End of day close out

The inspection teams assessed the use of PPE during spraying and washing activities, stores records and arrangement, transportation of SOPs, and use of warning signs and first aid kits. Additionally, they inspected fire extinguishers in storerooms. The teams also ensured that wastes were correctly handled and packed during the operations in preparation for disposal at the end of the operations.



End of the day cleaning, Dora Campsite, Mutare District

Preparations of households for spraying and the instructions given to residents on what to do during and after spraying operations were monitored. Part of the inspections also involved observing the spray operators in the field.

Generally, the level of compliance was very high during the 2014 IRS. Out of the supervision visits made to 108 homes, 98 percent reported compliance with BMP requirements. Out of 26 observations of storekeeper performance, 92 percent reported BMP compliance. Out of 28 observations on performance during the end of the day clean up, the level of compliance was reported at 99 percent.

However, supervisors observed a number of issues as outlined below. Annex B provides additional information on the campaign environmental compliance inspections and observations including a summary table on main non-compliance observations and their causes.

Household owner preparation and SOP performance:

- 15 spray operators were seen to be missing some PPE: neck protection, , and occasionally visors and helmets. Several SOPs and supervisors were observed tucking overalls inside their boots, when they should be worn on the outside.
- Some household owners refused to have their houses sprayed due to the insecticide smell and suspected skin itchiness based on previous experience with pyrethroid insecticides.

Storekeeper performance:

- Some senior health officials tried to enter the storerooms without adequate PPE. Remedial advice was given to them on the spot.
- Some thermometers were seen placed outside and not inside the storerooms, thus not recording storeroom temperatures. This was noted at Rusitu and Mutare storerooms and corrected on the spot

Stacking of insecticides boxes above two meters from the floors was also noted. Remedial advice was given on site.

End of day spray operator performance:

- One issue of non-compliance was observed at Manica Bridge in Mutasa district – some SOPs stored spray pumps in a corner of their sleeping room. This was corrected by renting additional storage space for pumps.
- Another non-compliance issue was that two SOPs were drinking water in the field while donning PPE. The incidents happened in Berzeley Bridge and Chakohwa. Proper guidance to the SOP and supervisors was given on site.
- Poor drainage of Rusitu soak pit in Chimanimani district was also noted and appropriate repairs were made.

6.5 MANAGEMENT OF INSECTICIDE ADVERSE EFFECTS AND OTHER INCIDENTS

Each of the four IRS districts had some arrangement with local health centers and the district hospital for the management of adverse effects. The MOHCC team was responsible for addressing any adverse effects experienced by community members and/or the spray operations support staff during the spray campaign. During the IRS operations, the teams got on-the-job training on management of chemical poisoning and IRS adverse effects. No incident of adverse effects was experienced during 2014 IRS season.

During the same operations, no IRS vehicle accidents were experienced. The eight drivers from two private transport companies under went on the job training on safe transportation of insecticides and spraying teams.

6.6 POST-SEASON ENVIRONMENTAL ASSESSMENT

The post-season environmental assessment was conducted in the four districts using smartphones. It was found that all IRS items were collected from the 18 operation sites and those insecticides and IRS wastes were taken to provincial warehouse for storage, sorting and packaging. All 24 soak pits and their surroundings were cleaned, covered, and the doors securely locked. AIRS Zimbabwe agreed with the district and health center teams that adequate security should be provided for the soak pits and wash areas to ensure that they are not vandalized during the non-spraying season. Stores were cleaned and decontaminated before being handed over to the owners.

During the same exercise cleaning of the pumps, PPE, and tents was done in preparation for proper storage.

6.7 IRS WASTE DISPOSAL

At the end of the IRS campaign, the project collected the waste from all the four districts and moved it to the provincial warehouse in Mutare. There, the waste was separated and baled according to type in preparation for transportation and final disposal. The IRS waste was then disposed of at different sites according to the type generated during the IRS operations as indicated in Table 13. AIRS Zimbabwe received certificates from Clean and Green, a local recycling firm, confirming baling of empty bottles and non-contaminated boxes and identifying incineration location of the waste (South Africa) as shown in Annex C.

TABLE 13. IRS SOLID WASTE MANAGEMENT, BY CATEGORY

Type of Waste	Quantity (pieces)	Method of Disposal	Final Product	Supervision Dates of Disposal Process
Empty OP bottles	67,000	Recycling at Clean and Green firm Harare	Irrigation pipes in South Africa	February 4-7, 2015
Non-contaminated cardboard boxes	4,083	Recycling at Clean and Green firm Harare	Remolded into new packaging boxes in South Africa	February 4-7, 2015
Contaminated empty cardboard boxes	1,500	Incineration to be done Zimasco Smelting Company	Incinerated at Zimasco	February 27, 2015
Contaminated disposable face masks	13,377	Incineration to be done Zimasco Smelting Company	Incinerated at Zimasco	February 27, 2015
Worn and torn rubber gloves	388	Disinfected and handed over to spray operators	Disposed	January 2015
Torn overalls	312	Disinfected and handed over to spray operators	Disposed	January 2015
Satchels	253	Disinfected and handed over to spray operators	Disposed	January 2015
Socks	731	Disinfected and handed over to spray operators	Disposed	January 2015
Gumshoes	241	Disinfected and handed over to spray operators	Disposed	January 2015

7. POST- SPRAY SEASON ACTIVITIES

7.1 POST-SPRAY REVIEW MEETING

The Provincial Medical Director of Manicaland province in concurrence with the NMCP asked that only one post-spray season review meeting be conducted for all the seven districts, instead of two as per funding/implementing agents. In accordance with the request, a one-day meeting was held on January 15, 2015 in Mutare. The meeting was attended by participants from all seven districts in Manicaland (Table 14), which included the DEHOs, IRS Coordinators, IRS Data Managers, Warners, and Team Leaders. The facilitators were from the AIRS Zimbabwe project, the NMCP, provincial health officials, and a representative from Plan International Zimbabwe.

The main focus of the meeting was to share experiences, sustain strengths, explore opportunities, and review challenges and possible solutions on the implementation of 2014 IRS campaign. Major discussion points included:

- Districts implementation reports
- Observations and experiences during IRS supervision
- Lessons learned and best practices
- Provincial IRS overview
- National 2014 IRS perspective
- Entomological monitoring activities
- IRS data management and other related M&E issues

TABLE 14. IRS 2014 REVIEW MEETING PARTICIPANTS

District	Participants		Total
	Male	Female	
Chimanimani	6	0	6
Mutare	4	2	6
Mutasa	5	1	6
Nyanga	4	2	6
Buhera	4	1	5
Chipinge	5	1	6
Makoni	5	0	5
Total	33	7	40

Based on the experiences shared and challenges faced, the meeting agreed on the following key recommendations:

- IRS for 2015 to commence in October for all the seven districts in Manicaland
- IRS commodities to be delivered as early as possible to avoid delays in the start of the campaign
- Airtime to be supplied to IRS Coordinators and Data Managers during IRS campaign
- Need to procure more Hudson Expert sprayers as well adequate amount of spares for both Hudson Expert and IK GOIZPER sprayers for the 2015 IRS campaign
- Procure bigger and stronger satchels for SOPs so they can accommodate the OP bottles
- Procure or hire bowsers to assure adequate water supplies for use at camp sites and households in drought prone wards
- Engage local schools, churches and other community-based organizations to secure adequate accommodation at camp sites where spray teams are overcrowded
- AIRS Zimbabwe project to assist Makoni district to properly incinerate pyrethroids waste generated during the 2015 IRS campaign. In 2014, AIRS Zimbabwe assisted the district with transporting pyrethroid waste in the same truck when moving the OP boxes from Manicaland province to the incineration facilities.
- The province to assess the partial and temporal distribution of malaria vector species in Manicaland province
- Cross-border collaboration to be strengthened in Manicaland in order to harmonize operations and systems to cope with malaria burden along the border with Mozambique. AIRS Zimbabwe to actively contribute to the work and meetings occurred between Manicaland province of Zimbabwe and Manica province of Mozambique. The meetings are usually held in Mutare.

The review meeting was important because IRS stakeholders shared experiences, learned from each other, and explored opportunities to improve the implementation of 2015 IRS campaign.

7.2 INVENTORY

Following completion of IRS operations, all of the commodities at the camp site stores were transported to the district stores. The camp site storekeepers updated their stock records and handed them over to the district storekeepers/logistics assistants. At the district stores, stock records were updated to show the remaining stock including the commodities that were retrieved from the camp site stores and the district inventories were updated accordingly. All returned items from the districts were transported to the main warehouse in Mutare. See Annex D for a detailed inventory.

8. ENTOMOLOGY

Entomological surveillance for the 2014 IRS campaign began in October 2014 and will continue until the 2015 IRS campaign begins. Listed below is a summary of the entomological surveillance tasks completed so far. A final entomological report, to be submitted to PMI Zimbabwe in March 2015, will provide more details about the 2014 entomological surveillance findings.

Working with the NMCP, NIHR, and MOHCC provincial and district personnel, AIRS Zimbabwe implemented entomological activities aimed at:

- Assessing malaria vector density and species composition in intervention and control areas;
- Monitoring vector feeding behavior;
- Assessing the quality of insecticide application and monitoring insecticide decay rates;
- Assessing vector resting behavior in non-living structures; and
- Piloting the Prokopac Aspirator for sampling indoor resting mosquitoes.

8.1 SENTINEL SITES FOR ENTOMOLOGICAL SURVEILLANCE

AIRS Zimbabwe carried out entomological surveillance activities in the following sentinel sites, all in Manicaland Province.

Burma Valley (Mutare District). Burma Valley is largely a commercial farming area; main crops are banana, tobacco, and timber. Human settlements fall into two main categories: farm compounds under farm management and scattered resettled farmers in adjacent farms. There are both modern (western) houses and traditional huts. Burma Valley borders Mozambique to the east and extends into Mutasa District in the north, and into Chimanimani District in the south. The area is characterized by dense vegetation, perennial rivers, and dams. Burma Valley was sprayed with pirimiphos-methyl CS on November 2, 2014. Cone bioassay tests and routine monitoring of vector density and behavior were assessed at Brandhill Farm, while the assessment of vector resting behavior in non-living structures and the Prokopac pilot were conducted at Matanuska Farm, about 3 km from Brandhill. Previous work determined that *An. funestus* is the main malaria vector in Burma Valley.

Chakohwa (Chimanimani District): Chakohwa is a rural settlement in the south of Burma Valley that features both semi-commercial horticulture under irrigation and subsistence farming. Most houses are modern structures. Chakohwa was sprayed with pirimiphos methyl on November 3, 2014; cone bioassay tests started 24 hours after the area was sprayed and continued on a monthly basis until the mosquito mortalities fell below 80 percent.

Mukamba (Makoni District): Mukamba under Chief Chiduku was identified as the control site following suggestions from the health officers in Manicaland. The community in Chiduku did not have IRS intervention but received insecticide-treated nets (ITNs) in 2014.

8.2 WALL BIOASSAYS TO DETERMINE SPRAY QUALITY AND

WHO standard cone bioassays were conducted in 10 sprayed rooms at sentinel sites in both Mutare (Brandhill Farm only) and Chimanimani (Chakohwa) to monitor the quality of spraying and insecticide decay rate. Control test cones were placed on clean white paper set inside Bugdorm cages. The team used cages to avoid any influence that could come from the fumigant (airborne) effect of insecticides. The bioassay cones were not stuck on the sides of the cage but instead positioned on a sheet of paper placed on the floor of the cage (Figure 1). The cone bioassay tests were conducted using *An. gambiae* s.l. collected from Masakadza in Gokwe South district. The susceptibility of the field-collected mosquitoes to pirimiphos-methyl CS had been established in August 2014, prior to their use in cone bioassay tests. Field mosquitoes were used because sufficient susceptible colony mosquitoes were not provided from the NIHR insectary in Harare when the cone bioassay exercise began in November.

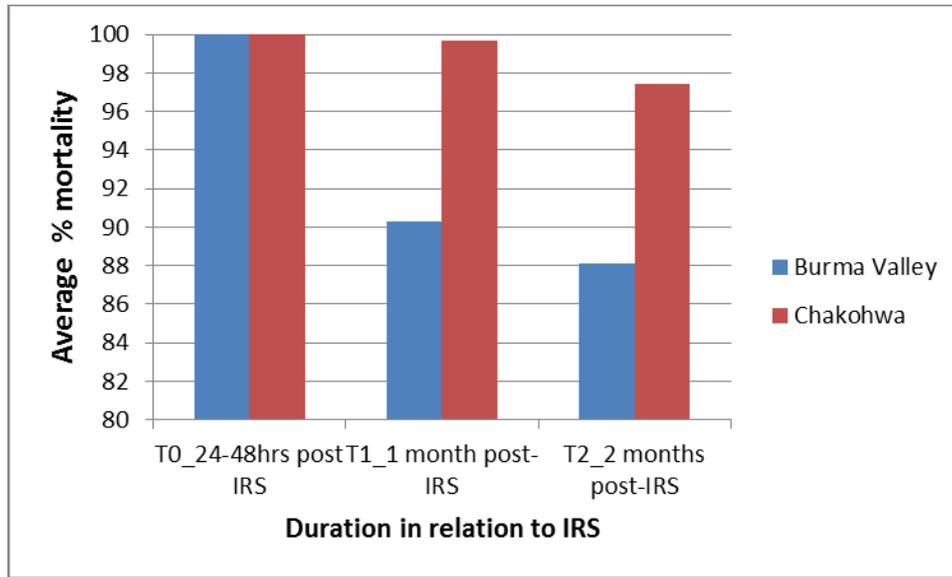
FIGURE 1. CONTROL CONES SET INSIDE BUGDORM CAGE DURING CONE BIOASSAY TESTS



Cone bioassays conducted within 24-48 hours of spraying in November 2014 showed 100 percent mortality of susceptible *An. gambiae* s.l. for all the tests. However, relying on quality-assurance data collected only at T0 might not be sufficient for IRS with pirimiphos-methyl CS; the mosquitoes could possibly die with 100 percent mortality even in poorly sprayed houses due to the fumigant effect of the insecticide. Therefore, tests were repeated in subsequent months applying Abbott's formula in the events when control mortalities exceeded 5 percent.

Bioassay tests conducted in the two months following the spraying (December and January) showed a mortality of the *An. gambiae* s.l. of less than 100 percent at both test sites (Figure 2). While Chakohwa showed minimal decline in mortality (99.5 percent and 97.0 percent in the respective months), the decline observed at Burma Valley was 90.0 percent and 88.0 percent, a much greater decline than expected.

FIGURE 2: WALL BIOASSAY TEST RESULTS, NOVEMBER 2014–JANUARY 2015



The team also looked at effectiveness of spraying on different wall types. At Burma Valley, the painted walls (four rooms) showed the greatest decline in insecticide efficacy, more than walls of mud (one room), brick (two rooms), and cement plaster (three rooms) (Figure 3). At Chakohwa, brick (four rooms) and painted (one room) did not show any consistent decline, though the cement plastered walls (five rooms) did (Figure 4). For example, in one house, the raw data at T1 showed 100 percent mortality at top and middle positions, but 0 percent at the low position of the cone, suggesting poor quality of spraying since the sprayed walls had not been tampered or not affected by human interference. Additionally, carbamates and OP class insecticides undergo alkaline hydrolysis when mixed with alkaline water; it is possible this also contributed to the unexpected insecticide decay at Burma Valley. Assuming the insecticide was mixed with the same water during IRS, it is not the water, but the surfaces that may need investigation. pH tests of the affected walls are recommended.

FIGURE 3: WALL BIOASSAY RESULTS BY WALL TYPE, BURMA VALLEY, NOVEMBER 2014–JANUARY 2015

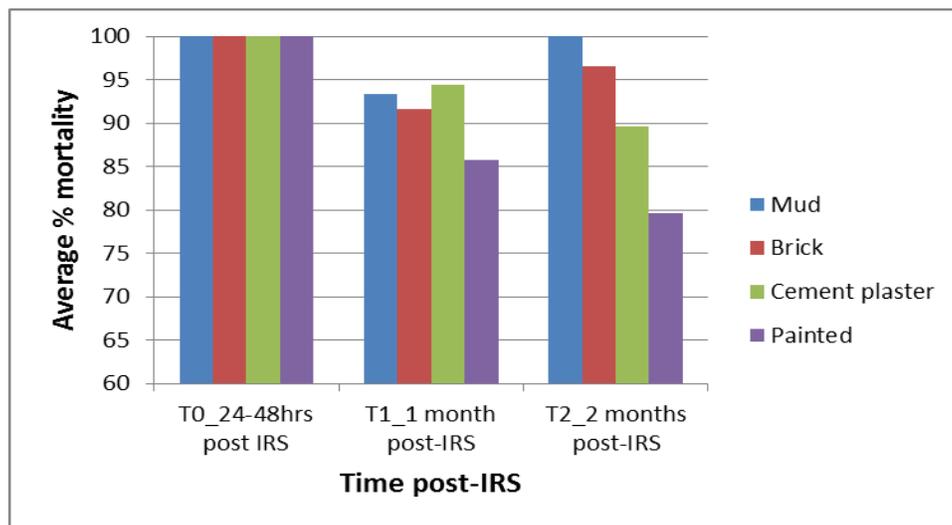
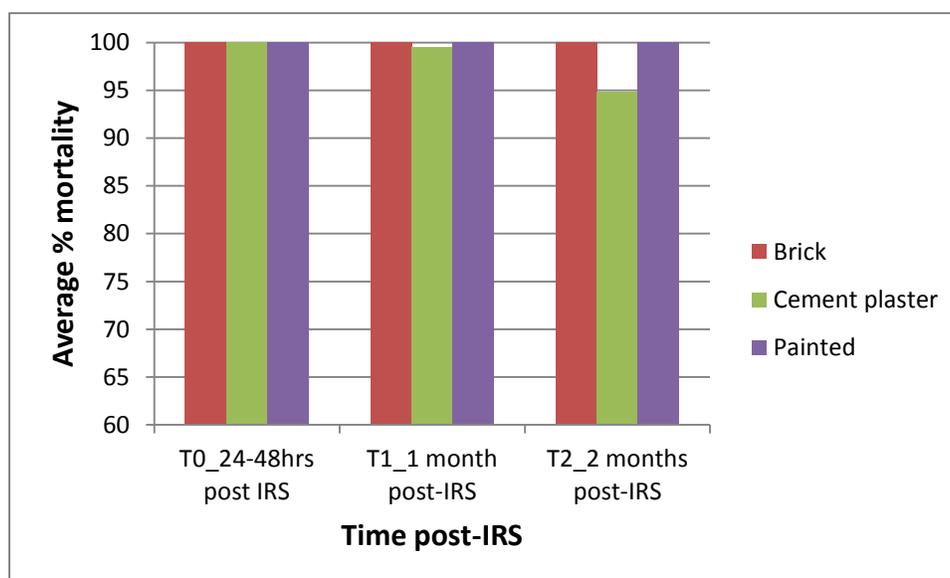


FIGURE 4: WALL BIOASSAY RESULTS BY WALL TYPE, CHAKOHWA, NOVEMBER 2014–JANUARY 2015



8.3 SUPPLEMENTARY BIOASSAY TESTS TO DETERMINE FUMIGANT EFFECT OF PIRIMIPHOS-METHYL CS

Supplementary tests to verify the fumigant effect of pirimiphos-methyl CS were carried out to investigate the results from T1 and T2 the cone bioassay tests observed in Burma Valley. The tests took place at Bezel Bridge, in three freshly-sprayed structures with different wall surface types: brick, cement-plastered, and painted. The supplementary tests used suspension and cone bioassays. Wild-collected *An. gambiae* s.l. from Gokwe were used for these tests.

Three paper cups, each with 10 mosquitoes, were suspended 50 cm from the sprayed wall per room at three levels: 0.5, 1.0, and 1.5m above the floor. Each paper cup was suspended by wire through the wire loop. The mosquitoes were exposed for 30 minutes, at which point they were removed and the number knocked down recorded. The number of mosquitoes knocked down was also recorded one hour after exposure. Cone bioassay tests were run concurrently in the same room with cones set at the 0.5, 1.0, and 1.5m levels on sprayed walls as described in the standard bioassay protocol. Thus, in each room, three paper cups to determine the fumigant effect of insecticide were set parallel to three cones for the contact bioassay tests on walls. After exposure, mosquitoes were transferred to clean cups and provided with 10 percent sucrose solution for the 24-hour observation period after which the final mortality was recorded. Pirimiphos-methyl CS had the same effect (100 percent mortality) on mosquitoes exposed either by suspension or by contact bioassay (Table 15). This showed that the OP insecticide had a fumigant effect in freshly sprayed rooms on all three types of walls. Therefore, the reasons for fast declining efficacy in Burma Valley could be a combination of poor quality of spraying and type of the wall surface. However, the collected data are inconclusive to clearly explain the lower mortality rate at T1 and T2.

Note: The most recent data indicate that the spray operators tended to under-spray the lower part of the wall. For instance, the T4 cone bioassay results for March 2015 show the average mosquito

mortality was: 80% at 1.5m; 79% at 1.0m; and 65% at 0.5m. Going forward, special attention to this issue will be given during the SOP training.

TABLE 15. RESULTS OF SUSPENSION AND CONE BIOASSAY TESTS OF THE FUMIGANT EFFECT OF PIRIMIPHOS-METHYL CS

Wall Type	Distance from Floor (m)	No. of Mosquitoes Exposed	% Mortality after 24 hr Period	
			Contact Bioassay	Suspension Bioassay
Brick	0.5	10	100	100
	1.0	10	100	100
	1.5	10	100	100
Paint	0.5	10	100	100
	1.0	10	100	100
	1.5	10	100	100
Cement plaster	0.5	10	100	100
	1.0	10	100	100
	1.5	10	100	100

8.4 VECTOR SPECIES COMPOSITION, DENSITIES, FEEDING TIME AND LOCATION

Monthly mosquito collections were done to assess the vector species composition, density, and behavior at the three sentinel sites in Manicaland: two sites in OP-sprayed districts and one non-sprayed control site. Baseline entomological surveillance data were collected at all three sentinel sites in October 2014. This report includes the results from monthly routine entomological monitoring that the project conducted through January 2015.

Mosquitoes were collected using pyrethrum spray collection (PSC) and CDC light trap methods. For PSC, 15 rooms were sampled at each site per month to estimate vector densities. Vector density was calculated as the average number of *An. funestus* or *An. gambiae* s.l. collected per room per day from PSC data. Twelve CDC light traps were set for one night at each site per month: six traps indoors and six outdoors, to monitor mosquito behavior indoors and outdoors concurrently. The indoor traps were set in bedrooms (which would have humans as bait), while the outdoor traps were not baited. In communities where people were not willing to sleep alongside the traps, the team set up the CDC traps outside only. In addition a CDC light trap was set alongside a person sleeping under a treated mosquito net (LLIN) as proxy for human landing collections. Collections were monitored from sunset (18:00 hours) to sunrise (06:00 hours).

An. funestus was the only important malaria vector identified during the entomological monitoring collections in Burma Valley. Hardly any mosquitoes were collected from Chakohwa and Mukamba over the four-month period (before and after IRS).

8.4.1 PYRETHRUM SPRAY COLLECTION AND VECTOR SPECIES COMPOSITION

There was a marked drop in vector densities after spraying with pirimiphos-methyl CS at the Burma Valley sentinel site (Table 16). The average density fell by 95 percent, from 1.2 mosquitoes/room before

IRS to 0.06 mosquitoes/room after IRS. No mosquitoes were found resting indoors in December, one month after IRS. Even though mosquitoes are relatively scarce at Burma Valley, these data suggest the possible impact pirimiphos-methyl CS might have had on the vector population at that site. January data indicate the vector is not completely wiped out, since one fed *An. funestus* was found from an unsprayed structure.

Data from Chakohwa and Mukamba are too scanty to make a conclusion. There were hardly any mosquitoes either before or after IRS. Only one blood-fed *An. gambiae* s.l. was collected in December at Chakohwa (Table 17), and not a single mosquito was caught at Mukamba, the control site.

TABLE 16: INDOOR RESTING MOSQUITOES (*AN. FUNESTUS*), PSC, BURMA VALLEY

Species	Month of collection	Abdominal condition of female mosquitoes collected				Total	Number of rooms	Av. No. of mosquitoes /room
		Unfed	Fed	Half Gravid	Gravid			
<i>An. funestus</i>	October	1	14	2	1	18	15	1.2
	November	1	0	0	0	1	15	0.06
	December	0	0	0	0	0	15	0
	January	0	1	0	0	1	15	0.06
	Total	2	15	2	1	20	60	0.33

TABLE 17: INDOOR RESTING MOSQUITOES (*AN. GAMBIAE* S.L.), PSC, CHAKOHWA

Species	Month of collection	Abdominal condition of female mosquitoes collected				Total	Number of rooms	Av. No. of mosquitoes /room
		Unfed	Fed	Half Gravid	Gravid			
<i>An. gambiae</i> s.l	October	0	0	0	0	0	15	0
	November	0	0	0	0	0	15	0
	December	0	1	0	0	1	15	0.07
	January	0	0	0	0	0	15	0
	Total	0	1	0	0	1	60	0.02

8.4.2 CDC LIGHT TRAP COLLECTIONS

Few *An. funestus* were collected from CDC light traps at Burma Valley. The average number of mosquitoes collected indoors was highest before IRS in October (1.7 mosquitoes/trap); the number declined progressively to zero in January, presumably due to IRS (Table 18). This trend suggests IRS had the intended effect on vector density and as well as on vectors' tendency to enter rooms. In contrast, the collections from the traps set outdoors suggest an increase from pre-IRS levels in October (0.33 mosquitoes/trap) up to a maximum (2.17 mosquitoes/trap) one month post-IRS, in December. This may indicate the fumigant effect of pirimiphos-methyl CS possibly had an excito-repellent effect on *An. funestus* (Table 19). It was observed that the majority of *An. funestus* collected were unfed regardless of collection point, indoors or outdoors. This is logical since fed or gravid mosquitoes are less active and prefer to rest.

CDC light traps were not productive at Chakohwa and Mukamba – no mosquitoes were caught in the four test months. No differences were noted between the pre- and post-IRS periods, or between indoor and outdoor locations. These data suggest malaria vectors are scarce at the two sentinel sites. It is therefore not possible to determine the impact of IRS on the vector at Chakohwa.

TABLE 18: MOSQUITOES CAUGHT INDOORS, CDC LIGHT TRAPS, BURMA VALLEY

Species	Month of collection	Abdominal condition of female mosquitoes collected				Total	Number of traps	Av. No. of mosquitoes /trap
		Unfed	Fed	Half Gravid	Gravid			
<i>An. funestus</i>	October	9	1	0	0	10	6	1.7
	November	8	0	0	0	8	6	1.3
	December	1	1	2	0	4	6	0.67
	January	0	0	0	0	0	6	0
	Total	18	2	2	0	22	24	0.92

TABLE 19: MOSQUITOES CAUGHT OUTDOORS, CDC LIGHT TRAPS, BURMA VALLEY

Species	Month of collection	Abdominal condition of female mosquitoes collected				Total	Number of traps	Av. No. of mosquitoes /trap
		Unfed	Fed	Half Gravid	Gravid			
<i>An. funestus</i>	October	1	1	0	0	2	6	0.33
	November	6	0	0	0	6	6	1.00
	December	13	0	0	0	13	6	2.17
	January	3	0	0	0	3	6	0.5
	Total	23	1	0	0	24	24	1.0

8.4.3 CDC LIGHT TRAP COLLECTIONS SET WITH HUMAN BAIT

Efforts to collect mosquitoes in CDC light traps set alongside human bait were not very productive either before or after IRS. Neither *An. funestus* nor *An. gambiae* s.l. was caught at Burma Valley and Chakohwa. In January, two unfed *An. gambiae* s.l. and one unfed *An. gambiae* s.l. were caught indoors and outdoors, respectively, on the same night at Mukamba, the control site. *Anopheles coustani* (two specimens) and *An. pretoriensis* (three specimens) were collected outdoors in November and December, respectively, during the night at Burma Valley. These two anopheline species are generally not considered to be malaria vectors in the areas of their distribution. Currently there are no comparable areas that can be used as control to check on Mukamba results. Any area that has any significant number of mosquitoes is sprayed.

8.4.4 MOSQUITOES COLLECTED FROM LIVING AND NON-LIVING STRUCTURES, PROKOPAC ASPIRATOR AND PSC METHODS

Preliminary investigations show that *An. funestus* rests in non-living structures such as toilets (latrines), bathrooms, and animal shelters. The Prokopac Aspirator is a better method than PSC for collecting indoor resting mosquitoes.

In October, the Prokopac Aspirator and PSC respectively yielded close results of 0.63 and 0.59 mosquitoes per structure, in both living and non-living structures. In the two post-spray collections, however, the Prokopac Aspirator performed better than PSC in collecting mosquitoes from both living and non-living structures. In November, the Prokopac Aspirator collected on average almost three times more mosquitoes per structure than did the PSC method. In December, it collected 1.77 times as many. In non-living structures only, the Prokopac Aspirator performed twice as well as PSC. In November, it collected on average three times more mosquitoes than did PSC. In December, it

performed marginally better than PSC. On average, the Prokopac Aspirator collected 2.85 times more mosquitoes than PSC.

In addition to simply collecting more mosquitoes, the Prokopac Aspirator was shown to have the following advantages over the PSC method:

- One person can collect mosquitoes as opposed to the two ideally required for PSC.
- The aspirator's telescoping handle can reach corners that PSC might miss (from .74m contracted to 1.55m extended).
- The aspirator collects live mosquitoes that can be useful for other entomological investigations.

Full details of the results will be presented in Entomological Report.

8.5 INSECTICIDE SUSCEPTIBILITY TESTS

Insecticide susceptibility tests were not done at the three sentinel sites in Manicaland owing to scanty vector densities encountered at all sites. More aggressive sampling will be started in March-April 2015 (subject to availability of mosquitoes) so that vector susceptibility can be ascertained. Outside Manicaland, susceptibility tests were done at six sentinel sites in six different provinces. As Table 20 shows, vector resistance to three insecticides was detected, namely, to lambda-cyhalothrin at Manjolo, Kamhororo, and Chakari; to bendiocarb at Makakavhule; and to DDT at Chilonga albeit based on a small sample. Possible resistance was noted for two insecticides: bendiocarb at Kamhororo, and DDT at Kamhororo, and Makakavhule. Vectors were susceptible to pirimiphos-methyl CS at all the three sites where it was tested. Pirimiphos-methyl CS remains the best option to consider where resistance is detected.

TABLE 20. MORTALITY RATES OF AN. GAMBIAE S.L. FIELD POPULATION AT SENTINEL SITES

Province	Site	Month	Insecticide tested	No. of mosquitoes tested	% Mortality after 24 hour observation period	Interpretation
Matebeleland North	Manjolo	Jan-Feb, 2015	DDT (4%)	100	98	S
			Lambda-cyhalothrin (0.05%)	100	86	R
Midlands	Kamhororo	Dec 2014	Bendiocarb (0.1%)	100	97	PR
			DDT (4%)	200	92	PR
			Lambda-cyhalothrin (0.05%)	200	79	R
			Pirimiphos-methyl CS (1.0%)	100	100	S
Mashonaland West	Chakari/Sanyati	Jan 2015	DDT (4%)	100	99	S
			Lambda-cyhalothrin (0.05%)	100	83	R
Mashonaland Central	Old Mazowe Bridge	Dec 2014, Jan 2015	Bendiocarb (0.1%)	61	100	S
			DDT (4%)	60	98	S
			Lambda-cyhalothrin (0.05%)	60	100	S
			Pirimiphos-methyl CS(1.0%)	64	100	S

Province	Site	Month	Insecticide tested	No. of mosquitoes tested	% Mortality after 24 hour observation period	Interpretation
Matebeleland South	Makakavhule	Aug 2014,	Bendiocarb (0.1%)	100	84	R
			DDT (4%)	100	90	PR
		Feb 2015	Lambdacyhalothrin (0.05%)	100	100	S
			Pirimiphos-methyl CS(1.0%)	100	100	S
Masvingo	Chilonga	Dec 2014,	DDT (4%)	13	84.6	R
			Feb 2015	Lambdacyhalothrin (0.05%)	48	100

S = 'susceptible'; PR = 'Possible resistance' and R = 'resistant' using the revised WHO criteria.

9. MONITORING AND EVALUATION

9.1 2014 HYBRID M&E SYSTEM: STANDARD NMCP M&E METHODS WITH AIRS COMPONENTS

Before the 2014 IRS campaign, AIRS and the NMCP worked together to identify ways to combine the successful components of their individual M&E systems for improved M&E methods and data quality. As a start, AIRS and the NMCP merged their standard Daily Spray Operator Form (SO1) template for a comprehensive data collection tool that captures household spray information needed for both NMCP and PMI reporting (e.g., rooms vs. structures found/sprayed, pregnant women and children under 5 years protected, etc.). In addition, AIRS and the NMCP implemented the Error Eliminator, an AIRS M&E supervisory tool, in all 47 IRS districts, including the four PMI-supported districts. AIRS also purchased a laptop for each of the four PMI IRS data managers to pilot data entry of the weekly summary form into a Microsoft Excel file.

Data managers were given air time and mobile modems to submit the aggregated data to the NMCP and AIRS on a weekly basis. The NMCP would like to have data managers submit the summary data on a daily basis in 2015. However, individual structure (or room) data will not be entered or reported as done in other AIRS countries. Electronic spray data will be helpful for the NMCP because the Frontline SMS system collects only a select few IRS indicators, and AIRS will have access to spray data daily (versus weekly) under this new system. The daily summary forms submitted in Excel will include all IRS data for a complete analysis.

After an onsite short-term technical assistance review, the AIRS home office M&E Specialist found that the combined AIRS/NMCP M&E system did meet the IRS operational feedback and reporting needs for the 2014 campaign. IRS campaign data were collected on a daily basis by each SOP and verified by supervisors and team leaders with daily summary tools. The data manager gathered all data collection and verification tools, then corrected and entered the data into a daily summary form and completed a paper-based spray performance tracker. At the end of each week, the data manager compiled the daily summary sheets for the last seven days, and entered the totals for the week into an IRS weekly summary sheet. As implemented in 2013, the totals of the weekly IRS summary sheet were submitted by the data manager via the Frontline SMS system, and auto-integrated into DHIS2 and accessible by NMCP and MOHCC staff (i.e., DEHOs and PEHOs). Hard copies of spray data were sent to DEHOs, PEHOs, and the NMCP after the data were submitted via Frontline, but these staff members had access to DHIS2 and could view IRS data at any time.

The NMCP created a job aid messaging system for data managers in all 47 districts using the messaging platform, *WhatsApp*. The NMCP sent IRS messages to data managers through the application, who then relayed the information to spray teams during morning mobilization at campsites. Given that AIRS Zimbabwe is considering a similar initiative for the 2015 campaign, the possibility of building on this system, rather than reinventing it, should be considered.

AIRS Zimbabwe, in collaboration with the NMCP, created a data flow document that helped to eliminate parallel M&E systems and ensured district and provincial officials reviewed the data before approving and sending to AIRS. (See *AIRS Zimbabwe Data Flow Plan* in Annex E).

9.2 RESULTS OF 2014 IRS CAMPAIGN

All AIRS Zimbabwe performance indicators are presented in an M&E Plan matrix in Annex F. AIRS Zimbabwe sprayed 147,949 structures out of 163,922 structures found for 90.3 percent spray coverage, protecting 334,637 people in the four PMI-supported districts. A breakdown of the 2014 IRS campaign results by district are noted in Table 21. Tables 22 and 23 provide information on insecticide usage collected during the spraying and ITNs.

TABLE 21: SUMMARY OF SPRAY COVERAGE DURING THE 2014 IRS CAMPAIGN

District	Structures Found	Structures Sprayed	% of Structures Sprayed	Population Protected	Males Protected	Females Protected	Population Found	Population Not Protected	% of Population Protected	Pregnant Women Protected	Children <5 Years Protected
Chimanimani	26,922	24,405	90.70%	62,476	28,667	33,809	64,265	1,789	97.20%	986	10,241
Mutare	48,887	45,810	93.70%	108,066	51,802	56,373	110,122	2,056	98.10%	1,450	19,188
Mutasa	40,245	35,133	87.30%	80,896	37,729	43,167	87,836	6,940	92.10%	1,072	11,951
Nyanga	47,868	42,601	89.00%	83,199	39,557	43,642	89,352	6,153	93.10%	1,034	13,173
4 Districts	163,922	147,949	90.30%	334,637	157,755	176,991	351,575	16,938	95.20%	4,542	54,553

TABLE 22: SUMMARY OF INSECTICIDE USAGE DURING THE 2014 IRS CAMPAIGN

District	Structures Sprayed	Total Bottles Received	Total Used	Total Lost/ Damaged	Total Left	# of Days Worked	Av # of SOPs	Avg # Str Sprayed/ Bottle	Avg # of Str Sprayed/SOP /Day	Average # of Bottles/SOP /Day
Chimanimani	24,405	14,000	12,293	0	1,707	38	37	2.0	17.4	8.7
Mutare	45,810	24,123	22,454	0	1,669	37	72	2.0	17.2	8.4
Mutasa	35,133	21,420	15,473	0	5,947	38	61	2.3	15.2	6.7
Nyanga	42,601	20,886	16,820	1*	4,065	38	63	2.5	17.8	7.0
Total	147,949	80,429	67,040	1	13,388	151	58	2.2	16.9	7.7

*The case was reported to the police as it was a suspected theft by SOP. The bottle was not recovered. The SOP was dismissed from the campaign

TABLE 23: SUMMARY OF ITN FINDINGS DURING THE 2014 IRS CAMPAIGN

Insecticide Treated Nets			
District	Total ITNs Found	Pregnant Women Sleeping Under ITNs	Children <5 Years Sleeping Under ITNs
Chimanimani	19,637	520	6,178
Mutare	34,311	645	10,195
Mutasa	27,545	551	7,636
Nyanga	29,736	658	8,915
Total	111,229	2,374	32,924

*SOPs were instructed to collect data on pregnant women and children under five sleeping under ITNs for sprayed and unsprayed structures. However, they only recorded the data for sprayed structures. During the 2015 SOP training, AIRS Zimbabwe will emphasize that SOPs collect these data for both sprayed and found structures.

POSSIBLE REASONS STRUCTURES WERE NOT SPRAYED

Although in 2014 AIRS Zimbabwe sprayed 90.3 percent of eligible structures found, exceeding the project goal of 85 percent spray coverage, NMCP spray data reported that 15,973 structures were not sprayed. According to the NMCP, and per discussions with the MOHCC and AIRS field observations, a structure might not have been sprayed because of the following reasons:

- Households not warned in time to prepare their houses for spraying.
- There was an infant/baby sleeping in the sprayable structure/room.
- No one was home or present at the time of spray, which could be the result of ineffective IRS messaging.
- Free maize seed distribution coincided with spraying in some villages and so residents were not home to comply with spraying preparations.
- Household owners noted that they already use an ITN and therefore refused IRS.
- Apparently due to a drought in some areas, some residents refused IRS when spray operators asked for water from their well or tap to mix the insecticide.
- Some people claimed to have asthma or an allergy to IRS insecticides and therefore refused IRS.
- Religious beliefs preclude some households from allowing chemicals (such as IRS insecticide) in their houses.
- From experience participating in previous IRS campaigns, some households reported high-mosquito density *after* spraying, and that the chemical does not kill all insects (i.e. roaches, lice).

CHALLENGES TO HIGH-QUALITY DATA REPORTING

- Data are aggregated multiple times (i.e., Daily SOP form to Supervisory Summary form to Daily IRS Summary form to Weekly IRS Summary form) before being reported. This risks transcription error at each level of aggregation, jeopardizing data quality.
- Since the newly purchased laptops were not at the campsites at the start of the IRS campaign (as they needed to be reviewed and entered into asset registers at the NMCP, provincial and district offices before being deployed to the camp sites), data managers could not electronically submit

summary spray data to the Operations Manager on a weekly basis (after NMCP approval). Consequently, the Operations Manager had to call each of the data managers and collect the weekly progress via phone, again risking transcription error and jeopardizing data quality.

- Eligible structures are not assigned a unique IRS structure number and data are not entered into a pre-programmed validated database by structure, making it difficult to assess the validity of the current M&E system and to verify spray coverage.
- Data were available to AIRS on a weekly basis, not daily as in other AIRS countries, making it difficult to closely monitor spray progress and address operational concerns in “real-time.” IRS data are also submitted to the NMCP weekly, slowing down its ability to respond to campaign challenges.

10. CHALLENGES AND RECOMMENDATIONS

10.1 CHALLENGES

- Too many SOPs per team (five per supervisor) compared to 2013 (three per supervisor) are reducing the level of supervisory oversight and data verification.
- The daily SOP target is too high (36 rooms/18 structures) compared to a 32-room target for the 2013 campaign. SOPs this year had a difficult time even meeting the 2013 target (32 rooms/day) because of certain operational changes (new pumps, insecticide switch to OPs, etc.). This may have contributed to low spray quality as detected from quality of spray cone bioassay tests.
- A daily load of OP bottles is too heavy for SOPs to carry and the six-bottle carrying satchel is too small. Each bottle weighs 1kg (in addition to the PPE, tank, and water that the SOP carries), and SOPs need to carry eight bottles when they start each day.
- Rains slowed spray progress because SOPs couldn't spray villages fast enough, and they had to walk 2-3 km to reach spray areas that were inaccessible to lorries because of slippery roads.
- Spray teams complained of having to wash their own PPE and cook their own dinner after trying to spray 36 rooms/18 structures per day in remote areas. Some teams mentioned that they leave the campsite by 6 am and do not return until 4-5 pm, due to target villages being extremely remote.
- Periodic malfunctioning of Goizper spray pumps negatively impacted on the daily spray performance, especially during the first week of the campaign.
- Dropouts by some spray operators for unspecified reasons contributed to reduced overall spray coverage.
- Storage space for IRS commodities and camping equipment and washing facilities for IRS campaign teams remain a major challenge.
- There is need to SBCC activities to enhance community acceptance and program coverage. To address this, the team will perform a beneficiary satisfaction assessment to investigate reasons for refusals and locked rooms. The assessment will also gather information on IRS and malaria knowledge among targeted households. The results will inform future planning for mobilization and SBCC.
- Susceptibility tests could not be done as planned at most sentinel sites particularly in Manicaland due to scarcity of mosquitoes. To address this in 2015, the team will more closely follow the rainy season pattern to identify the mosquito density peaks and establish a flexible schedule for the data collection trips.

10.2 RECOMMENDATIONS

- Hire washers and cooks so that SOPs can rest once back at the campsite and feel rested the next

day to help ensure they meet the daily spray targets.

- Start the spray campaign in October, to avoid the rains and the difficulties traversing wet roads.
- Add a buffer of trained SOPs, who can quickly replace any dropouts.
- Have team leaders, supervisors and other IRS staff carry bottles for SOPs and/or store them in the lorry to reduce the SOPs' burden of carrying the heavy satchel bag in addition to other equipment.
- Perform a beneficiary satisfaction survey to investigate IRS and malaria knowledge and reasons why targeted households accept or refuse IRS. This will allow the IEC team to better program IRS messages and spray operations for the 2015 campaign.
- Conduct a post-spray data quality audit after the 2015 campaign to investigate the quality of the data collected and reported under the current M&E system.
- Intensify training on the use and maintenance of the Goizper sprayer for SOPs and IRS supervisors to reduce the number of breakdowns.
- Enhance SOP training and strengthen performance supervision to ensure the spraying is done of a high quality and in full compliance with standard operating procedures.
- Conduct IRS campsite weekly review meetings by AIRS staff, DEHOs, and the PEHO to assess progress, address challenges, and map future activities.
- Increase the number of women engaged in the 2015 campaign in all districts by creating enabling environment at the campsites and advocating to PEHO and DEHOs to recruit at least 5% women SOPs.
- Increase the number of the IRS teams in Chimanimani district from two to three based on the number of structures to be sprayed. In 2014, Mutare district provided IRS assistance following Chimanimani's failure to finish on time.
- Expand entomological monitoring to cover all districts in Manicaland province.
- Hire four data clerks to enter data daily in AIRS laptops to reduce transcription error, and send the data to the NMCP and AIRS on a daily basis to monitor spray progress in "real-time." They will work closely with the four data managers who will be reviewing and validating all Spray Operator and Supervisor Summary forms, and aggregating spray data on the daily and weekly IRS summary forms. If this is unfeasible, institute daily SMS of operational data to the Operations Manager and M&E consultant to closely monitor progress and immediately address issues.
- Hire an M&E consultant to support and lead all M&E aspects of AIRS Zimbabwe's responsibility and remove the M&E workload of the Operations Manager. This should include leading all M&E related activities. Among them are training seasonal personnel on data collection and management, daily field supervision of seasonal spray staff, validating spray data collected, assembling weekly reports to PMI, and instituting a Data Collection Verification Tool to interview households post-spray.
- Invite IRS managers to the data clerk and database manager training for 2015. This will give IRS managers a chance to meet the data clerks and database managers before spraying begins, and will be an opportunity to participate in the data collection and entry verification exercises required of field staff.

ANNEX A: 2014 LOCAL AND INTERNATIONAL PROCUREMENT

TABLE A-I. LOCAL PROCUREMENT

Description	Quantity / Number
Mutare Warehouse PPEs	
Shovel	8
Galvanized buckets	8
Fire extinguishers	2
Hygrometers (Thermometers)	4
Gloves 45 cm	10
Soft Brooms	8
First aid kits	2
Small dust bins	8
Clear bags	55
PPE and Commodities	
Mattresses	348
Tents (8-man tTents)	16
Tents (4-man tents)	16
Shovels	22
Gloves	28
Hand towels	334
Satchels - Shoulder bag with 1 compartment	297
Cotton socks (Sizes 6 – 12)	731
Mutton cloth - 0.5 Kg Rolls	178
Progressive rinsing drums	35
First Aid Kit	16
10 l washing buckets (Plastic buckets for bathing)	378
20 l washing buckets (Plastic buckets for washing)	53
20 l plastic containers	40
50 l washing buckets (Plastic buckets for washing)	30
Black PVC Sheet (2m x 50m per roll)	20
Plastic jugs (2 litre)	126
Soap – liquid soap (1L)	355
Soap – washing bars (1kg)	355
Standard plastic torches	334
Standard batteries for plastic torches	1200
Plastic buckets (20l heavy duty plastic buckets with lids)	16
1m x 1m Foam rubber mattresses	8

Description	Quantity / Number
Large scissors	16
Black PVC sheet (2 x 50m per roll)	4
Drill bits (5mm)	8
Clear bags	200
HP 255 G3 laptops	4
Jerry cans	2
Siphoning pipes	2
Loud hailers	16
Mobile phone	4
Internet mobile modems	4
Mobile phone line	8
Padlock keys	20
Hygrometers (Thermometers)	8

TABLE A-2. INTERNATIONAL PROCUREMENT

Description	Quantity / Number
Personal Protective Equipment (PPEs) and Commodities	
IRS Spray pumps	245
Helmets brackets	317
Faceshields	317
Face mask	17,280

ANNEX B: INSPECTION REPORTS AND SUPERVISION RESULTS

TABLE B-I. HOME OWNER PREPARATION AND SOP PERFORMANCE

n=108

#	Observations	Compliant	No compliant
1	Community given advance notice of the coming of the IRS teams	104(96%)	4(4%)
2	Household goods moved outside before spraying	107(99%)	1(1%)
3	Household goods covered with PVC sheet before spraying	104(96%)	4(4%)
4	All things hanging on the walls removed before spraying	108(100%)	0(0%)
5	Homeowners accepted having their houses sprayed	104(96%)	4(4%)
6	SOPs were in full PPE during spraying operations	93(86%)	15(4%)
7	SOPs did triple rinsing of OP bottles while in the field	108(100%)	0(0%)
8	SOPs perform all proper spraying techniques	108(100%)	0(0%)
9	History of incidents of insecticide poisoning among spray operators	108(100%)	0(0%)
10	SOPs sprayed the right surfaces (walls, roofs, and behind unmovable furniture)	108(100%)	0(0%)
11	SOPs informed the homeowners on action to take for adverse reactions	105(97%)	3(3%)
12	SOPs gave homeowner information on disposal of dead insects after spraying	108(100%)	0(0%)
13	SOPs did not spray floors, metal roofs, the outside of doors, glass, inside of cupboards, wallpaper, food granaries, curtains, latrines, animal pens	103(95%)	5(5%)
14	SOPs did not smoke, drink, or eat during the day	105(97%)	3(3%)
15	Team leaders used the Error Eliminator to check the accuracy of Spray Operators' data?	87(98%)	1(2%)

Comments

The 2014 IRS campaign found 98 percent of observations (1,560 of 1,598) found compliance with the BMP manual. Generally, there was a high level of environmental compliance in IRS homeowner and spray operator performance.

Following are reasons for non-compliance noted during the 2014 IRS season:

- Failure to give the community advance notice of the IRS team's approach. This was observed in Manica Bridge, Mutasa District.
- Failure to move household goods outside before spraying. This was observed in Biriwiri, Chimanimani District.
- Failure to cover a household's goods with PVC sheet before spraying. This was observed in Biriwiri, Chimanimani district.
- Homeowners did not accept having their houses sprayed. This was observed in Chisuko ward, Mutasa District. The reasons given for non-acceptance were perceived itchiness and smell of the insecticide.

- SOPs did not wear/use full PPE during spray operations. This was observed in Nyagundi, Mutare District, where spray operators spray without face shields and neck protection.
- SOPs did not inform homeowners of how to counter adverse reactions. This was observed in Chakowa ward, Chimanimani District.
- SOPs spraying floors, metal roofs, the outside of doors, glass, inside of cupboards, wallpaper, food granaries, curtains, latrines, animal pens. This was observed in Nyamaropa ward, Nyanga District.
- SOPs were seen smoking, drinking, or eating during IRS. This was observed in Chisuko, Mutasa district.

TABLE B-2. SUMMARY OF END OF DAY CLEANUP

N=28

Observations /Questions	Compliant	Non Compliant
Does the SOPs continue to wear PPE on the way back to the operations site?	28	0
Upon return to the storehouse, are full and empty sachets returned to stores?	28	0
Are the empty sachets counted and stored in labeled, sealed containers?	28	0
Do the SOPs complete their daily report forms?	28	0
Are forms checked by spray supervisors?	28	0
Have there been any accidents? (pesticide exposure, vehicle accidents, other injuries or property damage)?	28	0
Have any SOPs complained of irritation (throat, skin, etc.)?	28	0
Are the team leaders supervising the cleaning and wash-up?	28	0
Are there wash facilities with soap and water available for operators?	28	0
Do workers at a minimum wash their face and hands with soap and water?	28	0
Is there a sloped concrete catchment area or tarpaulin spread out on the ground to catch all effluent?	28	0
Are all people (spray operators, washers, maintenance techs) in the wash/soak pit area wearing full PPE?	28	0
Is anyone eating or drinking prior to removing PPE and washing?	26(93%)	2(7%)
Is all pesticide remaining in pumps emptied into the #1 drum?	28	0
Do the #2, 4, and 6 drums have sufficient water for today's cleanup?	28	0
Are spray pumps triple-rinsed using the progressive rinse method?	28	0
Are the outsides of the pumps rinsed off in the soak pit?	28	0
Are the helmets, visors, boots, and gloves rinsed off in the soak pit?	28	0
Are the overalls washed and then hung for drying?	28	0
Is the soak pit used to dispose of all contaminated water?	28	0
Does all contaminated water drain properly into the soak pit?	28	0
Is the soak pit absorbing all the effluent waste without creating a puddle and/or run off?	27(96%)	1(4%)
Is there adequate gravel to act as a filter?	28	
Are spray pumps hung upside down to dry?	28	
Are washed spray pumps stored in an orderly way for easy preparation the next day?	27(96%)	1(4%)
Are the covers placed on the 7 triple-rinse drums after all pumps are cleaned?	28	0
Total observations	724	4

Comments

Generally, the level of compliance on end of day spray operator performance was very high; 720/724 (99 percent) of observations were made over 28 spraying days were compliant with the BMP manual.

- One issue of non-compliance was improper storage of pumps at Manica Bridge in Mutasa district. Some pumps were stored in a corner of the spray operators' sleeping room. This was remediated

by renting additional storage space for pumps.

- Another non-compliance issue was that two spray operators were seen drinking water in the field while donning PPE. The incidents happened in Berzeley Bridge and Chakohwa. Advice to the spray operators and supervisors was given on site.
- Poor drainage of Rusitu soak pit in Chimanimani district was also noted and appropriate repairs were made.

TABLE B-3. SUMMARY OF STOREKEEPER PERFORMANCE

n=26

Observation/Questions	Compliant	Non compliant
Do people entering the pesticide storage area wear masks?	20(77%)	6(23%)
Do people wear masks, gloves, boots and overalls when handling pesticides?	22(85%)	4(15%)
Do warehouse teams eat inside the warehouse?	24(92%)	2(8%)
Are soap and water basins available for washing hands?	24(92%)	2(8%)
Is the current pesticide Material Safety Data Sheet (MSDS) posted?	23(88%)	3(12%)
Are storekeepers familiar with the symptoms of pesticide poisoning?	26(100%)	0
Are the following items in the emergency first aid kit?	23(88%)	3(12%)
Do storekeepers know where the nearest health facility is located?	26(100%)	0
Are there records of pregnancy testing available?	22(85%)	4(15%)
Is there a thermometer for monitoring daily temperature in the storage facility?	26(100%)	0
Is there a spill kit and a fire extinguisher in the warehouse?	25(95%)	1(5%)
Is there any evidence of pesticide leakage?	24(92%)	2(8%)
Is the pesticide stock stored no more than 2 m high and off the ground?	20(77%)	6(23%)
Are the insecticide and contaminated waste stored away from other materials in the store?	24(92%)	2(8%)
Is the number of sachets or bottles counted and recorded before distribution to SOP?	26(100%)	0
Is there a system of recording stock cards?	26(100%)	0
Are the stock cards up to date?	26(100%)	0
Are the stock of waste (especially, used packaging and dust masks) recorded?	23(88%)	3(12%)
Using the stock cards, can the storekeeper indicate the quantity of stock that has been used to date?	26(100%)	0
Are stocks stored on shelves and labeled?	24(92%)	2(8%)
Are pesticides properly labeled?	24(92%)	2(8%)
Are the insecticides distributed on a “first expired, first out” (FEFO) system so that the insecticide that expires first is distributed first?	26(100%)	0
Are there any insecticides past their expiration date?	26(100%)	0
Are barrels or containers for empty sachets and used masks available and clearly labeled?	26(100%)	0
Are the used sachets counted and stored neatly in the labeled containers?	24(92%)	2(8%)
Does the number of empty sachets equal what the storekeeper indicates as the quantity of stock issued to date?	24(92%)	2(8%)
Is there more than one spray season of accumulated solid waste?	26(100%)	0
Is there a strategy in place for disposing of solid waste?	26(100%)	0
Have there been any complications with identifying a disposal system?	19(73%)	7(27%)
Is the Spray Performance Tracking Sheet displayed and correctly filled out?	20(70%)	3(30%)
Is the store ledger book fully updated?	20(70%)	3(30%)

Observation/Questions	Compliant	Non compliant
Are the stock cards for all the stock items fully updated?	22(95%)	1(5%)
Does the balance in the store ledger book match the balance on the stock card for all stock items?	22(95%)	1(5%)
Does the balance on the stock card equal the result of a physical stock count for each item?	22(95%)	1(5%)
Does the stock balance on the Spray Performance Tracking Sheet equal to the physical stock count?	22(95%)	1(5%)
Is the Insecticide Tracking Sheet completed daily?	20(70%)	3(30%)
Does the stock balance on the Insecticide Tracking Sheet match the balances in the store ledger and on the stock card?	21(91%)	2(9%)
Does the sum of the stock balance on the stock card + the stock issued out for the day + the stock balance of empty sachets/bottles, equal to the opening balance in the ledger?	23(100%)	0
Does the sum of the stock balance on the stock card + the stock issued out for the day + the stock balance of used masks, equal to the opening balance in the ledger?	23(100%)	0

Comments

Generally, there was level of environmental compliance in IRS storekeeping during the 2014 IRS; 900/981 (91 percent) of observations made at storerooms were compliant with BMP manual.

The major reasons for non- compliance noted during 2014 IRS season were;

- Storing of insecticide higher than 2 meters above the ground. The actions were observed at Chisuko and Biriwiri. Appropriate advice was given to storekeepers.
- It was noted at Rusitu, Biriwiri, and Bezyle bridge storeroom that the measurement of temperature for storerooms was not being properly done as some thermometers were placed outside. Remedial action was however instituted as the spraying progressed.
- Senior health officials were seen entering the storage area without adequate PPE though the behavior was later rectified. The above actions were observed at Mupotedzi, Bezyle Bridge, Rusitu, and Biriwiri.
- Generally, chemical poisoning management antidotes were not available at campsites since MOHCC policy was to have these administered at the district hospital level. The issue was observed at the following campsites: Nyamaropa, Nyatate, Chitakatira, Chisuko, Gatsi, and Biriwiri.
- Failure to update IRS commodities and insecticides registers was noted in Mutasa and Nyanga districts campsites.

TABLE B-4: OBSERVATIONS AND ROOT CAUSE OF MAIN EC ISSUES

Observations	Non compliance (%)	Root cause	Action taken
Some communities were not given advance notice of the coming of the IRS teams	4	Lack of adequate coverage by field staff doing community mobilization.	Procured loud speakers to assist in community mobilisation. Support and supervision was also intensified during IRS.
Refusals among some homeowners for IRS in their homes	4	Fear of itchininess and smell from the insecticide.	Encouraged the community to reenter their houses after 2 hours post spraying to open windows to allow aeration of the rooms and use the sprayed structure after 2½ hours post spraying. The community was advised to clean the door handles, and floors with soapy water after spraying. Proper disposal of dead insecticides was also advised. Need to emphasize that the benefits outweigh these problems.
Some SOPs were not caring for and, thus, wearing full PPE during spraying operations	15	Insufficient care of IRS equipment	The spray operators were provided with new sets of neck protection. In the future campaigns, SOPs will be told that 2 nd occurrence will require replacement at operator expense or dismissal.
Some SOPs did not inform the homeowners on action to take for adverse reactions	3	Lack of adequate support and supervision on EC issues by field supervisors. Lack of adequate knowledge by spray operators.	Intensified supervision of spray operators. Spray operators were retrained on the possible adverse effects to the community.
SOPs sprayed floors, metal roofs, the outside of doors, glass, inside of cupboards, wallpaper, food granaries, curtains, latrines, animal pens	5	The spraying of walls was done in hurry without diligently removing things outside. This was mainly prevalent in those households, where the owners have initially refused IRS and accepted it after sensitization by the district people.	Increased health education on importance of removal of all goods on the walls before spraying. Increased support and supervision of spray operators.
Some SOPs were observed smoking, drinking, or eating during the day	3	Hot temperatures, thirst and hunger together with weak supervision made SOPs to break the standard procedures during on drinking, eating and smoking.	Though still a debatable issue, spray operators were advised to wash their faces mouth and hands before drinking. Drinking of water also discouraged in the field. In the next IRS campaign training, the project team will reinforce proper behaviors and their supervision.

ANNEX C: DISPOSAL CERTIFICATES

Environment House
Transtobac Building
Hillside Rd
Masasa
Harare

CELL: 0774 368 150/ 0776 215 919
Email: sales@cleanandgreen.co.zw
info@cleanandgreen.co.zw
www.cleanandgreen.co.zw

Certificate of Recycling

The Management of this company hereby certifies that the waste products listed here under were bailed for recycling in our factory at Clean & Green Harare on the dates shown, under conditions conforming to National Regulation for the Management of specific Waste.

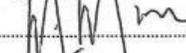
Client : MINISTRY OF HEALTH & CHILD CARE
Province : MANICALAND/ MUTASA/MUTARE/ NYANGA/ CHIMANIMANI
Mass Recycled : 4000 CARDBOARD BOXES
Waste Category : EMPTY CARDBOARD BOSES
Final product : CARDBOARD BOXES AND EXERCISE BOOKS AT GAYATRI
PAPER MILLS IN SOUTH AFRICA.
Certificate No. : 02/2015

SIGNED:  DATE: 04/02/15

SHE MANAGER

SIGNED:  DATE: 04/02/15

PRODUCTION MANAGER

SIGNED:  DATE: 04/02/15

GENERAL MANAGER

Directors : Alfred Goulbourne, Nyasha Makwana, Jacqueline Anderson

Environment House
Transtobac Building
Hillside Rd
Masasa
Harare

CELL: 0774 368 150/ 0776 215 919
Email: sales@cleanandgreen.co.zw
info@cleanandgreen.co.zw
www.cleanandgreen.co.zw

Certificate of Recycling

The Management of this company hereby certifies that the waste products listed here under were bailed for recycling in our factory at Clean & Green Harare on the dates shown, under conditions conforming to National Regulation for the Management of specific Waste.

Client : MINISTRY OF HEALTH & CHILD CARE
Province : MANICALAND/ MUTASA/MUTARE/ NYANGA/ CHIMANIMANI
Mass Recycled : 67000 OP BOTTLES ORGANOPHOSPHATE
Waste Category : PIRIMIPHOS-methyl Bottles
Final product : IRRIGATION PIPES AND POWER CABLES AT GOUNDED TIGER AND
COMMERCE IN SOUTH AFRICA
Certificate No. : 02/2015

SIGNED.....*Rance*.....

DATE.....04/02/15.....

SHE MANAGER

SIGNED.....*[Signature]*.....

DATE.....04/02/15.....

PRODUCTION MANAGER

SIGNED.....*[Signature]*.....

DATE.....04/02/15.....

GENERAL MANAGER

Directors : Alfred Goulbourne, Nyasha Makuyana, Jacqueline Anderson

ANNEX D: STOCK INVENTORY

Commodity	Total Issued by Warehouse	Items returned	Comment
Total yellow overalls	518	285	Some torn and damaged,no longer usable
Total white overalls	102	23	Some torn and damaged,no longer usable
Gumboots	395	154	Some torn and damaged,no longer usable
Safety helmets	390	390	To be verified after consulting with districts
Rinsing drums 210 liters	35	35	
First aid kits	18	18	To be verified after consulting with districts
Spill kits (metal pails)	15	15	To be verified after consulting with districts
Mattresses	348	348	To be verified after consulting with districts
IKS spray pumps	245	245	To be verified after consulting with districts
8-man tents	16	16	To be verified after consulting with districts
4-man tents	16	16	To be verified after consulting with districts
Helmet brackets	317	154	Some damaged during IRS campaign
Faceshields	317	199	Some damaged during IRS campaign
Torches	334	307	Some damaged during IRS campaign
Laptop - HP 255 G3 (CND4294GBI)	4	4	
Loud hailers	16	16	
Fire extinguishers	14	14	
Total	2,085	1,777	

ANNEX E. AIRS ZIMBABWE DATA FLOW PLAN

Noted in Section 9: Monitoring & Evaluation above, the data flow plan for the 2014 IRS campaign) takes into account PMI's guidance to eliminate any parallel systems, 2) allows district and provincial officials to review the data before sharing with PMI, and 3) ensures the required PMI and NMCP IRS indicators are collected. To accommodate PMI and NMCP data collection and reporting protocols, the IRS data flow is divided into five levels 1) campsite (primary data collection), 2) district, 3) provincial, 4) national, and 5) PMI (Figure E-1). A hard copy of the data for each week is expected to arrive to the district and province on the 9th and 11th day, respectively. In other words, transport takes an average of two days from the campsite to the district, and another two days to the province. The national level and PMI will receive the same data at the end of the second week.

Level I (Campsite)

- Spray operators collect spray data daily by both rooms and structures, using the spray cards in the spray operator's notebook. The NMCP and PMI required indicators have been added to the spray operator forms before the start of spraying. Spray operator forms are filed and retained with the data manager during the campaign. Once spraying is completed and data have been reported, the spray operator forms and other data collection tools are transported to the AIRS Harare office for storage. However, each district retains a duplicate copy of the spray operator forms and other data collection and supervisory tools.
- At the end of the spray day when the spray teams return to the campsite, spray data will be submitted to the supervisor for a quick review. Supervisors then submit spray operator forms to team leaders for more thorough data verification.
- Team leaders use the paper-based data quality assurance tool, Error Eliminator, to verify the spray data before transferring the data to the team leader daily summary form. Team leaders summarize the spray data received from the 15 spray operators that they each oversee. Team leaders submit the summary forms to the IRS coordinator and data manager at the site for review every day.
- The data manager manually transfers the aggregated data from the team leader daily summary forms to the data manager's daily summary form. The data manager's daily summary form totals the spray data collected by spray operators at each campsite by operational day. The aggregation of the data is performed on paper. Once data are verified, the DEC will enter spray data, summarized by operational day and spray team, into a Microsoft Excel-based spreadsheet provided by the NMCP. The DEC will use the laptop purchased by AIRS in 2014 to electronically send the data to the AIRS M&E Consultant on a daily basis given the NMCP approves this process.
- At the end of each week, the data manager adds the summary line for each of the seven days and transfers to a weekly summary form.
- The data from the weekly summary form are sent to the DEHO and MOHCC officers in two ways: by 1) SMS, and 2) hard copy as follows:
 - Data manager sends via SMS the sum of the predefined NMCP and PMI IRS indicators for the previous seven spray days, per the weekly summary form to DHIS2 for direct auto-

integration. MOHCC (at all levels – district, provincial, and national) staff can access the DHIS2 data, as long as the officers have passwords and access to the Internet.

- Data manager sends a hard copy (i.e., a copy of the original document) of the weekly summary form to the DEHO's office, usually by hand delivery.

Level 2 (District)

- Upon receipt of the weekly summary form, the DEHO reviews, makes a hard copy and sends to the Provincial Environmental Health Officer (PEHO) within 1-3 days of receipt. If the DEHO has any questions, s/he follows up with the data manager.

Level 3 (Provincial)

- Similarly, the PEHO reviews the weekly summary forms sent from the districts. The PEHO compiles the data into a provincial weekly summary report and forwards a hard copy to the NMCP.
- When the review process is complete, the PEHO makes available the IRS weekly summary forms from the four PMI-supported districts to AIRS Zimbabwe every Tuesday of the following week. AIRS Zimbabwe visits the PEHO office on Tuesdays to collect the data and to report to PMI. Data managers have also been tasked with entering and emailing the electronic weekly summary report to AIRS Zimbabwe with the four procured laptops, eliminating the need for AIRS to travel to the PEHO offices.

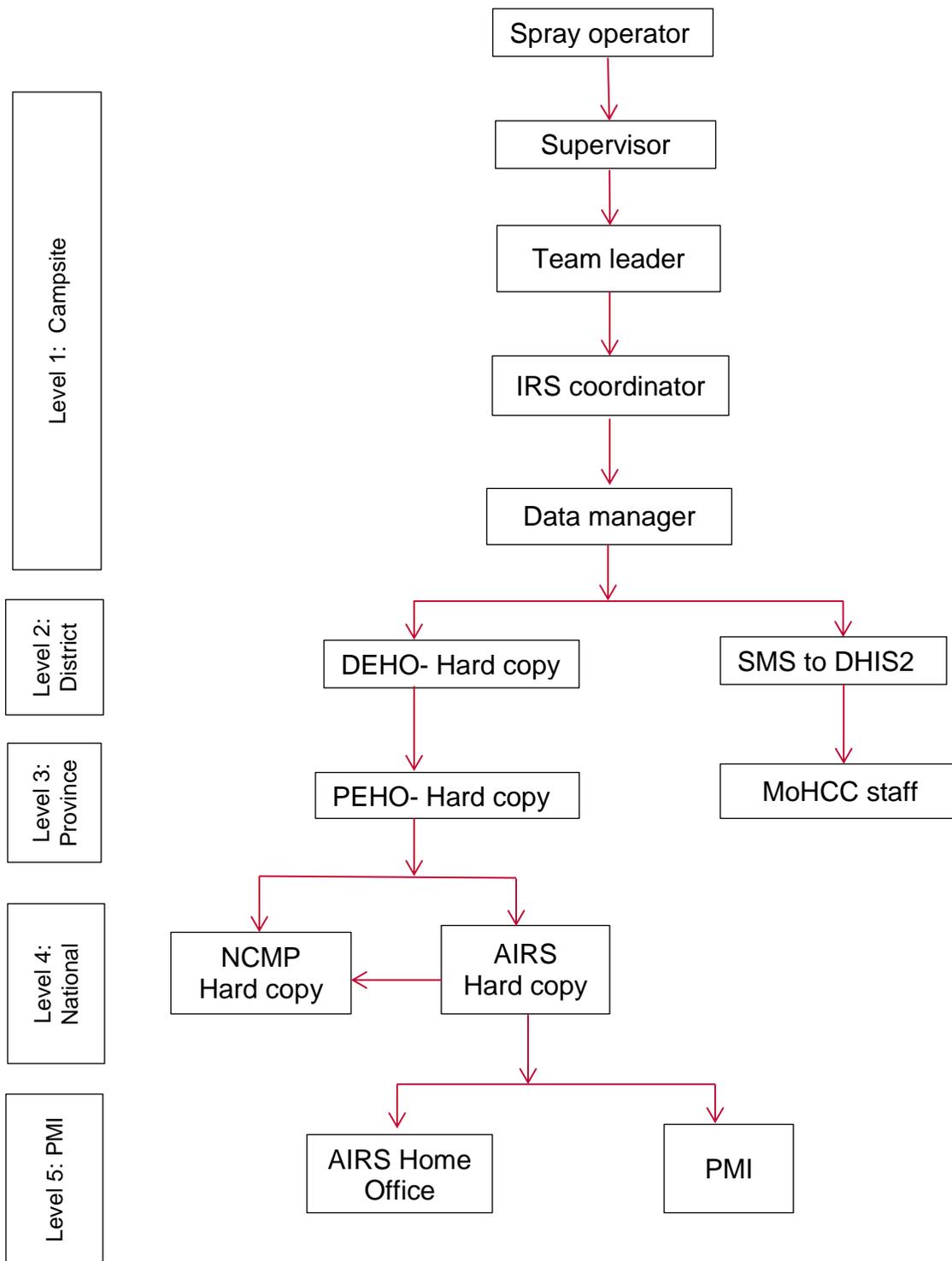
Level 4 (National)

- NMCP reviews and compiles the data from all the provinces on a weekly basis, although data delivery to the national level is generally one week behind. The data are shared with partners upon request.

Level 5 (PMI)

- The approved data from district and provincial health staff are submitted in the spray progress report to PMI every week during the campaign.

FIGURE E-1: 2014 IRS DATA FLOW



ANNEX F: MONITORING AND EVALUATION PLAN

INDICATOR MATRIX

Matrix Updated February 18, 2015

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Targets	Results	Targets	Results	Targets	Results
Component I: Establish cost-effective supply chain mechanisms including procurement, distribution and storage of IRS-related commodities and execute all aspects of logistical plans for IRS-related activities.											
I.1 Procurement											
I.1.1 Number and percentage of international insecticide procurement orders delivered in country, at port of entry, at least 30 days prior to the start of spray operations	<p>[<i>Numerator</i>: Number of international insecticide procurement orders delivered in country, at port of entry, at least 30 days prior to the start of spray operations]</p> <p>[<i>Denominator</i>: Total number of international insecticide procurement orders]</p> <p><i>Calculation</i>: [Numerator ÷ Denominator] × 100</p>	Y1, Y2, Y3	<p><i>Data source</i>: Logistics and Procurement Inventory Reports</p> <p><i>Reporting frequency</i>: Each spray season</p>	By Spray Campaign	AIRS	N.A.	N.A.	N.A.	N.A.	1; 100%	1; 100%
I.1.2 Number and percentage of international procurement orders for equipment,	[<i>Numerator</i> : Number of international procurements for equipment, including PPE, received at port of entry, 30 days prior to start of spray operations]	Y1, Y2, Y3	<p><i>Data source</i>: Logistics and Procurement Inventory Reports</p>	By Spray Campaign	AIRS	N.A.; 85%	2; 0%	2; 100%	1; 50%	2; 100%	3; 100%

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Targets	Results	Targets	Results	Targets	Results
including PPE, received at port of entry, 30 days prior to start of spray operations.	[Denominator: Total number of international procurements for equipment, including PPE.] Calculation: [Numerator ÷ Denominator] × 100		Reporting frequency: Each spray season								
1.1.3 Number and percentage of local PPE procurement orders that are delivered to the main warehouse, 14 days before the start of spray operations	[Numerator: Number of local PPE procurement orders delivered to the main warehouse 14 days before the start of spray operations] [Denominator: Total number of local PPE procurement orders] Calculation: [Numerator ÷ Denominator] × 100	Y1, Y2, Y3	Data source: Logistics and Procurement Inventory Reports Reporting frequency: Each spray season	By Spray Campaign	AIRS	N.A.; 80%	13; 0%	11; 100%	13; 76%	15; 100%	15; 100%
1.1.4 Successfully completed spray operations without an insecticide stock-out	Milestone: (Achieved/Not achieved)	Y1, Y2, Y3	Data source: Logistics Inventory Report Reporting frequency: Each spray season	By Spray Campaign	AIRS	N.A.	N.A.	N.A.	N.A.	Complete	Complete
1.2.1 Number and percentage of logistics and warehouse managers trained in IRS supply chain management	[Numerator: Total number of logistics and warehouse managers trained in IRS supply chain management using AIRS Project resources.]	Y1, Y2, Y3	Data source: Routine training records Reporting frequency:	By Spray Campaign By Gender	AIRS	N.A.	N.A.	N.A.	N.A.	5; 100%	21; 100% 20 males 1 female

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Targets	Results	Targets	Results	Targets	Results
	<p>[Denominator: Total number of AIRS logistics and warehouse managers.]</p> <p>Calculation: $[\text{Numerator} \div \text{Denominator}] \times 100$</p>		Each spray season								
1.2.2 Number and percentage of base stores where physical inventories are verified with up-to-date stock records	<p>[Numerator: Number of base stores where physical inventories are verified by up-to-date stock records]</p> <p>[Denominator: Total number of base stores audited.]</p> <p>Calculation: $[\text{Numerator} \div \text{Denominator}] \times 100$</p> <p>(See PIRS for details on sample size for operational audits)</p>	Y2, Y3	<p>Data source: Logistics and Environmental compliance reports</p> <p>Reporting frequency: Each spray season</p>	By Spray Campaign	AIRS	N.A	N.A	N.A	N.A	5; 100%	18; 100%
1.2.3 Submit up-to-date inventory records to AIRS Home Office 30 days after the end of each spray campaign	Milestone: (Completed/Not Completed)	Y2, Y3	<p>Data source: Post-Spray Logistics Inventory Report</p> <p>Reporting frequency: Each spray season</p>	By Spray Campaign	AIRS	N.A	N.A	N.A	N.A	Complete	Complete

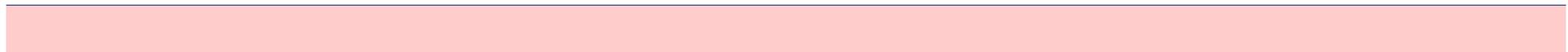
Component 2: Implement safe and high-quality IRS programs and provide operational management support



Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Targets	Results	Targets	Results	Targets	Results
including PPE, received at port of entry, 30 days prior to start of spray operations.	[Denominator: Total number of international procurements for equipment, including PPE.] Calculation: [Numerator ÷ Denominator] × 100		Reporting frequency: Each spray season								
I.1.3 Number and percentage of local PPE procurement orders that are delivered to the main warehouse, 14 days before the start of spray operations	[Numerator: Number of local PPE procurement orders delivered to the main warehouse 14 days before the start of spray operations] [Denominator: Total number of local PPE procurement orders] Calculation: [Numerator ÷ Denominator] × 100	Y1, Y2, Y3	Data source: Logistics and Procurement Inventory Reports Reporting frequency: Each spray season	By Spray Campaign	AIRS	N.A.; 80%	13; 0%	11; 100%	13; 76%	15; 100%	15; 100%
I.1.4 Successfully completed spray operations without an insecticide stock-out	Milestone: (Achieved/Not achieved)	Y1, Y2, Y3	Data source: Logistics Inventory Report Reporting frequency: Each spray season	By Spray Campaign	AIRS	N.A.	N.A.	N.A.	N.A.	Complete	Complete
I.2 In-country Logistics, Warehousing, and Training											
I.2.1 Number and percentage of logistics and warehouse managers trained in IRS supply chain management	[Numerator: Total number of logistics and warehouse managers trained in IRS supply chain management using AIRS Project resources.]	Y1, Y2, Y3	Data source: Routine training records Reporting frequency:	By Spray Campaign By Gender	AIRS	N.A.	N.A.	N.A.	N.A.	5; 100%	21; 100% 20 males 1 female

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
	<p>[Denominator: Total number of AIRS logistics and warehouse managers.]</p> <p>Calculation: $[\text{Numerator} \div \text{Denominator}] \times 100$</p>		Each spray season								
1.2.2 Number and percentage of base stores where physical inventories are verified with up-to-date stock records	<p>[Numerator: Number of base stores where physical inventories are verified by up-to-date stock records]</p> <p>[Denominator: Total number of base stores audited.]</p> <p>Calculation: $[\text{Numerator} \div \text{Denominator}] \times 100$</p> <p>(See PIRS for details on sample size for operational audits)</p>	Y2, Y3	<p>Data source: Logistics and Environmental compliance reports</p> <p>Reporting frequency: Each spray season</p>	By Spray Campaign	AIRS	N.A	N.A	N.A	N.A	5; 100%	18; 100%
1.2.3 Submit up-to-date inventory records to AIRS Home Office 30 days after the end of each spray campaign	Milestone: (Completed/Not Completed)	Y2, Y3	<p>Data source: Post-Spray Logistics Inventory Report</p> <p>Reporting frequency: Each spray season</p>	By Spray Campaign	AIRS	N.A	N.A	N.A	N.A	Complete	Complete

Component 2: Implement safe and high-quality IRS programs and provide operational management support



Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Targets	Results	Targets	Results	Targets	Results
2.1.1 Annual IRS country work plan developed and submitted on time	Milestone: (Completed/Not Completed)	Y1, Y2, Y3	Data source: Project records Reporting frequency: Annually		AIRS	Complete	Complete	Complete	Complete	Complete	Complete
2.2 Support of Safety and Health Best Practices and Compliance with USAID and Host Country Environmental Regulations											
2.2.1 SEA/letter report submitted on time ¹	Milestone: (Completed/Not Completed)	Y1, Y2, Y3	Data source: Project records – submitted SEAs/ letter reports Reporting frequency: Each spray campaign	By Spray Campaign	AIRS	Complete	Complete	Complete	Complete	Complete	Complete
2.2.2 Number and percentage of soak pits and storerooms inspected and approved prior to spraying	[Numerator: Number and percentage of soak pits and warehouses/storerooms inspected and certified by an environmental officer/AIRS Environmental Compliance Officer prior to each spray campaign supported by the AIRS Project] [Denominator: Total number of project soak pits and/or storerooms]	Y1, Y2, Y3	Data source: Pre, Mid and Post Inspection Reports submitted by environmental officers Reporting frequency: Each spray season	By Spray Campaign By Soak Pit By Warehouse/ Storeroom	AIRS	N.A	N.A	N.A	N.A	30, 100%	51; 100% 24 soak pits 27 store rooms

¹ In Year 1, SEAs were due 30 days prior to the commencement of spraying and letter reports were to be submitted 14 days prior to the commencement of spraying. In Year 2 and Year 3, due dates agreed upon with Washington-PMI will be noted in each country-specific Monitoring and Evaluation Plan to assess indicator 2.2.1.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Targets	Results	Targets	Results	Targets	Results
	Calculation: $[\text{Numerator} \div \text{Denominator}] \times 100$										
2.2.3 Number of government environmental and health officers trained in IRS environmental compliance	Total number of government environmental and health officers trained in IRS environmental compliance using AIRS Project resources	Y1, Y2, Y3	Data source: Training reports from Environmental Compliance Officer Reporting frequency: Semi-annually	By Spray Campaign By Gender	AIRS	38	37; 34 males, 3 females	283; 273 males, 10 females	573; 481 males, 92 females	184	188 163 males 25 females
2.2.4 Number of spray personnel trained in environmental compliance and personal safety standards in IRS implementation	Total number of spray personnel who attend a training in environmental compliance and personal safety standards in IRS implementation using AIRS Project resources, includes all staff who received environmental compliance training - spray operators, team leaders, washpersons, storekeepers, etc.	Y1, Y2, Y3	Data source: Project records – Training reports Reporting frequency: Each spray season	By Spray Campaign By Gender	AIRS	802	754; 688 males, 66 females	N.A.	75; 67 males, 8 females	400	332 311 males 21 female
2.2.5 Number of health workers receiving insecticide poisoning case management training	Total number of clinical personnel trained in insecticide poisoning case management using AIRS Project resources	Y2, Y3	Data source: Project records – Training reports Reporting frequency: Each spray season	By Spray Campaign By Gender	AIRS	N.A	N.A	N.A	N.A	74	96 80 males 16 females
2.2.6 Number of adverse reactions to pesticide exposure documented	Total number of incidents of pesticide exposure reported that resulted in a referral for medical care	Y1, Y2, Y3	Data source: Incident report forms that are required for each	By Spray Campaign By	AIRS	N.A	N.A	N.A	N.A	0	0

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Targets	Results	Targets	Results	Targets	Results
			incidence of pesticide exposure <i>Reporting frequency:</i> Each spray season	residential/ occupational exposure							
2.2.7. Number of vehicular accidents reported	Total number of vehicular accidents reported	Y1, Y2, Y3	<i>Data source:</i> Vehicular incident report forms that are required for each accident <i>Reporting frequency:</i> Each spray season	By Spray Campaign	AIRS	0	0	0	0	0	0
2.3 Support Entomological Monitoring Activities and Insecticide Resistance Strategies											
2.3.1 Number of sentinel sites supported by the AIRS project	Total number of entomological sentinel sites supported by the AIRS project	Y1, Y2, Y3	<i>Data source:</i> Entomological reports <i>Reporting frequency:</i> Annually	By Spray Campaign	AIRS	4	4	4	4	10	10
2.3.2 Number and percentage of entomological monitoring sentinel sites measuring all five primary PMI entomological	<i>[Numerator:</i> Number of entomological monitoring sites measuring all five primary PMI entomological indicators] <i>[Denominator:</i> Number of entomological monitoring sentinel	Y1, Y2, Y3	<i>Data source:</i> Entomological reports <i>Reporting frequency:</i> Annually	By Spray Campaign	AIRS	3	0; 0%	4; 100%	4; 100%	3; 100%	2; 67%

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Targets	Results	Targets	Results	Targets	Results
indicators	sites] <i>Calculation: [Numerator ÷ Denominator] x 100</i>										
2.3.3 Number and percentage of entomological monitoring sites measuring at least one secondary PMI indicator	<i>[Numerator: Number of entomological monitoring sites measuring at least one secondary PMI indicator]</i> <i>[Denominator: Number of entomological monitoring sites]</i> <i>Calculation: [Numerator ÷ Denominator] x 100</i>	Y1, Y2, Y3	<i>Data source: Entomological reports</i> <i>Reporting frequency: Annually</i>	By Spray Campaign	AIRS	4; 100%	3; 75%	4; 100%	4; 100%	10	0
2.3.4 Number and percentage of insecticide resistance testing sites that tested at least one insecticide from each of the four classes of insecticides recommended for malaria vector control	<i>[Numerator: Number of insecticide resistance testing sites that tested at least one insecticide from each of the four classes of insecticides recommended for malaria vector control.]</i> <i>[Denominator: Number of insecticide resistance testing sites]</i> <i>Calculation: [Numerator ÷ Denominator] x 100</i>	Y1, Y2, Y3	<i>Data source: Entomological reports</i> <i>Reporting frequency: Annually</i>	By Spray Campaign By Type of Insecticide	AIRS	N.A.	N.A.	12; 100%	4; 33.3%	10; 100%	6; 60%
2.3.5 Number of wall bioassays conducted within 2 weeks of spraying to evaluate the quality of IRS	Total number of wall bioassay studies conducted in established sentinel sites to evaluate quality of IRS spraying activities	Y1, Y2, Y3	<i>Data source: Entomological reports</i> <i>Reporting frequency: Per spray campaign</i>	By Spray Campaign	PMI	3	1	30	29	2	2

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Targets	Results	Targets	Results	Targets	Results
2.3.6 Number of wall bioassays conducted after the completion of spraying at monthly intervals to evaluate insecticide decay	Total number of wall bioassay studies conducted at monthly intervals in established sentinel sites to evaluate the rate of insecticide decay on sprayed surfaces	Y1, Y2, Y3	Data source: Entomological reports Reporting frequency: Per spray campaign	By Spray Campaign	PMI	3	0	150	100; 66.7%	8	6
2.3.7 Number of vector susceptibility tests for different insecticides conducted in selected sentinel sites	Total number of vector susceptibility tests conducted to gauge the effectiveness of individual insecticides proposed for use in spray operations	Y1, Y2, Y3	Data source: Entomological reports Reporting frequency: Per spray campaign	By Spray Campaign By Type of Insecticide	PMI	N.A.	N.A.	48	15	40	18
2.4 Conduct Communications Activities and Community Mobilization											
2.4.1 Number of radio spots and talk shows aired	Total number of radio spots and talk shows aired in target spray districts to stress the safety and benefits of IRS, ensure successful spray coverage, timely vacating of premises and adherence to IRS safety precautions by community members	Y1, Y2, Y3	Data source: Project records Reporting frequency: Semi-annually	By Spray Campaign	AIRS	N.A.	N.A.	N.A.	N.A.	30	30
2.4.2 Number of IRS print materials disseminated	Total number of IRS educational materials developed, printed and distributed to community members in target spray districts using AIRS Project resources	Y1, Y2, Y3	Data source: Project records Reporting frequency: Semi-annually	By Spray Campaign By Type of printed material and message(s)	AIRS	N.A	N.A.	50,000	36,950	140,000	25,200

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Targets	Results	Targets	Results	Targets	Results
2.4.3 Number of people reached with IRS messages via door-to-door mobilization	Total number of adults reached with IRS message during pre-spray community, door-to-door mobilization	Y1, Y2, Y3	Data source: Mobilization Data Collection Forms Reporting frequency: Daily per mobilization conducted	By Spray Campaign By Gender	AIRS	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
2.5 Spray Targeted Structures According to Technical Specifications											
2.5.1 Number of structures targeted for spraying	Total number of structures found in targeted spray districts by Spray Operators	Y1, Y2, Y3	Data source: Daily Spray Operator Forms Reporting frequency: Daily per spray campaign	By Spray Campaign	PMI	581,165	N.A.	680,674	N.A.	159,387	163,922
2.5.2 Number of structures sprayed with IRS ²	Total number of structures sprayed in targeted districts	Y1, Y2, Y3	Data source: Daily Spray Operator Forms Reporting frequency: Daily per spray campaign	By Spray Campaign	PMI	581,165	501,613	680,674	622,300	135,479	147,949
2.5.3 Percentage of total structures targeted for spraying that were sprayed	[Numerator: Total number of structures sprayed in targeted districts]	Y1, Y2, Y3	Data source: Daily Spray Operator Forms	By Spray Campaign	PMI	85%	86%	85%	91.4%	85%	90.3%

² The annual target is based on 85% spray coverage of indicator 2.5.1.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Targets	Results	Targets	Results	Targets	Results
with a residual insecticide (Spray Coverage)	[Denominator: Total number of structures in targeted areas found by spray operators] Calculation: $[\text{Numerator} \div \text{Denominator}] \times 100$		Reporting frequency: Daily per spray campaign								
2.5.4 Number of people residing in structures sprayed (Number of people protected by IRS)	Total number of people residing in structures sprayed (Actual numbers are collected during spray operations; population estimates are not used.)	Y1, Y2, Y3	Data source: Daily Spray Operator Forms Reporting frequency: Daily per spray campaign	By Spray Campaign By Number of pregnant women By Number of children <5 years old	PMI	1,330,072	1,164,586	1,531,192	1,431,643	340,476	334,746 157,755 males 176,991 females

Component 3: Provide ongoing monitoring and evaluation and quality control measures

3.1 Submit Monitoring and Evaluation Plan (MEP) to PMI-Rwanda	Milestone: (Completed/Not Completed)	Y1, Y2, Y3	Data source: Project records Reporting frequency: Semi-annual		AIRS	Complete	Complete	Complete	Complete	Complete	Complete
3.2 Submit a post-spray data quality audit report to the M&E Specialist in the AIRS Home Office within 60-180 days of completion of spray operations	Milestone: (Completed/Not Completed)	Y1, Y2, Y3	Data source: PSDQA Summary Report Reporting frequency: Per spray campaign	By Spray Campaign	AIRS	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
3.3 Submit a country-specific	Milestone: (Completed/Not Completed)	Y1	Data source: Project records		AIRS	Complete	Complete	Complete	Complete	Complete	Complete

Performance Indicator						Year 1		Year 2		Year 3	
						Targets	Results	Targets	Results	Targets	Results
						Eligible Structure Definition Document to local PMI and NMCP			<i>Reporting frequency: Semi-annually</i>		
3.4 Supply chain review conducted by RTT	Milestone: (Completed/Not Completed)	Y1, Y2	<i>Data source:</i> RTT supply chain review reports <i>Reporting frequency:</i> Semi-annually	By Spray Campaign	AIRS	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

Component 4:

Contribute to Global IRS Policy-Setting and Country-Level Policy Development of Evidence-Based IRS; Disseminate Experiences and Best Practices

4.1 Number of guidelines/checklists/tools related to IRS operations developed or refined with project support	Total number of implementation guidelines, process checklists and program tools related to IRS operations developed or refined using the technical and/or financial resources of the AIRS Project	Y1, Y2, Y3	<i>Data source:</i> Project records – Activity reports <i>Reporting frequency:</i> Semi-annually	By Guideline/checklist/tool	AIRS	N.A.	2 By tool: EC monitoring checklist; room-to-structure conversion DCT	4	2 By tool: Revised EC monitoring checklist; soak pit construction guidelines	5	8 (M&E 2;) EC 6)
4.2 Number of articles/best practices documents published	Total number of articles or other best-practice documents that have been published in relevant journals or through PMI/USAID communications vehicles	Y2, Y3	<i>Data source:</i> EOSR <i>Reporting frequency:</i> Semi-annually	By Spray Campaign By IRS Technical Area	AIRS	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

Performance Indicator						Year 1		Year 2		Year 3	
						Targets	Results	Targets	Results	Targets	Results
						4.3 Number of best practice presentations given at national/regional/international workshops and conferences	Total number of project-related oral and poster presentations delivered in national, regional and/or international meetings related to IRS.	Y2, Y3	Data source: Project records – Activity reports Reporting frequency: Semi-annually	By IRS Technical Area	AIRS

Component 5 (Cross-cutting): Capacity Building, Knowledge Transfer, Gender Inclusion

5.1 Capacity Building (Gender Inclusion)

5.1.1 Number of people trained in IRS implementation	Total number of personnel trained in IRS implementation using AIRS Project resources. This figure only spray personnel (i.e. spray operators, team leaders, supervisors, clinicians.)	Y1, Y2, Y3	Data source: Project records – Training reports Reporting frequency: Semi-annually	By Spray Campaign By Gender Percentage of Women Trained	PMI	N.A.	968 688 males 66 females	N.A.	N.A.	450	331; 311 males 20 females 6.3% women
5.1.2 Number of people trained to deliver or support IRS in target districts	Total number of people trained using AIRS Project resources to implement/support elements of IRS in target districts. This figure includes all cadre that serve a role in IRS.	Y1, Y2, Y3	Data source: Project records – Training reports Reporting frequency: Semi-annually	By Spray Campaign By Gender By Role (e.g., spray operator, storekeeper) Percentage of women trained	AIRS	N.A.	N.A.	N.A.	N.A.	450	431; 407 males, 24 females 5.6% women

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Targets	Results	Targets	Results	Targets	Results
5.1.3 Number of personnel trained as IRS implementation trainers	Total number of personnel trained in Training of Trainers (TOT) for IRS delivery	Y1, Y2, Y3	Data source: Project records – Training reports Reporting frequency: Semi-annually	By Spray Campaign By Gender Percentage of women trained	AIRS	N.A.	N.A.	N.A.	N.A.	61	23 22 males; 1 females 4.3% women
5.1.4 Number of government environmental and/or health officials trained in IRS oversight	Total number of national and sub-national/district government environmental and/or health officials who are trained in oversight of IRS implementation using AIRS Project resources	Y1, Y2, Y3	Data source: Project records – Training reports Reporting frequency: Semi-annually	By Spray Campaign By Gender Percentage of Women Trained Type of government official (e.g. environmental/health)	AIRS	38	37; 34 males, 3 females	283; 273 males, 10 females	573; 481 males, 92 females	184	121 97 males 24 females
5.1.5 AIRS conducted a capacity assessment	AIRS Rwanda program conducted an assessment of IRS capacity among national and sub-national/district government health officials	Y1, Y2	Data source: Project records – Capacity assessment reports Reporting frequency: Semi-annually		AIRS	Complete	In process	Complete	Complete	N.A.	N.A.
5.1.6 Number of capacity-building MOUs signed by	Total number of Memoranda of Understanding (MOU) on provision of local capacity building	Y1, Y2, Y3	Data source: Project records – MOUs	By Spray Campaign	AIRS	N.A.					

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Actuals					
						Year 1		Year 2		Year 3	
						Targets	Results	Targets	Results	Targets	Results
AIRS, NMCP and partners/ institutions	finalized and signed between AIRS, the Malaria and Other Parasitic Diseases Division (MOPPD), and other local partners and institutions		Reporting frequency: Semi-annually								