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PMI | VECTORLINK Project

Indoor Residual Spraying (IRS 2) Task Order One

ZIMBABWE
END OF SPRAY REPORT
2018

SPRAY CAMPAIGN:
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ACRONYMS

AIRS	Africa Indoor Residual Spraying
BMP	Best Management Practices Manual
COP	Chief of Party
CS	Capsule Suspension
DDT	Dichlorodiphenyltrichloroethane
DEHO	District Environmental Health Officer
DHE	District Health Executive
DHIS 2	District Health Information System 2
EC	Environmental Compliance
ECO	Environmental Compliance Officer
ECA	Environmental Compliance Assistant
EHO	Environmental Health Officer
EHT	Environmental Health Technician
IEC	Information, Education and Communication
IRM	Insecticide Resistance Management
IRS	Indoor Residual Spraying
ITN	Insecticide-treated Net
MOHCC	Ministry of Health and Child Care
M&E	Monitoring and Evaluation
MEP	Monitoring and Evaluation Plan
MSP	Mobile Soak Pit
NIHR	National Institute for Health Research
NMCP	National Malaria Control Program
OP	Organophosphate
PEDCO	Provincial Epidemiology and Disease Control Officer
PEHO	Provincial Environmental Health Officer
PFO	Provincial Field Officer
PHE	Provincial Health Executive
PMI	President's Malaria Initiative
PPE	Personal Protective Equipment
PSECA	Pre-Spray Environmental Compliance Assessment

PSI	Population Services International
SBCC	Social and Behavior Change Communication
SOP	Spray Operator
TOT	Training of Trainers
USAID	United States Agency for International Development
VHW	Village Health Worker
WHO	World Health Organization
WHOPES	World Health Organization Pesticide Evaluation Scheme
ZAPIM	Zimbabwe Assistance Program in Malaria
ZCA	Zimbabwe Christian AID

EXECUTIVE SUMMARY

The President's Malaria Initiative (PMI) has a long history of malaria vector control in Zimbabwe using indoor residual spraying (IRS), dating back to August 2011. Abt Associates first implemented PMI-supported IRS through the two three-year Africa Indoor Residual Spraying (AIRS) projects, IRS 2 Task Orders 4 and 6. Task Order 4 provided technical support for IRS operations, environmental compliance (EC) activities, and entomological monitoring; the project ended in 2013. Task Order 6, which ended in 2018, was meant to showcase best practices for planning, implementing, monitoring, and evaluating an IRS program in selected high malaria-burdened districts of Manicaland Province (Chimanimani, Mutare, Mutasa, and Nyanga). These best practices should ultimately form a model IRS program for Zimbabwe.

Currently, Abt is implementing the PMI VectorLink project in up to 23 African countries, including Zimbabwe, through a five-year contract launched in October 2017. VectorLink Zimbabwe implements a full package of IRS support in two districts (Mudzi, Mutoko) in Mashonaland East Province, supports transitioning of four districts in Manicaland Province previously under PMI support, and conducts entomological monitoring in Mashonaland East and Manicaland as well as in seven other rural provinces. The 2018 spray campaign in PMI-supported districts in Mashonaland East commenced on November 5, and ended on December 18, whereas entomological monitoring is being conducted throughout the year in 20 sentinel sites nationwide, from March 2018 through February 2019, and includes data collection on malaria vector species composition and abundance, behavior, and insecticide susceptibility. VectorLink continues to work with National Institute of Health Research (NIHR) and Africa University (AU), the latter identified by PMI in 2015 as an additional entity to provide technical expertise and services through the establishment of a molecular and immuno-diagnostic laboratory for analysis of entomological specimens. The PMI-supported AU insectary has started to provide mosquitoes for cone bioassays and as control specimens to VectorLink for insecticide susceptibility tests.

In 2018, VectorLink Zimbabwe continued working with the National Malaria Control Program (NMCP), as well as the provincial and district health officials in two districts in Mashonaland East Province, to plan, implement, manage, and monitor the IRS campaign. To ensure that the gains made under the AIRS project are not lost, PMI VectorLink developed and implemented a transitional strategy for the withdrawal of its IRS support from Manicaland. This plan supported the NMCP to sustain coverage targets met in four districts in Manicaland in 2017 through targeted technical assistance and selected material support for the 2018 IRS campaign.

For the IRS campaign in Mashonaland East, the project recruited and trained seasonal staff prior to the spraying; procured insecticide, personal protective equipment (PPE), and IRS equipment; made logistical arrangements; and did EC preparation and monitoring before, during, and after the IRS campaign to ensure that the standard operating procedures and protocols from the PMI Best Management Practices (BMP) Manual were consistently adhered to. In Manicaland, VectorLink Zimbabwe support was more technical than material. In both provinces, the project held stakeholder and partner planning meetings, as well as health worker sensitizations, which were cascaded to the communities in order to create the beneficiary awareness and service demand needed for successful spray operations. To improve the accuracy and reliability of baseline data of targeted structures for spraying, the VectorLink project collaborated with the NMCP and Mashonaland East provincial health officials to conduct geo-mapping in Mudzi and Mutoko districts, which included using satellite and machine imagery to guide identification of eligible structures as part of a ground-truthing exercise.

Key results emerging from the 2018 campaign are summarized in Table ES-1.

TABLE ES 1. 2018 PMI VECTORLINK ZIMBABWE AT A GLANCE

Number of districts covered by PMI-supported IRS in 2018	2 districts: Mudzi, Mutoko
Insecticide	Pirimiphos-methyl (Actellic 300CS)
Number of structures targeted by PMI-supported IRS	125,068
Number of structures found by SOPs during PMI-supported IRS spray season	125,249
Spray coverage**	90.1%
Number of structures sprayed by PMI-supported IRS	112,805
Number of eligible structures found by geo-mapping	150, 335
Population protected by PMI-supported IRS	276,343 (including 3,846 pregnant women and 43,789 children under 5 years old)
Dates of PMI-supported IRS campaign	November 5 to December 18, 2018
Length of campaign	37 days
Number of people trained with U.S. Government funds to deliver IRS*	295 (232 men, 63 women)

Note: SOP=spray operator
* Based on the PMI indicator definition. It includes only spray personnel such as SOPs, team leaders, supervisors, IRS coordinators, provincial/district environmental health officers, provincial field officer and logistics assistant/transport officer.
** Percent sprayed is the number of sprayed structures out of those found by SOPs in 2018.

VectorLink Zimbabwe used pirimiphos-methyl capsule suspension (CS) formulation (Actellic 300CS), an organophosphate (OP) class insecticide, for IRS in the two districts. The selection of pirimiphos-methyl was guided by the insecticide resistance management plan and its long residual effect on the sprayed surfaces. The province decided on rotating DDT with OPs in the two districts, Mudzi and Mutoko during the 2018 IRS campaign.

Some major challenges affecting spray operations and associated recommendations are below:

- The deteriorating political and socio-economic environment in which cash and fuel shortages coupled with a three-tier pricing system in a USD-denominated cash economy posed huge procurement and logistical challenges, which sometimes resulted in delayed implementation of planned activities. The launch of the 2019 IRS campaign in Mudzi and Mutoko had to be postponed from October 29 to November 5, 2018, to allow sufficient time to stockpile fuel and secure lorries and trucks for the campaign.
- The geo-mapping ground-truthing activity was originally planned for implementation in advance of spraying to provide the most accurate enumeration of eligible structures, but delays resulted in it occurring concurrently with spray operations. This prohibited the use of geo-mapping data to prospectively target structures, but did allow for use in identifying areas where call-backs (going back to areas already sprayed) were needed.
- Rough terrain and hard-to-reach areas in the more mountainous areas made it difficult for spray operators to meet daily targets; however, call backs were done in these areas when the spray coverage at the ward-level was less than 85%. Additionally, in migrant farming and mining communities, household members were not at home on the date of spray, so VectorLink had to work with community leadership to coordinate specific times to return for call backs.
- Inadequate water supply at Chindenga and Kapondoro Campsites in Mutoko resulted in more time spent in search of water from community boreholes located more than one km from each campsite. VectorLink purchased the required electrical cable and inverter to rectify the problem with the water supply system, but due to delays in procuring through the Ministry of Health and Child Care

(MOHCC's), installation of the accessories took longer than anticipated, delaying restoration of water at the affected sites. Four tanks of water were also purchased to boost water supplies at campsites in the two districts.

- Inadequate cash for the payment of allowances for SOPs due to the ongoing limitations in transacting and accessing cash from the banks. VectorLink mobilized cash from the bank slowly over weekly intervals (as permitted by the bank policy) to partially pay the SOPs, over time. All SOPs were paid by the end of March 2019. Cash flow issues also affected vendor payments, but VectorLink worked with the Abt home office to make some of the payments from the United States.
- Competing programs such as the food handouts and maize seed distributions for agriculture adversely affected IRS performance. VectorLink rescheduled IRS in such areas in order to accommodate the other programs, which was a factor in the delay of the IRS planned end date.
- The breakdown of two MOHCC lorries affected spray team performances in both districts as some SOPs could not be deployed on time. VectorLink managed to fix one of the lorries and the other was replaced by a rented vehicle. In 2019, VectorLink plans to only hire lorries from the private sector to reduce resources spent on repairs.
- Overloading of lorries. VectorLink used vehicle loading standards were based on the typical NMCP lorry which can safely accommodate 40 people (at .45 meter per person). The vehicles used were smaller and can only safely accommodate 35. VectorLink will better assess vehicle measurements in 2019, and hire additional lorries as needed.
- IRS operations were also adversely affected by by-elections for the Member of Parliament for Mutoko North constituency as villagers were mobilized to attend campaign meetings. Callbacks were conducted in the affected wards.
- Electricity challenges at Nzira campsite in Mutoko affected the completion of supervisory forms using smartphones as phones could not be charged. Additionally, spray team work days were extended late into the night as they had to share solar lamps to complete daily de-mobilization activities. To alleviate the situation, VectorLink purchased solar lamps while a VectorLink officer would also collect the phones for overnight charging at a local hotel.
- SOPs in Mashonaland East experienced blocked continuous flow valves (CFVs), which would hold up spray operations as they took time to try and unblock the CFV. Sometimes the spray operators were able to unblock the CFV and in other cases had to move forward spraying without it, which could compromise spray quality. For the 2019 campaign, VectorLink plans to provide at least two CFVs per SOP to provide a back-up for any blockages.
- Homeowners not removing belongings from their homes prior to SOPs' arrival meant that SOPs had to spend a considerable amount of time assisting with this removal process which slowed the pace of spraying. To ensure household preparedness during future spray campaigns, the project will enhance collaboration with village health workers and headmen to increase their role and support in this IRS mobilization activity.
- VectorLink best practices called for a higher number of supervisors to be hired in 2018 than were used under the MOHCC model in prior years. In an environment with limited skilled personnel, this meant that some of the supervisors hired had limited experience in IRS, which affected IRS supervision. VectorLink worked with provincial- and district-level leadership to provide on-the-job training and supportive supervision to help build capacity and confidence among the supervisors. For the 2019 IRS campaign VectorLink will engage with NMCP/MOHCC for more meaningful involvement in the selection and recruitment of supervisors, team leaders, and IRS coordinators.

- Although most of the supervisors hired indicated having experience in using smartphones, it was a challenge for some of them during the first week of IRS operations. VectorLink Zimbabwe conducted on-the-job training, and support and supervision to address this issue. The project will also continue to conduct refresher training on the use of smartphones and supervision applications for all supervisors, team leaders, and IRS coordinators.
- Delivery of new smartphones meant for use in the 2018 IRS campaign was delayed and the project continued to use old phones which had problems detecting GPS signals and had shorter battery life, adversely affected the completion of supervisory forms. In 2019, the project will use a new smartphone model that is better at detecting GPS signals and have longer battery life.
- The absence in Zimbabwe of dedicated logistics, procurement, and warehouse personnel in both provinces, unlike in other PMI VectorLink country project teams, affected timely execution of activities as the small team available was overstretched. These positions will need to be added in support of the 2019 IRS campaign.

1. INTRODUCTION

The President's Malaria Initiative (PMI), funded by the United States Agency for International Development (USAID) and co-implemented with the U.S Centers for Disease Control and Prevention (CDC), awarded Abt Associates two consecutive three-year Africa-wide Indoor Residual Spraying (AIRS) projects, in August 2011 and September 2014. The projects supported the implementation of vector control activities for the prevention of mosquito-borne diseases. In 2017, PMI awarded Abt a five-year contract to continue the implementation of the vector control activities. This project, VectorLink, is implemented in 23 different African countries, Zimbabwe among them.

Malaria remains the most important vector-borne public health problem in Zimbabwe, with the major burden occurring in Manicaland, Mashonaland East and Mashonaland Central Provinces. In Zimbabwe, IRS (indoor residual spraying) remains one of the most critical strategies for the reduction in malaria incidence. Spraying of structures with residual insecticides reduces the longevity of indoor-resting anopheline mosquitoes, greatly limiting the probability of malaria transmission in a geographical area.

In 2017, AIRS Zimbabwe continued spraying four districts (Chimanimani, Mutare, Mutasa, and Nyanga) in Manicaland Province, covering areas previously sprayed in 2016. In line with the Zimbabwe Insecticide Resistance Management (IRM) Plan 2016-2020, the National Malaria Control Program (NMCP) decided to rotate from pirimiphos-methyl to dichlorodiphenyltrichloroethane (DDT) in Manicaland in 2018. Given PMI's practical preference to continue supporting deployment of a non-DDT insecticide with similar environmental compliance procedures to organophosphates (OP), the NMCP advised that VectorLink transition out of implementing IRS in these four Manicaland districts and into other high-prevalence areas, specifically Mudzi and Mutoko Districts in Mashonaland East Province. However, the project continued to provide technical assistance in Manicaland, working with provincial and district health officials in all four districts to allow for a phased withdrawal and smooth transition of spray operations to NMCP management.

VectorLink Zimbabwe worked with the NMCP, as well as the provincial and district health officials to plan, implement, manage, and monitor a full IRS package in Mudzi and Mutoko Districts in Mashonaland East Province and support entomological surveillance in selected sentinel sites across the country. The support was guided by the following objectives:

- Spray at least 85 percent of the 125,068 structures found in the two districts (Mudzi 60,957; Mutoko 64,111) in 2017.
- Protect at least 85 percent of the 271,608 persons found in the two districts in 2017.
- Develop capacity for national, provincial, and district health staff to organize, plan, implement, monitor, and evaluate IRS through joint planning meetings, joint support and supervision, and monitoring and evaluation (M&E) activities during the IRS campaign, and data collection and analysis involving local counterparts in the IRS campaign.
- Ensure spray campaign data are entered daily into Microsoft Excel spreadsheets in accordance with the NMCP's M&E and data collection system, to allow VectorLink Zimbabwe to report on spray campaign progress weekly.
- Complete high-level entomological monitoring and surveillance to ensure data are available for future IRS decision making, programming, and campaign planning.

- Continue to strengthen environmental management capacity building to ensure safety of IRS operations before, during and after the campaign.
- Conduct advocacy and SBCC activities at provincial, district, ward and community level to create awareness and demand for IRS.
- Conduct geo-mapping exercise in Mudzi and Mutoko Districts to establish a baseline of structures eligible for spraying.

Other important areas that the project supported during the 2018 campaign included: co-facilitation and logistics of trainings; support for data collection and reporting; procurement, distribution and storage of insecticide, spray materials, and equipment; and monitoring of spray operations using the PMI VectorLink project-wide supervision forms.

Results in brief

Table 1 shows the percentage of structures sprayed and total population protected by district in 2018. Spray coverage is based on the number of structures found in 2018 whereas the target structures are based on the number of 2017 structures found during the NMCP-led 2017 IRS campaign, which is used as a proxy for planning purposes. Both districts exceeded the 85 percent the PMI spray coverage target.

TABLE 1. STRUCTURES AND POPULATION FOR 2018 IRS CAMPAIGN

District	Target Structures	Structures Found by SOPs in 2018	Eligible structures found by geo-mapping	Sprayed Structures N (%)*	Population Protected		
					Males	Females	Total
Mudzi	60,957	63,314	74,408	58,478 (92.4)	69,397	77,471	146,868
Mutoko	64,111	61,935	75,927	54,327 (87.7)	63,378	66,097	129,475
Total	**125,068**	**125,249**	**150,335**	**112,805 (90.1)**	**132,775**	**143,568**	**276,343**

**Percent sprayed is the number of sprayed structures out of those found by SOPs in 2018.*

Other Activities

In addition to providing transitional support to Manicaland spray operations, VectorLink Zimbabwe continued to provide technical assistance to the NMCP and partners on various national-level vector monitoring and control issues, as requested. This assistance included:

- Technical support to shift from traditional malaria vector control to integrated vector management in an effort to optimize use of resources for vector control
- Increased capacity to plan, implement, and monitor vector control programs
- Technical support for forecasting insecticide requirements for the NMCP for the period 2018-2020
- Technical support to ensure environmental compliance for IRS activities
- Participation in and support for malaria technical working groups and committees
- Technical support for implementing malaria elimination activities
- Review of the 2016-2020 IRM Plan
- Support of routine review and modification of the entomological monitoring plan, as necessary
- Support for malaria control messaging
- Technical support for rebranding the NMCP

2. Transitional Strategy for Withdrawing IRS Support in Manicaland

2.1 Context and Justification

The AIRS Zimbabwe project, with funding from USAID/ PMI, operated in Manicaland Province from 2014–2017 to reduce the burden of malaria in the districts of Chimanimani, Mutare, Mutasa, and Nyanga. During this period of operations, malaria cases in these districts decreased from 165,720 in 2014 to 52,501 cases in 2017. The achievements were the result of a comprehensive and high-quality IRS approach, robust entomological monitoring conducted in collaboration with the NMCP, National Health Institute for Health Research (NIHR), the Ministry of Health and Child Care (MOHCC) provincial and district leadership. To be compliant with the IRM Plan, the NMCP decided to rotate from pirimiphos-methyl to DDT for IRS in Manicaland Province in 2018. However, PMI's practical preference is to continue supporting deployment of a non-DDT insecticide with similar environmental compliance procedures to OPs. Cognizant of this, the NMCP advised that VectorLink transition out of implementing IRS in these four districts and into other high-prevalence areas, for the 2018 IRS campaign.

To ensure that the gains made under the AIRS project are not lost, PMI VectorLink developed and implemented a transitional strategy for withdrawal of its IRS support from Manicaland. This plan supported the NMCP to sustain coverage targets met in 2017 through targeted technical assistance and selected material support for the 2018 IRS campaign. The transitional strategy was developed in collaboration with the NMCP, PMI, and Manicaland provincial and district health officials following an analysis of the epidemiological profile of malaria in the four districts and a review of IRS implementation over the years by the NMCP in Zimbabwe. Through consultations among the NMCP, PMI Zimbabwe, and VectorLink, the NMCP identified capacity gaps allowing for successful implementation of a comprehensive IRS campaign in the four districts. The gaps included:

- Insufficient numbers of spray operators (SOPs) and other resources deployed by the NMCP in each of the four districts to sustain IRS blanket coverages reached in 2017,
- Inadequate spray equipment, personal protective equipment (PPE), and camping materials,
- Limited resources by NMCP, provincial medical director, and provincial and district officials to sustain best practices and tools introduced by AIRS, including smartphone-based IRS supervision, provision of morning mobilization including breakfast for spray teams, and procurement of loud hailers for community mobilization,
- Decreased environmental compliance (EC) support,
- Decreased SBCC interventions at provincial, district, and community levels,
- Limited transportation to ferry both IRS commodities and SOPs, and
- Limited capacity and resources to implement quality entomological surveillance.

2.2 Proposed Mitigation Measures

In order to minimize the gaps discussed above, VectorLink Zimbabwe planned and implemented mitigation measures during the transitional period in 2018. A VectorLink Manicaland provincial coordinator was hired full-time and resided in the province to provide direct support to the spray districts. The provincial coordinator was supported by the VectorLink Zimbabwe environmental compliance officer (ECO), operations manager, M&E manager, and chief of party (COP). The provincial coordinator worked very closely with the provincial and district MOHCC staff.

2.2.1 Pre-Spray Activities

VectorLink Zimbabwe worked with national, provincial, and district government stakeholders to conduct micro-planning meetings to most effectively plan for spray operations. At the national meeting, VectorLink met with the NMCP to share and review the NMCP Global Fund-supported operational plan, commodities and personnel requirements, spray performance targets, EC activities, and M&E requirements as well as review and agree on stakeholder roles and responsibilities. The national planning meeting was followed by a provincial meeting that included key Manicaland provincial and district health officials, who discussed several issues, especially gaps regarding IRS commodities, communication issues, and human resources, and possible solutions. This was followed by micro-planning meetings in each of the districts.

To ensure availability of storage facilities at the campsites, which are the operation sites during spraying, VectorLink Zimbabwe, in liaison with provincial and district MOHCC staff, conducted an inventory of storage facilities for the storage of insecticides and other IRS commodities at 21 operations sites.

Following an assessment of inventory left over from past spray operations, VectorLink Zimbabwe procured spare parts for the sprayers (as listed in Table 2) and stationery. The stationery included 500 SOP notebooks and other data collection tools to support operations in the four districts. Also, VectorLink assisted with transporting fuel purchased through the Global Fund from the province and districts to campsites.

TABLE 2. QUANTITIES OF PMI-SUPPORTED SPARE PARTS DISTRIBUTED IN MANICALAND, 2018

Description/Activity	Nyanga	Mutasa	Chimanimani	Mutare	Total
Hudson spares: Strainers	90	90	90	90	**360**
Trigger (shut off assembly)	22	20	22	31	**95**
Plunger assembly	15	17	12	20	**64**
Pump cylinder assembly	21	25	13	23	**82**
Strainer housing assembly	25	23	22	30	**100**
Male fitting for strainer housing	25	20	25	30	**100**
Extension tube	20	22	15	33	**90**
Nozzle body	23	26	23	35	**107**
Nozzle body cap	26	31	27	30	**114**
Pressure gauge	20	25	25	30	**100**

A month before the 2018 IRS campaign began in Manicaland, VectorLink worked with provincial- and district-level staff to ensure that all PPE, equipment, and commodities that had been delivered to the provincial medical director's warehouse in Mutare were delivered to the district warehouses in

Chimanimani, Mutasa and Nyanga (Mutare used the provincial warehouse). A week before the start of the IRS campaign, the project worked with the province to produce a distribution list for the IRS commodities, ensure storerooms were ready, guards and storekeepers were hired and deployed. VectorLink also provided logistical support to distribute the commodities to the storerooms at the operations sites. VectorLink hired 16 operations site staff, listed in Table 3.

TABLE 3: BREAKDOWN OF STAFF HIRED BY VECTORLINK IN MANICALAND, 2018

Position	Chimanimani		Mutare		Mutasa		Nyanga		Total			% Female
	M	F	M	F	M	F	M	F	M	F	Both	
Pump technicians	1	0	1	0	1	0	1	0	4	0	4	0
Storekeeper	1	1	2	0	2	0	1	1	6	2	8	25
Guards	1	0	1	0	1	0	1	0	4	0	4	0
Total	**3**	**1**	**4**	**0**	**4**	**0**	**3**	**1**	**14**	**2**	**16**	**12.5**

To ensure effective and safe implementation of IRS operations, the project participated in the IRS training program (Table 4). The training program followed the same curriculum as implemented by AIRS in previous years. Level 1, 2, and 3 trainings were funded by the Global Fund and facilitated by VectorLink staff. The Global Fund could not support the other specialized trainings normally part of the VectorLink standard training package (insecticide poisoning, guards, storekeepers, and driver trainings) so these were funded and facilitated by VectorLink.

TABLE 4: SUMMARY OF 2018 IRS TRAININGS, MANICALAND

Type of Training	Dates	Length (days)	Type of Participants	Description of Training
Level 1 training (National training of trainers (TOT))	Aug 20-24, 2018	5	PEDCOs, PEHOs, DEHOs, PFOs, IRS coordinators	Included review of challenges observed and lessons learned during the previous IRS campaign, IRS targets and plans for 2018, new IRS policies and operational procedures, insecticide management, community mobilization, spraying techniques, data tools and collection, support and supervision, EC issues, and entomological monitoring, especially World Health Organization (WHO) cone bioassays on sprayed surfaces to monitor quality of spray and insecticide decay rate
Level 2 training (Provincial TOT)	Sept 10-14, 2018	5	Team leaders, supervisors, data managers	Handling of insecticides and spray pumps, spraying techniques and practicals, trouble shooting, effective community mobilization, management of callbacks, daily targets, data cleaning, analysis, and utilization, importance of checklists in IRS, gender integration, IRS reporting frequency, supervision of spray operations, the importance of EC in IRS, IRS solid and liquid waste management, proper use of PPE, entomological monitoring, and management of IRS resources

Type of Training	Dates	Length (days)	Type of Participants	Description of Training
Guards, storekeepers and drivers training	Sept 18-19, 2018	2	Guards, storekeepers, drivers	Roles and responsibilities of guards, storekeepers and drivers, code of conduct, handling of insecticides (types) and PPE, insecticide poisoning signs and symptoms and first aid, spills response procedure, firefighting theory and demonstrations, storeroom standards, stock management, Concepts of EC in IRS operations and security of IRS commodities.
Insecticide poisoning training	Sept 20-21, 2018	2	Nurse	Roles and responsibilities of nurses in IRS, chemical handling and safety, hazard analysis, hazard mitigation plans, management of pesticide poisoning, management of snake, insect, and dog bites, concepts of EC in IRS operations and contingency planning.
EC training	Sept 17, 2018	1	DEHOs, team leaders, supervisors, data managers, guards,pump technicians	Technical training on PMI best management practices (BMP)in IRS liquid (DDT) waste management using mobile soak pits, demonstration of construction and use of DDT mobile soak pits
Level 3 training (training of SOPs)	Sept 24-28, 2018 (Chimaniman/ Mutarei Cluster) Oct 1-5, 2018 (Mutasa/Nyanga Cluster)	5	SOPs	Mixing insecticide, use of PPE, spraying techniques, dismantling and assembling of spray pumps, trouble shooting, maintenance and cleaning of spray pumps, spray targets, data collection tools and recording data, community information after spraying, community mobilization, and EC best practices.

NOTE: PEDCO=provincial epidemiology and disease control officer, PEHO=provincial environmental health officer, DEHO=district environmental health officer, PFO=provincial field officer

2.2.2 INFORMATION, EDUCATION, and COMMUNICATION ACTIVITIES

In collaboration with provincial and district health staff, VectorLink funded and provided technical assistance in a series of district and community mobilization meetings with stakeholders, influential leaders, and IRS beneficiaries. Further information on the meetings is highlighted below.

2.2.2.1 DISTRICT SENSITIZATION MEETINGS

One sensitization meeting was held in each district with provincial leadership. Objectives, messages, and outputs are presented below (Table 5). Two provincial staff attended at each district meeting. A total of 57 participants attended in Mutare, 49 in Chimanimani, 39 in Nyanga, and 65 in Mutasa.

TABLE 5: SUMMARY OF DISTRICT SENSITIZATION MEETINGS, 2018

Objectives:

- To engage key influential leaders and decision makers to mobilize communities for the IRS program.
- To foster partnerships for successful adoption of use of DDT.
- To create demand for the IRS programme using DDT.
- To enable MOHCC staff and stakeholders access relevant information and key messages on DDT.

Key IRS Messages Discussed

- DDT is used as part of chemical rotation as recommended by the WHO as insecticide rotation helps to limit selection pressure.
- DDT is recommended by WHO for IRS.
- If DDT is applied and managed in line with WHO guidelines, it is safe.
- DDT is a relatively low-cost, effective insecticide with long-term residual effect on sprayed surfaces.
- Roles of stakeholders in IRS.

2.2.2.2 *WARD SENSITIZATION MEETINGS*

In each of the four districts, over 15 wards were reached with sensitization meetings, and more than 30 meetings were held per district (Table 6). More than 24,000 people attended the meetings.

TABLE 6: SUMMARY OF WARD SENSITIZATION MEETINGS, 2018

Objectives:

- To sensitize the IRS beneficiaries, emphasized the use of DDT.
- To foster behaviour change toward IRS to achieve the NMCP 95% spray coverage target (rooms).
- To sensitize participants on the significance of IRS and emphasize the importance of insecticide rotation in IRS.
- To engage the community in IRS by encouraging participation and program ownership by leveraging active grass roots IRS support structures like village health workers (VHWs) and community malaria committees in the four districts.

Key IRS Messages Discussed

- Myths and misconception about DDT
- Advantages of using DDT (longevity, potency, cost effectiveness, sustainability, residual effect)
- Homeowner preparation
- Road to malaria elimination
- Community engagement and participation
- Insecticide risks and poisoning

Outputs						
District	**Number of wards targeted for IRS**	**Number of Wards Reached**	**Number of Sessions Held**	**Population Reached**		**Total**
				Male	**Female**	
Mutare	29	21	39	2,341	4,539	**6,880**
Mutasa	23	23	46	2,678	4,620	**7,298**
Nyanga	27	21	119	2,472	4,307	**6,779**
Chimanimani	17	17	34	1,741	1,577	**3,318**
Total	**96**	**82**	**238**	**9,232**	**15,043**	**24,275**

2.2.3 IRS OPERATIONS

For the 2018 IRS campaign, the four districts were divided into two clusters: Chimanimani/Mutare and Mutasa/Nyanga. After consultations and discussions during a series of micro-planning meetings, spray operations began as scheduled on October 1, 2018, in the Chimanimani/Mutare cluster. For the Mutasa/Nyanga cluster, the spray start date was delayed by one week, to October 6, 2018, due to competing water, sanitation and hygiene (WaSH) programs. The spray campaign was scheduled for 63 days in three phases of 21 days each, with a seven-day break mid-way. This is substantially longer than the approximately 30 days scheduled to complete the campaign in the previous four years under AIRS/VectorLink support, as 180 SOPs were hired by the NMCP for the 2018 campaign while AIRS/VectorLink hired 457 SOPs each spray season to support the four districts. Seven wards (six in Mutasa and one in Nyanga) were not sprayed by the anticipated campaign close in December due to fuel shortages. However, with additional fuel support from VectorLink, spraying resumed at the end of January and was completed during the first week of February 2019. Despite these challenges, spraying was completed in a total of 63 days, but over a longer period of time as originally scheduled.

As the Manicaland 2018 spray campaign was led by the NMCP, the NMCP's indicators were used to measure achievement. NMCP calculates coverage as the number of sprayed rooms out of the number of targeted rooms, whereas VectorLink calculates coverage as the number of structures sprayed out of the number of eligible structures found by SOPs during the current campaign. The number of targeted rooms in 2018 was calculated using the number of eligible structures found in the 2017 campaign and multiplying by 2.2, the estimated number of rooms per structure.

The province did not meet the NMCP target of 95 percent for both rooms sprayed and population protected in the four districts. All wards were sprayed in all districts with the exception of Mutare where 22 of the 29 were sprayed – the seven un-sprayed district were not targeted in 2018 due to NMCP resource constraints. In addition, due to resource and fuel limitation only "hot spots", or areas with higher malaria burden, were sprayed in six targeted wards in Mutasa. Results of the 2018 spray campaign are shown in Table 7.

TABLE 7: MANICALAND 2018 ACHIEVEMENTS

District	Campaign Days	Target Rooms*	Sprayed Rooms	% Rooms Sprayed	Target Population	Population Protected	% Population Protected
Chimanimani	20	72,683	55,614	76.5	87,281	74,497	85.3
Mutare	43	138,420	120,354	86.9	158,544	158,492	99.9
Nyanga	31	84,616	70,587	83.4	109,847	97,762	88.9
Mutasa	27	96,249	82,484	85.7	111,614	105,534	94.6.
TOTAL		**391,968**	**329,039**	**83.9**	**467,286**	**436,285**	**93.4**

*Targets do not include the room targets for the seven wards in Mutare that were not sprayed but do include all rooms targeted for the six wards in Mutasa where only "hot spots" were sprayed.

2.2.4 POST-SPRAY ACTIVITIES

VectorLink will participate in the post-spray review and planning meeting for Manicaland Province. Participants will be drawn from all seven districts in Manicaland Province (Chimanimani, Mutare, Mutasa, Nyanga, Buhera, Chipinge and Makoni). Objectives of the meeting will be to:

- Review 2018 IRS campaign implementation, and performance including lessons learned and best practices, challenges, and opportunities.
- Analyze IRS data collection, cleaning, and reporting systems.

- Share experiences in strengthening IRS operations, EC, and entomological monitoring resulting in consolidated IRS operations and waste disposal management.
- Strengthen linkages for sustaining gains and developments in IRS operations through strong partnerships.
- Develop a preliminary 2019 IRS provincial implementation plan based on recommendations emerging from the 2018 campaign.
- Determine the level of support needed from the VectorLink project in the 2019 IRS campaign – whether to maintain, decrease, or increase technical and material support to the four former PMI-supported districts in Manicaland.

2.2.5 ENVIRONMENTAL COMPLIANCE

VectorLink provided provincial and district-level support to help the four districts meet environmental compliance standards.

2.2.5.1 PROVISION OF IRS STOREROOMS

Specific VectorLink support to IRS storeroom management included:

- Trained storekeepers and guards.
- Where storeroom space was insufficient, hired local business space for use as IRS storerooms. This was done at six of the eight campsites: Ngorima, Nyanyadzi, Bazeley Bridge, Chisuko, Sherukuru, and Nyautare.
- Refurbished the Rowa Health Facility for use as the Mutare District storeroom. Under PMI support, the AIRS provincial warehouse had been used as the Mutare District warehouse; however, with the transfer of the VectorLink warehouse to Marondera, a new location had to be selected.
- Printed and distributed hard copies of storekeeper performance checklists for performance monitoring.

2.2.5.2 ENVIRONMENTAL COMPLIANCE MONITORING

The project provided technical and logistical support on EC monitoring using paper-based forms. Hard copies of EC monitoring forms were printed and distributed to all campsites. The EC monitoring forms printed and distributed included homeowner preparation, storekeeper performance, morning mobilization, vehicle transportation, end-of-day clean-up, and storekeeper performance checklists.

2.2.5.3 MOBILE SOAKPITS FOR DDT LIQUID WASTE MANAGEMENT

The project provided technical support and training on IRS liquid (DDT) waste management using mobile soak pits (MSP). A total of 33 IRS supervisors were trained on how to assemble and use a DDT MSP. The training, supported by the VectorLink Zimbabwe team, NMCP, and Manicaland provincial leadership, was led by Peter Chandonait, Abt/VectorLink Director of Environmental Compliance and Safety. After the training, the team worked to assemble two MSPs at each of the eight campsites (for a total of 16 MSPs) for effective filtration of the DDT waste water. VectorLink procured all the materials for the assembling of soak pits including buckets, stands, foam rubber, and the granulated activated charcoal (GAC), which is a major component for waste water filtration.

To assess the effectiveness and efficiency of the DDT mobile soak pits in filtration and decontamination of DDT waste water, VectorLink worked with provincial staff to take periodic influent and effluent

samples of the waste water generated at the wash area and from the MSPs. Sixty-four samples were taken and will be analyzed at the Zimbabwe Government Analyst Laboratory (GAL).

2.2.5.4 ENVIRONMENTAL COMPLIANCE CLOSE OUT ACTIVITIES

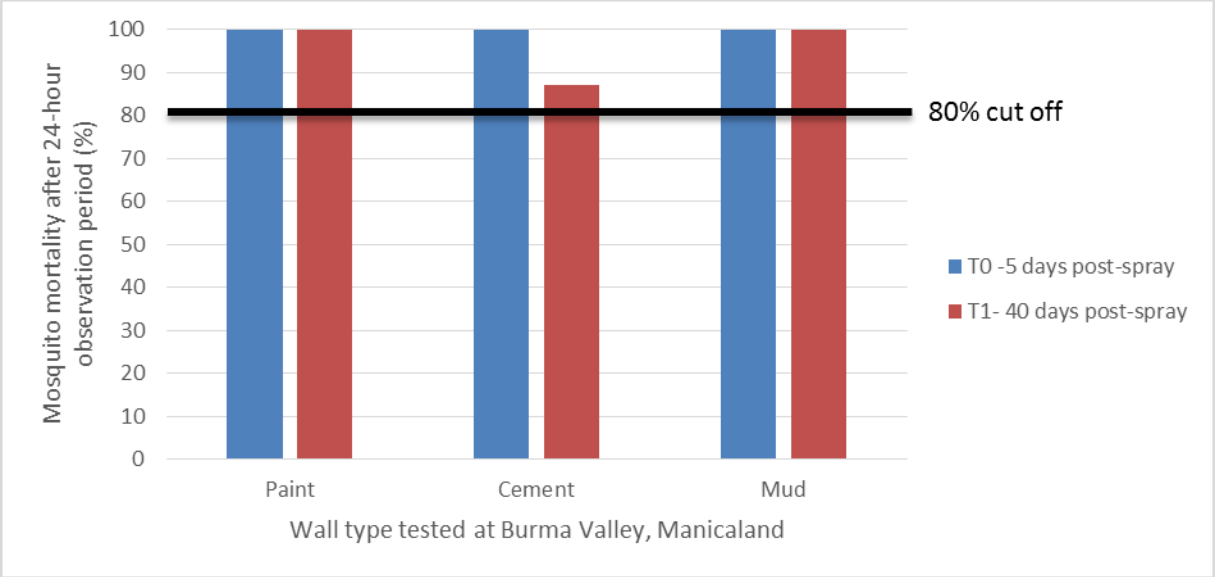
VectorLink worked with district and provincial staff to conduct several environmental compliance close-out activities post-IRS at all campsites used during the 2018 IRS season across the four districts. The activities included cleaning of the 20 IRS storeroom, the 16 soak pits, PPE retained for use during the 2019 season, tents, and the progressive rinsing drums as well as support in packaging IRS waste for transportation to the Hwange Incinerator for incineration. VectorLink provided each district with materials for proper sorting and packaging of IRS waste including plastic bag and tying strings.

2.2.6 QUALITY OF SPRAY AND RESIDUAL EFFICACY TESTS

Bioassay tests were done at Burma Valley site in Mutare, an intervention area sprayed with DDT on November 2, 2018, using the standard WHO protocol. Cone bioassay tests were done using a susceptible strain of *An. arabiensis* (KGB strain) in nine houses and two controls. The quality of spray was assessed through cone bioassays five days post-spray. The insecticide decay rate was assessed at T1, 40 days after spraying in December.

The results show that the application of insecticide was satisfactory at T0 (with 100 percent mosquito mortality on all three wall surfaces). At T1, mortality on all wall types met the minimum criteria of efficiency (>80 percent mortality) (Figure 1). Insecticide decay rate will continue to be assessed monthly until average mortality falls below 80 percent for two consecutive months. Nine sprayed houses, consisting of four cement, three mud and two painted, were selected for the cone bioassay tests.

FIGURE 1: SPRAY QUALITY AND RESIDUAL EFFICACY OF PIRIMIPHOS-METHYL IN BURMA VALLEY, MUTARE DISTRICT, AS MEASURED BY *AN. ARABIENSIS* (KGB STRAIN)* MORTALITY IN CONE BIOASSAYS, DECEMBER 2018



2.3 CHALLENGES/RECOMMENDATIONS

Overall, Manicaland has strong leadership and personnel who can plan and implement successful IRS operations, but it is hampered by limited financial resources. To ensure that gains made in the past years

with PMI support are not lost, the NMCP and provincial leadership should review challenges encountered in 2018 and identify how to address them in future campaigns (Table 8).

TABLE 8: SUMMARY OF CHALLENGES AND RECOMMENDATIONS

Challenges	Recommendations
Lack of airtime for communication for the IRS coordinators, team leaders, and data managers, and for sending data to the District Health Information System 2 (DHIS 2) platform.	The districts through the district health executive should provide airtime when the teams are operating in their districts.
Low stock of hard copy forms on support and supervision due to lack of smartphones	Manicaland Province should engage partners who can lend/assist them with smartphones for increased support and supervision instead of relying of paper forms.
Several of the specialty trainings previously supported under AIRS were not supported by the NMCP in 2018 including guards, storekeeper, drivers, and clinicians training.	VectorLink provided these trainings in the four-supported provinces of Manicaland.
The NMCP did not provide breakfast to spray teams which is a standard under VectorLink to ensure all SOPs eat breakfast. Failure to provide sometimes resulted in SOPs skipping breakfast to save time or money risking their health out in the field.	VectorLink to recommend that the NMCP include breakfast for spray teams in next year's spray campaign budget.
Inadequate sprayer spare parts (especially teflon washers) and PPE – specifically heavy-duty gloves, and respirators (N95) and face shields for SOPs, due to a lack of funds. In addition, spray pump strainers frequently collapsed, and strainer housing and pump cylinders cracked, which adversely affected daily performance because SOPs had to spend time fixing the problems.	The NMCP should better plan to procure adequate sprayer parts and PPE for the teams, seeking out additional funds to close any gaps.
Frequent sprayer blockages due to insolubility of DDT in water.	Manicaland should consider the purchase of continuous flow valves (CFVs) and Level 3 training and IRS camp meetings stress that continuous agitation method be used.
Rough terrain and hard-to-reach mountainous areas (especially in Chimanimani) targeted during the first phase of the campaign delayed spray teams, adversely affecting daily performance.	Slightly more days should be allocated to teams when they are camped in these hard-to-reach areas before moving to relatively more accessible areas.
Inadequate transportation for the spray teams. The teams used one lorry instead of two per campsite. Despite being serviced, two of the four lorries had frequent tire punctures and mechanical problems that resulted in downtime. The problem was compounded by fuel shortages in the country.	The NMCP should thoroughly check lorries before deploying them, and work to get them repaired/serviced as well as possible before spray operations begin.
Inadequate water supply at campsites such as Nyagundi and Chitakatira in Mutare District. The teams had to use water drawn from nearby protected shallow wells, which added to time for morning mobilization.	The MOHCC should ensure availability of an adequate water supply at all IRS camps before the spray program begins.

Challenges	Recommendations
There were delays in the payment of allowances for SOPs and supervisors. Third phase campaign allowances have not yet been paid due to interbank funds transfer challenges faced by the banks as well as bottlenecks in NMCP funding streams.	This is still a work in progress. The NMCP should look at funding streams and processes to assess bottlenecks to receiving funding in time to support operations.
Competing programs such as food handouts, agricultural inputs distribution, and funeral gatherings affected IRS. These activities resulted in more locked rooms as homeowners were absent from their homes when SOPs visited. The program rescheduled IRS in such instances.	The program should continue to work with local leadership to better understand competing programs and activities when planning for IRS. DEHOs and IRS coordinators will need to effectively coordinate with other key sectors, NGOs, and private sectors to obtain intelligence on competing activities planned in IRS areas.
Inadequate data collection tools, stationery, and chalks for SOPs' door marking.	VectorLink supplied the required forms, stationery, and chalk. VectorLink to work with the NMCP to better plan for procurement of supplies for spray teams.
Heavy rainfall affected spray performance as it disrupted IRS operations in some areas.	Callbacks were conducted to improve coverage.
Resource and fuel shortages did not allow for completion of spraying in seven wards in Mutare, six in Mutasa and one in Nyanga by the anticipated end of spraying in December.	VectorLink procured fuel to allow for completion of outstanding wards by February 2019. The NMCP will need to revisit resource allocations for the IRS districts to enable them to maintain and sustain IRS coverage in targeted districts, wards, and villages.
Province and districts do not have adequate capacity to sustain routine entomological surveillance	Provincial and district health teams should provide material and logistical support for entomological surveillance using the Global Fund budget.

3. Mashonaland East Pre-Spray Activities

3.1 Planning with Provincial and District Health Officials

In May 2018, VectorLink Zimbabwe began a series of regular planning and communications with the NMCP, and provincial and district health officials of Mashonaland East Province, with the final micro-planning meeting for the spray campaign in the two target districts (Mudzi and Mutoko) conducted during the second week of October 2018.

During these meetings, VectorLink Zimbabwe paid attention to the priorities and expected challenges of Mashonaland East provincial and Mudzi and Mutoko district authorities for the 2018 IRS campaign. VectorLink shared information about the geo-mapping exercise, needed insecticide, quality PPE, gender equity, storerooms, soak pits including MSPs, and IRS tools, such as supervisory checklists and operational data reporting tools, with health officials. New policies on travel safety were also shared. Together, VectorLink Zimbabwe and its government partners decided on timelines and modalities for hiring seasonal staff and supervisors, including dates for procuring and sending PPE and insecticide to the program warehouse in Marondera City and distributing the items to district warehouses and campsites. They also made decisions on dates for hiring vendors to provide lorries and breakfast, as well as for completing trainings and the start and end dates of the IRS campaign. Also discussed were medical examinations and pregnancy tests, the number of motorcycles required from the MOHCC for the information, education and communication (IEC) mobilizers ("warners") and the level of effort required to provide joint quality supervision and monitoring of the campaign.

3.2 Geo-Mapping Exercise

To improve the accuracy and reliability of baseline data of targeted structures for spray, the VectorLink project collaborated with the NMCP and Mashonaland East provincial health officials to conduct geo-mapping in Mudzi and Mutoko Districts. Digital Globe, a geospatial aid development company based in the United States, developed maps using satellite imagery and machine learning, which identified potential structures in both districts. These maps were created remotely and validated by a local consultant through a "ground-truthing" exercise. Teams of trained enumerators visited the field to validate whether structures identified in the satellite image were eligible to receive IRS. There were delays in conducting the ground truthing exercise which resulted in the activity happening concurrently with spray operations. Geo-mapping followed the spray calendar, with enumerators visiting wards in advance of spray teams. These data were then compared against structure-level information gathered by SOPs to determine areas where callbacks were required. If there was at least a 10 percent difference in the number of eligible structures found through geo-mapping and those reported found by SOPs, VectorLink conducted callbacks in those areas. Table 9 shows wards where callbacks were conducted using geo-mapping data. A total of 21 of the 46 sprayed wards received callbacks.

TABLE 9: WARDS WHERE CALLBACKS WERE CONDUCTED, 2018

Mutoko District	Mudzi District
Charehwa B	Chikwizo A
Nyamhanza B	Chikwizo B
Chiwore	Makaha
Chimoyo A	Shinga
Kawere	Nyamukoho
Chindenga	Mavhurazi
Mbudzi A	Mukota B
Gumbure Mutambwe	
Nyamuzizi	
Hoyuyu Lucky Dip	
Nyamukapa	
Nyamutsahuni	
Kabasa A	
Kabasa B	

Table 10 shows a comparison between eligible structures identified by the SOPs during spray operations and the number of eligible structures identified through geo-mapping. There was a 20% difference between eligible structures found by geo-mapping and SOPs. The structures missed by SOPs were dispersed throughout the districts. The discrepancy is likely because SOPs were using 2017 targets to plan and deploy spray operations so only focused on these targets.

TABLE 10: COMPARISON OF STRUCTURES IDENTIFIED BY SOPS AND GEO-MAPPING TEAMS, MASHONALAND EAST PROVINCE, 2018

District	2018 SOP-level Data	2018 Geo-mapping Exercise			Variance
	Total eligible structures found	Total structures found by geo-mapping ground-truthing	Eligible structures found by geo-mapping ground-trothing	Eligible rooms	% difference between SOPs and geo-mapping ground-truthing
Mudzi	63,314	138,918	74,408	111,885	17.5
Mutoko	61,935	178,655	75,927	120,845	22.6
Total	**125,249**	**317,573**	**150,335**	**232,730**	**20.0**

3.3 INSECTICIDE SELECTION

In 2016, the NMCP implemented IRS in Mudzi using pirimiphos-methyl, an OP insecticide, while DDT (an organochlorine insecticide) was used for the campaign in Mutoko. In 2017, a mosaic approach was used in both districts. In Mudzi, 41 percent of structures were sprayed with DDT and 59 percent with pirimiphos-methyl. In Mutoko, 79 percent of structures were sprayed with DDT and 21 percent with lambda-cyhalothrin, a pyrethroid insecticide. In alignment with the national IRM Plan developed in 2016, pirimiphos-methyl, an OP insecticide, was used in the 2018 IRS campaign in these two PMI-supported districts. Insecticide susceptibility tests performed by AIRS Zimbabwe in 2017 in Mashonaland East indicated that *Anopheles gambiae* s.l. is fully susceptible to both pirimiphos-methyl and DDT.

3.4 LOGISTICAL NEEDS ASSESSMENT

From July to September 2018, VectorLink Zimbabwe conducted an inventory of storage facilities, supplies, and materials required for the smooth and cost-efficient implementation of the 2018 IRS campaign. The inventory included field visits to the provincial and district warehouses, as well as all ward operations sites, to take stock of storage facilities and materials. The major activities carried out were:

- **Meetings at the national level:** The project held a series of meetings with the NMCP to discuss and give updates on IRS logistical arrangements, as well as existing and expected challenges. The arrangements included a spray operational plan, IRS commodity distribution plan, hiring of lorries and breakfast vendors, engagement of the NMCP and Mashonaland East Province to provide lorries and motorcycles, servicing of motorcycles, and joint field monitoring visits. The meetings also helped to clarify participants' roles and responsibilities, including provision of storage space for IRS commodities in government institutions, where possible, and venues for Level 3 training in the districts, as well as facilitating medical examinations and pregnancy tests.
- **Meetings at the provincial and district levels:** Several meetings were held with provincial and district health personnel to get their support in identifying and providing facilities for the storage of insecticides and other IRS commodities at operations sites. Meeting attendees agreed that the MOHCC would provide the project one room per operations sites at no-cost for the period of the spray campaign to store IRS commodities, including insecticides.
- **Quantification of IRS commodities:** IRS commodity needs were based on the number of structures provided by the NMCP, which was based on the number of rooms found during the NMCP-led spray campaign in the two districts in 2017. VectorLink provincial coordinators stationed in Mutare and Marondera, together with VectorLink's administration section, physically counted IRS commodities available in the central warehouse. The commodities were categorized into usable, usable after repairs, and unusable. The team used this information to quantify PPE, spray pumps, tents, and other supplies needed, and to develop a logistics distribution plan to dispatch locally and internationally procured IRS commodities from Harare to the provincial warehouse in Marondera and then to district stores and operations sites for the 2018 campaign.

3.5 Procurement of Internationally-sourced IRS Commodities

International procurement began in April 2018. This included procurement of 54,794 bottles of Actellic 300CS for the two districts, which was based on the number of structures targeted, as shown in Table 11.

TABLE 11: INSECTICIDE FORECAST FOR 2018 IRS CAMPAIGN

Number of Districts to be Sprayed	Number of Structures Targeted (A)*	Average Number of Structures Sprayed per Bottle (B)**	Stock Inventory Adjustment (C)	Buffer Stock @ 5% (D)	Insecticide Stock Leftover from 2017 (E)	Total Bottles of Insecticide Needed ([A/B]-C+D-E)
2	125,068	2.2	0	2,842	4,898	54,794

*Assumes 100% of structures sprayed by the NMCP in 2017 were to be sprayed in 2018.
**Based on the average number of structures sprayed per bottle in Manicaland 2015-2017.

Other international procurements included Hudson pump spare parts, gumboots, gloves, face masks, face shields, and IRS smartphones. Items from abroad were in good working condition and distributed to various operations sites before 2018 spray operations began. One exceptional challenge with international procurements was the IRS smartphones, which were not cleared on time due to unanticipated paperwork required from ZIMRA so spray teams instead had to use phones from the 2017 campaign.

3.6 Procurement of Local IRS Commodities

Procurement of local IRS commodities began in August and ended in early October 2018. It was an open and competitive selection process in compliance with USAID and Abt policies and procedures. The

VectorLink Zimbabwe procurement committee opened the bids and evaluated vendors using specifications listed in the advertisement; these included the ability to offer a competitive price, capacity to deliver within a reasonable time frame, and compliance with Zimbabwe company registration policies and regulations. The key services/commodities procured or hired locally were:

Area	Key Services and Commodities Sourced
Transportation	• 6 lorries (additional 2 lorries availed by MOHCC for a total of 8 in operation) • Five 4X4 vehicles for monitoring • 25 motorcycles for warners and supervisors • Vendors to service motorcycles • Vendors to service the MOHCC lorries
Operation Sites	• Rental of storage space for those campsites where MOHCC didn't provide space (procured for 7/8 campsites) • Materials and services for refurbishment/securing of IRS storerooms and soak pits • Vendors to prepare breakfast for the spraying teams • Vendors to fix and repair the water pumps and boreholes at some of the operation sites which included the purchase of inverters, electrical pipes, water tanks as well as fixing and repairing boreholes to alleviate the water crisis
Other Items	• Printing of M&E tools (data collection tools, performance tracker, error eliminator) • Service providers to handle mobile payments for spray teams • Cash-in-transit service provider to securely transport cash payments to vendors and spray teams • Network service provider to support mobile data services

Annex A provides more information on IRS commodities procured locally and internationally for use during the 2018 campaign.

3.7 Distribution of IRS Materials

A month prior to commencement of the 2018 IRS campaign, all PPE, equipment, and commodities that had been delivered to the VectorLink Zimbabwe office in Harare were transferred and placed in the provincial warehouse in Marondera. A week before the start of the IRS campaign, the project distributed the commodities to the warehouses in the districts and to the operations sites. Since these two districts (Mudzi, Mutoko) have more or less the same number of targeted structures, there was little variation in the materials distributed to each district.

3.8 Human Resources

The human resource requirements were grouped into three categories: 1) VectorLink staff, 2) GOZ/MOHCC staff, and 3) seasonal workers (SOPs, washers, guards, and storekeepers). The days for which the seasonal workers were hired ranged from 36 to 37. The government employees served as IRS coordinators, data managers, warners/community mobilizers, supervisors, team leaders, and pump technicians. The project worked with these officials for a maximum of 37 days. To strengthen IRS data management, the project hired a full-time M&E manager to directly support data collection and reporting, mHealth supervisory checklists, and SMS job aids in the field as well as monitor the geo-mapping exercise. The VectorLink IT consultant and other staff members conducted mHealth training. Efforts to support mHealth applications were complemented by the VectorLink partner, Dimagi, who provided remote trouble shooting to field challenges.

Table 12 shows the distribution of human resources by district and gender. The table excludes government officials who provided high-level supervision and technical expertise such as the PFO and PEHOs. A total of 385 staff (males 306; females 79) were engaged in various IRS positions during 2018 campaign. The majority were SOPs.

TABLE 12. POSITIONS ENGAGED FOR 2018 IRS CAMPAIGN, BY DISTRICT

Position	Mudzi		Mutoko		Total			% Female
	M	F	M	F	M	F	Both	
DEHOs	1	0	1	0	2	0	2	0
IRS district coordinator	2	0	2	0	4	0	4	0
Team leader	5	2	4	4	9	6	15	40
Field supervisor	20	8	15	13	35	21	56	37.5
SOP	103	9	85	27	188	36	224	16.1
Washers	3	2	4	1	7	3	10	30
Nurses/ Clinicians	5	3	6	4	11	7	18	38 .8
Pump technicians	2	0	2	0	4	0	4	0
Storekeeper	2	1	3	0	5	1	6	16.6
Guards	4	2	5	1	9	3	12	25
Mobilizers	11	0	11	0	22	0	22	0
Data managers	0	2	2	0	2	2	4	50
Drivers	4	0	4	0	8	0	8	0
Total	**162**	**29**	**144**	**50**	**306**	**79**	**385**	**20.5**

3.9 IRS TRAINING

Table 13 lists the types of training that VectorLink Zimbabwe conducted in 2018 to provide participants with the knowledge and skills that enabled them to effectively and safely implement IRS operations. For the training of SOPs, the project followed the NMCP's established three-level system of training, while for guards and storekeepers, it followed VectorLink project training guidelines. The provincial epidemiology and disease control officer, assisted by district medical officers and other senior clinicians, facilitated the insecticide poison management training.

Table 14 presents data on the people trained for all IRS positions in 2018.

TABLE 13. SUMMARY OF 2018 IRS TRAININGS:

Type of Training	Dates	Length (days)	Type of Participants	Description of Training
Level 1 training (National TOT)	20-24/08/18	5	PEDCO,PEHO, DEHO, PFO, IRS coordinators; personnel from other malaria stakeholders	Challenges observed during the previous IRS campaign, IRS targets and plans for 2018, budget and other resource requirements, insecticide management, community mobilization, spraying techniques, data tools and collection, support and supervision, EC issues and entomological monitoring, camp and personal hygiene, and communication channels
Level 2 training (Mashonaland provincial TOT)	03-07/09/18	5	Team leaders, supervisors, data manager	Handling of insecticides and spray pumps, spraying techniques and practicals, effective community mobilization, management of callbacks, daily targets, data cleaning, analysis and utilization, importance of checklists in IRS, gender integration, IRS reporting frequency, supervision of spray operations, the importance of EC in IRS, entomological monitoring and management of IRS resources
First aid training	07-09/10/18	2	DEHO, team leaders, supervisors, data managers,	Basic first aid techniques, management of fractures, management of snake, dog and insects bites, and basic first aid kit
Environmental compliance training	10-11/10/18	3	DEHO, team leaders, supervisors, data managers guards, storekeepers, drivers, pump technicians	Insecticede management procedures, spill management procedures,storeroom management, proper use of PPE
Guards, storekeepers, and drivers training	15-16/10/18	2	Guards, storekeepers, driversl	Roles and responsibilities of drivers, guards, and storekeepers, code of conduct, handling of insecticides (types) and PPE, insecticide poisoning signs and symptoms and first aid, spills response procedure, transportation of IRS commodities, firefighting theory and demonstrations, storeroom standards, stock management, and security of IRS commodities
Insecticide poisoning training	17-18/10/18	2	Nurses	Roles and responsibilities of nurses in IRS, chemical handling and safety, hazard analysis, hazard mitigation plans, management of pesticide poisoning, management of snake bites, and contingency planning
M&E training	19-20/10/18	1	PFO, DEHO, team leaders, supervisors, data managers	Overview of the IRS campaign, M&E, IRS M&E tools, EC monitoring indicators, data management and reporting deadlines

Type of Training	Dates	Length (days)	Type of Participants	Description of Training
mHealth training	19-20/10/18	1	PFO, DEHO, team leaders, supervisors, data managers	Familiarization with the smartphone, getting started with the CommCare software, opening the CommCare application on the phone's home screen, login to the application, diagram of the application and guidelines for data collection, navigating through the application, completing the supervisory checklists using the smartphone, registering information and answering questions, and adding comments to the checklist; SMS job aids
Mashonaland East Level 3 training (training of SOPs)	24-28/10/18	5	SOPs	Mixing insecticide, use of PPE, spraying techniques, dismantling and assembling of sprayers, trouble shooting, maintenance and cleaning of sprayers, spray targets, data collection tools and recording data, community information after spraying, and community mobilization

TABLE 14. NUMBER OF PEOPLE TRAINED, 2018

Categories of Persons Trained	Training on IRS Delivery				Other Trainings										
	TOT: Spray Ops		Spray Ops (including EC)		M&E		TOT: SBCC		Insecticide Poisoning Management		Drivers/ Storekeepers/ Guards		Total Participants		
Gender	M	F	M	F	M	F	M	F	M	F	M	F	M	F	TOTAL
Provincial Field Officer	1	0											1	0	**1**
DEHO/PEHO	2	0											2	0	**2**
SOPs			188	36									188	36	**224**
Team leaders			09	06									09	06	**15**
Data Manager					2	2							2	2	**4**
Washers			3	7									3	7	**10**
Transport Officer											1	0	1	0	**1**
Storekeepers											5	1	5	1	**6**
Nurses/ Clinicians									11	7			11	7	**18**
Pump technicians			4	0									4	0	**4**
IEC implementers, mobilizers							22	0					22	0	**22**
Field supervisors			35	21									35	21	**56**
IRS district coordinators	4	0											4	0	**4**
Drivers											8	0	8	0	**8**
Guards											9	3	9	3	**12**
TOTAL M/F	**7**	**0**	**239**	**70**	**2**	**2**	**22**	**0**	**11**	**7**	**23**	**4**	**304**	**83**	**387**
Total number of people trained to deliver IRS in target districts	**295 (232 males, 63 females)**														

Note: Positions highlighted in light blue are reported in the PMI indicator 1.4.1 "Number of people trained to support IRS in target districts."

3.10 Medical Examination of Spray Teams

One day before SOP training began, all SOPs and supervisors had a medical examination to assess their health and fitness to participate in the IRS campaign. District medical officers assisted by nurses under the supervision of the provincial epidemiology and disease control officer and provincial medical director, and in liaison with the DEHOs and PEHO, carried out the health examinations. The examinations consisted of a thorough routine physical check-up and a pregnancy test for all female workers including storekeepers and IRS supervisors. The pregnancy test was repeated just before the second phase of spraying began. None of the women tested positive.

The health examinations are required before the seasonal personnel are hired. The exams are documented in the district files in line with the Government of Zimbabwe's policies and procedures.

4. Information, Education and Communication Activities

4.1 Introduction

IEC is key to IRS programming because it focuses on education and information dissemination, thereby improving the uptake and preparedness of IRS and ownership by the beneficiaries. Cognizant of the importance of IEC in IRS, VectorLink Zimbabwe leveraged communication activities from past IRS campaigns implemented jointly by it, PMI AIRS, and other implementing partners over the years, especially in Manicaland. VectorLink worked with the project core partner, Population Service International (PSI), the NMCP, and provincial and district health staff in Mashonaland East to disseminate information on the 2018 IRS campaign. VectorLink Zimbabwe engaged PSI Zimbabwe to provide technical expertise on training and designing drama skits for roadshow implementation at designated sites in the two districts. IEC messages on IRS were transmitted through dramas, radio spots, posters, community meetings, and door-to-door mobilization, before and during the IRS campaign, to ensure beneficiaries were aware of the importance and benefits of spraying and ready to welcome SOPs for spraying. IEC messages were similar to those communicated in Manicaland (listed in Section 2.2.2 above) and include the importance of the IRS program, need to remove all goods from houses, need to provide adequate and clean water for SOPs to mix insecticide, proper management of dead pests following spray, and actions to take on occurrence of adverse events following IRS.

4.2 Sensitization Meetings

IRS sensitization meetings were conducted in three phases: provincial, district, and community level. These meetings targeted various stakeholders, especially influential leaders, to sensitize them on what they should and should not do prior to IRS and the role they were expected to play to ensure communities were ready for spray teams. Table 15 summarizes the number of participants at the provincial- and district-level meetings.

TABLE 15: PROVINCIAL AND DISTRICT SENSITIZATION MEETING PARTICIPANTS, BY GENDER, 2018

District	Females	Males	Total
Provincial	12	32	44
Mutoko	04	38	42
Mudzi	10	19	29
Total	**26**	**89**	**115**

4.2.1 Provincial IRS Sensitization Meeting

The provincial IRS sensitization meeting was held on September 21, 2018, at Hopefay Hotel in Marondera. Participants were drawn from various government departments, NGOs, and the private sector. The team agreed on several issues for the success of IRS program including:

- IRS sensitization meetings would be cascaded to districts.
- Districts were urged to cascade the sensitization meetings to ward and community levels.

- Stakeholders agreed to help mobilize local resources, such as firewood, for spray teams and to provide storage and boarding space.
- The MOHCC was urged to communicate IRS team schedules to all stakeholders in advance, to promote prepared households and minimize the number of locked rooms the teams would find.

4.2.2 District Sensitization Meetings

The Mudzi District IRS sensitization meeting was held on October 4, 2018, at the Mudzi Rural District Council office. The 29 participants were MOHCC and other government officials, local authorities, and NGOs. The Mutoko District sensitization meeting was held on October 5 at the Mutoko Rural District Council office and was attended by 42 stakeholders drawn from the same pool as in Mudzi District. In both meetings, stakeholders agreed that:

- Local leadership would identify and ensure availability of community volunteers to SOPs during implementation.
- Spray schedules would be communicated to all stakeholders and placed at community centers to increase access to the majority of beneficiaries.
- Roadshows would be conducted in all the 18 wards in Mudzi and 29 wards in Mutoko, with at least two roadshows per ward.
- Both districts agreed on the locations of all roadshows.
- The MOHCC and VectorLink would lead the support and supervision of the roadshow implementation.
- The stakeholders were urged to leverage any other meetings/gatherings to continue IRS mobilization.
- Environmental health technicians (EHTs) were urged to cascade the sensitization meetings to the ward level, conducting at least two meetings per ward.

4.2.3 Ward Sensitization Meetings

Local EHTs conducted community sensitization sessions during existing ward meetings. The sessions communicated similar messages as discussed in Manicaland sensitization meetings, with the exception of insecticide-specific messaging. The messages were similar to those communicated in Manicaland (listed in Section 2.2.2 above) and included signs and symptoms of malaria, route of transmission, preventative measures with emphasis on IRS, tentative dates for spray, type of insecticide to be used, roles of community leaders in IRS, roles of household owner /beneficiary pre- and post-spray, selection of volunteers to guide movement of SOPs in the villages, need to closely monitor SOPs in the field to minimize insecticide abuses, and need to report any un-sprayed structures.

4.3 Roadshows

To generate demand for IRS services, increase the proportion of the target population who understand that IRS is safe, and improve knowledge about how IRS helps to control and prevent malaria, VectorLink Zimbabwe held roadshows ahead of spraying in Mashonaland East Province. The activity was implemented jointly by the NMCP, MOHCC provincial and district staff, VectorLink Zimbabwe, PSI Zimbabwe, and Zimbabwe Christian AID (ZCA), an experienced roadshow drama group. ZCA has worked with PSI, the NMCP, and the MOHCC to put on roadshows to disseminate information on malaria. The drama group has nine members, one group leader, and a secretary.

4.3.1 Roadshow Training

The roadshow implementing partner training was done at Pumpkin Hotel in Mudzi on October 9-10, 2018. The training was facilitated by the NMCP, MOHCC provincial and district representatives, PSI Zimbabwe, and VectorLink Zimbabwe.

The training reviewed key messages and implementation modalities and allowed time for rehearsal. Some of the messages included malaria signs and symptoms, early treatment seeking behavior, the need to prevent malaria through IRS, type of insecticide to be used for IRS, tentative spray month, roles of community members before, during and after IRS, proper management of a sprayed structure, management of adverse events following IRS. The MOHCC staff who attended the training developed a schedule for the roadshow implementation.

4.3.2 Road Show Implementation

The road shows took place concurrently in each of the districts in October and November. (See photo.) One group with five people (4 males, 1 female) worked in Mudzi, while the other group with four people (3 males, 1 female) worked in Mutoko. Eighty-nine roadshows were conducted in the two districts; 36 in Mudzi and 53 in Mutoko. The roadshows explained the new insecticide that would be used and why a change was made, and they assured the beneficiaries of the safety of the insecticide. The roadshows' primary target audience was household heads; secondary audiences were community leaders and children. Dramas, music, dance, and quiz sessions engaged the audience and delivered key messages on IRS. Over 28,000 individuals attended the roadshows (Table 16).

TABLE 16: NUMBER OF PEOPLE WHO ATTENDED IRS ROADSHOWS IN MUTOKO AND MUDZI DISTRICTS, 2018*

District	Males	Females	Total
Mutoko	7,079	9,286	16,385
Mudzi	5,209	7,119	12,328
Total	12,288	16,405	28,713

*Count of audience members done at the middle of each session to approximate attendance.

Promotional materials were developed and handed out to community members during the roadshows. A total of 897 t-shirts, 897 hats, 100 event posters, and 20,000 IRS brochures were distributed.

MOHCC staff member in yellow overall responding to questions from the community members at the road show community mobilization at Dendera Rural Health Center in Mudzi District, 2018.

4.4 IRS RADIO SPOT

PSI Zimbabwe, in collaboration with the NMCP, Zimbabwe Assistance Program in Malaria (ZAPIM), and VectorLink, with ZAPIM funding, facilitated the development and production of an IRS radio spot to create awareness and demand for IRS among communities in the targeted districts in Mashonaland East and Manicaland. These 60-second spots reinforced the importance of participating in the IRS program and encouraged communities to be part of the program. A total of 33 spots were aired across the two districts, 11 on National FM, targeting Mashonaland East and Manicaland, and 22 on the Manicaland community radio station, Diamond FM.

4.5 PRODUCTION AND DISTRIBUTION OF IEC MATERIALS

Due to budget limitations, VectorLink Zimbabwe did not produce IEC materials during the 2018 campaign, but instead, it distributed IRS posters left from the 2017 campaign. Messages on the posters aimed to increase community acceptance of IRS and to explain the role of households during the campaign. VectorLink gave 200 posters to each of the five districts with the highest burden of malaria in Mashonaland East: Goromonzi, Murewa, Mudzi, Mutoko, and UMP, for a total of 1,000 posters distributed.

4.6 DOOR-TO-DOOR MOBILIZATION

As in previous IRS campaigns, warners visited every household in the spray areas the day before spraying took place to remind villagers of the upcoming spraying exercise, household preparation, and the overall IRS process. Following visits to each household, the warners marked all structures visited with chalk, noting the date of the visit, the initials of the warner, and if the structure was mobilized, refused mobilization, or was locked. In addition, the warners recorded in their notebooks the name of the head of the household, number of structures, and the population. The information was used by the IRS coordinators and team leaders to deploy spray teams the following day. The VectorLink Zimbabwe team and provincial and district MOHCC staff verified, where possible, that the number of households mobilized was adequate for each SOP to meet the following day's target.

To complement the door-to-door mobilization campaign, the warners made announcements and informed stakeholders at local Rural Health Centers, schools, and churches to ensure that the area(s) to be covered the following day were well sensitized. The warners used loudhailers around the communities to help key messages reach the majority of community members.

5. Implementation of IRS Activities

5.1 Spray Campaign

In 2018, VectorLink Zimbabwe sprayed two targeted districts (Mudzi and Mutoko) in Mashonaland East. The campaign covered 46 wards (all 18 in Mudzi; 28 of 29 in Mutoko) that the district health authorities prioritized for IRS based on the annual parasite incidence (API). The campaign was planned to start on October 29, 2018; however, the start was postponed to November 5, 2018 due to fuel and water shortages. The extra week gave the team time to stockpile fuel, fix water pumps, and ensure backup water supplies were available at designated camp sites. The spray campaign was scheduled to last for 35 days in two phases: 21 days for phase one and 14 days for phase two, with a seven-day break in between. However, political meetings, rains, food and agricultural input distribution programs, as well as other competing community activities, increased the number of callbacks needed, which extended the campaign to 36 and 37 days in Mutoko and Mudzi, respectively. Callbacks were revisits to an area by SOPs when spray coverage was less than 85 percent.

5.2 Phone-based IRS Supervision

Supervision was conducted at all levels to assess spray campaign compliance using a smartphone-based supervisory application. The application provided the five main supervisory checklists that were introduced in 2017 which assessed: (1) morning mobilization, (2) SOP transportation vehicle safety compliance, (3) household preparation and SOP performance, (4) storekeeper performance, and (5) end-of-day clean-up. Paper versions of the checklists were provided in case of smartphone system failure. Further details of these checklists are available in Annex C.

The VectorLink COP, ECO, operations manager, EC assistant, provincial coordinators, and the MOHCC PEHO, PFO, DEHOs, and EHOs were organized in supervisory teams that conducted regular IRS supportive supervision visits. The visits assessed EC, IRS operation monitoring, store inventory, and data collection and management. The teams visited all sites each day to assist spray teams to ensure full compliance, and to identify on-site problems and solve them when possible. Each supervisor was given a smartphone loaded with IRS supervisory checklists and the target number of checklists by type to be completed by each supervisor. The mobile checklist completion rate ranged from 83 percent for morning mobilization inspections to 100 percent for the end-of-day clean-up supervision. In the morning, every supervisor would also fill in an SOP Health Check form to ensure his/her SOPs are fit for the day. Only in a few cases did the supervisors have to take action, such as referring a sick SOP to the nearest health center or arranging a period of rest or lighter duties at the camp depending on severity of the case.

Team leaders and supervisors also closely observed spraying procedures and techniques and filled out the phone-based Directly Observed Spraying questionnaire to report findings. The most common error observed was minor leaking of old sprayers (25 percent (139/554) of all errors). Any contaminated soil and mutton cloth used for hard surface clean-up, resulting from leakage, was disposed of in accordance with the PMI BMP.

Joint supervisory field trips were conducted not only with the NMCP, and provincial and district MOHCC staff, but with PMI VectorLink home office team members as well as PMI Zimbabwe and Washington (Table 17). The short-term technical assistance visits from PMI Washington and Zimbabwe and the VectorLink home office before and during the campaign enabled the Zimbabwe team to inform

them of the difficult operating environment and allowed an opportunity to discuss and explore options for resolving challenges arising from the deteriorating political and economic situation in the country.

The joint supervisory approach improved team building and collaboration and assisted in experience and knowledge sharing. The regular and consistent IRS monitoring and IRS campsite meetings enabled early identification of challenges and appropriate corrective action to be taken. Supervision teams comprised of supervisors and VectorLink country staff, made on-the-spot performance corrections wherever possible, which improved overall spray output. This monitoring also enabled the identification of good operational procedures and best practices (e.g., supervisors and team leaders to carry with them a few insecticide bottles to give to SOPs who ran out of insecticide over the course of the day), which were rapidly shared with other supervisors and team leaders, further improving IRS operations.

TABLE 17. SUPERVISION OF 2018 IRS CAMPAIGN

Level	Organization/Position	Roles and Responsibilities
National	NMCP, PMI, VectorLink Zimbabwe	Provision of policies, procedures, and strategic directions. Overall IRS monitoring and supervision. Provision of solutions to field challenges where possible.
Provincial	PEDCO, PEHO, provincial health services administrator, PFO, provincial health promotion officer, transport officer	Provision of policies, procedures, and strategic directions. Logistical arrangements, routine IRS monitoring and supervision. Immediate resolution of challenges where possible. Sharing spray experiences from other districts. Monitoring compliance in the spray teams and taking corrective action where deviation from the set standard is found.
District	District medical officers, DEHO, district health promotion officer, district health services administrator, EHO, IRS coordinators, team leaders, supervisors	Regular, consistent, and close IRS monitoring and supervision. Monitoring spray performance against district targets. Ensuring IRS coordinators, warners, team leaders, data managers, and supervisors remain focused. Addressing challenges encountered and escalating issues to province and VectorLink.

VectorLink Zimbabwe developed a matrix with daily inspection targets and instructed supervisors to submit electronic forms to the main system daily to ensure close observation of the campaign. This enabled quick response and timely resolution of any issues at the spray level, improving IRS performance in general. As capacity to effectively use smartphones was a challenge during the first year of the program inception in Manicaland, the project worked with the NMCP/Provincial Medical Director to identify supervisors with experience in using smartphones and ensure adequate practical application during the mHealth training to minimize challenges. More on the job training sessions will be done in 2019 to improve supervision of SOPs at all levels of IRS operations.

5.3 PHONE-BASED IRS JOB AIDS

In 2018, VectorLink Zimbabwe strengthened and maintained the SMS-based job aid messaging system used in previous years. It used the system to convey important notices and information to all SOPs, supervisors, team leaders, and IRS coordinators at least three times a week throughout the spray campaign in both districts. Examples of the messages were:

- All untreated eligible structures should be included on the daily SOP form.
- One of the project goals is to create a safe and stable environment for each employee, man or woman, to achieve the fixed objectives.

- Supervisors must carefully check the filled SOPs' data collection forms at the close of the day before submitting to the team leader.
- Community mobilizers (warners) should notify the communities to prepare a day ahead of the arrival of the spray team.
- Team leaders must carefully review and verify SOPs' and supervisors' forms before submitting to the next level each day.
- Good morning! Remember the spray target is 36 rooms per SOP per day. Thanks for the good job.
- Full PPE use remains mandatory for the duration of the spray operation.
- IRS district coordinator must fill two data collection verification (DCV) forms per day

The VectorLink Zimbabwe team and other supervisors closely monitored the receipt of the SMS messages through interactions with spray team members during field inspection visits. Most recipients continued to acknowledge that the messaging approach was helpful and improved their daily operations. However, some spray teams received messages late as their phones ran out of power following electricity blackouts.

Prior to the campaign, an expert from Dimagi, a VectorLink partner, conducted online refresher training for VectorLink Zimbabwe staff on the two mHealth tools, phone-based supervision checklists and SMS job aids. To troubleshoot field challenges, Dimagi participated in weekly follow-up conference calls with the VectorLink Zimbabwe staff.

5.4 LOGISTICS

5.4.1 IRS STORAGE AND INSECTICIDE STOCK MANAGEMENT

The Marondera warehouse was used as a provincial storage facility and served as a distribution center for the two districts, while district storage facilities worked as distribution centers for all IRS equipment and materials required at operations sites. In the absence of a short-term warehouse manager for the provincial warehouse, the VectorLink provincial coordinator managed the warehouse in addition to her routine duties. Storekeepers, under close supervision by the VectorLink provincial coordinators, managed district and campsite storage facilities to ensure appropriate distribution and tight supervision of IRS commodities at all levels. Also, the COP, Operations Manager, and ECO monitored the management of IRS stocks at district and campsite levels.

The project inspected 11 operations sites that included storage facilities and campsites (one provincial store, two district stores, and 8 campsites) in the two districts. However, only 7 of the 8 campsites were used during the 2018 campaign. The project and MOHCC did not use one inspected campsite as previously planned due to water shortages. Among all sites used, the MOHCC provided the storeroom at one campsite at no cost to the project, while VectorLink Zimbabwe rented the remaining stores from private owners. The VectorLink Zimbabwe team closely supervised and monitored the performance of the storekeepers and provided guidance and on-the-job training on the spot, when required.

All storekeepers and the Provincial Coordinator at the provincial warehouse regularly and consistently maintained and updated records including stock cards and ledgers with notations for each item including details of transactions, quantities, dates, and destination. They tracked insecticide bottles at the operation sites and district stores by recording the number of bottles issued to each SOP every morning and compared it with the number of empty and full bottles returned by each SOP at the end of a spray day. All returned empty and full insecticide bottles were reconciled and documented on stock cards, with the records safely kept at local levels before being transported to provincial warehouse at the appropriate times and finally at the end of campaign for safe keeping and accountability. In addition, the

storekeepers read and recorded temperatures of the storerooms twice daily, in the morning and afternoon.

5.4.2 IRS VEHICLES

The project used eight lorries to support IRS operations, including two provided by the MOHCC and six rented from private transport companies. A third lorry was originally provided by the MOHCC but was unusable due to a broken water pump, which couldn't be procured in country. VectorLink Zimbabwe procured eight tires and tubes for the MOHCC lorries to make them usable. The lorries were used to transport PPE, insecticide, and other IRS commodities from Harare to the Marondera central warehouse, to district stores in the two districts, and to the district campsites. Lorries also transported spray teams from the campsites to the field and back, as well as empty OP bottles, cardboard boxes, and other IRS materials from the campsites to the central warehouse. The MOHCC also provided lorries to transfer contaminated solid waste to the incinerator at Hwange Colliery.

MOHCC provided 25 motorcycles that the project serviced and repaired for use; the motorcycles were fairly functional when the MOHCC turned them over to the project. Of these, 22 were used by warners for daily community mobilization and the others used for supervision.

The project also hired four 4x4 trucks to transport VectorLink Zimbabwe staff, NMCP staff, and provincial and district spray campaign supervisors to monitor IRS operations throughout the campaign. In addition to certification of all the hired vehicles by the Vehicle Inspection Department, VectorLink Zimbabwe with assistance from the MOHCC transport officer and senior drivers, conducted pre-contract physical inspections of the vehicles for compliance, and the MOHCC senior driver and transport officer road tested them. Where needed, the private vendors were asked to modify the vehicles to ensure that they were safe for transporting spray teams, IRS equipment, and insecticide. In some cases, VectorLink Zimbabwe provided fuel for district MOHCC vehicles to strengthen routine supervision and close monitoring of the campaign. In some instances, the MOHCC provincial office provided vehicles and fuel for provincial supervisory teams.

5.5 IRS PAYMENTS

The Zimbabwe Central Bank Governor announced the monetary policy statement on October 1, 2018. The policy statement required corporations and individuals to open Nostro Foreign Currency Accounts (FCA) that separated the United States Dollars accounts from the Bond Notes accounts. The policy statement caused a crisis in the banking sector. The project bank, along with other banks operating in Zimbabwe, refused to transfer funds to other banks, and though the project had used the electronic transfer channel since 2014 to 2017 to pay SOP allowances, it was rendered useless. The project had to withdraw cash from the bank on a daily basis, under bank limits, to pay SOPs in United States Dollars. By the end of the IRS campaign SOPs had only been paid for the first 10 days of the campaign. The rest of the payments were made at the end of February for Mudzi district and by the end of March 2019 for Mutoko district teams.

Due to this bank crisis and related cash shortages, many vendors could not be paid on time; however, as of mid-February, the banks had approved a channel for interbank transfers so VectorLink was able to clear outstanding payments. The fuel crisis which occurred as the IRS campaign got started seriously affected fuel supplies for IRS operations as team members spent a lot of time in fuel queues and were compelled to travel long distances to secure fuel supplies from Harare and back to Mutoko and Mudzi. Given these challenges, the VectorLink Zimbabwe team managed the following activities to support effective and efficient financial processes, to the greatest extent possible:

- Timely on-boarding of seasonal staff (SOPs, washer, storekeepers, security guards, and breakfast caterers), obtaining signed copies of associated documents for the records.

- The VL team procured fuel at a Direct Foreign Import (DFI) facility in Harare which only transacts DFI coupons, which have to be bought in USD cash. In addition, the team procured drums for fuel storage to ensure there was enough to last the campaign.
- Established and maintained log sheets for the IRS lorries, trucks, and motorcycles.
- Maintained daily registers for the SOPs, washers, lorry drivers, security guards, storekeepers, and breakfast caterers that were approved by the IRS coordinators on a regular basis. The VectorLink team verified the daily registers maintained by the breakfast vendors at each campsite to establish the number of people provided with food. For the spraying teams, the verification of registers informed the basis of establishing the number of days to be paid to the respective team members.
- Signed fixed-price contracts with lorry and trucks service providers. For the lorries, 50 percent was paid in cash locally and the balance was paid by the home office. The motorcycle repairs and riders' suits were paid from the home office. The project made the final payments only after vendor log sheets had been verified and reconciled for both lorries and 4x4 trucks.

All payments were verified and approved by the VectorLink Zimbabwe finance and administration staff and the Chief of Party.

5.6 Cost-efficiency of Spray Operations

- Out of eight lorries used for spray operations, MOHCC provided two lorries and VectorLink Zimbabwe hired six lorries through a competitive bidding process. Only two vendors responded to the call for a cost proposal. Before the final selection of vendors, the VectorLink team negotiated with the service provider and managed to reduce the daily rate from $315 to $290, which was lower than the $350 daily rate included in the 2018 approved budget.
- VectorLink Zimbabwe also negotiated down the price of the five 4x4 trucks that were used by the supervisory teams to monitor IRS operations. The daily rate approved in the budget was $130 but the project negotiated this to $120 per vehicle for the Mutare 4x4. The approved daily rate budget for the Harare-based truck rental was $170, but the team negotiated it to $120.
- The spray teams completed all callbacks to locked houses before moving from one campsite to another which saved time and transport costs.
- The project received 25 motorcycles from MOHCC which only needed to be repaired for use during the campaign. Repairs were cheaper than renting them from private sector or buying new ones.
- The provision of two lorries by MOHCC helped to reduce the rental costs of IRS operations.
- The project negotiated cheaper rates at some of the hotels in both districts for the supervisory staff. The approved budget indicated $189 per day but the project team at most paid $153 for lodging and per diems per day.

6. Post-Spray Activities

6.1 Inventory Assessment And Demobilization

Following the completion of the spray campaign, the project team moved all IRS commodities from the campsites to the district storerooms in Mudzi and Mutoko where a final district inventory was conducted. During the inventory, commodities were inspected, counted, and categorized into usable and unusable. Items identified as unusable such as ripped coveralls that can't be mended and boots with holes were donated to SOPs after a supervised thorough cleaning.

Retrieved items included coveralls, gumboots, helmets, rubber gloves, satchels, mattresses, tents, and spray pumps. The coveralls were sent to a private launderer for further cleaning, decontamination, and disinfection, and then stored at the provincial warehouse for use next season. The project hired six part-time workers, who, under the supervision of VectorLink Zimbabwe staff and PHOs, cleaned all the spray equipment at the Dendera Campsite in Mudzi District, located close to the new project provincial warehouse. The insecticide bottles were separately transported to the provincial warehouse for safe keeping. The temporary storerooms at operation sites were thoroughly cleaned using soapy water when spray teams changed from one campsite to another during operations. All eight lorries used during the campaign also were cleaned with soapy water and jointly inspected by VectorLink staff, MOHCC officials, and transport providers. When all parties were satisfied, the lorries were returned to the owners.

6.2 Post-spray Stakeholder Meeting

VectorLink Zimbabwe, together with the Provincial Medical Director of Mashonaland East Province and the NMCP, will organize a post-spray campaign conference for provincial stakeholders. Participants will share feedback and lessons learned on the campaign, discuss tools used, share best practices, and exchange ideas and knowledge on improving operations in future campaigns. VectorLink Zimbabwe and the provincial/district health office will complete several post-spray IRS review and planning meetings and conferences with provincial and district health officials. It will hold separate community leader and community beneficiary meetings to gather feedback on spray operations and answer questions about the IRS campaign.

7. ENTOMOLOGY

7.1 BIOASSAY TESTS

The standard WHO cone bioassay method was followed to measure the quality of spray and insecticide decay rate of pirimiphos-methyl (Actellic®300CS) following the routine spraying of walls at Dendera (Mudzi) and Kaware (Mutoko). All villages surrounding the Dendera entomological sentinel site in Mudzi District were sprayed on November 5, 2018, whereas villages around the Kawere site in Mutoko District were sprayed on December 5, 2018. To assess the spray quality of the IRS application, bioassays were conducted within 24 hours after spraying followed by monthly tests at T1 and T2, where applicable. Teams will conduct further bioassay tests at the two sites at monthly intervals until mosquito mortality falls below 80% for two consecutive months. For testing, teams used susceptible *Anopheles arabiensis* (KGB strain) from the NIHR's insectary in Harare and from AU in Mutare. The airborne effect of the insecticide was assessed concurrently with wall cone bioassays in all the test houses at both sites. Ten rooms were tested at each site with wall types summarized in Table 18 below.

TABLE 18: SUMMARY OF VECTORLINK WALL TYPES TESTED WITH CONE BIOASSAYS IN MASHONALAND EAST, 2018

Wall Type	Number of Houses	
	Dendera	Kaware
Mud	2	4
Brick	2	0
Cement	3	3
Paint	3	3
Total	**10**	**10**

For the wall cone bioassays, ten unfed, two to five-day old female mosquitoes were exposed on the treated walls per cone. Three cones were randomly positioned per room at 0.5, 1.0 and 1.5 meters above the floor. Mosquitoes were exposed for 30 minutes, after which they were aspirated to a holding paper cup, provided with 10 percent sugar solution before recording the mortality after a 24-hour holding period. Knockdown rates were also recorded at 30 minutes and 60 minutes. Mosquitoes exposed to unsprayed surfaces were run concurrently as controls. Temperature and relative humidity were recorded during the exposure and subsequent 24-hour holding period.

To assess the air-borne or fumigant effect, bioassays were conducted in each room where wall cone bioassay tests were done. Ten, two to five-day old unfed female mosquitoes placed in one paper cup per room, were exposed for 30 minutes at the same time as the wall bioassay tests. The paper cup was placed on a wire support, designed so it was 10 centimeters from a sprayed wall and one meter above the floor. Mosquitoes were removed after 30 minutes and scored for knock-downs. They were then transferred to holding paper cups using a clean aspirator and provided with 10 percent sugar solution before recording mortality after the 24-hour holding period. Controls for the air-borne effect bioassay were conducted using a similar setup but in an unsprayed room. The airborne effect refers to the toxic effect that the insecticide is likely to have on targeted mosquitoes without contact. In this instance the team monitored the airborne effect until the mosquito mortality dropped below 20% at which point the toxic effect is considered insignificant for vector control.

The quality of spray was satisfactory with 100 percent mosquito mortality observed at T0 on all wall surfaces at both sites, except the mud surface in Kawere, where 99.2 percent mosquito mortality was observed 24-hours post-exposure. Mosquito mortality at Dendera was still at 100 percent on all wall four surface types two months post-spray (T2) Mosquito mortality at Kawere was 100 percent across all the three wall surface types at one month post-spray (T1) (Figure 2).

FIGURE 2: MOSQUITO MORTALITY OF SUSCEPTIBLE *AN. ARABIENSIS* (KGB STRAIN) IN DENDERA AND KAWERE: WALL BIOASSAYS TEST RESULTS.

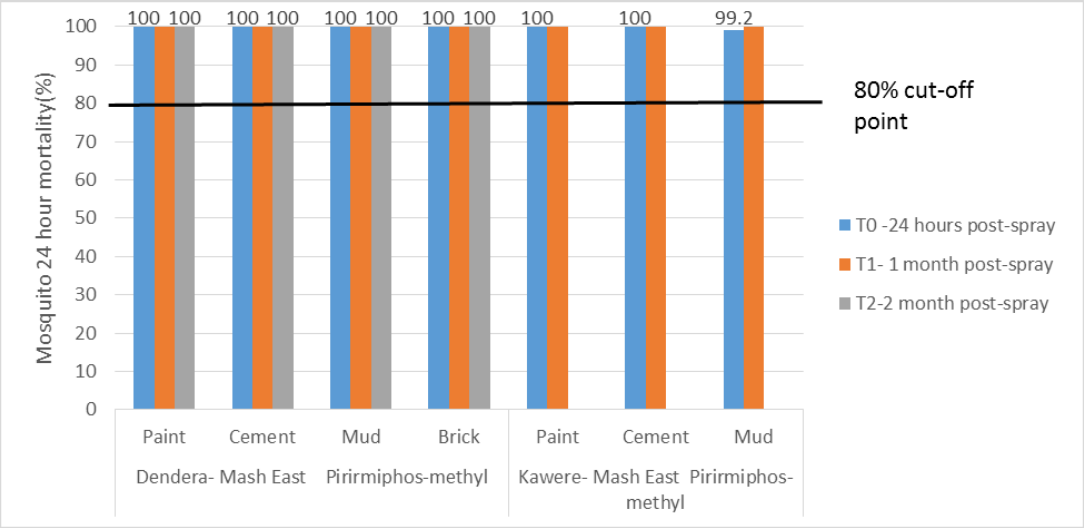
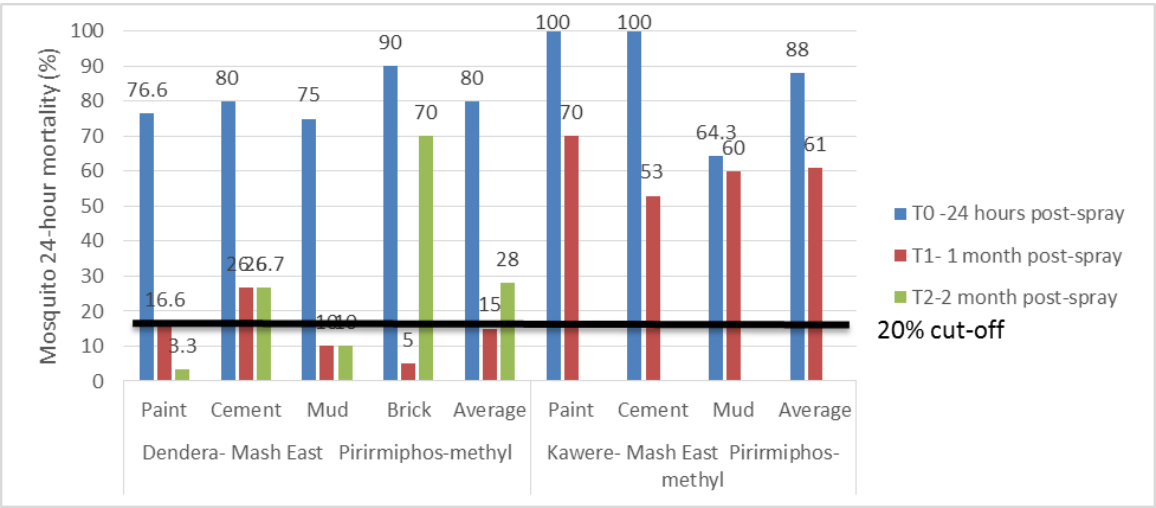


Figure 3 shows the mortality rate per wall type per month and per site of the airborne effect in Dendera in November (T0), December (T1) and January (T2) and in Kawere in December (T0) and January (T1). These results show a sharp decline in the average mortality from 80 to 15 percent across all the surface types in Dendera at T0 and T1, respectively, but increased to 28 percent at T2. Whilst at Kawere, the airborne effect declined from an average mortality of 88 percent at T0 in December to 61 percent one-month post-spray (T1). No mosquito mortality was recorded in the controls at the two sites during the tests, hence it was not necessary to use Abbott's formula.

FIGURE 3: MOSQUITO MORTALITY OF SUSCEPTIBLE *AN. ARABIENSIS* (KGB STRAIN) IN DENDERA AND KAWERE: AIRBORNE EFFECT BIOASSAYS TEST RESULTS.



8. ENVIRONMENTAL COMPLIANCE

8.1 PRE-SEASON ASSESSMENT

Successful implementation of IRS includes having in place EC procedures that ensure the safety of the SOPs and beneficiaries, and that protect the environment through appropriate use and disposal of insecticides and other waste. Prior to the start of any IRS program, an environmental assessment is conducted to inform the environmental mitigation plan.

8.1.1 SEA AMENDMENT

The Supplemental Environmental Assessment (SEA) for PMI-supported IRS in Zimbabwe for the period 2017-2022 was developed in 2017 after the one for 2012-2016 had expired. The new nationwide SEA, approved by USAID and PMI, was developed to meet the provisions of USAID 22 CFR (216) and reauthorizes WHO Prequalification-approved pyrethroids, carbamate, and organophosphate pesticides and expanded the authorization to the use of DDT, chlorfenapyr (when listed by the WHO Prequalification Team), and clothianidin. Two months before spray activities began, the project submitted the SEA amendment which was approved to authorize the use of clothianidin/deltamethrin mixtures for IRS in all areas of Zimbabwe and for PMI to provide support to the Zimbabwe NMCP in the use of DDT for vector control in Manicaland.

8.1.2 PRE-SEASON ENVIRONMENTAL COMPLIANCE ASSESSMENT (PSECA)

The 2018 PSECA was conducted from 18 to 22 June 2018 by two teams with each team covering one district. The teams comprised representatives from VectorLink Zimbabwe (ECO, Provincial IRS Coordinator), the PEHO office, and DEHOs from the two districts. Data were collected through observation and inspections of various proposed IRS campsites. Also observed was the general geographical environment of the proposed spraying areas checking on their accessibility during the spraying and highlighted above. The smartphone-based VectorLink environmental compliance form on ODK was used to record the data.

The broad aim of the PSECA was to assess the level of IRS preparedness for 2018 in the two PMI-supported IRS districts in Mashonaland East Province. Specifically, the objectives were to:

- Identify the locations and the physical conditions of sites proposed for storage of insecticides and other materials to be used for IRS
- Assess the availability and operational state of soak pits and wash areas at the proposed campsites
- Identify the most appropriate sites for soak pits, latrines and bathing facilities at the proposed IRS camps
- Identify important geographic challenges between campsites and targeted spray areas that are likely to affect spraying (hazardous crossings of water bodies, questionable bridges, flood-prone areas, etc.)

The following campsites and storerooms were inspected during the period under review (11 including two district stores and a provincial warehouse):

- **Mutoko District:** Chindenga, Kawere, Kapondoro, Jani/ Nzira and Mutoko District storeroom

- **Mudzi District**: Makaha, Suswe, Dendera, Shinga and Mudzi District storeroom
- **Marondera provincial warehouse:** Marondera City

Table 19 summarizes the major findings of the 2018 PSECA inspections by districts and the actions by VectorLink to ensure IRS operational facilities were in compliance with BMP requirements.

TABLE 19: SUMMARY OF 2018 VECTORLINK PSECA FINDINGS AND REMEDIAL ACTIONS

District	Finding	VectorLink Action
Mutoko	• 4 (100%) of the IRS campsites had dilapidated soak pits which needed replacement. • 1 (25%) of the IRS campsites had adequate water supply from nearby boreholes - Kapondoro, Kawere and Chindenga required repairs to the existing water supply facilities. • 4 (100%) of the IRS campsites had no latrines and bathing facilities for use by spray teams. • 5 (100%) sites had no storage facilities including the district Hospital for IRS commodities.	• Designed plans for establishing soak pits, latrines and bath facilities to facilitate standardization of structures at camp sites. • Provided new permanent soak pits at all the 8 campsites • Worked to repair water supply facilities and provide water tanks at those campsites without adequate water supply. • Demonstrated provision of soak pits, latrines and bathing facilities to a team of selected EHTS and DEHOs who were to assist in the supervision of construction work. • Worked with Suswe Health Center committee to provide additional fuel for the water pump to ensure constant supply of water to the campsite. Shinga campsite was not used due to persistent water supply issues. • Identified storerooms from the private service providers and renovated them to be compliant with the BMP requirements • Provided 8 squat latrines with bathrooms for both genders at each of the campsites • Renovated two district-level storerooms for safekeeping of IRS insecticides and IRS commodities • The VectorLink ECO and the DEHOs in the two targeted districts then did a final certification of the campsites to ensure compliance with the BMP requirements before use by the IRS teams.
Mudzi	• 4 (100%) of the IRS campsites had dilapidated soak pits which needed replacement. • 2/4 (50%) of the IRS campsites had adequate water supply from nearby boreholes - Suswe and Shinga required additional measures to get adequate water. • 4 (100%) of the IRS campsites had no latrines and bathing facilities for use by spray teams. • 5 (100%) sites had no storage facilities including the district Hospital for IRS commodities	
Marondera Provincial Warehouse	• Warning signs were not provided • Barrier access to the premises was not provided.	• Provided danger warning signs • Additional fencing was provided around the VectorLink warehouse in addition to the fencing in place for the entire complex.

8.2 Provision of Wash Facilities and Storerooms

The project provided eight temporary latrines and eight bathrooms for use by SOPs at campsites facilities in both Mudzi and Mutoko Districts. Generally, in other districts of the country, it was noted that SOPs had to wait for a long time for their turn to complete bathing because of the limited number

of bathing facilities at IRS campsites. The ECO, in liaison with Provincial IRS Coordinators and DEHOS, worked with local communities and the EHTs to ensure the provision of the above mentioned 16 wash facilities (two per site), with separate facilities for men and women, at eight campsites.

The project also identified storerooms at eight temporary campsites, two district storerooms, and one provincial warehouse that were refurbished in line with the PMI's Best Management Practices guidelines.

8.3 Provision of Soak Pits

As for the 2018 spray campaign, the project provided new permanent soak pits in Mudzi and Mutoko Districts in Mashonaland East Province as the results of the PESCA had shown that these facilities either did not exist or were in a poor state of repairs at the proposed campsites. To standardize the soak pit design, the VectorLink Zimbabwe ECO in collaboration with the NMCP vector control officer, provincial environmental health officer's representatives, and DEHOS led demonstrations on how to establish new soak pits to EHTs and others VectorLink staff members. The demonstrations included a review of the design, siting, layout and project monitoring aspects. The ECO then worked with local district environmental health officers, EHTs and the provincial IRS coordinator to supervise the local community works who were involved in the establishment of soak pits at selected sites.

Permanent soak pits were then provided in both Mudzi and Mutoko with each district having four soak pits each. Each soak pit area was provided with a wash slab, fence, danger warning signs, gate, sprayer and laundry hanging lines. Local materials were sourced from the community whilst the other hardware was provided through the project international procurement process. Community members were engaged for the work to establish the above-mentioned facilities with technical support from ECO, Provincial IRS Coordinators and local EHTs.

8.4 Mid-season Environmental Compliance Assessments

The VectorLink ECO, operations manager, COP, provincial coordinator, EC consultant as well as the DEHOs visited all seven campsites to conduct EC assessments using supervisory checklists and address any gaps in compliance. Assessments focused on proper storage of insecticides, stock control and inventory management procedures, proper IRS effluent disposal, proper spill response procedures, pump maintenance, availability and usage of PPE by spraying teams, and home owner preparation. The purpose of the abovementioned assessments was to ensure the safety of the IRS workers, community members and the environment. In total, the supervisors observed usage of all seven permanent soak pits on a daily basis.

It was observed that during IRS operations implementation personnel adhered to some environmental and health safety requirements for IRS. Appropriate PPE was issued to spray personnel and others who would be exposed to insecticide though some shortages were witnessed in PPE for supervisors and washers. PPE included coveralls, gloves, boots, helmets, face shields, neck protection, and dust masks. Supervision by VectorLink staff and IRS supervisors ensured the continuous use of PPE by all affected personnel, though the issues of face shields was a challenge amongst SOPs and supervisors. During the second phase of the spraying program the majority of SOPs had challenges in the use of face shields as face shields had been scratched hence impairing visibility. Home owner preparation was another area where some of SOPs were found to be not fully compliant; however, some efforts were made to remedy the situation through increased supervisor – SOP contact. The team observed also that all IRS sites met the standards for IRS operations. Various EC monitoring activities as described in Annex B were done to mitigate against noncompliance incidences observed during the spraying.

8.5 POST-SEASON ENVIRONMENTAL COMPLIANCE ASSESSMENT

Post-spray EC inspections were conducted in February 2019 and the exercise involved officially closing out of all IRS campsites that were used during the 2018 season. The soak pits and storerooms at eight operations sites were cleaned and locked according to BMP standards. Also the soak pits were provided with specially designed soak pit covers to prevent unauthorized access to pits by the general public and animals.

8.6 INCIDENTS

No incidents or accidents were experienced during the period under review.

8.7 WASTE DISPOSAL

All solid waste materials will be disposed of in accordance with the PMI BMP. Five main forms of solid waste were generated during the 2018 IRS campaign:

- Empty bottles of Actellic 300 CS
- Empty cardboard boxes
- Used disposable respirators
- Used mutton cloth
- Well-washed, damaged gloves, boots, and plastic sheets

OP waste (empty bottles and uncontaminated cardboard boxes) at Mudzi Provincial warehouse were thoroughly sorted out according to levels of contamination before transportation to Harare for baling. The project engaged David Tebogo Investments who chipped and baled 39,235 empty OP bottles, bottle tops and uncontaminated empty OP cardboard boxes generated from the 2018 spray campaign at their Warehouse in Harare. The process was completed by the last week of February 2019. The company transported the baled and crushed empty OP bottles to their South Africa-based sister company during the first week of March for recycling into pallets, irrigation pipes, electrical conduits, and refuse bins. All uncontaminated cardboard boxes will be remolded into new boxes, tissue hardcore, tissue paper and covers for school workbooks. The VectorLink ECO, Provincial IRS Coordinators, one NMCP representative, and one representative from the Environmental Management Agency and the Provincial Medical Director's office observed the chipping and baling of the empty OP bottles in Harare. The project also sorted and packed the contaminated waste at Mudzi Provincial warehouse in preparation for incineration. A total of 750kgs of contaminated waste which included used disposable respirators, used mutton cloth, and contaminated empty cardboard boxes was then incinerated at Hwange Colliery incinerator during the first week of April 2019. The process was witnessed by Hwange District and Provincial Environmental Health Office officials.

The detailed environmental monitoring and mitigation report is attached as Annex B.

9. MONITORING AND EVALUATION

9.1 HYBRID M&E SYSTEM: STANDARD NMCP M&E METHODS WITH PMI VECTORLINK COMPONENTS

In 2014, under the PMI AIRS project, AIRS Zimbabwe, in collaboration with the NMCP, created a data flow document that helped to eliminate parallel M&E systems and ensured that district and provincial officials would review the data before approving and sending the data to the NMCP and VectorLink Zimbabwe. The diagram of this data flow, which continues into the VectorLink project, is presented in Annex D.

In 2018, data managers used camp-specific Microsoft Excel spreadsheets originally developed under the PMI AIRS project to enter and aggregate data at the end of each week during the IRS campaign. These spreadsheets were then collected and analyzed by the VectorLink Zimbabwe M&E Manager for weekly reporting. The data managers also submitted spray data in the weekly IRS summary sheet via the Frontline SMS system, which auto-integrated them into District Health Information System 2 (DHIS 2). Hard copies of spray data were sent to DEHOs, PEHO, and the NMCP after the data were submitted via Frontline, but these staff members had access to DHIS 2 so could view IRS data electronically at any time.

9.2 RESULTS OF 2018 IRS CAMPAIGN

All VectorLink Zimbabwe performance indicators are presented in an M&E Plan matrix in Annex E. VectorLink Zimbabwe sprayed 112,805 structures out of the 125,249 eligible structures found, resulting in a 90.1 percent spray coverage. The campaign protected 276,343 people (132,775 males and 143,568 females) in the two supported districts. This included 3,846 pregnant women and 43,789 children under 5 years old. A breakdown of the 2018 IRS campaign results by district is shown in Table 20. Target structures are the number of structures found during 2017 government-led operations and was used in planning for 2018 operations. A breakdown of the spray coverage and spray progress by campsite is shown in Figure 4 and 5. Spray coverage and progress were 90.1% and 90.2% respectively. Lorry mechanical faults which were experienced during phase one contributed to low spray progress in Chindenga/Kawere camp. The average structures sprayed per SOP per day were 13.6 against a target of 18. Tables 21 and 22 provide information on insecticide usage and ITNs respectively collected during the spray campaign. A total of 20,457 bottles of insecticide were left over. The entire balance will be used for the 2019 campaign.

TABLE 20. SUMMARY OF THE 2018 IRS CAMPAIGN SPRAY COVERAGE AND GEO-MAPPING RESULTS

District	Target Structures	Structures Found in 2018	Structures Sprayed	% of Structures Sprayed	2018 Geo-mapping	Population Protected					Overall Population		% of Population Protected
					Eligible structures found	Total	Males	Females	Pregnant Women	Children <5 Years	Total Found	Not Protected	
Mudzi	60,957	63,314	58,478	92.4%	74,408	146,868	69,397	77,471	2,105	24,118	152,926	6,058	96.0%
Mutoko	64,111	61,935	54,327	87.7%	75,927	129,475	63,378	66,097	1,741	19,671	144,144	14,669	89.8%
Total	**125,068**	**125,249**	**112,805**	**90.1%**	**150,335**	**276,343**	**132,775**	**143,568**	**3,846**	**43,789**	**297,070**	**20,727**	**93.0%**

TABLE 21. SUMMARY OF INSECTICDE USAGE DURING THE 2018 IRS CAMPAIGN

District	Structures Sprayed	Total Bottles Received	Total Bottles Used	Total Lost/ Damaged	Total Bottles Remaining	# of Days Worked	Avg # of SOPs	Avg # Str Sprayed/ Bottle	Avg # of Str Sprayed/SOP /Day	Avg # of Bottles Used/SOP /Day
Mudzi	58,478	31,409	21,151	0	10,258	36	111	2.8	14.6	5.3
Mutoko	54,327	31,318	21,119	0	10,199	37	113	2.6	13.0	5.1
Total	**112,805**	**62,727**	**42,270**	**0**	**20,457**	**37**	**224**	**2.7**	**13.6**	**5.1**

Note: The 2018 insecticide balance of 20,457 bottles has expiration date of May 2020.The project will use the entire balance for the 2019 IRS campaign. Ministry of Health and Child Care provided 3,703 bottles of leftover chemical from the 2017 IRS campaign. VectorLink used the provided chemical first as it was expiring in April 2019.

FIGURE 4: SPRAY COVERAGE MUDZI AND MUTOKO DISTRICTS, 2018 IRS CAMPAIGN

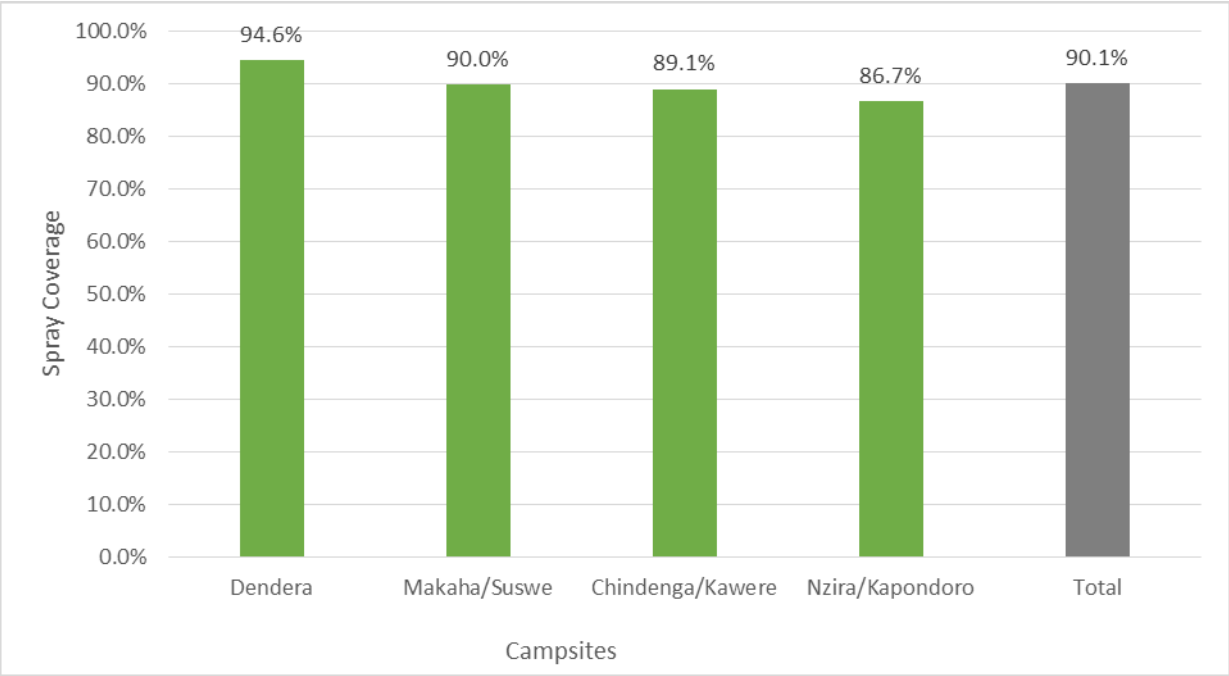


FIGURE 5: SPRAY PROGRESS MUDZI AND MUTOKO DISTRICTS, 2018 IRS CAMPAIGN

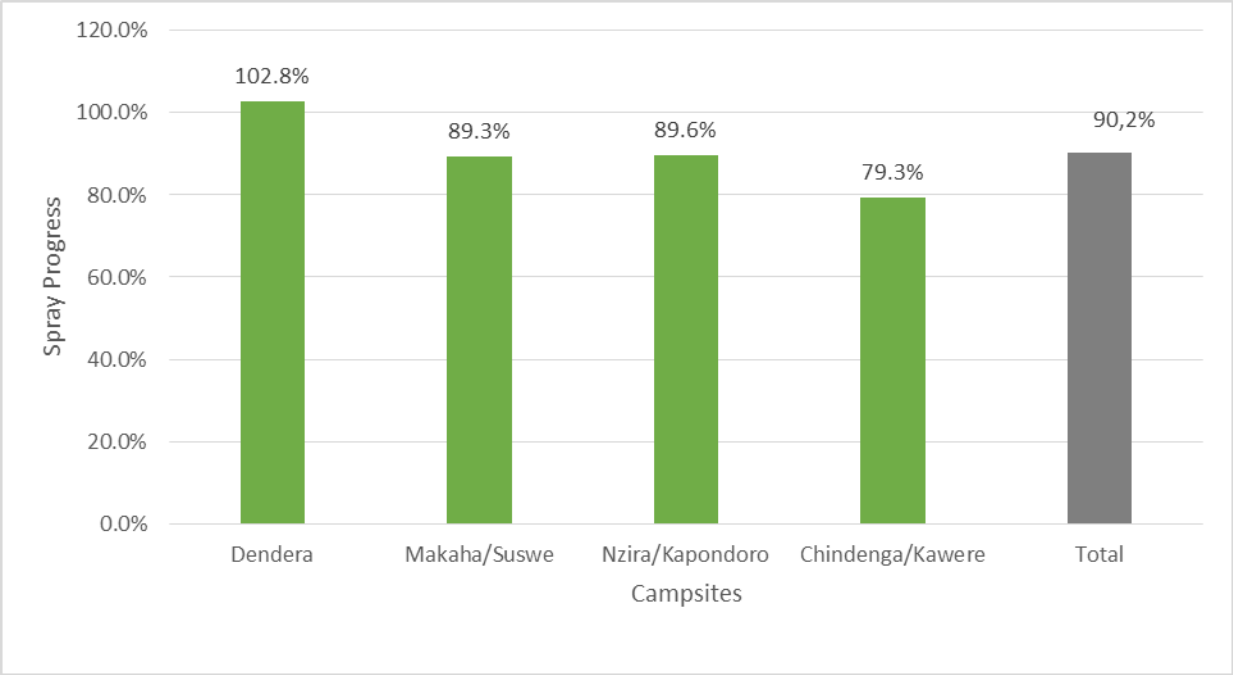


TABLE 22. SUMMARY OF ITN FINDINGS IN SPRAYED STRUCTURES IN TWO PMI SUPPORTED DISTRICTS, 2018 IRS CAMPAIGN

District	Total ITNs Found	Total Pregnant Women Found	Pregnant Women Sleeping Under ITNs	% Pregnan Women sleeping Under ITNs	Total Children <5 Years Found	Children <5 Years Sleeping Under ITNs	% Children <5 Years Sleeping Under ITNs
Mudzi	9,728	2,105	279	13,3%	24,118	3,673	15,2%
Mutoko	16,706	1,741	390	22,4%	19,671	4,735	24,1%
Total	**26,434**	**3,846**	**669**	**17,4%**	**43,789**	**8,408**	**19,2%**

Note: SOPs were instructed to collect data on pregnant women and children under five sleeping under ITNs for sprayed and non-sprayed structures. However, they only recorded the data for sprayed structures.

9.2.1 Reasons Targeted Structures Were Not Sprayed

Despite achieving spray coverage of 90.1 percent of eligible structures found in 2018, exceeding the minimum threshold of the 85 percent PMI spray coverage target, 12,444 of the found structures were not sprayed. Reasons for which structures were not sprayed included the following:

- Household members were out in the field, rather than the home, during the rainy season, when people prioritized farming operations.
- Heavy rainfall in some parts of the districts caused less time available for SOPs to be in the field to meet daily targets.
- Homeowners were not keen on preparing their homes for IRS during rain because they did not want their belongings to get wet, resulting in refusals. In some cases when homeowners didn't want to put their belonging out in the rain, belongings would instead be put in the kitchen, which in many cases was freestanding so still considered an eligible structure. For those freestanding kitchens, these then couldn't be sprayed and counted against coverage.
- By–elections and campaign for the Mutoko North Constituency Member of Parliament which were conducted from October 25, 2018 to November 25, 2018 affected spray performance as homeowners were not at home while they participated in campaign rallies and actual voting.
- Some of the tobacco farmers in Mutoko area did not want their homes to be sprayed because some structures were used as storage for tobacco. Agricultural extension officers had sent misleading information regarding the effect of the IRS chemical on their tobacco.
- The distribution of food handouts and agricultural inputs, such as seed, also resulted in locked structures as homeowners prioritized these activities over being available to receive spray teams.

An additional 25,086 structures (for a total of 150,335) were identified as eligible during geo-mapping ground-truthing, but not found (and subsequently not sprayed) by the SOPs.

9.2.2 Challenges to High-Quality Data Reporting

Some challenges with high quality data and reporting included:

- VectorLink worked with new data managers in Mashonaland East Province who were not experienced in using the VectorLink database. Despite having been oriented on the database, data entry errors were common during the first phase of the campaign. Regular supportive supervision and on-job training helped to resolve issues by the second phase.
- Some of the areas had limited network connectivity for the data managers to send the data on time to the M&E Manager.

- The Microsoft Excel Database would at times fail to add up figures from the data entry sheet into the summary sheets. The M&E Manager would manually add up the figures.
- Data were 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. Strengthening monitoring and supervision for the data quality audits at each level of data aggregation will help reduce transcription errors.
- To conform with the approved NMCP data flow, eligible structures were not assigned a unique IRS structure number. Therefore, data were not entered into a pre-programmed, validated database by structure (as in other VectorLink countries), making it difficult to verify spray coverage data. Geo-coding of structures by SOPs and the new VectorLink data management system planned for implementation in 2019 will address this challenge.

10. Capacity Building

Using the PMI VectorLink project capacity assessment framework developed under the two previous projects, VectorLink Zimbabwe conducted a country-specific assessment, with the NMCP to assess its IRS operations, procurement and logistics, EC, entomological monitoring, and M & E. The aim of the activity was to determine current capacity and capabilities of the MOHCC, NMCP, line ministries, district-level stakeholders, and private sector to assume responsibility for implementation of the various components of IRS in line with PMI's Best Management Practices guidelines and safety requirements, as well as to identify any gaps to improve management of IRS. Gaps identified included inadequate storerooms at all levels for IRS commodities, inadequate knowledge on EC, and unavailability of soak pits in the regions where NMCP is working throughout the country.

VectorLink project continued to build provincial and district capacity to plan, implement, and monitor and evaluate IRS operations. The project achieved this by exposing MOHCC staff to the innovations and tools developed and tested by the AIRS global project over the years. In 2018, VectorLink Zimbabwe built MOHCC staff and other malaria stakeholder capacity on campaign management and compliance, for example the project demonstrated the set-up of soak pits, latrines, and bath facilities at campsites to the NMCP and Mashonaland East officials. In addition, VectorLink entomologists continued to provide on-the-job training of Insectary Managers and/or Bioassay Focal Persons and Provincial Field Officers during routine entomological surveillance at established sentinel sites.

11. GENDER INTEGRATION

The PMI VectorLink project supported gender equality and female empowerment as independent development objectives and approaches to improve vector control activities. The Zimbabwe Gender Focal Person, trained in 2015, with support from the other members of the team, led project-level gender mainstreaming agenda for Zimbabwe. This was based on USAID's Gender Equality and Female Empowerment Policy and the VectorLink Project Gender Strategy. VectorLink Zimbabwe mainstreamed gender throughout its project operations, with a focus on women's economic empowerment through seasonal employment with the project. The Mashonaland East provincial coordinator was responsible for gender mainstreaming in Mashonaland East, with remote support to Manicaland, as needed. The new Manicaland provincial coordinator was responsible for gender mainstreaming in Manicaland. Specific action items are listed below:

- *Training*: To strengthen the support of gender equality in IRS, the project conducted gender integration trainings, which started in Level 1 training and cascaded to Level 2 and 3 trainings, and other trainings like drivers, guards and storekeepers training. Also, the VectorLink Zimbabwe gender focal persons trained provincial and district MOHC leaders on gender during provincial team meetings held in Mashonaland East and Manicaland Provinces.
- *Increased women's recruitment*: The VectorLink project continued to integrate gender and non-discrimination practices into the spray operations personnel recruitment, training of trainers, and community mobilization (Table 23). In 2018, VectorLink hired the highest proportion of women (21 percent) since AIRS started supporting IRS in Zimbabwe in 2014.

TABLE 23. FEMALES HIRED, 2014-2018

Province	Year	Supervisory Role				Other Roles					Total	% of Total Staff Hired
		IRS coordinator	Team leader	IRS supervisor	Total	Data manager	SOP	Washer	Warner	Total		
Manicaland	2014	0	5	11	16	0	2	0	0	2	18	5.6
	2015	0	1	26	27	1	10	9	1	21	48	14.2
	2016	0	8	32	40	1	22	20	1	44	84	15.9
	2017	1	7	33	41	1	29	19	1	50	91	13.7
Mash East	2018	0	6	21	27	2	36	7	0	45	72	21.4

- *Gender-friendly work environment*: The project provided well-demarcated accommodations and washing facilities for females and males at campsites, as well as provision of adequate and safe water supplies in most campsites. Also, the project provided feminine hygiene products to female seasonal workers to eliminate menstruation as a possible barrier to women's participation in the spray campaign.

12. Challenges and Recommendations

The following challenges, lessons learned, and recommendations were identified during the 2018 spray campaign.

Challenge	Solution/Recommendation
Heavy rainfall affected spray coverage in all districts. Homeowners were not keen on preparing their homes for IRS because they did not want their belongings to get wet, resulting in refusals.	In some cases when homeowners didn't want to put their belonging out in the rain, belongings would instead be put in the kitchen, which in many cases was freestanding so considered an eligible structure. For those freestanding kitchens, these then couldn't be sprayed and counted against coverage. The project needs to postpone operations for the day when there is heavy rains.
A large number of new and inexperienced SOPs had issues meeting daily spray targets, since they tend to spend more time at one household and take more time to trouble shoot in the event of their pumps failing to work, especially during the first week of the campaign.	The project will continue to work with provincial- and district level leadership to provide on-the job-training and supportive supervision to build capacity and confidence among spray staff with limited experience in IRS.
Some homeowners did not remove their belongings from their homes before the spray teams arrived, so SOPs had to spend a considerable amount of time assisting with the removals. This slowed the pace of spraying and kept SOPs from achieving daily spray targets.	The project needs to strengthen the training of SOPs, supervisors, and team leaders on importance and requirements for home owner preparation. SBCC should be strengthened stressing the roles of communities in IRS operations. Also, the project is looking into the option of hiring community members to help with household preparation. The project should consider re-engaging VHWs and community guides during 2019 IRS campaign to improve uptake of the program and increase their role and support in IRS mobilization activities. The project should consider incentivizing the VHWs and community guides for effective mobilization of communities and homeowners.

Challenge	Solution/Recommendation
Homeowners were not home at the time of spray resulting in lower coverage and increased callbacks (an additional one to two days needed in each district). Reasons for this include homeowners prioritizing farming operations with the onset of rain, agricultural and food distribution exercises, by-elections in Mutoko district, and gold-panning.	VectorLink rescheduled IRS in such areas in order to accommodate the other programs and callbacks were done where needed. The project should continue to work and consult the district and local ward and village leadership on dates targeted for other competing programs to enable IRS Coordinator and team to reschedule and avoid deploying SOPs in an area where there will be another program taking place on the same date.
Campsites had trouble supporting the water needed for spray operations. Specifically, inadequate water supply at Chindenga, Kawere and Kapondoro campsites in Mutoko district led to more time spent by spray teams in search of water at nearby boreholes.	VectorLink purchased the required electrical cable for Chindenga, inverter and electrical cable for Kapondoro, and a water pump for Kawere to rectify the problem with the water supply system, but due to MOHCC's long processes and procedures, installation of the accessories took longer than anticipated, delaying restoration of water at the affected sites. Four water tanks were also purchased to boost water supplies at camp sites in the two districts. The eighth campsite, Shinga was not used due to continuing unavailability of water
Break down of two MOHCC provided lorries affected spray team performances in both districts during phase one of campaign. The breakdown resulted in failure to deploy SOPs on scheduled time, thereby affecting the daily targets.	The project should hire all lorries for operations, rather than using those from MOHCC.
The deteriorating political and socio-economic environment in which cash and fuel shortages coupled with a three-tier pricing system in a USD denominated cash economy posed huge procurement and logistical challenges which sometimes resulted in delayed implementation of planned activities.	The launch of the 2019 IRS campaign in Mudzi and Mutoko had to be postponed from October 29 to November 5, 2018 to allow sufficient time to stockpile fuel and secure lorries and trucks for the campaign.
Inadequate cash for the payment of SOP allowances and delayed vendor payments due to the ongoing limitations in transacting and accessing cash from the banks.	VectorLink to continue to mobilize cash from the bank in-order to pay the outstanding balances for SOPs as soon as possible. The project continues to work with the Abt home office to get some of the vendor payments done from the States.

Challenge	Solution/Recommendation
As the project needed a higher number of supervisors in an environment with limited skilled personnel, some of the supervisors hired had limited experience in IRS, thus affecting IRS supervision.	VectorLink worked with provincial- and district-level leadership to provide on-the-job training and supportive supervision to help build capacity and confidence among the supervisors. For the 2019 IRS campaign VectorLink will engage with NMCP/MOHCC for more meaningful involvement in the selection and recruitment of supervisors, team leaders and IRS coordinators.
Although most of the supervisors hired indicated having some experiences in using smartphones, it was a challenge for some of them during the first week of IRS operation.	On-the-job training and supportive supervision were conducted. The project will also continue to conduct refresher training on the use of smart phones and supervision applications for all supervisors, team leaders, and IRS coordinators.
Delivery of new smartphones meant for use in the 2018 IRS campaign was delayed and the project continued to use old phones which had challenges detecting GPS signals and had shorter battery life, adversely affected the completion of supervisory forms as some batteries ran out of power during spraying.	In 2019, the project will use new models of smartphones which are more sensitive in detecting GPS signals and have longer battery life.
The absence of dedicated cadres for procurement, logistics and warehouse positions affected timely completion of planned procurement and IRS operations activities. The Mashonaland East Provincial Coordinator also served as the logistics and warehouse officer reducing the time available to monitor and support IRS operations during the campaign.	Consideration should be made to recruit and train logistics and procurement assistants as well as a short-term warehouse manager for the 2019 IRS campaign.
Electricity outages at Nzira led to the inability to charge phones for daily reporting and extended work days as spray team members had to share lamps to conduct daily de-mobilization efforts.	Purchased more power banks for use at campsites and in the field.
Geo-mapping was conducted a bit late so only partly useful for the spray teams.	VectorLink Zimbabwe to use geo-mapping targets in 2019 when data are cleaned, finalized, accepted and approved by all stakeholders to strengthen baseline data on targeted and eligible structures in respective districts.

Challenge	Solution/Recommendation
SOPs in Mashonaland experienced blocked continuous flow valves (CFVs), which would hold up spray operations as they took time to try and unblock the CFV. Sometimes the spray operators were able to unblock the CFV and in other cases had to move forward spraying without it, which could compromise spray quality.	For the 2019 campaign, VectorLink plans to provide at least two CFVs per SOP to provide a back-up for any blockages.

ANNEX A. INVENTORY OF STOCK AND QUANTITIES POST-SPRAY

TABLE A-1. IRS 2018 INTERNATIONALLY PROCURED ITEMS

Item	Balance from 2017	Quantity procured	Total	Quantity used	Quantity damaged	Quantity remaining
Pesticide						
Actellic 300CS	4,898	54,794	59,692	39,235	0	20,457
Coverall	1,208	0	1,208	722	486	0
Boots	693	144	837	353	340	144
Face Shield	65	295	360	360	0	360
Hand Gloves	504	0	504	504	0	0
Hard Hat	709	0	709	353		356
Respirators	0	10,000	10,000	10,000	0	0
Pumps and Accessories						
Hudson (10 ltr)	268	144	412	224	0	412
Goizper pump	122	0	122	0	0	122
Constant flow valve	3,500		350	350	0	0
Seal (16.5mmx9mmx2mm)	350		350	350	0	0

TABLE A-2. IRS 2018 LOCALLY PROCURED ITEMS

Item	Balance from 2018	Quantity procured	Total	Quantity used	Quantity damaged/ unusable	Quantity remaining
PPE						
Apron	37	10	19	10	9	0
Cotton Socks	0	706	706	706	0	0
Raincots	529	0	529	529	0	0
Face Shield Brackets	823	300	1,123	1,123	1,123	0
Calculator	11	25	36	25	11	25
Fire Extinguisher	14	0	14	14	0	14
Padlock	10	40	50	40	10	40
Tool Kit	6	4	10	4	6	0
Rinsing Cup	375	0	375	224	49	326

Item	Balance from 2018	Quantity procured	Total	Quantity used	Quantity damaged/ unusable	Quantity remaining
Spray Bag	640	0	640	224	416	0
Pvc Spread Sheet	0	30	30	20	0	10
Laptop	4	0	4	4	0	4
Spill Storage Clear Bags	100	200	300	300	0	0
Progresive Rinsing Drums 200l	19	0	19	19	0	19
Water Buckets	406	0	406	365	15	391
Spray Operator Matresses	707	0	707	365	0	707
Shovels	40	0	40	40	0	40
Spill Kits	0	0	0	0	0	0
Solar Lamp	6	12	18	12	6	12
First Aid Kits	14	14	28	14	14	0
Loud Hailers	30	9	39	22	17	22
Tents	81	0	81	81	0	81
Tarpaulin	7	0	7	7	2	5
Nylon Rope	4	4	8	4	4	4
Petrol Can 20littre	0	10	10	2	0	8
Scissors	1	0	1	1	0	0
Nozzles	0	155	155	155	0	0
Torchlights	284	0	284	0	284	0
Black Pvc Bins 50 Litres	4	0	4	4	0	4
Electricty Adaptors	20	0	20	20	6	14
IRS Consumables						
Towel	0	358	358	358	0	0
Mutton Cloth	20	235	255	245	0	10
Print Materials						
Team Leader Summary Books	0	2,220	2,220	2,220	0	0
Daily Spray Operator's Books	12	250	262	224	0	39
Spills Response Procedures	0	20	20	20	0	0
End-of-Day Clean-Up Checklist	0	100	0	100	0	0
Error Elimin/ Team Leader Card	0	100	100	100	0	0
Homeowner Prep. Checklist	0	200	200	200	0	0
Storerom Danger Warning Signs	0	20	20	20	0	0
Temperature Recording Sheets	0	40	40	40	0	0
Motorcycle Log Sheets	0	250	250	250	0	0
Vehicle Hire Log Book	4	15	19	15	0	4
IRS Mobilizer Book	0	50	50	22	0	28

Item	Balance from 2018	Quantity procured	Total	Quantity used	Quantity damaged/ unusable	Quantity remaining
A3 Stickers	0	7	7	7	0	0
Material Safety Data Sheets	0	10	10	10	0	0
Storekeeper Performance Checklist	0	400	400	400	0	0
Mobile Phone For Reporting						
Huawei Ascend Y511	59	0	59	59	59	0
Huawei Ascend Y5c	65	0	65	65	65	0
Nokia Asha	8	0	8	0	0	8
Huawei Ascend Y li	10	0	10	10	0	10

ANNEX B. IRS ENVIRONMENTAL MITIGATION AND MONITORING REPORT

Implementing Organization: Abt Associates
Geographic location of USAID-funded activities: Mashonaland East (Mudzi and Mutoko)
Period covered by this Reporting Form and Certification: 1 March 2018–28 February 2019

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
1a. Pre-contract inspection and certification of vehicles used for pesticide or spray team transport.	Pre-contract inspection and certification of vehicles was conducted in October 2018. Intial inspections by the Vectorlink ECO, Provincial Coordinator and Minstry of Health officials. Government of Zimbabwe Vehicle Inspection Department found defects on all vehicles during the intial stage which were later fixed to met all certification criteria. A total of 8 lorries were certified for the 2018 spray operations.	No outstanding issues	After repairs to the vehicles there was total compliance.
1b. Driver training	All 11 drivers, IRS supervisors, coordinators, and DEHOs were trained in Mudzi on October 15-16 2018. Topics included safety measures for transporting insecticides, accident and spills response procedures, and safe driving techniques. Drivers, guards and storekeepers were trained together.	No outstanding issues	There was total compliance.

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
1c. Cell phone, personal protective equipment (PPE) and spill kits on board during pesticide transportation.	All 11 drivers had cell phones as a pre-requisite to their vehicles being rented. All were given a set of PPE to use when transporting insecticides and/ or spray team members. Each vehicle used for the transportation of pesticides was equipped with a spill kit. A total of 230 morning mobilization vehicle inspections were conducted during the 2018 spray campaign. On 150 occasions, the vehicle had all required PPE and spill kits. The major non compliance incidences recorded included cases of missing certictaes and benches for vehicles that were supplied by the MOHCC but the situation was rectified during the course of the programme. Also two incidences of lorries carrying drums of diesel together with spray operators were observred and remedial action was taken.	No outstanding issues	
1d. Initial and 30-day pregnancy testing for female candidates for jobs with potential pesticide contact.	Before Level 3 training, 72 females (SOPs, washers, team leaders and supervisors) were screened for pregnancy during the last week of October 2018. A second screening was done before the second phase of IRS began in the last week of November.	No outstanding issues	No females were found to be pregnant during tests. All test records are available on file. There was total compliance.
1e. Health fitness testing for all operators	All 365 spray personnel candidates had the required pre-spray general physical/ medical examination on October 20-21 2018. All 365 spraying candidates passed the medical examination and were declared to be medically fit for training as spray team members. The medical examination included checking blood pressure, respiratory system, pulse, vision, ear nose and throat, chest condition, allergies to OPs and Locometer system. The exam was conducted by qualified Medical Officers from government health facilities.	No outstanding issue	All candidates passed the medical examination. The physical examination records are available on file.

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
1f. Procurement of, distribution to, and training on the use of PPE for all workers with potential pesticide contact.	Both international and local procurements for PPE were done on time. The PPE was received and distributed to all operations sites on time, before the spray campaign started. Only PVC approns were not procured in time as they were not readily available in country All candidates with potential pesticides contact were fully trained on correct PPE use.	PVC approns were not procured in time for the start of the spraying programme as weren't available in-country	There was some compliance.
1g. Training on mixing pesticides and the proper use and maintenance of spray pumps.	At district-level 3 SOP trainings, trainers demonstrated the proper mixing of pesticides including triple rinse of the Actellic 300 CS bottles. The trainings also demonstrated the proper use and maintenance of spray pumps. All supervisors, IRS coordinators, team leaders, SOPs, and government officials (field officers and DEHOs in the targeted districts) were trained, and a total of 365 people were covered.	No outstanding issue	There was total compliance.
1h. Provision of adequate facilities and supplies for end-of-day cleanup,	A total of 7/8 (88%) campsites were used. Each IRS campsite had an adequate storage facility that was either provided by the MOHCC or health centers, or rented from an individual at local busines centers. Each IRS campsite was provided with latrines and bathing facilities for both sexes of spray operators and supervisors. All facilities were compliant, and had the materials required for clean-up. A total of 320 end-of-day inspections were conducted and one episode of non compliance was noted and this was that of spray operator. Also, 365 SOPs and supervisors were issued soap for bathing.	No outstanding issue	Adequate water, barrels, wash basins, soap, and detergents were available at all times at each operations site. Washing facilities for both female and male SOPs and supervisors were provided at all campsites for total compliance. Shinga campsite could not be used due to water challenges.

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
1i. Enforce spray and clean-up procedures.	All clean-up procedures were inspected as scheduled. Sprayer clean-up procedures were done in the soak pits as required and supervised by the IRS coordinators every day throughout the spray campaign. Washing or bathing of spray operators were supervised by team leaders and field supervisors. ECOs, COP, DEHOs, operations managers and the IRS coordintaors supervised clean-up procedures when present at any operations site. A total of 320 end-of-day inspections conducted and some incidences of non-compliant during clean-up procedures were identified. Appropriate advice regarding identified defects was given to SOPs. The major defects noted during end of day clean-up, was those who were drinking while still in some PPE. There is however an issue of the modified boot bath which the project had designed for use by spray operators in removing grit which was said to leading to spillages around the soakpit areas , and it was then recommended that it should futher modified to manage spillages. Also it was noted that spray operators were not fully using PPE especially visors and face shields as they had developed scratches.	No outstanding issues	
2a. IEC campaigns to inform homeowners of responsibilities and precautions.	Homeowners were fully informed about their roles, responsibilities, and precautions mainly throughhouse-to-house mobilization. In addition, community meetings and discussions highlighted the roles, responsibilities, and precautions for homeowners before, during, and after their homes are sprayed.	No outstanding issues	There was ws some compliance though some improvements o home onwerr preparation are needed.

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
2b. Prohibition of spraying houses that are not properly prepared.	Nearly all structures (112,805) that were sprayed, were properly prepared. All SOPs, team leaders, and field supervisors were trained on how to prepare structures before spraying is done. Of the 7315 homeowner preparation inspections carried out, only 772 (10%) indicated that homeowners and SOPs were non-compliant with preparations of houses before they are sprayed. However obersvtaions during spraying noted that the community was not very willing to remove theire househiolds good before seeing a spray operator. This developmnt has a risk of not being fully prepared for the spraying or it forces the spray operator to assist in the preparation of households leading to the reduced movement of the spray operators or risking having a home being sprayed without full preperation.	No outstanding issues	There was some degree of compliance. However home onwer preparations needs to be improved
2c. Two-hour exclusion from house after spraying	SOPs reminded households to wait two hours after spraying before they opened the rooms to allow circulation of air. All 7,315 Homeowners were advised to bury dead insects and wash their hands with soap and water after cleaning.	No outstanding issues	There was total compliance.
2d. Instruct homeowners to wash itchy skin and go to health clinic if symptoms do not subside.	All 7,315 homeowners were instructed to wash with plenty of water and soap if any household member experienced itching skin and to visit the nearest clinic if itching persisted. No incidences of itchness were reported.	No outstanding issues	
3a. Packaging for pesticide shipments over water	No insecticides were transported over water in the PMI/VectorLink supported districts.	No outstanding issues	N/A
3b. Protection of bees/pollinators	Spraying was done indoors only and also at least 30 meters away from sensitive areas including bee hives.		

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
3c. Use of proper spray techniques	All 224 SOPs and 141 team leaders were trained on standard spray techniques during Level 3 training. This included emphasizing standing one meter away from the "sprayable" surface, keeping the nozzle tip 45 cm from the sprayable surface, and spraying at the correct speed. There was constant supervision in the field to ensure that SOPs adhered to all BMP standards. Also, 100/7,315(1.4%) incidences of spraying with inadquate PPE were recorded – the majority were due to missing flash lights, 226/7,315(3%) incidences on none adherence to overlap as prescribed by the BMP were recored though the type of the nozzles (8002E) which was being used did not require an overlap, and 143/7,315(2%) cases of spray leaks were observed and appropiate action was taken due the spraying.	There was a shortage of flash lights so not all spray operators had these in the first phase of the campaign.	The major issue noted was the type of nozzle (8002E) that the NMCP recommdends for use, This type of nozzle does not require an overlap. However our suppervision checklist based on the BMP requires an overlap of 5 cm hence it was regarded as being non compliant.
3d. Indoor spraying only.	All 224 SOPs sprayed only the indoors of sleeping rooms. This included inner walls, ceiling, and eaves of all sleeping rooms.	No outstanding issues	There was total compliance. The issue of spraying rooms used for both sleeping and cooking was discussed and priority was was given to the epidemilogical impact of spraying of those houses

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
3e. Maintenance of pumps	The 365 SOPs, supervisors, and team leaders were trained in pump maintenance during Level 3 training. Pumps were checked daily before use by the spray pump technician. During the supervision of SOPs, 143/7,315(2%) incidences of leakages were observed and the parts of pumps that were found to be faulty were replaced.	No outstanding issues	There should be at least one spray pump technician in each district to service the pumps on daily/weekly basis. Provision should be made for pump technicains to assess and service spray pumps well before the campaign begins.
4a. Choose sites for disposal of liquid wastes, including mobile soak pit sites, according to PMI BMPs.	All 8 IRS campsites were provided with soak pits for disposal of IRS liquid waste. All operations sites were inspected to ensure that they meet BMP standards before they were certified for use. Also, SOPs' washing slabs were provided at all campsites to facilitate their decent bathing.	No outstanding issues	There was total compliance.
4b. Maintain soak pits as necessary during season.	All 8 soak pits were established in Mudzi and Mutoko according to BMP standards. During the entire spray period, there was no need to do any form of renovation. All soak pits lasted throughout the spray campaign without any problems.	No outstanding issues	There was total compliance.
4d. Inspection and certification of solid waste disposal sites before spray campaign.	All combustible solid waste generated will be incinerated at Hwange Colliery, and empty bottles will be recycled by David Tebogo Investments formerly Go Green, Harare, in collaboration with its South African partner. These facilities are certified by Enviromental Management Agency. Incineration and recycling will be done in March 2019.	No outstanding issues	There was total compliance.

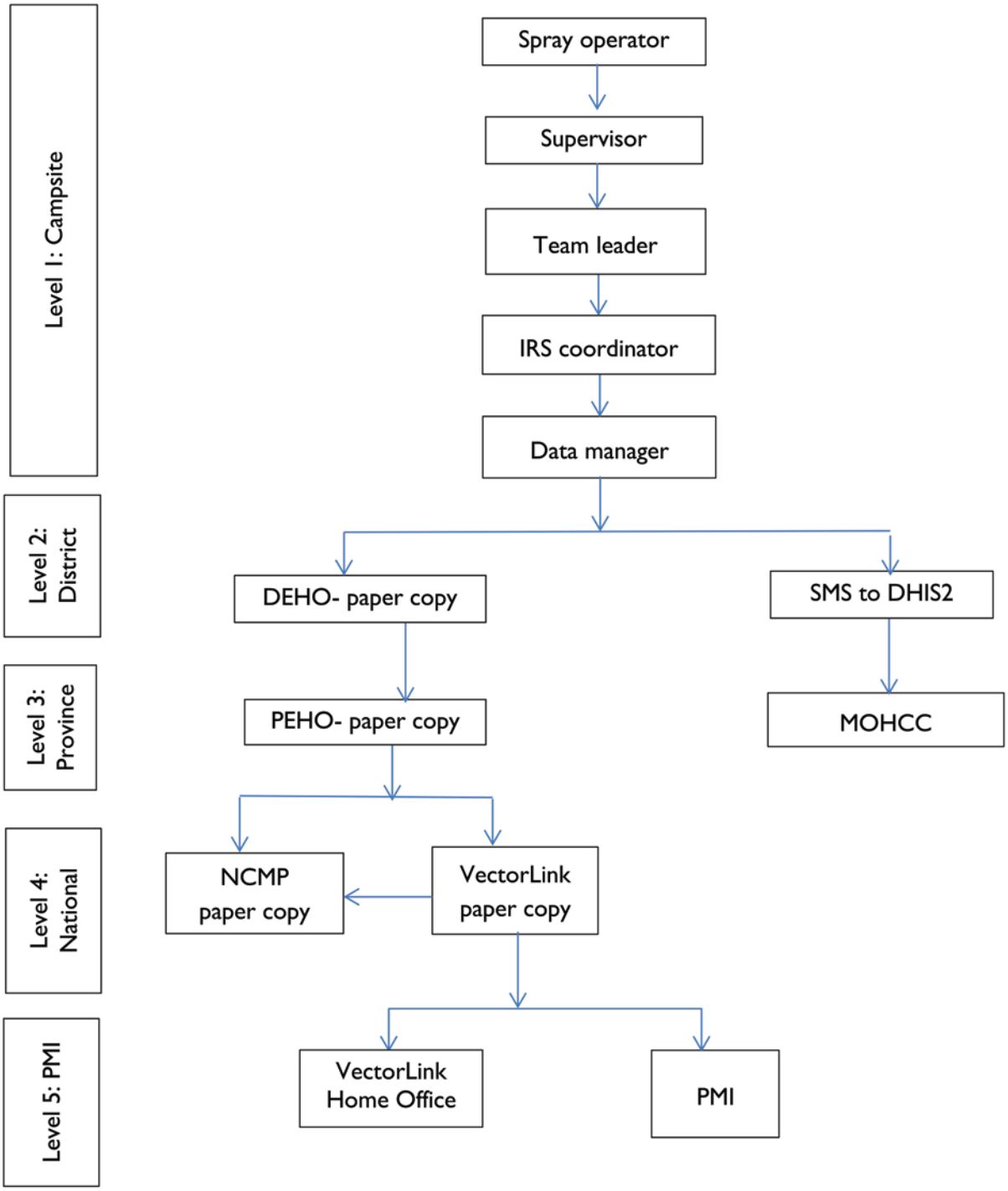
Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
4e. Monitoring waste storage and management during campaign.	All waste materials were stored and managed according to PMI BMPs during the spray campaign. Generally, there was clear labeling of sacks/ boxes for storing used nose masks, hand gloves, and all other waste that was generated. However, there was one instance where such labeling was not done. A total of 85 storekeeper performance monitoring visits were done duiring the course of the IRS season and only 24 incidences of non-compliance were noted in storage and stock management.	No outstanding issues	There was some degree of compliance.
4f. Monitoring disposal procedures post-campaign.	IRS waste from campsites was collected and stored at district storerooms at Mudzi and Mutoko. The waste will be sorted according to the level of contamination and type in preparation for recycling and incineration. Waste disposal incineration will be done at Hwange Colliery, which has already been inspected and meets WHO requirements for waste disposal. The ECO and MOHCC officials will monitor the post-spray campaign solid waste management procedures.		All solids including triple-rinsed empty Actellic 300 CS bottles will be baled at Mudzi/Mutoko . Recycling will be done in March 2019.
5a. Maintain records of all pesticide receipts, issuance, and return of empty sachets/bottles.	Records of all pesticides receipts, issuance, and returned empties were kept on stock cards with a backup in a ledger books at the regional, district, and operations site-level. A total of 85 storerooms inspections were done with 24 incidences of non-compliance noted. The non compliance incidences included the 5 cases of failing to regularly reconcile and balance stocks. Remedial action was done to prevent reoccurance of non compliance incidence identified in the field.	No outstanding issues	There was some compliance. We should consider engaging personnel with some previous stores management experience for the 2019 IRS campaign to safeguard security of assets and record keeping.
5b. Reconciliation of number of houses sprayed vs. number of sachets/bottles used.	In Zimbabwe, the average number of structures sprayed per bottle is 2.2. This indicator was calculated daily throughout the spray campaign to ensure that insecticides usage was consistent with number of structures sprayed.	No outstanding issues	There was total compliance.

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
5c. Visual examination of houses sprayed to confirm pesticide application.	Team leaders, field supervisors, senior supervisor, operations manager, and/or the COP performed a total of 7,315 spot checks in sprayed houses to verify/confirm insecticides application. This was mainly done through an observation checklist which included visual examination of sprayed walls, eaves, and ceilings.	No outstanding issues	There was some compliance.There is however the need to increase contact between spray operarors and their supervisors.
5d. Perform physical inventory counts during the spray season.	The ECO, Provincial Coordinator, storekeepers, operations manager, and COP performed regular inventory counts throughout the spray campaign across all the operations sites. Two improperly managed stocks were observed and the storekeepers were advised to regularly update their inventories. A total of 85 storerooms inspections were done with 24 incidences of non-compliance noted. Only 5 cases of failing to regularly reconcile and balance stocks were recorded.	No outstanding issues	All inventory stock cards are available and were used for final inventory reconciliation.

Annex C. Spray Campaign Supervisory Tools

Supervisory Checklist	Purpose and Person Responsible for Completing Checklist
Morning mobilization and transport	Aim: To ensure spray teams leave for the day with adequate and appropriate PPE and clothing, insecticide, and supplies, and are safely transported to the spray areas. Person responsible: ECO, Provincial IRS coordinator and IRS coordinators
End-of-day clean-up	Aim: To ensure spray teams correctly follow EC standard procedures for cleaning IRS equipment, and account for insecticide stocks and safe storage of equipment. Person responsible: ECO, Provincial IRS coordinator and IRS coordinators
Homeowner preparation and SOP performance checklist	Aim: To ensure that SOPs spray houses that have been correctly prepared for spraying and that they use correct spraying techniques. Person responsible: IRS field supervisors, team leaders, IRS coordinators, Provincial IRS coordinators EC consultant, operations manager, COP and ECO
Directly observed spraying	Aim: To ensure that SOPs are following the prescribed spray techniques and can show spray skills and achieve high quality of spray. SOPs have adequate PPE and properly use it. Person responsible: IRS field supervisors, team leaders, IRS coordinators, ECO, operations manager, and the VectorLink COP
Storekeeper performance checklist	Aim: To ensure that storekeepers are following the prescribed best warehousing practices and can account for stocks and equipment in their stores at any time. Person responsible: IRS coordinator, EC consultant, ECO, provincial IRS coordinator, operations manager, and COP

ANNEX D. VECTORLINK ZIMBABWE



ANNEX E: MUTOKO GEO-MAPPING RESULTS 2018

Ward #	Ward Name	Total Homesteads	Total Structures	Eligible Structures	Sprayable Rooms
1	Charehwa B	1,247	5,225	2,180	2,819
2	Chindenga	1,693	7,100	3,083	4,924
3	Charehwa A	1,570	7,053	2,749	4,085
4	Kawere	1,626	6,872	2,663	4,213
5	Nyamuganhu	1,595	7,099	2,899	5,003
6	Kabasa B	972	4,045	1,490	2,379
7	Kabasa A	1,437	6,305	2,384	4,288
8	Mbudzi B	1,255	5,519	2,355	4,248
9	Chimoyo C	897	3,774	1,530	2,450
10	Nyamutsahuni	1,267	5,960	2,522	4,068
11	Nyamukapa	1,391	7,753	3,210	6,059
12	Mawanga	1,232	5,462	2,355	4,083
13	Mbudzi A	1,292	5,741	2,270	3,964
14	Chimoyo A	1,757	6,850	2,840	4,248
15	Chimoyo B	1,198	4,712	2,160	3,379
16	Chiwore	2,117	8,334	3,581	6,394
17	Nyahunure	1,920	8,718	3,993	6,313
18	Nyamhanza B	2,695	11,100	4,522	6,621
19	Nyamhanza A	1,758	8,342	4,096	5,192
21	Gambure Mutambwe	147	1,175	526	963
22	Nyahondo	364	1,962	768	1,384
23	Marira	197	1,291	533	973
24	Matedza	222	1,135	444	688
25	Nyadire	2,103	10,283	4,706	7,989
26	Hoyuyu Mangondo	1,754	8,041	3,490	5,363
27	Hoyuyu Clearwin	2,610	12,957	5,020	8,095

Ward #	Ward Name	Total Homesteads	Total Structures	Eligible Structures	Sprayable Rooms
28	Nyamuzizi	1,134	5,181	2,675	3,794
29	Hoyuyu Luckydip	2,055	10,666	4,883	6,866
	TOTAL	39,505	178,655	75,927	120,845

ANNEX F: MUDZI DISTRICT GEO-MAPPING RESULTS 2018

Ward#	Ward Name	Number of Homesteads	Total Structures	Eligible structures	Sprayable Rooms
1	Goronga A	2,272	7,645	4,171	6,632
2	Mukota A	2,453	7,901	4,661	6,801
3	Chimukoko	2,185	8,292	4,096	5,998
4	Shinga	2,867	10,953	5,163	7,286
5	Bangauya	1,807	6,658	3,262	4,514
6	Nyamukoho	1,829	6,553	3,342	4,460
7	Suswe	3,085	12,137	5,667	8,377
8	Masarakufa	1,945	7,558	4,377	6,631
9	Mukota C	1,973	7,152	3,300	5,204
10	Mukota B	3,160	8,609	4,556	10,626
11	Goronga B	2,131	7,079	4,018	5,864
12	Masahwa	2,444	9,408	5,057	7,333
13	Nyakuchena	1,671	5,808	3,092	4,480
14	Makaha	3,101	9,036	5,658	8,524
15	Chikwizo B	2,547	8,971	5,095	7,170
16	Chikwizo A	1,864	6,568	3,732	4,850
17	Mukota D	1,490	5,302	3,022	4,077
18	Mavhurazi	1,004	3,288	2,139	3,058
	TOTALS	39,828	138,918	74,408	111,885

ANNEX G. MONITORING AND EVALUATION PLAN INDICATOR MATRIX

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1[1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
Objective 1: Implementation of Malaria Vector Control (VC) Interventions													
1.1	Successfully execute IRS and other malaria vector control programs												
1.1.1	Completed annual country work plan developed and submitted on-time	Project records Annually		Completed	Completed								
1.1.2	Number of eligible structures targeted for spraying	Project records Annually		125,068	125,249								
1.1.3	Number of eligible structures sprayed with IRS	Project records Annually		102,546	112,805								
1.1.4	Percentage of total structures targeted for spraying that were sprayed with a residual insecticide (Spray Coverage)	Project records Annually		85%	90.1%								
1.1.5	Number of people protected by IRS	Project records Annually	Sex Pregnant women Children <5	271,608	276,343 143,568 (52.0%) females 132,775 (48.0%) males 3,856 pregnant women 43,789 children <5								
1.1.6	EOSR submitted within 45 days after the end of spray (including completing MEP and EMMR)	Project Annually	Country	Completed	Not Completed[2]								

[1] In Year 1, VectorLink Zimbabwe will only be supporting IRS operations. No other VC interventions are referred to in this MEP for Year 1.

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1[1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
1.1.7	Post-spray Data Quality Audit conducted within 90 days of spray completion	Data Collection Forms Annually		N/A	N/A								
1.1.8	Number of Insecticide Treated Nets (ITNs) distributed, by channel	Project Records Annually	Channel	N/A	N/A								
1.1.9	Conducted at least one process assessment of the quality of ITN distribution planning, the quality of household registration, and or ITN distribution implementation during a mass ITN distribution campaign	Project Records Annually	Channel	N/A	N/A								
1.1.10	Operational routine monitoring systems for continuous ITN distribution established and disaggregated by channel	Project Records Annually	Channel	N/A	N/A								
1.1.11	ITN durability monitoring data collection completed on time as planned in a given project year	Project Records Annually		N/A	N/A								
1.2	Provide technical assistance and planning support for IRS and other integrated malaria vector control activities												
1.2.1	Number of VC project training workshops targeting NMCP and other host country staff	Project Training Records Annually	Technical Area (SBCC, EC, Operations) Job Function	4; Malaria Entomology and Opsl Staff	8; Ops (1), mHealth (1), M&E (1), EC (3), Ento (1),SBCC (1)								
1.2.2	Number of NMCP and other vector control host country staff accessing DHIS2	DHIS2 Logs Annually	Job Function	N/A	N/A								
1.3	Ensure safe and judicious use of insecticides and other malaria vector control products												
1.3.1	Number of vector control personnel trained in environmental compliance and personal safety standards in vector control implementation	Project Training Records Annually	Sex (# and %) Job Function	385[3]	385 79 20,5%) females 306 (79.9%) males								

[2] EOSR could not be submitted within 45 days after the end of spray due to the closure of VectorLink offices for over 10 days due to strikes, civil unrest, crack down by security forces, and an order by the government to shut down internet services. In addition, in December 2018, an extension for submission was granted following discussions with PMI Zimbabwe and PMI Washington to avail additional fuel to enable the two Manicaland districts to complete spraying in those 7 wards which had been left out.

[3] This indicator includes the following vector control personnel: district coordinators (4), team leaders (15), field supervisors (56), spray operators (224), storekeepers (6), guards (12), spray pump technicians (4), warners (22), washers (10), data managers (4), DEHOs(2) Clinicians/Nurses(18), Drivers (8)

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1[1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
1.3.2	Number of health workers receiving insecticide poisoning case management training	Project Training Records Annually	Sex (# and %)	30	22 7 (32%) females 15 (68%) males								
1.3.3	Number of adverse reactions to pesticide exposure documented	Incident Report Forms Annually	Type of Exposure	0	0								
1.4	Strengthen capacity of NMCPs, vector control personnel, and other institutions to implement and manage IRS and other vector control activities												
1.4.1	Total number of people trained to support VC in targeted areas	Project Training Records Annually	Sex (# and %) VC Intervention Type	402	385 63 (21.4%) females 232 (78.6%) males								
1.4.2	Number of people trained during IRS Training of Trainers	Project Training Records Annually	Sex (# and %)	50	29 29 (100%) males								
1.4.3	Total number of people hired to support VC in target districts	Project Records Annually	Sex (# and %) Job Function VC Intervention Type	365[4]	385; 79 (20.5%) females 306 (79.5 %) males								
1.4.4	Number of government/district officials who acted as supervisors during VC campaigns	Project Records Annually	VC Intervention Type	116	99								
1.5	Promote gender equality in all facets of planning and implementation												
1.5.1	Number of women hired to support VC campaigns	Project Records Annually	Country Returning female seasonal workers hired in a more senior capacity	75; 75%	0								
1.5.2	Number and percentage of women hired in supervisory roles in target areas for vector control activities	Project Records Annually	VC Intervention Type Job Function	24; 30%	14[5]; 4%								
1.5.3	Number and percentage of staff (permanent and seasonal) who have completed gender awareness training	Project Training Records Annually	Sex Job Function	418; 100%	385; 92.1%								

[4] This indicator includes the following vector control personnel: district coordinators (4), team leaders (15), field supervisors (56), spray operators (224), storekeepers (6), guards (12), spray pump technicians (4), warners (22), washers (10), data managers (4), and drivers (8)
[5] Team leaders (6); Field supervisors (8)

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1[1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
1.5.4	Number and percentage of women in senior leadership roles in VectorLink country offices	Project Records Annually	Sex (# and %)	N/A	N/A								
1.6	Implement and support social behavioral change communication and mobilization activities												
1.6.1	Number of radio spots and talk shows aired	Project Records Annually	VC Intervention Type	2	33								
1.6.2	Number of print materials disseminated	Project Records Annually	VC Intervention Type	103,880	22,894[6]								
1.6.3	Number of people reached with vector control and/or SBCC messages via door-to-door messaging	Project Records Annually	VC Intervention Type Sex	102,546	74,268(29,707 males,44,561 females)								
1.6.4	Number and percentage of people who feel that the proposed action (sleeping under an ITN/accepting IRS) will reduce their risk of malaria	Project Records Annually		N/A	N/A								
1.6.5	Number and percentage of people with a favorable attitude toward the practice/product (i.e., ITNs, IRS)	Project Records Annually	VC Intervention Type	N/A	N/A								
1.6.6	Number and percentage of people who believe that the majority of their friends and community members practice the behavior	Project Records Annually	VC Intervention Type	N/A	N/A								
1.7	Environmental compliance												
1.7.1	SEA (with EMMPs) or Letter Report submitted at least 60 days prior to the commencement of vector control campaigns	Project Records Annually		Completed	Completed								
1.7.2	Number and percentage of permanent and mobile soak pits inspected and approved prior to IRS campaigns	Project Records Annually	Soak Pit Type	8[7]; 100%	8 permanent (100%)								
1.7.3	Number and percentage of storehouses inspected and approved prior to IRS campaigns	Project Records Annually	Storehouse Type	11[8]; 100%	11 (100%) (1 provincial, 2 districts, 8 camp sites)								

[6] 20,000 brochures; 1,100 posters; 897 hats; 897 t-shirts
[7] The 8 soak pits include 4 permanent soak pits in each of the spray districts.
[8] This includes 1 Provincial Warehouse, 2 district storerooms (one each in Mudzi and Mutoko), and 8 campsite storerooms (4 in Mudzi and 4 in Mutoko)

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1[1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
1.7.4	Number and percentage of fixed soak pits that are compliant with PMI's Best Management Practices	Project Records Annually		8; 100%	8 (100%)								
2. Entomological and Epidemiological Data to Drive Decision-Making													
2.1	Vector control activities monitored via entomological and epidemiological data												
2.1.1	Number and percentage of project-supported entomological sentinel sites established to monitor vector bionomics and behavior (vector species, distribution, seasonality, feeding time, and location)	Entomological Reports Annually	VC Intervention Type	4; 19%	4; 100%								
2.1.2	Number and percentage of entomological monitoring sentinel sites measuring all five basic PMI entomological monitoring indicators (i.e., species composition, abundance, and seasonality of malaria vector; insecticide susceptibility and resistance intensity; mechanism of resistance; quality assurance and residual efficacy monitoring of IRS programs; or vector behavior: feeding time & location)	Entomological Reports Annually	VC Intervention	2; 10%	2; 100%								
2.1.3	Number and percentage of entomological monitoring sentinel sites measuring at least one advanced PMI indicator (i.e., identification of mosquito infectivity; parity rates; or blood-meal analysis)	Entomological Reports Annually	VC Intervention	21, 100%	2; 10%								
2.1.4	Number and percentage of insecticide resistance testing sites that tested at least one insecticide from pyrethroid, organophosphate, carbamate, organochlorine, clothianidin, and chlorfenapyr insecticides	Entomological Reports Annually	Insecticide Type	21; 100%	7, 33% Deltamethrin 2, 29% Pirimiphos-methyl 6, 86% DDT 5, 71% Lambdacyhalothrin 3, 43% Permethrin 1, 14%								

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1[1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
2.1.5	Number of wall bioassays conducted within 2 weeks of spraying to evaluate the quality of IRS	Entomological Reports Annually		20	20; 100%								
2.1.6	Number and percentage of cone bioassays conducted within two weeks of spraying with greater than 98% test mortality recorded	Entomological Reports Annually		20 (Mash East); 100%	20; 100%								
2.1.7	Number of wall bioassays conducted after the completion of spraying at monthly intervals to evaluate insecticide decay	Entomological Reports Annually	Insecticide Type	120	DDT 40, 33% Pirimiphos-methyl 80, 67%								
2.1.8	Number of vector susceptibility tests for different insecticides conducted in selected sentinel sites	Entomological Reports Annually	Insecticide Type[9]	17	17; 14% Pyrethroid: 6, 35% OP: 6, 35% DDT 5, 30%								
2.1.9	Integrated vector control analytics dashboard available for decision making	Project Records Annually		N/A	N/A								
2.1.10	Number of staff (VectorLink-contracted or non-VectorLink) trained in entomological monitoring	Project Training Records Annually	Sex (# and %) Job Function	20	35; 6 (17.1%) females 29 (82.9%) males								
2.2	NMCPs develop country-level IRS and other malaria vector control strategies												
2.2.1	Developed an integrated malaria vector control strategy, including a plan for monitoring and managing insecticide resistance supported by the project	Project Records Annually		N/A[10]	N/A								
2.2.2	Completed integrated data and visualization landscaping for vector control decision making complete	Project Records Annually		N/A	N/A								
2.2.3	Implemented sub-national insecticide rotation as part of an IRM strategy	Project Records Annually		Completed	Completed								

[9] Insecticide types: organophosphate, organochlorine, carbamate, pyrethroid, neonicotinoid and pyrrole
[10] GOZ has already developed an Insecticide Rotation Management Plan that is already being implemented.

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1[1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
2.3	Build capacity of NMCPs and local institutions to collect, analyze, and use data for strategic malaria control decision-making												
2.3.1	Number of individuals trained from NMCPs and national institutions to review and interpret data for integrated vector control decision making	Project Training Records Annually	Job Function Organization	N/A	N/A								
2.3.2	Proportion of targeted individuals who report using new analytical tools and/or skills in their planning, resourcing, implementation, or measurement activities	Capacity Assessments Thrice Over Project Life	Job Function Organization	N/A	N/A								
3. Procure insecticides for IRS and support the delivery and storage of IRS and other malaria vector control products													
3.1	Cost-effective procurement mechanism established												
3.1.1	Number and percentage of insecticide procurements that had a pre-shipment QA/QC test at least 60 days prior to spray campaign	Procurement Records Annually	Insecticide Type	1; 100%	1;100%								
3.1.2	Number and percentage of insecticide procurements received on-time to allow for the initiation of spray operations as scheduled	Procurement Records Annually	Insecticide Type	1; 100%	1;100%								
3.1.3	Number and percentage of international equipment procurements, including PPE, received on-time to allow for the initiation of vector control campaigns as scheduled	Procurement Records Annually	VC Intervention Type	1; 100%	1;100%								
3.1.4	Number and percentage of targeted countries with local procurements for PPE received on-time to allow for the initiation of spray operations as scheduled	Procurement Records Annually		1; 100%	1;100%								
3.1.5	PPE procured according to workforce composition	Procurement Records Annually		N/A	N/A								
3.2	Robust inventory management and logistics systems established												
3.2.1	Number and percentage of logistics and warehouse managers trained in vector control supply chain management	Project Training Records Annually	VC Intervention Type Sex	6; 100%	6; 100%								
3.2.2	Number and percentage of operations site warehouses where physical inventories can be verified by daily stock records	Inventory and Stock Records Annually	Insecticide Type	8; 100%	7; 88%								

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1[1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
3.2.3	Successfully completed spray operations without an insecticide stock-out	Inventory and Stock Records Annually	Insecticide Type	Completed	Completed								
4. Innovation													
4.1	Conduct operational research or monitoring to scale up new tools, methods, and approaches												
4.1.1	Number of operational research studies on promising new tools or new methods/approaches to existing tools that are implemented	Project Records Annually	Type of Innovation	N/A	N/A								
4.2	Create and share knowledge through dissemination of best practices and lessons learned												
4.2.1	Number of innovations, best practices, and other data or lessons learned shared with other partners or international institutions for global reporting on the Vector Learning Exchange	Project Records Annually	Technical Area	0	0								
4.2.2	Number of individual members who use the Vector Learning Exchange	Project Records Annually		10	15								
4.2.3	Number of symposia and/or presentations submitted to and accepted at global conferences	Project Records Annually	Technical Area	0	0								
4.2.4	Number of success stories written or videos produced and shared on the VectorLink project website	Project Records Annually		1	0								
4.2.5	Number of peer-reviewed journal articles submitted and accepted	Project Records Annually	Technical Area	0	0								
4.2.6	Number of critical guidance, standards, or plans that incorporate disseminated findings/best practices	Project Records Annually	Technical Area	1	1								
4.3	Develop and deploy cost-savings approaches												
4.3.1	Number of innovative or novel approaches implemented to achieve cost savings in IRS and integrated malaria vector control programs	Project Records Annually	VC Intervention Type	1	1								
4.3.2	Number of cost effectiveness assessments of existing approaches in the implementation of IRS and integrated malaria vector control programs	Project Records Annually	VC Intervention Type	1	1								

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1[1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
4.4	Cultivate public-private partnerships												
4.4.1	Number of private sector entities engaged with to establish public-private partnerships to increase the quality and coverage of malaria vector control activities globally	Project Records Annually	Private Sector Organization	2	11								

Private Sector Organisations: Hwange Colliery, Sycott Transport,The Bike Hospital, Fawcett Security Company,Redan Petrolium,Zimbabwe Christian Aid, Allied Systems, Shelly Takeaways, Kanoyangwa Traditional Kitchen, Mubatanidzwa Rural Catering, Jembere Catering