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ZIMBABWE END OF SPRAY REPORT 2019

SPRAY CAMPAIGN:
NOVEMBER 4 – DECEMBER 16, 2019

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ACRONYMS

AIRS	Africa Indoor Residual Spraying
AU	Africa University
BMP	Best Management Practices Manual
CFV	Control Flow Valve
COP	Chief of Party
CS	Capsule Suspension
DCV	Data Collection Verification
DDT	Dichlorodiphenyltrichloroethane
DEHO	District Environmental Health Officer
DHIS 2	District Health Information System 2
DOS	Directly Observed Spraying
EC	Environmental Compliance
ECO	Environmental Compliance Officer
EHT	Environmental Health Technician
IEC	Information, Education and Communication
IRS	Indoor Residual Spraying
ITN	Insecticide-treated Net
M&E	Monitoring and Evaluation
MEP	Monitoring and Evaluation Plan
MOHCC	Ministry of Health and Child Care
NIHR	National Institute for Health Research
NMCP	National Malaria Control Program
OP	Organophosphate
PEHO	Provincial Environmental Health Officer
PFO	Provincial Field Officer
PHPO	Provincial Health Promotions Officer
PMI	President's Malaria Initiative
PPE	Personal Protective Equipment
PSECA	Pre-Spray Environmental Compliance Assessment
RHC	Rural Health Centre
SBCC	Social and Behavior Change Communication

SEA	Supplemental Environmental Assessment
SOP	Spray Operator
TOT	Training of Trainers
USAID	United States Agency for International Development
VHW	Village Health Worker
WHO	World Health Organization
ZAPIM	Zimbabwe Assistance Program in Malaria
ZINWA	Zimbabwe National Water Authority

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 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 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.

Abt Associates Inc. is currently implementing the PMI VectorLink project in up to 24 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 and Mutoko) in Mashonaland East Province, provides technical assistance to the Government of Zimbabwe IRS programs in Manicaland Province, and conducts entomological monitoring in Mashonaland East and Manicaland province.

The 2019 spray campaign in PMI-supported districts in Mashonaland East commenced on November 4 and ended on December 16, 2019 with a spray target of 149,645 structures and a target population of 297,070 in both Mudzi and Mutoko Districts. VectorLink Zimbabwe used both the organophosphate pirimiphos-methyl micro-encapsulated suspension (CS) formulation (Actellic 300CS), and the neonicotinoid and pyrethroid mixture clothianidin/deltamethrin (Fludora Fusion) in Mudzi District, while Fludora Fusion was the only insecticide used in Mutoko District. The selection of pirimiphos-methyl and Fludora Fusion was guided by the country's Insecticide Resistance Management Plan 2016-2020 and the results of insecticide susceptibility assays conducted in Mashonaland East Province. Entomological monitoring was conducted throughout the year in six sentinel sites in Mashonaland East and Manicaland provinces.

In 2019, 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. The project also worked in collaboration with the provincial and district leadership to recruit and train seasonal staff prior to the spraying; procured insecticide, personal protective equipment, and IRS equipment; made logistical arrangements; and did environmental compliance 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's support under the extended transitional plan was more technical than material.

Stakeholder and partner planning meetings were held in both provinces, as was health worker sensitization meetings, which were cascaded to the communities in order to create the beneficiary awareness and service demand needed for successful spray operations. To improve social mobilization and homeowner preparation, the VectorLink project collaborated with the Mashonaland East provincial and district health officials and community leadership to pilot social mobilization and homeowner preparation in five wards in Mutoko District with low coverage rates during the 2018 campaign. Community guides were recruited to assist spray operators (SOPs) in preparing homes and locating eligible structures for IRS.

Key results emerging from the 2019 campaign are summarized in Table ES 1.

TABLE ES I. 2019 PMI VECTORLINK ZIMBABWE AT A GLANCE

Number of districts covered by PMI-supported IRS in 2019	2 districts: Mudzi, Mutoko
Insecticide	Pirimiphos-methyl (Actellic 300CS) Clothianidin/Deltamethrin (Fludora Fusion)
Number of structures targeted by PMI-supported IRS (based on 2018 geo-mapping activity)	149,645
Number of structures found by SOPs during PMI-supported IRS spray season	139,736
Spray coverage*	93.9%
Spray progress**	87.7%
Number of structures sprayed by PMI-supported IRS	131,191
Targeted population for PMI-supported IRS in 2019 (based on 2018 IRS results)	297,070
Population protected by PMI-supported IRS in 2019	307,209 (including 5,010 pregnant women and 48,047 children under 5 years old)
Proportion of targeted population protected by PMI-supported IRS in 2019	103.4%
Total population found by SOPs in 2019	324,685
Population not protected	17,476
Dates of PMI-supported IRS campaign	November 4 to December 16, 2019
Length of campaign	36 days
Number of people trained with U.S. Government funds to deliver IRS***	430 (309 men, 121 women)

* Spray coverage is the percent sprayed structures out of those found by SOPs in 2019.

**Spray progress is the percentage of sprayed structures out of those found by the geo-mapping activity in 2018.

*** 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.

I. Country Background

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 (IRS) 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, PMI VectorLink, is implemented in 24 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, indoor residual spraying (IRS) 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 implemented IRS in four districts (Chimanimani, Mutare, Mutasa, and Nyanga) in Manicaland Province, covering areas previously sprayed in 2016. In line with the Zimbabwe Insecticide Resistance Management 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 (EC) procedures to organophosphates (OPs), the NMCP advised that VectorLink Zimbabwe 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.

In 2019, VectorLink Zimbabwe continued to work with the NMCP, as well as with 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% of the 149,645 structures found in the two districts (Mudzi 74,340; Mutoko 75,305) in 2018 by the geo-mapping activity.
- Protect at least 85% of the 297,070 persons found in the two districts in 2018.
- 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 and to import data from the Microsoft Excel databases to the District Health Information System (DHIS) 2-based VectorLink Collect system on a weekly basis to allow for near real-time data analysis.
- 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 social and behavior change communication (SBCC) activities at provincial, district, ward, and community levels to create awareness and demand for IRS.

Other important areas that the project supported during the 2019 campaign included: co-facilitation and logistics of trainings; procurement, distribution, and storage of insecticide, spray materials, and equipment; and monitoring of spray operations using the PMI VectorLink project-wide supervision forms, and homeowner preparation pilot.

Other Activities

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 an integrated vector management strategy in an effort to optimize use of resources for vector control
- Increased capacity to plan, implement, and monitor vector control programs
- Incorporating mapping data into IRS planning and implementation
- Technical support for the development of the Cyclone Idai Emergency Grant for the Global Fund
- Technical support for forecasting insecticide requirements for the NMCP for the period 2018-2020
- Technical support to ensure EC for IRS activities
- Participation in and support for malaria technical working groups and committees
- Technical support for implementing malaria elimination activities
- Mid-term Review of the 2016-2020 Malaria Control and Elimination Strategic Plan
- Support of routine review and modification of the entomological monitoring plan, as necessary
- Technical support for rebranding the NMCP

2. Manicaland Province Technical Support

2.1 BACKGROUND

In 2018, NMCP advised that VectorLink transition out of implementing IRS in the four districts supported in Manicaland and move into other high-prevalence areas, specifically Mudzi and Mutoko in Mashonaland East. The NMCP took over implementation of IRS in the four districts previously supported by PMI. To ensure that the gains made under the AIRS project were sustained, PMI VectorLink developed and implemented a transitional strategy for withdrawal of IRS support from Manicaland. While NMCP took over implementation of IRS in Manicaland, VectorLink provided targeted technical assistance and select material support for the 2018 and 2019 IRS campaigns.

2.2 VECTORLINK 2019 MANICALAND TRANSITION ACTIVITIES

The VectorLink Manicaland Provincial Coordinator continued residing in the province to provide direct support to the four spray districts, while also providing support to mHealth activities for the Mashonaland East campaign. VectorLink implemented the following activities during the 2019 IRS campaign in Manicaland:

- Hired guards and storekeepers to ensure safety of insecticides and good stock management.
- Supported trainings for storekeepers and guards in safe handling and stock management of insecticides.
- Supported training of drivers in handling and transportation of insecticides, as well as safe transportation of spraying teams.
- Supported training of clinicians on management of insecticide poisoning and other IRS-related emergencies.
- Provided technical support and stationery during IRS level 3 trainings.
- Provided technical support on EC monitoring.
- Printed and distributed EC monitoring paper-based forms.
- Provide technical support in setting up of two mobile soak pits at each campsite.
- Collected DDT waste water samples for analysis.
- Rented storerooms for storing insecticides and other IRS equipment.
- Conducted monthly entomological surveillance at two sites in Mutare District, namely Burma Valley, an intervention area sprayed with DDT and Vumba, a control site.

2.3 HUMAN RESOURCES AND TRAININGS

Table 1 summarizes the staff hired by VectorLink in Manicaland in 2019.

TABLE 1: BREAKDOWN OF STAFF HIRED BY VECTORLINK IN MANICALAND 2019

Position	Chimanimani		Mutare		Mutasa		Nyanga		Total			% Female
	M	F	M	F	M	F	M	F	M	F	Both	
Storekeeper	2	0	2	0	2	0	1	1	7	1	8	13
Guards	1	0	1	0	1	0	1	0	4	0	4	0
Total	3	0	3	0	3	0	2	1	11	1	12	8

2.3.1 TRAININGS

Table 2 summarizes the trainings supported by VectorLink in Manicaland.

TABLE 2: SUMMARY OF MANICALAND PROVINCE 2019 IRS TRAININGS

Type of Training	Dates	Length (days)	Location	Description of Training
Level 2 training (Provincial TOT)*	Oct 5-9, 2019	5	Musangano lodge, Mutasa	Handling of insecticides and spray pumps, spraying techniques and practicals, trouble shooting, effective community mobilization, management of call-backs, 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
Level 3 training (training of SOPs)*	Oct 15-19, 2019 (Mutare-Chimanimani Cluster)	5	Ngorima and Biriiri, Chimanimani	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.
	Oct 27-31, 2019 (Nyanga-Mutasa Cluster)		Chisuko, Mutasa Nyamaropa, Nyanga	

Type of Training	Dates	Length (days)	Location	Description of Training
Guards and storekeepers training	Sept 17-18, 2019	2	Christmas Pass Hotel, Mutare	Roles and responsibilities of guards and storekeepers, 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.
Drivers training	Sept 17-18, 2019	2	Christmas Pass Hotel, Mutare	Roles and responsibilities of drivers in IRS, code of conduct, handling of vehicles, handling of insecticides (types) and PPE, insecticide poisoning signs, symptoms, and first aid, spills response procedure, transportation of IRS commodities, firefighting theory and demonstrations, security of IRS commodities, Concepts of EC in IRS operations and accident response procedures.
Management of chemical poisoning	Sept 19-20, 2018	2	Christmas Pass Hotel, Mutare	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.

**Global Fund supported Level 2 and 3 trainings. VectorLink support limited to facilitation.*

2.4 IRS OPERATIONS

For the 2019 IRS campaign, the four districts continued spraying as two clusters: Chimanimani/Mutare and Mutasa/Nyanga. Chimanimani/Mutare cluster started IRS on the 20th of October 2019. Mutasa/Nyanga cluster started late on the 1st of November 2019 due to logistical challenges. The spray campaign was scheduled for 63 days in three phases of 21 days each, with a seven-day break mid-way, with the campaign originally scheduled to end in mid-December. However the second phase break was longer as it fell within the festive season. Frequent lorry breakdowns and fuel shortages seriously affected operations. This pushed the IRS campaign end date to 28 January 2020. Despite these challenges, spraying was completed in a total of 63 days, but over a longer period of time than originally scheduled.

In Manicaland, NMCP 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 province did not meet the NMCP target of 95 percent for both rooms sprayed and population protected in all the four districts. All wards were sprayed in all districts with the exception of Nyanga where 24 of the 27 targeted wards were sprayed. Results of the 2019 spray campaign are shown in Table 3.

TABLE 3: MANICALAND IRS ACHIEVEMENTS 2019

District	Wards Targeted	Wards Sprayed	Targeted Rooms	Rooms sprayed	% Coverage	Targeted Population	Population Protected	% Population Protected	Insecticide Used
Chimanimani	17	17	77,955	58,273	74.8	100,028	83,114	83.1	13,431
Mutare	27	27	160,063	135,997	85	191,897	177,652	92.6	29,302
Mutasa	23	23	97,938	73,680	75.2	117,278	97,555	83.2	16,884
Nyanga	27	24	78,637	53,034	67.4	90,593	76,638	84.6	12,196
Totals	94	91	414,593	320,984	77.4	499,796	434,959	87	71,813

2.5 ENVIRONMENTAL COMPLIANCE

2.5.1 PROVISION OF IRS STOREROOMS

Where possible, available space in health facilities was used for storerooms. However, where space was not available, VectorLink rented from the private sector. Storerooms were hired at the following campsites: Ngorima, Nyanyadzi, Bazeley Bridge, Chisuko, Sherukuru, Nyatate, Nyarumvurwe and Nyautare. No refurbishments were done to the hired or to the health facility based storerooms.

2.5.2 EC MONITORING

As the NMCP does not use an electronic-based monitoring system, VectorLink printed and distributed paper-based EC monitoring forms including the homeowner preparation and spray operator performance form; morning mobilization form; transportation vehicle inspection form; end of day clean-up form; and the storekeeper performance form.

2.5.3 MOBILE SOAK PITS

VectorLink continued providing technical support and on the job training on the PMI Best Management Practices (BMP) in DDT waste management using mobile soak pits. Two mobile soak pits were assembled at each campsite, making a total of 8 soak pits across the four districts. The teams moved with the mobile soak pits from one campsite to another. Forty samples were collected over the course of the 2019 campaign to evaluate the efficiency of the mobile soak pits, bringing the total samples collected to 104 across the 2019 and 2018 campaigns. Samples are currently awaiting analysis. VectorLink also monitored IRS waste management at each campsite.

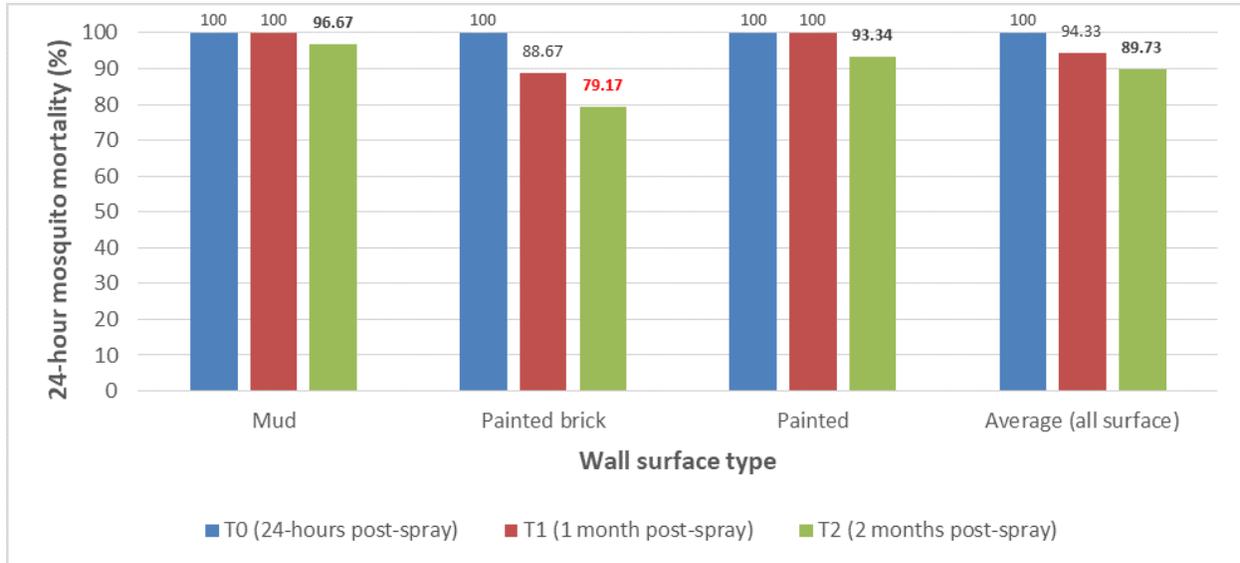
2.6 QUALITY OF SPRAY AND RESIDUAL EFFICACY TESTS

Bioassay tests were done at the Burma Valley sentinel site in Mutare District, using the standard WHO protocol, which was sprayed with DDT on November 8, 2019. Cone bioassay tests were conducted using a susceptible colony mosquitoes of *Anopheles arabensis* (KGB strain) in ten sprayed houses and ten controls. The quality of spray was assessed through bioassays four days post-spray. The insecticide decay rate was assessed at T1 and T2, one month and two months after spraying, respectively (Figure 1).

Ten sprayed houses, consisting of two mud, three painted, and five brick were randomly selected for the bioassay tests. Results show that the application of insecticide was satisfactory at T0 (with 100% mosquito mortality) on all three types of wall surfaces. At T1, mortality declined on both mud, brick and painted wall surfaces but met the minimum criteria of efficiency (>80% mortality). However, mortality declined at

an alarming rate at T2, especially on the brick surfaces (79% mortality). Insecticide decay rate will continue to be assessed monthly until the average mortality falls below 80% for two consecutive months.

FIGURE I. SPRAY QUALITY AND RESIDUAL EFFICACY OF DDT IN BURMA VALLEY, MUTARE DISTRICT, AS MEASURED BY AN. ARABIENSIS (KGB STRAIN).



2.7 MANICALAND RECOMMENDATIONS AND CHALLENGES

Table 4 summarizes the challenges encountered during the campaign as well as associated solutions and recommendations.

TABLE 4: SUMMARY OF CHALLENGES AND RECOMMENDATIONS / SOLUTIONS

Challenges	Recommendations / Solutions
Inadequate PPE/C for storekeepers and guards hired by VectorLink	VectorLink will include seasonal staff supported by the project in Manicaland when procuring PPE/C for the Mashonaland East campaign.
Risk for inadequate budget for refurbishments of storerooms	The team managed to negotiate with the previous vendors whose storerooms were refurbished in the 2018 campaign. However, if these storerooms are not available in 2020, refurbishment may be needed in any new space.
Breaking down of pumps causing issues in meeting daily targets.	VectorLink supported a pump technician for each campsite in 2018, as part of transition activities. This was not supported in 2019 by VectorLink or the NMCP. If the budget allows, VectorLink should consider supporting at least one pump technician per district.

Challenges	Recommendations / Solutions
Shortages of fuel	There is need to stock fuel before IRS campaign starts or ensure availability of Direct Fuel Import (DFI) facility coupons which are convenient as there are a number DFI service stations now operating in Mutare.
Late disbursement of PPE/C and fuel. All the four districts commenced IRS with inadequate PPE/C impacting negatively on environmental compliance.	VectorLink to encourage the NMCP to have PPE/C and fuel availed and pre-positioned to districts at least one month before the start of the campaign.
Chimanmani lorry experienced frequent breakdown resulting in significant downtime and increased number of days in the field.	VectorLink to encourage NMCP and districts to take lorries in for major service before IRS starts. Contingency plans should be in place so that breakdowns are attended to swiftly.
Inadequate stationery and other IRS consumables.	VectorLink to work with NMCP and districts to encourage sourcing stationery and other IRS consumables by June 2020.
DDT refusal by beneficiaries due to inadequate SBCC	VectorLink supported SBCC activities in previous years, but was not well supported by the NMCP in 2019. The NMCP needs to strengthen SBCC before, during and after the IRS campaign.

3. Implementation of IRS Activities in Mashonaland East Province

3.1 IRS PLANNING AND PARTNERS COLLABORATION

In May 2019, VectorLink Zimbabwe began a series of regular planning and communications with the NMCP, and the provincial and district health officials of Mashonaland East Province, with the final micro-planning meeting held during the second week of October 2019. The main objective was to plan the spray campaign in the two target districts (Mudzi and Mutoko) together with provincial and district authorities and reach agreement with all partners on the specific operational approaches, sites, and campaign dates as well as partners' roles and responsibilities.

VectorLink Zimbabwe re-visited 2018 challenges and listened to the priorities and anticipated new challenges of Mashonaland East provincial and Mudzi and Mutoko district authorities for the upcoming spraying season. VectorLink shared results on the geo-mapping exercise, needed insecticide, quality personal protective equipment (PPE), gender equity, storerooms, soak pits, including mobile soak pits, and the IRS tools, including supervisory checklists and operational data reporting tools that the project regularly updates to improve performance, with health officials. New policies on travel safety continue to be part of the discussions. Jointly, VectorLink Zimbabwe and its government partners discussed and agreed on timelines and modalities for hiring seasonal staff and supervisors, including dates for procuring and distributing PPE and insecticide to the program warehouses at Kotwa Growth Point, as well as final distribution of the items to campsites. Decisions were made on dates for hiring vendors to provide lorries and breakfast, dates for trainings and the start date for the IRS campaign. Also, determined and agreed upon were medical examinations and pregnancy tests as mandatory activities for IRS, the number of motorcycles required for the information, education and communication mobilizers ("warners"), and the level of effort required to provide joint quality supervision and monitoring of the campaign.

VectorLink Zimbabwe worked in collaboration with the NMCP, provincial and district Ministry of Health and Child Care (MOHCC) officials, the National Institute of Health Research (NIHR), Africa University (AU), and the Zimbabwe Assistance Program in Malaria (ZAPIM), another five-year USAID-funded project managed by Abt Associates and partners. VectorLink and ZAPIM collaborated in pertinent research and entomological surveillance in Angwa Ward of Mashonaland Central Province for evidence-based vector control interventions. VectorLink Zimbabwe continued to collaborate with the NIHR, the research department of the MOHCC, and with AU, a private university. NIHR and AU provided susceptible mosquito specimens for VectorLink cone bioassays to monitor spray quality and insecticide decay rate. The two institutions analyzed mosquito specimens collected by the country program to identify the species, detect sporozoites and identify blood meal sources, as well as to disseminate and use data. VectorLink Zimbabwe continued to provide technical and financial support for an insectary at AU as well as an animal-rearing facility for rabbits to feed the mosquitoes. The VectorLink Zimbabwe project worked closely with the NMCP to create a platform for malaria partners to plan and discuss IRS and entomological related activities in the country, as well as to engage communities to promote program ownership and joint implementation of interventions. Also, the project continued to work with Dimagi on mHealth activities in Zimbabwe, especially on the smartphone-based spray supervision system, bulk SMS job aids, and data collection verification checklist.

3.2 TRAININGS FOR IRS OPERATIONS

VectorLink Zimbabwe continued to support the well-established levels 1, 2, and 3 spray campaign trainings (Table 5) as well as other trainings related to IRS (Table 6). Trainings are summarized by gender in Table 7. For level 1 training, which was funded by the Global Fund, the project provided technical inputs to ensure that IRS operations in Zimbabwe remain standardized. For the levels 2 and 3 trainings, the country program updated relevant sessions to ensure continuous usage of PMI VectorLink tools and concepts by the government counterparts during the 2019 IRS campaign in Mashonaland East Province. These tools and concepts included the IRS performance tracking sheet; use of the control flow valve; gender inclusion, especially for higher-level IRS positions; and the various supervisory checklists.

3.2.1 IRS TRAINING

In collaboration with the NMCP and provincial and district health officials, VectorLink Zimbabwe conducted trainings from September through November 2019. The SOP manual guided all the trainings. Level 1 training was meant for IRS provincial managers, level 2 was for IRS district managers and supervisors, while level 3 was SOP training. VectorLink Zimbabwe facilitated and provided technical support to levels 1 and 2, while for level 3, the country program provided both financial support and facilitation. One day before SOP training began, all SOPs and supervisors were medically examined by District Medical Officers to assess their health and fitness to participate in the IRS campaign. The examinations consisted of a thorough routine physical check-up. All SOPs and supervisors assessed were reported to be in good health for IRS operations. Also, all female seasonal staff who worked close to insecticides went for pregnancy tests twice during the campaign, before the first phase and before the second phase. None of the women tested positive for pregnancy on either occasion.

TABLE 5. SUMMARY OF 2019 IRS TRAININGS

Type of Training	Dates	Length (days)	Type of Participants	Description of Training
Level 1 training (National training of trainers (TOT))	8-13/9/19	5	PEHOs, DEHOs, PFOs, IRS coordinators; personnel from other malaria stakeholders	Review challenges observed during the 2018 IRS campaign, IRS targets and plans for 2019, insecticide management, community mobilization, spraying techniques, data tools and collection, support and supervision, EC issues, and entomological monitoring
Level 2 training (Provincial TOT)	23-28/9/19	5	Team leaders, supervisors, data manager	Handling of insecticides and spray pumps, spraying techniques, 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, and campsite hygiene
Level 3 training (Training of SOPs)	30/10-3/11/19	5	SOPs	Mixing insecticide, use of PPE, spraying techniques, dismantling and assembling of sprayers, troubleshooting, maintenance and cleansing of sprayers, spray targets, data collection tools and recording data, community information before and after spraying, and community mobilization

Note: TOT=training of trainers, PEHO=provincial environmental health officer, DEHO=district environmental health officer. PFO=provincial field officer

3.2.2 OTHER IRS CAMPAIGN TRAININGS

VectorLink Zimbabwe conducted and completed several other IRS-related trainings as shown in Table 6 for seasonal staff supporting the 2019 IRS campaign. To increase knowledge of first aid and emphasize the importance of morning health checks, the project organized orientation meetings on such assistance with various groups of seasonal workers.

TABLE 6. DESCRIPTION OF OTHER 2019 IRS-RELATED TRAININGS

Training	Type of Participants	No of Participants	Issues Covered During Training	No of Days
Guards, drivers and storekeepers	Guards, drivers, and Storekeepers	36	Roles of guards, drivers, and storekeepers in IRS, vehicle management policies, standards and safety issues, and emergency procedures in case of a chemical spill in the vehicle. Stock-keeping system including management policies and standards, and emergency procedures in case of a chemical spill, poisoning, or theft of insecticide	1½
Management of chemical poisoning	Environmental and clinical health workers	18	Orientation for environmental and clinical health workers on management of chemical poisoning and first aid. Management of dog, snake and scorpion bites	1½
Data management (mHealth) training	Data managers, IRS coordinator, team leaders, and supervisors	87	Training on IRS data entry and reporting using phones; data verification and validation techniques to ensure data accuracy and quality	2
Information, education and communication (IEC)/SBCC	PHPO, PEHO, PFOs, EHTs, warners and DEHOs	43	Training and involvement of IRS mobilizers, review of key messages for ward sensitization and key messages on IRS warning, training on use of electronic loud hailer, and use of participatory approaches for IRS programming, IRS key messages, before, during, and after, myths and misconceptions of IRS	2
TOT: Spray operations	PEHO, PFO, DEHO, team leaders, field supervisors, data managers, and IRS coordinators	50	Training on spray technique, data capture and verification, IRS stock management, EC, bioassays, code of conduct, transport management, mobilization, gender equality and inclusion	5

Note: EHT=environmental health technician

TABLE 7. SUMMARY OF NUMBER OF PEOPLE TRAINED BY GENDER, 2019

Categories of Persons Trained	Training on IRS Delivery				Other Trainings								Total Participants			
	TOT: Spray Ops		Spray Ops (including EC)		M&E		SBCC		Insecticide Poisoning Management		Drivers/ Storekeepers/ Guards					
Gender	M	F	M	F	M	F	M	F	M	F	M	F	M	F	TOTAL	
PFO	1	0	1	0	1	0	1	0	1	0	1	0	6	0	6	
DEHO/PEHO/PHPO	2	0	2	0	2	0	1	0	2	0	2	0	11	0	11	
SOPs	0	0	192	47	0	0	0	0	0	0	0	0	192	47	239	
Team leaders	12	4	12	4	12	4	0	0	0	0	0	0	36	12	48	
Data Manager	2	2	2	2	2	2	0	0	0	0	0	0	6	6	12	
Washers	0	0	4	8	0	0	0	0	0	0	0	0	4	8	12	
Transport Officer	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	
Storekeepers	0	0	3	3	0	0	0	0	0	0	3	3	6	6	12	
Nurses/ Clinicians	0	0	0	0	0	0	0	0	4	7	0	0	4	7	11	
Pump technicians	0	0	4	0	0	0	0	0	0	0	0	0	4	0	4	
IEC implementers, mobilizers	0	0	22	0	0	0	25	12	0	0	0	0	47	12	59	
Field supervisors	15	8	33	27	33	27	0	0	0	0	0	0	81	62	143	
IRS district coordinators	4	0	4	0	4	0	4	0	4	0	4	0	24	0	24	
Drivers	0	0	9	0	0	0	0	0	0	0	12	0	21	0	21	
Guards	0	0	9	1	0	0	0	0	0	0	9	1	18	2	20	
TOTAL M/F	36	14	297	92	54	33	31	12	11	7	32	4	461	162	623	
*Total number of people trained to deliver IRS in target districts	430 (309 males, 121 females)															

*Note: PHPO=provincial health promotions officer. Positions highlighted in light blue are reported in the PMI indicator 1.4.1 “Number of people trained to support IRS in target districts.

3.3 SPRAY OPERATIONS AND SUPERVISION

3.3.1 SPRAY OPERATIONS

In 2019, VectorLink Zimbabwe sprayed two districts (Mudzi and Mutoko) in Mashonaland East Province. The campaign covered all wards (Mudzi 18; Mutoko 28) that the district health authorities prioritized for IRS based on the Annual Parasite Incidence (API) – only wards with an annual parasite incidence of less than 5 per 1,000 population are eligible for IRS, the remaining receive ITNs. Only one ward in Mutoko was not included for IRS, as ITNs are distributed there. VectorLink Zimbabwe organized the IRS campaign to be conducted by 16 teams comprising approximately 239 SOPs, 60 field supervisors, and 16 team leaders. Although the plan was to spray for 35 days in each district between November 4 and December 15 (inclusive), with a seven-day unpaid break in the middle, the campaign was extended by one day, to allow for call backs to improve spray progress, resulting in a 36-day spray campaign. A seven-day break after 21 operational days of spraying allowed SOPs to physically recharge and enabled the project to replenish insecticide stocks at the campsite and address challenges encountered in Phase I. After the break, SOPs returned for 15 days to complete the spray campaign. During the break, the team continued reviewing and entering data, assessed spray progress, addressed challenges, and identified callbacks needed from the first phase. Also, the team planned for the remaining period of spray, in coordination with district and provincial officials. Spraying was carried out in both districts simultaneously with all spray teams working from 6:00 a.m. to 2:00 p.m., seven days a week. SOPs and other spray teams were provided a daily breakfast before going to the spray areas. As part of a pilot assessment in five wards in Mutoko District, SOPs were led by community volunteers to assist SOPs in locating homes as well as helping the beneficiaries with home preparation. Further details for this are in Section 2.7.

VectorLink Zimbabwe ensured that IRS campaign positions were filled by district and provincial health staff with a record of good performance from the 2018 spray campaign. VectorLink Zimbabwe, under leadership of the district health officers and in close collaboration with the MOHCC Human Resources Department, recruited all seasonal positions. VectorLink emphasized increasing the number of women recruited for different positions to support the campaign (Table 8).

TABLE 8. POSITIONS ENGAGED FOR 2019 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	7	1	5	3	12	4	16	25
Field supervisor	14	16	17	13	33	27	60	48.3
SOP	102	16	90	31	192	47	239	19.7
Washers	3	3	1	5	4	8	12	66.7
Pump technician	2	0	2	0	4	0	4	0
Storekeeper	0	3	3	0	3	3	6	50

Position	Mudzi		Mutoko		Total			% Female
	M	F	M	F	M	F	Both	
Guard	3	1	6	0	9	1	10	10
Mobilizer	11	0	11	0	22	0	22	0
Data manager	0	2	2	0	2	2	4	50
Driver	4	0	5	0	9	0	9	0
Total	151	45	147	56	296	92	388	23.7

For the areas where SOPs encountered locked houses or refusals, IRS coordinators together with team leaders, field supervisors, warners, and data managers organized a ‘callback’, where SOPs returned to the location to spray the missed houses before the team moved to the next campsite. Call backs were only initiated in those wards where the spray coverage and spray progress was less than 85%. Houses that SOPs were unable to spray were recorded by SOPs in their data collection form and categorized according to the reason (locked or refused). This practice was mandated and monitored by supervisors and team leaders.

3.3.2 SUPERVISION OF THE SPRAY CAMPAIGN

To maintain strict and consistent supervision of the campaign, VectorLink Zimbabwe assigned one technical staff (Chief of Party (COP), Operations Manager, Environmental Compliance Office (ECO), or M&E Manager) to each of the two districts each day throughout the campaign period. Team members used a phone-based checklist for each area of supervision and were responsible for on-the-spot trainings and corrective actions for any non-performance issues observed. In addition, the VectorLink IT consultant provided remote assistance to the smartphone users to ensure smooth phone-based IRS supervision. Also, the VectorLink provincial coordinator created a mHealth WhatsApp group for the supervisors, to facilitate quick sharing of mHealth field challenges and possible solutions. The information shared in this group was reviewed by the provincial coordinator for Mashonaland East, who is the focal person for mHealth.

The mHealth application provided the five main supervisory checklists, which seasonal staff supervisors were required to use when observing spraying. The checklists included: (1) morning mobilization, (2) SOP transportation vehicle inspection, (3) household preparation and SOP performance, (4) storekeeper performance, and (5) end-of-day clean-up. 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.

3.3.3 SHORT MESSAGE SERVICE-BASED JOB AIDS FOR SPRAY PERSONNEL

To strengthen spray performance, the VectorLink IT consultant facilitated mHealth training and supported the field staff by strengthening and maintaining the established SMS-based job aid system. The project home office and country team reviewed the major challenges faced in 2018, as well as the type of messages and frequencies. The information gathered was helpful to prepare appropriate communications and more suitable schedules to maximize use of broadcast messages by the SOPs and supervisors in 2019.

3.3.4 IRS CAMPAIGN VEHICLES

VectorLink Zimbabwe continued to rent vehicles for the 2019 campaign to transport seasonal personnel and supervisors and dispatch spray materials. VectorLink Zimbabwe made certain that the final vendors selected modified their lorries to ensure that safety measures were in place to protect spray teams, IRS equipment, and insecticide. These included being fitted with benches, safety belts (where possible), roll bars, and purpose made shades, which were weatherproof. The VectorLink team and the Government of Zimbabwe Vehicle Inspection Department conducted pre-contract inspections for the vehicles to ascertain their safety and compliance prior to signing rental agreements.

VectorLink Zimbabwe procured transportation services (hired lorries and 4x4 lorries) through open competition and the selection of the lowest, technically acceptable offer. Additionally, motorcycles were secured for 22 warners to carry out door-to-door mobilization. IRS district coordinators also used them to effectively manage IRS operations and communicate with team leaders, supervisors, and influential community leaders in the field. For that, MOHCC provincial health services administrators of PMI-supported districts provided motorcycles for the period of the campaign. VectorLink Zimbabwe funded the servicing of the motorcycles and supplied fuel.

3.3.5 PAYMENT OF SPRAY TEAMS AND VENDORS

In 2019, the project planned to use two payment platforms for paying allowances – Ecocash for seasonal workers and Nostro for MOHCC staff and vendors. See below for a summary of how payments were made for each of the major payment phases during the campaign:

- Level 3 Training: MOHCC staff received allowances soon after training through Nostro accounts. Unfortunately the project encountered challenges with the Ecocash platform as the payment coincided with the Ecocash platform update. The project had submitted the payroll for the Level 3 training allowances during the second week of November 2019, but were received by staff until the second week of December 2019, due to continued issues with the Ecocash system following the upgrade. This delay negatively affected the morale of the seasonal workers and affected the ability of those at the Nzira/Chindenga campsite to pay for dinner. This was the only campsite where a “one pot” concept was not used. In other sites, resources were pulled together to prepare dinner from one big pot. To avoid a repeat of this problem, the project plans to pay Level 3 training allowances in cash during the next campaign.
- Phase 1: Given the issues with Ecocash, VectorLink worked to pay all staff through the Nostro. VectorLink successfully paid allowances for Phase 1 to MOHCC in November 2019 for those staff who already had Nostro bank accounts. For those that didn't, the DEHOs helped to set-up these so personnel could be paid. Seasonal workers opened their Nostro bank accounts on the day they decamped at the end of Phase 1 and payments were processed by VectorLink in December 2019 through their Nostro accounts. Unfortunately, seasonal workers with Steward Bank accounts could not withdraw foreign currency particularly as the bank did not have USD cash available for withdrawal. The delays in receiving foreign currency disadvantaged them by not having hard cash on time. Seasonal workers who opened bank accounts with CBZ and Agri bank received the money on time.
- Phase 2: Allowance for seasonal workers and MOHCC staff were paid during the first week of January using Nostro accounts. However, due to bank administrative errors, a number of seasonal workers account numbers were in accessible and the funds bounced back to the VectorLink Nostro account. In these cases, VectorLink paid staff in USD cash

To alleviate the problems encountered in 2019, the project plans to pay the Level 3 training and one of the phases in USD cash and the other one through the Nostro bank accounts, for the 2020 campaign.

The breakfast vendors and IRS lorry vendors were paid in December 2019 for Phase 1 and in January 2020 for Phase 2. Breakfast vendors were paid through Nostro accounts and lorry vendors were paid through Nostro and USD cash (50% each). The project did not hire the 4x4 trucks from the private sector, and instead used the ZAPIM and VectorLink vehicles during the campaign.

The VectorLink Zimbabwe team managed the following activities to support effective and efficient financial processes, to the greatest extent possible:

- Conducted timely on-boarding of seasonal staff (SOPs, washers, storekeepers, security guards, and breakfast caterers), obtaining signed copies of associated on-boarding documents for the records.
- 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. They verified the daily registers for the breakfast caterers and IRS spraying teams to establish who was on duty on a particular day before preparing payrolls.
- Signed fixed-price contracts with lorry service providers. The motorcycle repairs were paid through the project bank Nostro account. The project made the final payments only after vendor log sheets had been verified and reconciled for the lorries.

All payments were verified and approved by the VectorLink Zimbabwe finance and administration staff and the COP.

3.3.6 COST-EFFICIENCY OF SPRAY OPERATIONS

- The project hired nine lorries from the private sector through a competitive bidding process. Only four vendors responded to the call for a cost proposal. The three lorries that the MOHCC provided were not used due to major mechanical faults that required imported parts that the project could not afford. Before the final selection of lorry vendors, the VectorLink team negotiated with the service providers and managed to reduce the daily rate from \$300 to \$287, which was lower than the \$300 daily rate included in the 2019 approved budget.
- VectorLink Zimbabwe also negotiated down the price of the plate of breakfast from \$3.00 a plate to \$1.10 a plate. The total savings from this budget line item was \$27,000.
- 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 22 motorcycles from the MOHCC which only needed to be repaired for use during the campaign. Repairs were cheaper than renting from the private sector or buying new ones.
- The project negotiated cheaper rates at some of the hotels in both districts for the supervisory staff. The approved budget indicated \$140 per day but the project team at most paid \$111 for lodging and per diems per day.

3.4 INSECTICIDE NEEDS

VectorLink Zimbabwe ensured that adequate insecticide was procured. Given the dangers that are associated with use of insecticides, the program ensured that all SOPs were adequately equipped to complete IRS and safely protected from the risks of using insecticides. The PMI VectorLink project completed quality local and international procurement in a timely manner and all materials and IRS equipment were delivered, stored, and distributed to designated sites before the start of the campaign.

The total amount of insecticide required for the 2019 IRS campaign in Mashonaland East was calculated assuming 100% spray coverage of 149,645 structures, as identified through the 2018 geo-mapping

exercise. This was a decrease from the initial target of 150,335, following further data cleaning of the geo-mapping data. The average number of structures sprayed per bottle in Mashonaland East Province in 2018 was 2.2, which was the same rate used for 2019 procurement estimates. Using this rate, the number of insecticide sachets needed was 68,334. Given that the project had 20,457 leftover bottles of Actellic, only 47,877 sachets of Fludora Fusion, without buffer stock, was procured in 2019. A total of 17,542 sachets of Fludora Fusion remained in stock at the end of the campaign, which will be used in 2020. Insecticide susceptibility tests performed by VectorLink Zimbabwe in March 2019 in Mashonaland East indicated that *Anopheles gambiae* s.l. is fully susceptible to both clothianidin and deltamethrin.

Independent and local laboratories were engaged to conduct pre-shipment inspections and quality analysis of all batches of insecticide that were imported. The insecticide was also subjected to quality control testing by the Zimbabwe Government Analyst's Laboratory, a department of the MOHCC. The results of pre-shipment quality analysis and the Zimbabwe Government Analyst's Laboratory assessment of all batches of insecticide were within the acceptable limits to allow the insecticide to be used for malaria vector control.

Insecticide and other IRS materials and equipment were safely stored at provincial, district, and operational stores. All storerooms were manned by storekeepers, with security services provided by the guards. 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 VectorLink logistician and provincial coordinator at all levels 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/sachets at the operations sites and district stores by recording the serial numbers of bottles issued to each SOP every morning and compared it with the serial numbers of empty and full bottles returned by each SOP at the end of a spray day. All returned empty and full insecticide bottles/sachets were reconciled and documented on stock cards, with the records safely kept at local levels before being transported to the 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 (around 10:00 a.m.) and afternoon (around 3.00 p.m.).

3.4.1 INVENTORY ASSESSMENT

Following the completion of the spray campaign, all IRS commodities and equipment (PPE, insecticide, tents, pumps, etc.) were counted, washed, and transferred from the campsites back to the main warehouse at Kotwa Growth Point, Mudzi District. Subsequently, the project conducted a review of inventory, internal financial and logistics audits, and inspection in compliance with storage and tracking requirements. Following the audit, the inventory was closed until preparation for the next spray campaign begins. Remaining, usable commodities and equipment were noted and safely kept for the next IRS campaign planning. Inventory of stock and quantities post spray is attached as Annex C.

3.4.2 POST-SPRAY CONFERENCE

VectorLink Zimbabwe, together with the Provincial Medical Director of Mashonaland East Province and the NMCP, organized a post-spray campaign conference for provincial stakeholders. Participants shared feedback and lessons learned on the 2019 campaign, discussed tools used, shared best practices, and exchanged ideas and knowledge on improving operations in future campaigns. Separate community leader and community beneficiary meetings will be held during the course of 2020 to gather feedback on spray operations and answer questions about the IRS campaign. This will help to strengthen IRS operations in future campaigns.

3.5 INFORMATION EDUCATION AND COMMUNICATION ACTIVITIES AND OUTCOMES

3.5.1 INTRODUCTION

Information, Education, and Communication (IEC) is key to IRS programming because it improves the uptake and preparedness of IRS and ownership by the beneficiaries. VectorLink worked with the project core partner, the NMCP, and provincial and district health staff in Mashonaland East to disseminate information for the 2019 IRS campaign. IEC messages on IRS were transmitted through 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 were ready to welcome SOPs for spraying. All IEC print materials distributed in 2019 were left over from the 2018. For the 2019 IRS season the project conducted three community meetings per ward as planned, reaching all 46 wards across both Mutoko and Mudzi Districts.

IEC messages clearly highlighted 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 in case an adverse event occurs following IRS.

The IEC activities could be strengthened as the project only utilized sensitization meetings and limited print material distribution as an IEC strategy. Additional IEC activities should be considered for next year so that more people could be reached via different channels of communication including roadshows, radio spots, and end of spray community feedback meetings.

3.5.2 INFORMATION, EDUCATION AND COMMUNICATION TRAINING

IEC being a major component that contributes to high acceptance of IRS program, VectorLink Zimbabwe and the MOHCC realized that there was a gap in terms of IRS communication, especially selection of appropriate strategies to enhance acceptance. For this reason, it was agreed that a refresher training would be conducted for district and provincial officials who communicate with the communities during the ward sensitization meetings. A total of 43 MOHCC officers were trained at Chibanguza Hotel, including the EHTs, DEHOs, and PFO. The training was facilitated by the PHPO, PEHO and PFO. The following were the training outcomes:

- There was synchronization and standardization of IRS key messages to be delivered to the communities before, during, and after the IRS campaign.
- Outlined a procedure to conduct community sensitization meeting.
- The team agreed to use different modes of channels to ensure that all the beneficiaries were reached during the sensitization meetings (church gatherings, council meetings, schools, traditional meeting gatherings etc.).
- Developed an IEC activity reporting template.
- Selected five wards to participate in a pilot of community guides in Mutoko District, Ward 5, 11, 26, 27, and 29 (see Section 3.8 for more details).
- Discussed the national chemical rotation plan at length to ensure all participants were clear on the way forward.

3.5.3 SENSITIZATION MEETINGS

IRS sensitization meetings were conducted in three phases: provincial, district, and community level. These meetings targeted various stakeholders, especially influential leaders, sensitizing 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 9 summarizes the number of participants at the provincial- and district-level meetings.

TABLE 9. SENSITIZATION MEETING PARTICIPANTS, BY GENDER, 2019

Type of Meeting	District	Wards	Female	Male	Total
Provincial	-	-	21	32	53
District	Mudzi	-	7	33	40
	Mutoko	-	11	40	51
District Total			39	105	144
Community	Mudzi	28	2151	1359	3510
	Mutoko	18	2168	1751	3919
Community Total		46	4319	3110	7429

3.5.4 PROVINCIAL IRS SENSITIZATION MEETING

The provincial IRS sensitization meeting was held on September 19, 2019, 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.
- The team discussed the new insecticide Fludora Fusion for use in both Mutoko and Mudzi districts.
- The concept of an insecticide rotation plan, which the MOHCC is using as a way of managing insecticide resistance, was explained and it was agreed that the same information was to be cascaded to lower levels.
- The team agreed on a schedule for ward sensitization meetings in which the local EHTs, in partnership with other key stakeholders, would sensitize the communities prior to IRS, giving information on the provisional dates, do's and don'ts, type of insecticide to be used, and management of adverse events after spraying.
- Recruitment of spray teams was discussed.

3.5.5 DISTRICT SENSITIZATION MEETINGS

Mudzi District IRS sensitization meeting was held on October 8, 2019, at Mudzi Rural District Council offices. The 40 participants who attended were MOHCC and other government officials, local authorities, and NGOs. The Mutoko District sensitization meeting was held on October 9, 2019, at the Mutoko Rural District Council offices and was attended by 51 stakeholders drawn from the same pool as in Mudzi District. In both meetings, stakeholders agreed that:

- Local leadership would identify and ensure that there are community guides to guide SOPs during implementation phase.
- The stakeholders urged the MOHCC to share a tentative team movement schedule as they will be conducting the ward sensitization meetings.
- Both districts agreed that local leadership should develop a procedure on how to deal with people who refused to have their houses sprayed.

- Stakeholders advocated for post-spray feedback meetings, at which the coverage, challenges, and achievements were shared for program strengthening in future campaigns.
- Participants agreed that, budget permitting, road shows could be reintroduced because this strategy was observed to be helpful in disseminating key IRS messages in 2018 IRS campaign (note that the budget did not permit this).
- Community roles were clearly spelled out and agreed upon.
- Ward sensitization meetings schedules for both districts were shared.

3.5.6 COMMUNITY SENSITIZATION MEETINGS

The community is the major beneficiary of the IRS program. For the program to succeed, a high percentage of community members must accept spraying. This requires proper communication. For this reason, local EHTs conducted three community sensitization meetings per ward in Mutoko and Mudzi to inform the communities about the IRS program. The sensitization meetings mainly focused on malaria transmission, signs and symptoms of malaria, preventive 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 unsprayed structures.

3.5.7 PRODUCTION AND DISTRIBUTION OF IEC MATERIALS

Due to budget limitations, VectorLink Zimbabwe did not produce IEC materials during the 2019 campaign, but instead, the districts managed to recycle and distribute 400 posters and 1,000 pamphlets that remained from 2018. Messages on the posters aimed to increase community acceptance of IRS and to explain the role of households during the campaign.

3.5.8 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 or 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 warner's used loudhailers around the communities to help key messages reach the majority of community members.

3.6 CAPACITY-BUILDING EFFORTS

VectorLink continued to build national, provincial, and district capacity to plan, implement, and monitor and evaluate IRS operations. It achieved this by exposing MOHCC staff to the innovations and tools developed and tested by the VectorLink /AIRS global project over the years. Selected personnel from non-PMI supported districts were supported to visit and observe VectorLink's best practices in IRS for wider adoption and scale up.

VectorLink Zimbabwe participated in one quarterly Vector Control Subcommittee meeting in October 2019, in Harare, where entomological data were discussed. Participants included representatives from the NMCP, National Institute for Health Research, VectorLink and PMDs offices. Also discussed were entomological data management and analysis. VectorLink continued to provide on-the-job training for MOHCC staff at each of the six sentinel sites (Arcturus, Dendera, Kawere, Makarara, Burma Valley and Vumba) for insectary managers and/or bioassay focal persons and provincial field officers. Furthermore, VectorLink Zimbabwe support included training of the AU staff to conduct morphological identification of mosquitoes and to establish procedures for mosquito samples and data reporting to VectorLink Zimbabwe and the NMCP. VectorLink Zimbabwe also assisted the AU staff in creating an updated list of reagents and other supplies for the smooth running of the molecular laboratory. A stock out of gel-red, needed for PCR-based assays, delayed the analysis of specimens towards the end of the year. The project team is working with AU to improve stock management to avoid such stock-outs going forward.

3.7 GENDER MAINSTREAMING

The PMI VectorLink Project supports gender equality and female empowerment as independent development objectives and approaches to improve vector control activities. The trained Zimbabwe Gender Focal Person, with support from the other members of the project team, leads project-level gender mainstreaming agenda for Zimbabwe. This agenda is based on USAID’s Gender Equality and Female Empowerment Policy and the VectorLink Project Gender Strategy. VectorLink Zimbabwe mainstreams gender throughout its project operations, with a focus on women’s economic empowerment through seasonal employment with the project.

In 2019, the Mashonaland East provincial coordinator was responsible for gender mainstreaming in Mashonaland East. The Manicaland provincial coordinator was responsible for gender mainstreaming in that province. 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, TOTs, and community mobilization (Table 10). In 2019, VectorLink hired the highest proportion of women since AIRS started supporting IRS in Zimbabwe in 2014.

TABLE 10. FEMALES HIRED, 2014-2019

Province	Year	Supervisory Role				Other Roles							Total	% of Total Staff Hired
		IRS coordinator	Team leader	IRS supervisor	Total	Data manager	SOP	Washer	Warner	Storekeeper	Guard	Total		
Manicaland	2014	0	5	11	16	0	2	0	0	0	0	2	18	5.6
	2015	0	1	26	27	1	10	9	1	0	0	21	48	14.2
	2016	0	8	32	40	1	22	20	1	0	0	44	84	15.9
	2017	1	7	33	41	1	29	19	1	0	0	50	91	13.7
Mash East	2018	0	6	21	27	2	36	7	0	1	2	48	75	21.4
	2019	0	4	27	31	2	47	8	0	3	1	61	92	23.7%

- *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.

3.8 OVERVIEW AND RESULTS OF THE COMMUNITY GUIDE PILOT

Adequate homeowner preparation has been a long-term challenge in Zimbabwe, and this places additional burden and delays on SOPs. Therefore, VectorLink Zimbabwe piloted the use of local community guides to help beneficiaries to remove household goods to facilitate smooth spray operations. VectorLink used the community guides to also address gaps in coverage reported in 2018. Therefore, in coordination with provincial and district officials, VectorLink selected five wards from Mutoko District, which did not meet 2018 coverage targets, to participate in the pilot. The leadership in the five selected wards nominated community guides who were tasked with the following:

- Assist SOPs to locate homes, especially in areas where homes were isolated or covered by thick vegetation or on/behind mountains.
- Mobilize their villages a day before the spraying team arrived.
- Inform the villagers on homeowner preparation, the need to ensure availability of adequate and clean water for insecticide mixing, reentry time, and proper management of dead insects following IRS.
- On the day of spraying, assist the SOPs by locating homes and assist the beneficiaries with homeowner preparation.
- After spraying, capture all the refused and locked structures and give the information to the local leadership for transmitting to the IRS coordinator for help in planning call-backs.

Health promotion officers from the MOHCC, who are the communication focal person at district level, led one-day sensitization meetings with community guides that clearly spelled out their roles in the IRS campaign (Table 11)

TABLE 11. SUMMARY OF COMMUNITY GUIDES, BY WARD, 2019

Ward	Center	Females	Males	Total
Hoyuyu Luckydip	Nzira RHC	12	10	22
	Hoyuyu II RHC	8	9	17
Nyamuganhu	Nyamakope	7	15	22
	Gurure RHC	9	23	32
Hoyuyu Clearwing	Rukanda Primary School	5	11	16
Nyamukapa	Musvaire Hall	9	18	27
	Tsiga Hall	9	18	27
Hoyuyu Mangondo	Cornerstore Business Centre	10	29	39
	Kushinga RHC	12	18	30
	Hoyuyu I RHC	11	30	41
TOTAL		92	181	273

Note: RHC=Rural Health Center

Each village head selected a lead guide, who worked with warners to strategize with SOPs on where to meet each day. The community guides were provided with a lunch allowance for their work. Overall the pilot was a success. Although most of spray progress in the pilot wards did not exceed the 85% PMI target, except for Nyamuganhu Ward, the pilot resulted in improved spray progress, spray coverage and structures sprayed as compared to that in 2018 (Table 12).

TABLE 12. 2019 HOMEOWNER PREPARATION PILOT RESULTS COMPARED TO 2018 COVERAGE, MUTOKO DISTRICT

Ward Name	2018				2019					
	Structures Found	Structures Sprayed	% Spray Coverage	% Spray Progress	Target (per 2018 geo-mapping)	Structures Found	Structures Sprayed	% Spray Coverage	% Spray Progress	% Increase in Structures Sprayed
Nyamukapa	2,326	1,938	83.3%	61.4%	3,154	2,816	2,635	93.6%	83.5%	26.5%
Hoyuyu Luckydip	4,574	3,343	73.1%	68.9%	4,851	4,791	4,077	85.1%	84.0%	18%
Hoyuyu Mangondo	2,732	2,304	84.3%	66.0%	3,490	3,011	2,727	90.6%	78.1%	15.55
Hoyuyu Clearwin	3,473	2,937	84.6%	58.6%	5,011	4,035	3,600	89.2%	71.8%	18.4%
Nyamuganhu	1,758	1,505	85.6%	61.7%	2,441	2,270	2,188	96.4%	89.6%	31.2%

4. Entomology

4.1 INSECTICIDE SUSCEPTIBILITY TESTS

Insecticide susceptibility tests completed at seven sites in three districts in Mashonaland East Province are shown in Table 13. Deltamethrin and clothianidin were tested for susceptibility tests in anticipation of the introduction of Fludora Fusion in Mutoko and Mudzi districts, whereas pirimiphos-methyl was tested in UMP in anticipation of using left-over Actellic 300CS in the district during the 2019 IRS campaign. Note that leftover Actellic was ultimately used in Mudzi and not UMP. All tests were done using the CDC bottle bioassay protocol except for clothianidin, for which the World Health Organization (WHO) tube test was used.

TABLE 13. RESULTS OF INSECTICIDE SUSCEPTIBILITY TESTS ON *AN. GAMBIAE S.L.* CONDUCTED AT SITES IN MASHONALAND EAST PROVINCE

District	Sentinel Site	Larval Collection Site (date of test)	Insecticide Tested (Dose)	Total Number of Mosquitoes Tested	Status (Mosquito mortality)
Mudzi	Dendera	Mafuta (Mar 2019)	Deltamethrin (0.05%)	70	S (100%)
			Clothianidin (13.5mg)	100	S (100%)
		Katena (Jul 2019)	Chlorfenapyr (100 µg)	7	S (100%)
Mutoko	Kawere	Manyenga (Mar 2019)	Deltamethrin (0.05%)	102	S (100%)
			Clothianidin (13.5mg)	67	S (100%)
		Karigoro (Mar 2019)	Clothianidin (13.5mg)	28	S (100%)
UMP	Maramba	Musasa (Mar 2019)	Deltamethrin (0.05%)	62	S (100%)
			Clothianidin (13.5mg)	75	S (100%)
		Kunditsungira (Mar 2019)	Clothianidin (13.5mg)	30	S (100%)
		Mawanza (Jun 2019)	Pirimiphos-methyl (0.25%)	55	S (100%)

S = susceptible

4.2 RESIDUAL EFFICACY

The standard WHO cone bioassay method was followed to measure the quality of spraying and insecticide decay rate of two insecticides, namely, deltamethrin + clothianidin combination (Fludora Fusion WP) and pirimiphos-methyl (Actellic 300CS) following the routine spraying of walls at Kawere (Mutoko) and Dendera (Mudzi), respectively. All villages selected for quality assessment near Dendera

entomological sentinel site in Mudzi District, and near the Kawere site in Mutoko District were sprayed on November 6, 2019. 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. 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 also 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 14 below.

TABLE 14. SUMMARY OF WALL TYPES TESTED WITH CONE BIOASSAYS IN MASHONALAND EAST, 2019

Wall surface type	Number of Houses	
	Kawere (Mutoko District)	Dendera (Mudzi District)
Mud	2	2
Brick	2	2
Cement	5	4
Paint	1	2
Total	10	10

For the WHO cone bioassays, 10 unfed, 2–5-day-old female mosquitoes were exposed on the treated walls per cone. Three cones were fixed 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% 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, one each per room for the wall bioassay tests and one cup per every two rooms for the airborne effect. Temperature and relative humidity were recorded during the exposure and subsequent 24-hour holding period. Mortality for the Fludora Fusion was observed up to 96-hour holding period. To assess the airborne or fumigant effect, bioassays were conducted in each room where wall cone bioassay tests were done.

The quality of spray was satisfactory with 100% mosquito mortality observed at T0 on all wall surfaces at both sites that was observed 24 hours post exposure. Mosquito mortalities were still at 100% on all wall four surface types at Kawere site two months post-spray and also 100% on mud and brick surface, but was 95.0% and 99.17% on painted and cement surfaces, respectively, at Dendera site (T2) (Figure 2).

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

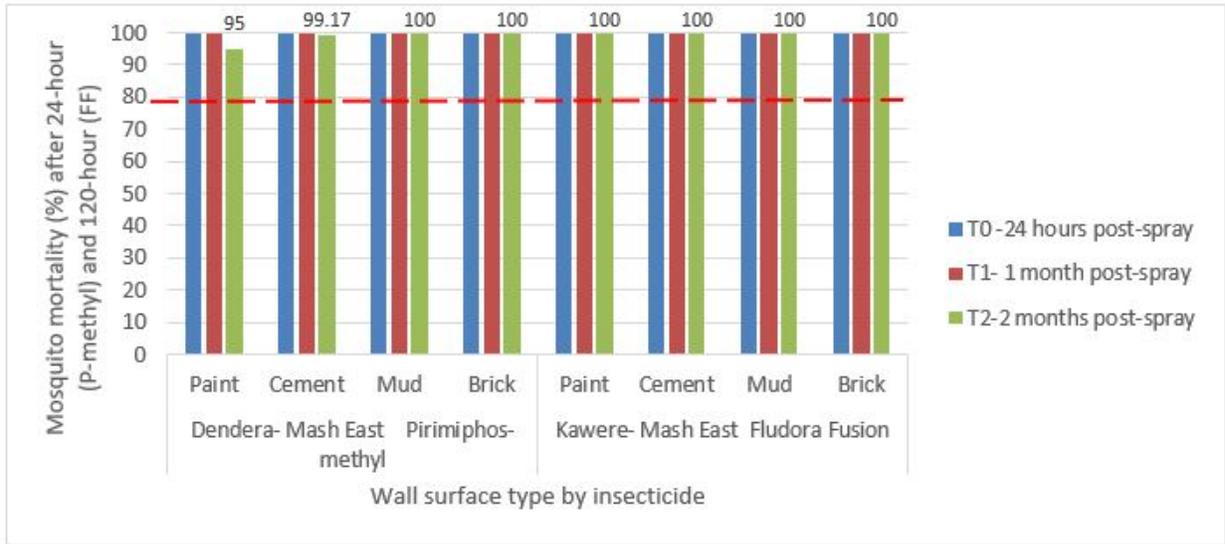
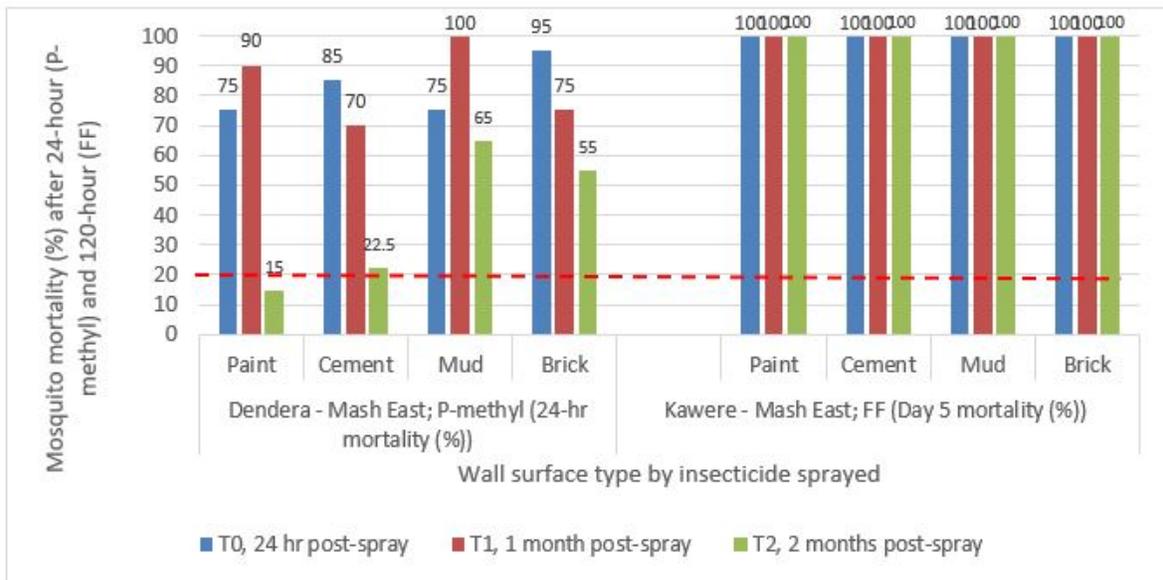


Figure 3 shows the mortality rate per wall type per month and per site of the airborne effect in Dendera and in Kawere in November (T0), December (T1), and January (T2). These results show a sharp decline in the average mortality from 83.7% to 39.4% across all the surface types in Dendera at T1 and T2, respectively, from an initial 82.5% at T0 after 24 hours (Day1). At Kawere, the airborne effect declined from an average mortality of 93.5% at T0 in November, to 83% and 60.7% at one month (T1) and two months post spray (T2), respectively after 24 hours but 100% mortality was observed by Day 5 in all walls types. 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



5. Environmental Compliance

5.1 PRE-SEASON ASSESSMENT

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

5.1.1 LETTER REPORT

PMI VectorLink Zimbabwe operates under a Supplemental Environmental Assessment (SEA) that was developed and approved in 2017. The SEA, which is valid for the period of 2017-2022, covers the use of pyrethroids, carbamates, organochlorines, and organophosphates, in addition to clothianidin and chlorfenapyr (when approved by the WHO Pre-qualification Team (PQ)), for IRS in Zimbabwe. In 2018, PMI approved an amendment to the SEA to authorize technical assistance for DDT (organochlorine) use by the Government of Zimbabwe and the clothianidin/deltamethrin combination for IRS. A Letter Report was approved in 2019 to fulfill the requirement of the SEA for an annual report rationalizing the continued use and choice of pesticides for IRS, and to report on the preparations and readiness for the IRS campaign in Zimbabwe for 2019.

The Letter Report for 2019, submitted to PMI in August 2019, indicated that PMI VectorLink Zimbabwe would conduct spray operations in two districts in Mashonaland East Province: the same two districts that were sprayed in 2018. However, the larger proportion of these two districts was sprayed with Fludora Fusion (clothianidin/deltamethrin combination active ingredient), whereas Actellic 300CS (organophosphate) left over from 2018 was used in areas where organophosphate has been used for IRS for less than two years. Before, during, and after the spray campaign, PMI VectorLink Zimbabwe followed all safety requirements, as specified in the approved SEA.

5.2 PRE-SEASON ENVIRONMENTAL COMPLIANCE ASSESSMENT

The 2019 pre-season environmental compliance assessments (PSECA) were conducted in Mudzi and Mutoko districts of Mashonaland East Province from August 4 to 9, 2019. The exercise was conducted by a team composed of the PFO (Mashonaland East), VectorLink ECO, and DEHOs for Mudzi and Mutoko districts, and supported by the NMCP Vector Control Officer. The team inspected 10 sites in the two districts.

Data were collected through observation and inspection of the proposed IRS campsites. Also observed was the general geographical environment of the proposed spray areas, to assess accessibility during the spraying. The VectorLink EC checklist on Open Data Kit (ODK) was used for the inspections at all proposed campsites.

The broad aim of the PSECA was to assess the level of IRS preparedness for 2019 in the two PMI-supported IRS districts in Mashonaland East Province. Specifically, the objectives were to:

- Identify the locations of and the physical conditions at sites proposed for storage of insecticides and other materials to be used for IRS
- Assess the operational state of soak pits and wash areas at the proposed campsites

- Identify important geographic challenges between campsites and targeted spray areas that are likely to affect smooth spraying (hazardous crossings of water bodies, questionable bridges, flood-prone areas, etc.)
- Identify most appropriate sites for soak pits, latrines, and bathing facilities at the proposed IRS camps
- Input geographical coordinates of each operations site, number of SOPs, and size of soak pit at each site
- Develop an assessment report with recommendations, and propose a plan for resolution of any gaps

The following campsites and storerooms were inspected during the period under review (nine, including seven campsites, one district store and a provincial warehouse):

- **Mutoko District:** Chindenga, Kawere, Kapondoro, Nzira, and Mutoko District storeroom
- **Mudzi District:** Makaha, Suswe, Dendera, and Mudzi Provincial storeroom

Annex D summarizes the major findings of the 2018 PSECA inspections by districts and the follow-up actions completed by VectorLink to ensure IRS operational facilities were in compliance with BMP requirements.

5.2.1 PROVISION OF WATER AT IRS CAMPSITES

The project provided water supply facilities at various IRS campsites after having noted the challenges when the PSECA were conducted at seven sites in Mudzi and Mutoko districts, as indicated below.

Mudzi District

The following are the main measures that were put in place in Mudzi District in order to improve the water supply situation at the IRS campsites:

- A new water tank and an electric water pump was fitted at Dendera IRS sites as the existing water sources were at the verge of drying up during IRS.
- Suswe was provided with a new water tank, but later the water source reticulation system developed some leakages resulting in water failing to get to the tank. The project then assisted by transporting water from a nearby Zimbabwe National Water Authority (ZINWA) reservoir using water tankers, while at the same time assisting ZINWA with some repairs to the leaks.
- Assisted in repairing the water reticulation system at Makaha IRS site before the campaign started as the piping system was clogged with silt.

Mutoko District

The following are the main measures put in place in Mutoko District in order to improve the water supply situation the IRS campsites:

- A new water tank was installed at Nzira IRS site as the existing water tanks were failing to meet the IRS needs.
- The borehole at Chindenga IRS site was desilted in order to improve the water supply yield
- A new solar-powered pump was installed at Kawere IRS campsite as the old one was having some operational challenges.
- The solar-powered pump and solar panels at Kapondoro were replaced because the old ones were not operating well.

5.2.2 PROVISION OF MOBILE AND PERMANENT SOAK PITS

For the 2019 spray campaign, the project provided new large capacity mobile soak pits and new permanent soak pits at both Mudzi and Mutoko districts in Mashonaland East Province, as the PSECA had shown that the existing wash areas at all the IRS sites in the two district were not adequate for the

number of SOPs working from the sites. Mutoko District was provided with three large-capacity mobile soak pits at both Nzira and Chindenga IRS sites as the existing wash areas could not accommodate the number SOPs at those sites. Also, in Mutoko, an additional permanent soak pit was upgraded from soak pits that were used the AIRS project at Kapondoro IRS site. In Mudzi, two large-capacity mobile soak pits were installed at both Makaha and Suswe IRS sites, to accommodate the increased number of SOPs at those sites. At Dendera IRS site, an additional permanent soak pit was installed.

5.3 MID-SEASON ENVIRONMENTAL COMPLIANCE ASSESSMENTS

The VectorLink ECO, Operations Manager, COP, Provincial Coordinator, 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 homeowner preparation. The purpose of these 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 environmental and health safety requirements for IRS. Appropriate PPE was issued to spray personnel and others who could be exposed to insecticides including coveralls, gloves, boots, helmets, face shields, neck protection, and dust masks. However, some shortage of PPE for supervisors and SOPs including face shields and gloves were identified. Both of these shortages were the result of damage during spray operations. These were quickly procured and distributed, to close any gaps. During the second phase of the spraying program, some SOPs had trouble using face shields, which had been scratched and were impairing visibility, however the project supplied new face shields to the spray operators. The team encountered challenges in maintaining the recommended temperature ranges at Dendera IRS campsite as the area is generally hot and the team was using a temporary shelter piloted for the first time in 2020, which did not insulate against the heat as well as permanent structures. Electric fans were installed at various campsites storerooms in order to mitigate against high temperatures.

There was an observed improvement in household preparation as SOPs found most of the homes fully compliant: The situation was aided by the use of village volunteers as community guides, and intensified support and supervision. The team observed also that all IRS sites met the standards for IRS operations. Various EC monitoring activities as described in Annex B were conducted to mitigate against noncompliance incidents that were observed during the spraying.

5.4 POST-SEASON ENVIRONMENTAL COMPLIANCE ASSESSMENT

Post-spray EC inspections were conducted in January 2020, which involved officially closing out of all seven of the IRS campsites and cleaning of IRS storerooms that were used during the 2019 season. The soak pits at the campsites in Mudzi and Mutoko were cleaned and locked according to BMP standards. The soak pits were covered with the specially designed soak pit covers in order to prevent unauthorized access to pits by the general public and animals.

5.5 INCIDENT REPORTS

Two major incidents were recorded during the 2019 IRS campaign. See below for a summary of these.

INCIDENT ID	BRIEF DESCRIPTION OF INCIDENT	LOCATION
ZIM-120719-001-	Suspected food poisoning. SOPs were exposed to food that had been kept at room temperature and then developed severe diarrhea.	Nzira IRS Campsite, Mutoko District, Mashonaland East Province, Zimbabwe

INCIDENT ID	BRIEF DESCRIPTION OF INCIDENT	LOCATION
ZIM-120719-002-	Theft and sale of two Fludora Fusion sachets by a male SOP. He sold the sachets to a community member who then reported the issue to a team leader. The sachets were recovered, and the SOP was dismissed immediately.	Chidenga IRS campsite, Mutoko District, Mashonaland East Province, Zimbabwe

5.6 WASTE DISPOSAL

All IRS solid waste materials were disposed of in accordance with the PMI BMP. Six types of solid waste were generated during the 2019 IRS campaign:

- Empty cardboard boxes
- Used disposable respirators
- Used mutton cloth
- Well-washed, damaged gloves, boots, contaminated and damaged PPE and plastic sheets
- Empty Fludora Fusion sachets
- Empty Actellic bottles

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. All OP empty bottles were thoroughly cleaned at Dendera Campsite soak pit so as to remove traces of insecticide from the bottles. All recyclable waste includes 24,000 empty OP bottles, bottle tops, and uncontaminated empty OP cardboard boxes were then transported to Harare for baling.

In previous years, the project used David Tebogo Investments for recycling, however, the business closed due to economic hardship. Therefore, the project engaged a new company, Recycle Inc. for recycling. The Recycle Inc. will transport the baled and crushed empty OP bottles to its 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 baling of the empty OP bottles.

The project also sorted and packed the contaminated waste at Mudzi Provincial warehouse and later transported them to Hwange Colliery for incineration. The incineration of the contaminated waste, which included Fludora Fusion empty sachets, used disposable respirators, used mutton cloth, contaminated empty cardboard boxes, and damaged PPE was done at Hwange Colliery during the second week of February 2020 and the process was witnessed by Hwange District Environmental Management Agency officials and MOHCC officials. A total of 1920 kilograms of waste was incinerated during the above described exercise.

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

6. Monitoring and Evaluation

6.1 M&E OBJECTIVES

The objectives of the M&E activities were as follows:

- Emphasize and supervise accurate data collection and data management, through participation in staff trainings at all levels;
- Streamline and standardize data flow to minimize aggregation errors and facilitate timely reporting to PMI, NMCP, and provincial and district offices;
- Ensure IRS data security and storage through the establishment and enforcement of proper protocols;
- Increase the use of the *Data Collection Verification (DCV)* tool in all two districts to enhance data quality; and,
- Develop and roll out the VectorLink Collect data management system for IRS data.

6.2 DATA MANAGEMENT

Following multiple discussions with NMCP on the roll-out of the VectorLink Collect database, the NMCP approved the modified use of the VectorLink Collect database to serve only as a place to house VectorLink Zimbabwe data following approval by the Zimbabwe NMCP. Approval was also granted to accommodate the use of VectorLink Collect for reporting data to PMI and allow for key visualizations to be created to monitor campaign progress within the DHIS 2-based system. Data flow and operations within the country remained the same, including VectorLink receiving data at the ward level, as opposed to structure-level as is standard across other VectorLink countries.

In 2019, data managers continued to use the campsite-specific Microsoft Excel spreadsheets originally developed under the PMI AIRS project to enter and aggregate at the ward level data at the end of each week during the IRS campaign. Once finalized by the campsite data manager, the VectorLink Zimbabwe M&E Manager would collect data weekly, review it for quality and analyze the data before sending to the Home Office M&E Specialist who imported data into the VectorLink Collect System. This system allowed for immediate analysis using the robust DHIS 2 functionalities.

The data managers also submitted spray data into the weekly IRS summary sheet via the Frontline SMS system, which auto-integrated this data into the national DHIS 2 system hosted by the MOHCC. Hard copies of spray data were sent to DEHOs, PEHO, and the NMCP after the data were submitted via Frontline, but these staff members also had access to the national DHIS 2 and could view IRS data electronically at any time.

6.3 DATA COLLECTION, ENTRY AND SECURITY

The same data collection tools used for the VectorLink project in 2018 IRS campaign (*Daily Spray Operator Form, Daily Team Leader Summary Form, and Daily Data Manager Summary Form*) were used in 2019 to record and document IRS campaign data. The weekly report spreadsheets for 2019 were updated by the home office this year to remove the formula errors and large-scale data quality issues that were problematic during the 2018 IRS campaign.

To ensure the secure storage of all data collected, all paper forms submitted were filed by geographical area and date in binders shelved at the campsite. Electronic data were secured and backed up to the

VectorLink Collect servers, cloud-hosted by the BAO Systems team. The data manager and IRS coordinator safeguarded the laptop password by preventing others' access to spray data and campaign hardware (laptop and printer). Laptops were transferred to the Harare office for safe storage during the offseason.

6.4 DATA QUALITY ASSURANCE

6.4.1 DATA COLLECTION VERIFICATION (DCV)

The DCV tool is used to verify data accuracy by ensuring that the data recorded on Daily Spray Operator Forms matches the information reported by households. The Home Office M&E Specialist, M&E Manager, Operations Manager, COP as well as a few IRS coordinators were involved in data collection verification. However, the VectorLink Zimbabwe team faced challenges in conducting sufficient numbers of DCV forms to allow for an adequate sample size to inform decisions about data quality. The team took many steps to troubleshoot this process, yet it could not meet the targeted number of DCVs with primarily VectorLink staff being used for data collection, as VectorLink staff often had competing duties that prevented them from providing full effort to DCV collection. In all other PMI VectorLink countries, M&E seasonal staff collect these data. To avoid these challenges in future campaigns, the team recognizes that additional M&E seasonal staff are essential.

6.4.2 DATA COLLECTION SUPERVISION

Data Collection Supervision was also conducted to ensure data quality. Field spot checks were conducted to verify the data collected and where inaccuracies occurred, and corrections were made to the collected data. Supervisors, team leaders and data managers also reviewed the SOP data collection forms and signed off on the data collection forms to indicate that they had reviewed the data and inaccuracies had been corrected.

6.5 DATA REPORTING

Weekly IRS progress reports were produced and shared with the Home Office, PMI, provinces, and districts. Pre-programmed standard dashboards created in the VectorLink Collect database provided information on key IRS indicators to allow for near real-time tracking of progress by stakeholders. These indicators could be visualized and analyzed at the ward, campsite, district, or national level. The data allowed stakeholders to make informed decisions about IRS. Stakeholders such as PMI and district officials had access to the VectorLink Collect database and could monitor campaign progress.

6.6 MHEALTH RESULTS

During the 2019 IRS campaign, the two PMI-supported districts (Mudzi and Mutoko) continued EC and data quality monitoring using mHealth tools. SOPs were randomly sampled for observations on a daily basis. Smartphone-based EC and DCV checklists were used for data collection. The checklists were administered by IRS field supervisors, team leaders, IRS coordinators, VectorLink staff, and district and provincial officers. The following smartphone-based checklists supported by the CommCare and ODK applications were used for data collection.

6.6.1 STOREKEEPER PERFORMANCE FORM

The main aim of conducting storekeeper performance inspections is to ensure that storekeepers are following the prescribed best warehousing practices and can account for stocks and equipment in their stores at all times. The plan was to inspect all four campsite storerooms used concurrently on a daily basis, aggregating to a minimum of 140 inspections. The team did 122 inspections.

6.6.2 MORNING MOBILIZATION FORM

The objectives of morning mobilization are to ensure spray teams leave for the day fed, healthy, and well prepared, and with adequate and appropriate PPE, insecticide, and supplies for the day's work. In 2019, the reporting level was significantly higher (209%) as team leaders were assisting the coordinators in morning mobilization inspections.

6.6.3 HOMEOWNER PREPARATION AND SPRAY OPERATOR PERFORMANCE FORM

The aim of the homeowner preparation form is to ensure that SOPs spray houses that have been correctly prepared for spraying and use correct spraying techniques. Initially, both team leaders and supervisors completed the forms. Later, supervisors moved to ODK and the team leaders were left to complete these forms by themselves. A total of 3,274 forms were completed against a target of 2,800. Total submissions included forms completed by supervisors during the first week of the campaign.

6.6.4 END-OF-DAY CLEAN-UP FORM

To ensure spray teams correctly follow EC standard procedures for cleaning IRS equipment, and account for insecticide stocks and safe storage of equipment, the end-of-day clean-up checklist was used. Eighty-five percent of the targeted forms were completed by the two districts.

6.6.5 TRANSPORTATION VEHICLE INSPECTION CHECKLIST

The aim of using this checklist is to assess and ensure safe transportation of spray teams and IRS commodities and supplies. Both districts had a total of nine lorries that were supposed to be inspected on a daily basis, thus giving a target of 315 for the 35-day campaign. A total of 244 (77% of the target number) inspections were recorded and submitted. Supervisors would sometimes complete one form to inspect the two lorries at the campsite, rather than one each, resulting in the missed target. This will be addressed during trainings in 2020.

6.6.6 DATA COLLECTION VERIFICATION CHECKLIST

The aim of the form is to verify the quality of data collected by SOPs. In 2019, VectorLink staff were supposed to complete at least 20 DCV forms per ward for a target of 920 forms. A total of 487 forms were completed, a 52.9% achievement. Challenges in completing the targeted number of DCVs was described above in Section 6.4.1.

6.6.7 DIRECTLY OBSERVED SPRAYING

The aim of the DOS checklist is to ensure that SOPs are following the prescribed spray techniques and can show spray skills and achieve high quality of spray, and that they have adequate PPE, worn properly. Field supervisors were responsible for DOS checklist. Each field supervisor was supposed to complete one form with at least six observations (2 per SOP) each day. 2,124 DOS forms were submitted by the two districts with a total of 9,879 observations.

Table 15 summarizes the mHealth results during the 2019 campaign. Forms were completed on a daily basis. Both CommCare and ODK applications do not allow the user to proceed without filling in all the required information. Completeness was therefore at 100% for all forms submitted. The challenge was on timelines for submission of forms. Users were not able to submit their forms on a daily basis as required as they sometimes failed to sync with the server due to poor internet connectivity at most of the campsites. However whenever the teams were in an area with better signal all the hanging forms were be sent to the server.

Where coverage targets were not made, this was the result of supervisors under-reporting inspections. For example, the target for vehicle inspections was number of days of the campaign multiplied by the number of lorries. However, some coordinators would inspect both lorries at a campsite at the same time and complete one form instead of two separate forms for each lorry. The same applies to end of day clean-up forms whereby the target was based on the completion of a form on each lorry's arrival. Instead the team leaders would complete one form if both lorries arrive back from the field at the same time and one team leader was supervising end of day clean-up of both lorries.

TABLE 15. COMM CARE AND ODK RESULTS BY FORM FOR MUDZI AND MUTOKO DISTRICTS

Form/Checklist	Targeted Number of Forms	Number of Forms Filled	Percent Coverage
Storekeeper Performance	140	122	87%
Morning Mobilization	140	293	209%
Homeowner Preparation and Spray Operator Performance	2800	3274	117%
End-of-Day Clean-up	280	238	85%
Transportation Vehicle Inspection	315	244	77%
DCV	920	487	52.9%
DOS	2100	2124	101%

The most common non-compliance issues observed were leaking pumps and incorrect insecticide mixing which had 86 and 31 observations recorded, respectively (Table 16).

TABLE 16. NON COMPLIANCE ISSUES OBSERVED ON DOS

Observation	Non-Compliant	Compliant	Total Observations
1 Did the SOP mix the insecticide to form a 7.5l solution?	31	9848	9879
2 Did the SO triple rinse the empty insecticide bottle?	5	9874	9879
3 Is the SOP in full PPE	9	9870	9879
4 Is the SOP spraying with a pump fitted with a CFV?	5	9874	9879
5 Have all belongings, food items, animals/sick persons been removed?	3	9876	9879
6 Have all items that cannot be removed been covered with plastic sheeting?	6	9873	9879
7 Are there any leaks from the pump?	86	9793	9879
8 Is the SOP spraying with the tip of the nozzle 45cm away from the wall?	7	9872	9879
9 Is the SOP maintaining the correct speed of spray?	9	9870	9879
10 Is there a 2cm overlap with each successive swath?	13	9866	9879

This was the second year of using the mHealth applications in Mashonaland East. There was a great improvement from 2018 IRS campaign, when most supervisors were struggling to navigate through the application and made numerous incorrect entries. The new Samsung phones used for the 2019 campaign had better battery life; hence few phones ran out of power in the field.

Power challenges were experienced at Nzira campsite only. Solar-power systems were installed at Kawere and Chindenga campsites therefore charging of phones was not interrupted. However, power challenges did not significantly inhibit the ability to collect sufficient mHealth data. All phones had adequate airtime bundles for data transmission.

6.7 RESULTS OF 2019 IRS CAMPAIGN

VectorLink Zimbabwe sprayed 131,191 structures out of the 139,736 eligible structures found, resulting in a 93.9% spray coverage. The campaign protected 307,209 people (147,180 males and 160,029 females) in the two supported districts. This included 5,010 pregnant women and 48,047 children under 5 years old. A breakdown of the 2019 IRS campaign results by district is shown in Table 17. Target structures are the number of eligible structures found during 2018 geo-mapping activity and was used in planning for 2018 operations. Table 18 shows insecticide usage. A total of 17,542 sachets of insecticide (Fludora Fusion) were left over and will be used for the 2020 IRS campaign. The average structures sprayed per SOP per day were 15.3 against a target of 18.

A breakdown of the spray coverage and spray progress by district is shown in Figures 4 and 5. Spray coverage and spray progress were 93.9% and 87.7%, respectively. The inability to identify eligible structures that were identified by the 2018 geo-mapping activity contributed to low spray progress in Mutoko District. Long distance between structures in some wards also contributed to low spray progress. Despite conducting callbacks, spray progress remained relatively low. A verification exercise in 2020 will be conducted to understand the geo-mapping data in wards which showed a large discrepancy between what SOPs found and the geo-mapping data.

TABLE 17. SUMMARY OF THE 2019 IRS CAMPAIGN SPRAY COVERAGE

District	Target Structures	Structures Found in 2019	Structures Sprayed	% Spray Coverage	% Spray Progress	Non-sprayed Structures		Population Protected					Overall Population		% of Population Protected
						Refused	Locked	Total	Males	Females	Pregnant Women	Children <5 Years	Total Found	Not Protected	
Mudzi	74,340	68,089	65,995	96.9%	88.8%	1,171	923	163,898	78,303	85,595	2,499	25,504	169,690	5,792	96.6%
Mutoko	75,305	71,647	65,196	91.0%	86.6%	3,393	3,058	143,311	68,877	74,434	2,511	22,543	154,995	11,684	92.5%
Total	149,645	139,736	131,191	93.9%	87.7%	4,564	3,981	307,209	147,180	160,029	5,010	48,047	324,685	17,476	94.6%

TABLE 18. SUMMARY OF INSECTICIDE USAGE DURING THE 2019 IRS CAMPAIGN

District	Structures Sprayed by Insecticide Type		Total Structures Sprayed	Total Bottles/Sachets Received		Total Bottles/Sachets Used	Total Lost/Damaged	Total Bottles Remaining		# of Days Worked	Avg # of SOPs	Avg # of Str Sprayed/SOP/Day
	Actellic	Fludora Fusion		Actellic	Fludora Fusion			Actellic	Fludora Fusion			
Mudzi	60,102	5,893	65,995	20,457	3,099	23,556	0	0	0	36	118	15.5
Mutoko	0	65,196	65,196	0	44,858	27,316	0	0	17,542	36	121	15
Total	60,102	71,089	131,191	20,457	47,970	50,872	0	0	17,542	36	239	15.3

Note: Actellic balance of 20,457 bottles from the 2018 IRS campaign was used up. The 2019 insecticide (Fludora Fusion) balance of 17,542 bottles has expiration date of August 2021.

FIGURE 4. SPRAY COVERAGE MUDZI AND MUTOKO DISTRICTS, 2019 IRS CAMPAIGN

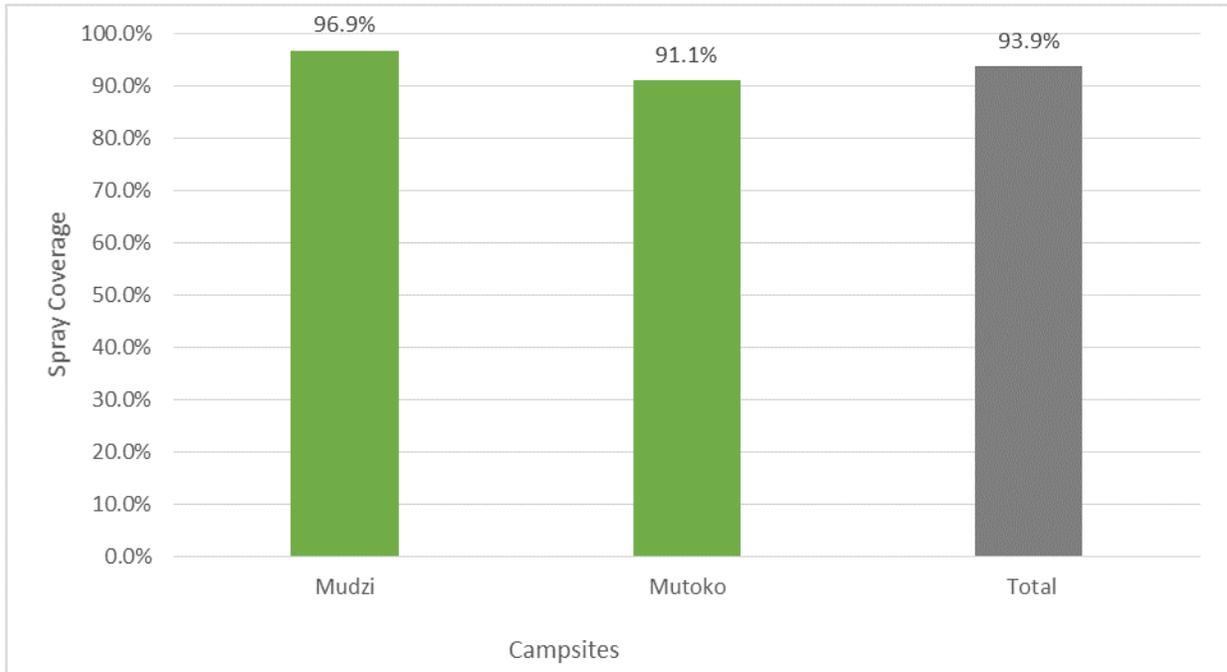
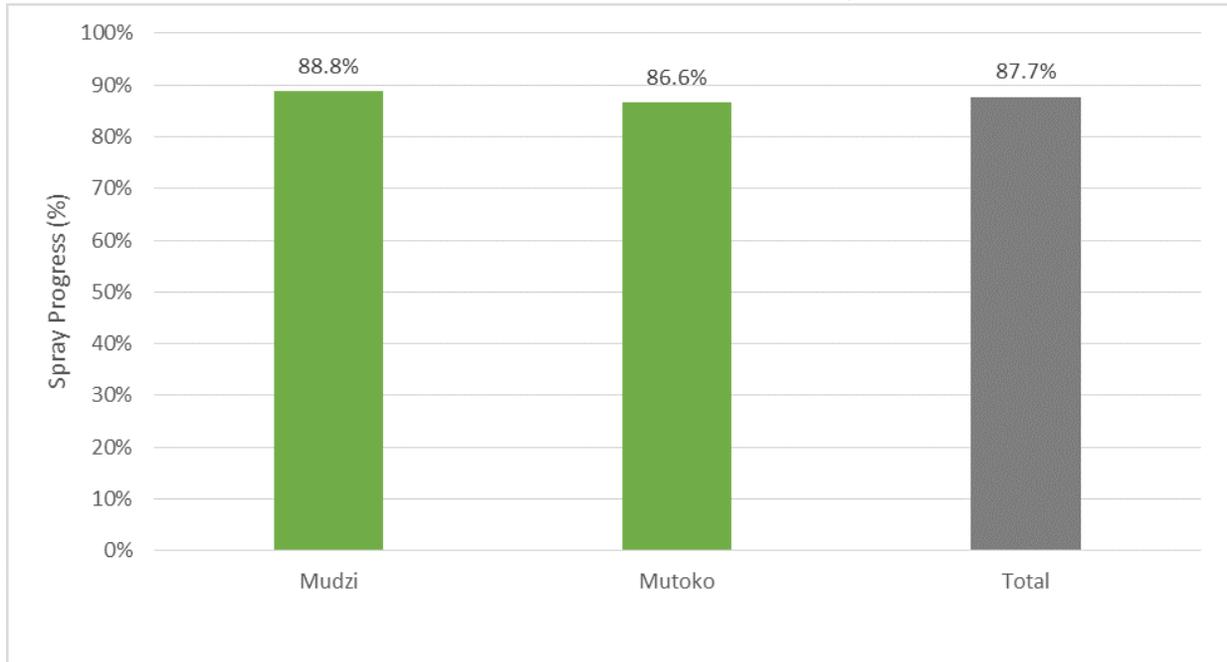


FIGURE 5. SPRAY PROGRESS MUDZI AND MUTOKO DISTRICTS, 2019 IRS CAMPAIGN



7. Challenges and Recommendations

The following challenges, lessons learned, solutions and recommendations were identified during the 2019 spray campaign.

Challenge	Solution/Recommendation
<p>IRS operations were affected by a diarrheal outbreak at Nzira campsite in Mutoko, thus affecting daily performance as SOPs could not reach the targets for the day.</p>	<p>Callbacks were conducted to improve coverage in the affected areas. Outbreak investigation was carried out to assess the extent of the severity of the outbreak and to identify possible causes and measures to prevent further occurrence of the outbreak. Regular monitoring of all food processing steps as well as observing high standards of personal hygiene were put in place. The outbreak was controlled, and an incident report was shared.</p> <p>A checklist to standardize monitoring of food safety at IRS camp sites will be developed for use in the 2020 campaign.</p>
<p>Delays in the payment of IRS level 3 training allowances due to a system challenge with the Ecocash payment platform.</p>	<p>The Ecocash payment facility resolved the system challenge, but to avoid delays in the future payment of allowances through Ecocash, the districts and VectorLink worked with SOPs to open Foreign Currency Accounts with local banks. These accounts were used to pay allowances for level 3 training and for subsequent allowance payments.</p>
<p>Despite payment of allowances through bank accounts, SOPs who used Steward Bank could not access their cash from local branches.</p>	<p>VectorLink facilitated cash payment for bus fares to district capitals for SOPs who could not access cash from the local banks. SOPs should be encouraged to open Foreign Currency Accounts with banks such as Agribank and CBZ, where there were no cash challenges.</p>
<p>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.</p>	<p>The project worked with village health workers (VHWs) and community guides to improve uptake of IRS and increase their role and support of IRS mobilization activities. The project piloted the use of community guides and VHWs in homeowner preparation in five wards in Mutoko District. The pilot resulted in higher coverage in those wards. The project is planning to scale up the pilot in other wards during the 2020 campaign.</p>

Challenge	Solution/Recommendation
<p>Homeowners were not at home at the time of spray resulting in lower coverage and callbacks. Reasons for this included competing programs such as World Food Programme and World Vision community registration for donor aid, distribution of food handouts and agricultural inputs such as seed and fertilizers, homeowners prioritizing farming operations with the onset of rain, agricultural and food distribution exercises, and gold-panning.</p>	<p>VectorLink rescheduled IRS in such areas in order to accommodate the other programs and callbacks were done where needed.</p> <p>The project should continue to work and consult the district and local ward and village leadership on dates targeted for other competing programs so that the IRS coordinator and team can reschedule and avoid deploying SOPs in an area where another program will take place on the same day. The project also encouraged the spray teams to leave camp earlier in the morning to find homeowners before they left for the other competing programs.</p>
<p>Campsites had trouble supporting the water needed for spray operations. Specifically, the water supply at Chindenga campsite in Mutoko District was inadequate due to low yield resulting from the low water table. At Suswe campsite in Mudzi, the challenge was mainly due to ZINWA pump failure to push large volumes of water from the source to the main reservoir.</p>	<p>VectorLink activated a contingency plan of water delivery to the affected campsites. The project liaised with the ZINWA and assisted with the repair of the pump at Suswe campsite.</p>
<p>A lorry broke down at Makaha/Suswe campsite toward the end of the first phase of the IRS campaign, resulting in two days downtime and delays in deploying SOPs at the scheduled time, thereby affecting the daily targets.</p>	<p>The team ended up conducting callbacks on foot in nearby villages in Makaha ward. The service provider also managed to fix the lorry during the IRS break.</p>
<p>There were delays in issuing and receiving insecticide at the campsite store at the start and end of the day, due to the sachet serialization and serial number verification process.</p>	<p>VectorLink adjusted the serialization process, which was a new initiative for 2019, so that supervisors instead of team leaders would be managing the SOP-level sachet serial number tracking. The project will be using stickers, scanners, and barcodes to improve the process in 2020.</p>
<p>Rough terrain and long distances between households meant SOPs had to spend more time walking from one household to the other, affecting progress particularly in Mutoko.</p>	<p>Callbacks were conducted to improve spray progress. For 2020, the project will improve on planning and deployment by increasing SOPs coverage and reducing targets in areas with rough terrain and long distances between households.</p>

Challenge	Solution/Recommendation
The MOHCC had pledged to support the IRS campaign with two lorries. These lorries were taken in for maintenance and repair at Duly Trucks workshop in Harare, but supply chain challenges prevented the workshop from making the trucks available as scheduled.	VectorLink managed to source an additional lorry from the private sector in order to complement the existing fleet base for effective transport.
Electricity outages at Nzira, Kapondoro, Kawere, and Chindenga led to the inability to charge smartphones for support and supervision and laptops for daily data capture by data managers.	VectorLink purchased portable solar systems as a back-up power source for Kawere and Chindenga campsites. The project also made use of portable power banks that the SOPs and supervisors could use at campsites and in the field. The project also purchased multi-port adapters, which could charge more phones at the same time.
Some areas (Nzira, Chindenga) had limited network connectivity for the data managers to send the data on time to the M&E Manager.	The M&E Manager would travel to the affected campsites to collect data for reporting.
Rainfall and funeral gatherings affected spray progress in both Mudzi and Mutoko districts.	Callbacks were conducted in the affected villages in order to improve coverage.
Some tents leaked at seams and zippers and in some cases at sidewalls.	Black polythene sheets were used to cover the tents to prevent leaks. Prior to the next campaign, the project will patch tents, where possible, and replace others, where the budget permits.
There were challenges with temperature regulation in storage facilities due to lack of electrical connections for fans at Nzira, Suswe, and Chindenga storerooms.	The project encouraged stores personnel to open storeroom windows during the day to ensure natural cross-ventilation.
Initially the team was not receiving ODK submission reports; hence it was difficult to monitor supervisors' performance and respond to red flags.	The project later worked with the Home Office to ensure the team receives ODK reports and responds to the red flags raised.

Challenge	Solution/Recommendation
<p>There were wards with low spray progress and discrepancies between geo-mapped numbers and what SOPs were finding on the ground.</p>	<p>Several callbacks were conducted in wards with low spray progress but there were insignificant spray progress increases. Tabulation of targets and structures found for 2018 and 2019 campaigns and comparisons of data for structures found/sprayed by SOPs across the years at ward level is recommended. Given discrepancies between geo-mapped numbers and what SOPs were finding on the ground in some wards, the project plans to conduct a verification exercise to understand the reliability of the geo-mapping data in wards with large discrepancies.</p>
<p>The completion of sufficient percentage of DCVs was a challenge. In other PMI VectorLink country programs, M&E assistants are assigned to complete DCV forms in areas that were previously visited by SOPs. Due to the lack of M&E assistants in Zimbabwe, only VectorLink staff were assigned to conduct DCVs. The team struggled to complete the recommended number of DCVs due to many competing IRS demands.</p>	<p>The project proposes to hire seasonal M&E assistants in next year's campaign to ensure that DCVs can be completed and used properly to inform data quality.</p>

Annex A. 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	Completed	Completed						
1.1.2	Number of eligible structures targeted for spraying	Project records Annually		125,068	125,249	149,645	139,736						
1.1.3	Number of eligible structures sprayed with IRS	Project records Annually		102,546	112,805	127,199	131,191						
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%	85%	93.9						
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	297,070	307,209 160,029 (52.1%) females,147,180(47 .9%) males,5,010 pregnant women,48,047 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	Completed	Completed						
1.1.7	Post-spray Data Quality Audit conducted within 90 days of spray completion	Data Collection Forms Annually		N/A	N/A	N/A	N/A						

¹ In Year 2, VectorLink Zimbabwe will only be supporting IRS operations. No other VC interventions are referred to in this MEP for Year 2.

#	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
1.1.8	Number of Insecticide Treated Nets (ITNs) distributed, by channel	Project Records Annually	Channel	N/A	N/A	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	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	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	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 Opst Staff	8; Ops (1), mHealth (1), M&E (1), EC (3), Ento (1),SBCC (1)	8: Malaria, Entomology,EC,SBC C	7:Ops (1),M&E (2), EC (3),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	15	3						

#	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	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	416	389; Males 297 (76.3%), Females 92 (23.7%) PFO 1,DEHOs 2,IRS coordinators 4,Team leaders 16 Supervisors 60,SOPs 239,washers 12,Pump techs 4,Storekeepers 6,Guards 10,Mobilisers 22,Data Managers 4,Drivers 9.							
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	30	18 (11 Males, 7 Females)							
1.3.3	Number of adverse reactions to pesticide exposure documented	Incident Report Forms Annually	Type of Exposure	0	0	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	324	430; Males 309 (71.9%), Females 121 (28.1%) IRS							
1.4.2	Number of people trained during IRS Training of Trainers	Project Training Records Annually	Sex (# and %)	50	29 29 (100%) males	75	50 (36 males, 14 females)							
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	402	388; Males 296 (76.3%), Females 92 (23.7%)							

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)

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)

#	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
1.4.4	Number of government/district officials who acted as supervisors during VC campaigns	Project Records Annually	VC Intervention Type	116	99	91	91, IRS						
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	35;35%	92;23.7%						
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%	28;30%	31; 33.7% IRS, 4 team leaders,27 IRS Supervisors						
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%	420;100%	417; 99.2% PFO 1,PEHO 1,DEHOs 2,IRS coordinators 4,Team leaders 16 Supervisors 60,SOPs 239,washers 12,Pump techs 4,Storekeepers 6,Guards 10,Mobilisers 22,Data Managers 4,Drivers 9,VL staff 15,clinicians 11,Transport Officer 1						
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	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	66	0						
1.6.2	Number of print materials disseminated	Project Records Annually	VC Intervention Type	103,880	22,894 ⁶	103,880	400 posters and 1000 pamphlets						

⁵ Team leaders (6); Field supervisors (8)

⁶ 20,000 brochures; 1,100 posters; 897 hats; 897 t-shirts

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1 ⁷		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
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)	102,546	87,164 (41,838 males, 45,325 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	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	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	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	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%)	8;100%	8;100%	Permanent soak pits					
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)	11;100%	9;81.8% 1 provincial, 1 district, 7 campsites,						
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%)	8;100%	7;87.5%						
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%	6;100%	6;100%						

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		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
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%	3;50%	3;50%						
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%	6;100%	6;100%						
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%	6;100%	4, 66.7%: Deltamethrin 3, 50%; Pirimiphos- methyl 1, 16.7%; DDT 1, 16.7%; chlorfenapyr 1, 16.7%; clothianidin 1, 16.7%						
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%	30;100%	30;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%	30;100% 20Mash East, 10 Manicaland	30;100%						

#	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
2.1.7	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%	120;100% 2 sites Mash East and 1 site in Manicaland	120;100% DDT 40;33.3% Pirimiphos- methyl 40,33.3% Fludora Fusion 40;33.3%						
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%	54;100%	Pyrethroid: 3, 12.5%; OP: 1, 16.7%; OC: 1, 16.7%; Neonicotinoid: 3, 50%; Pyrrole: 1, 16.7%						
2.1.9	Integrated vector control analytics dashboard available for decision making	Project Records Annually		N/A	N/A	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	N/A	N/A						
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	N/A	N/A						
2.2.2	Completed integrated data and visualization landscaping for vector control decision making	Project Records Annually		N/A	N/A	N/A	N/A						
2.2.3	Implemented sub-national insecticide rotation as part of an insecticide resistance management strategy	Project Records Annually		Completed	Completed	Completed	Completed						
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	N/A	N/A						

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
2.3.2	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	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%	1;100%	1;100% Fludora Fusion						
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%	1;100%	1;100% Fludora Fusion						
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%	1;100%	1;100% IRS						
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%	1;100%	1;100%						
3.1.5	PPE procured according to workforce composition	Procurement Records Annually		N/A	N/A	1;100%	1;100%						
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%	6;100%	6;100% 3 males,3 females,IRS						
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%	7;100%	7;100% Actellic 300CS and Fludora Fusion						
3.2.3	Successfully completed spray operations without an insecticide stock-out	Inventory and Stock Records Annually	Insecticide Type	Completed	Completed	Completed	Completed						

#	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. 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	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	1	0							
4.2.2	Number of individual members who use the Vector Learning Exchange	Project Records Annually		10	15	15	0							
4.2.3	Number of symposia and/or presentations submitted to and accepted at global conferences	Project Records Annually	Technical Area	0	0	1	0							
4.2.4	Number of success stories written or videos produced and shared on the VectorLink project website	Project Records Annually		1	0	1	0							
4.2.5	Number of peer-reviewed journal articles submitted and accepted	Project Records Annually	Technical Area	0	0	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	1	1							

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results										
				Year 1		Year 2		Year 3		Year 4		Year 5		
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result	
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	1	3							
							Use of ZAPIM vehicle instead of hiring vehicles, Daily movement planning, Creation of an mHealth, M&E whatsapp group which was an information hub for sharing experiences and allowing for quick responses to mHealth and M&E issues							
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	1	0							
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	11	10 (Hwange Colliery, Sycott Transport, The Bike Hospital, Fawcett Security Company, Redan Petroleum, Zimbabwe, Shelly Investments, Kanjanda Investment, Kanoyangwa Traditional Kitchen, Kumboedza Catering, David Tebogo Investments)							

ANNEX B. 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 2019–28 February 2020

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
Ia. 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 2019. Initial inspections were done by the VectorLink ECO, provincial coordinator, and MOHCC officials. The Government of Zimbabwe Vehicle Inspection Department found defects in all vehicles during the initial stage, which were fixed to meet all certification criteria. A total of 9 lorries were certified for the 2019 spray operations.	No outstanding issues	After repairs to the vehicles there was total compliance.
Ib. Driver training	All 11 drivers, IRS supervisors, coordinators, and DEHOs were trained in Mudzi on October 23-24, 2019. 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.
Ic. Cell phone, personal protective equipment (PPE) and spill kits on board during pesticide transportation.	All 9 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 293 morning mobilization vehicle inspections were conducted during the 2019 spray campaign. On 293 occasions, the vehicles had all required PPE and spill kits. No major non-compliance incidences were recorded.	No outstanding issues	There was total compliance.
Id. Initial and 30-day pregnancy testing for female candidates for jobs with potential pesticide contact.	Before Level 3 training, 94 females (SOPs, washers, team leaders, and supervisors) were given pregnancy tests during the last week of October 2019. A second screening was done before the second phase of IRS began in the first week of December 2019.	No outstanding issues	No females were found to be pregnant during tests. All test records are available on file. There was total compliance.

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
I.e. Health fitness testing for all operators	All 386 spray personnel candidates had the required pre-spray general physical/ medical examination on October 29-30, 2019. All 386 spraying candidates passed the medical examination and were declared 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, locometer system, and for allergies to OPs. 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.
I.f. 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. All candidates with potential pesticides contact were fully trained on correct PPE use. Staff had issues with face shields scratching and gloves ripping; therefore a second batch of face shields and rubber gloves for SOPs were provided to replace damaged ones.	PVC aprons were not procured in time for the start of the spraying program as they weren't available in-country	There was some compliance.
I.g. 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 (both OPs (Actellic 300 CS) and Fludora Fusion) including triple rinse of the Actellic 300 CS bottles. The trainings also demonstrated the proper use and maintenance of spray pumps. A total of 386 staff were trained including all supervisors, IRS coordinators, team leaders, SOPs, and government officials (field officers and DEHOs in the targeted districts).	No outstanding issue	There was total compliance.

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
I h. Provision of adequate facilities and supplies for end-of-day cleanup,	A total of 7/8 (88%) campsites were used. Each IRS campsite was provided with an adequate storage facility that was either provided by the MOHCC or health centers, or rented from an individual at local business centers. Each IRS campsite had latrines and bathing facilities for both sexes. All facilities were compliant, and had the materials required for clean-up. A total of 238 end-of-day inspections were conducted. Also, 386 SOPs and supervisors were issued soap for bathing. Improvements in water supply were done at all IRS sites.	No outstanding issues	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.
I i. 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 SOPs were supervised by team leaders and field supervisors. ECOs, COP, DEHOs, operations managers and the IRS coordinators supervised clean-up procedures when they were present at an operations site. A total of 238 end-of-day inspections were conducted, and some incidents of non-compliance were identified during clean-up. Appropriate advice regarding the non-compliance was given to SOPs. The major problem noted was instead of using the hanging rails to dry the sprayers, SOPs were using mutton cloth to dry. Also it was noted that SOPs were not fully using PPE during clean-up, as face shields had become scratched, limiting vision.	No outstanding issues	Team purchased additional face shields for those SOPs where scratches were obstructing vision.

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
2a. IEC campaigns to inform homeowners of responsibilities and precautions.	Homeowners were fully informed about their roles, responsibilities, and precautions mainly through house-to-house mobilization. In addition, community meetings and use of community guides assisted in promoting homeowner preparation and discussions on homeowners' roles, responsibilities, and precautions for before, during, and after their homes are sprayed. This played an important role in enhancing homeowner preparations. VectorLink Zimbabwe continued to pilot the use of local community workers to help the beneficiaries to remove household goods to facilitate smooth spray operations in five wards in Mutoko District.	No outstanding issues	There was increased compliance but additional improvements to homeowner preparations are needed.
2b. Prohibition of spraying houses that are not properly prepared.	<p>Nearly all structures (131,191) that were sprayed, were properly prepared. All SOPs, team leaders, and field supervisors were trained on how to prepare structures for spraying. Of the 3,274 homeowner preparation inspections carried out, failing to fully remove household goods by the community before the arrival of the spray operators was one of the challenges observed during homeowner preparation</p> <p>Failure to prepare structures for spraying poses a risk if household goods are sprayed, or it forces the SOPs to waste spray time while assisting in the preparation.</p>	No outstanding issues	There was some degree of compliance. However, homeowner preparations need 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 3,274 homeowners were advised to bury dead insects and wash their hands with soap and water after cleaning.	No outstanding issues	There was total compliance.

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
2d. Instruct homeowners to wash itchy skin and go to health clinic if symptoms do not subside.	All 3,274 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 incidents of itchiness were formally reported.	No outstanding issues	There was total compliance.
3a. Packaging for pesticide shipments over water	No insecticides were transported over water in the PMI/VectorLink-supported districts.	No outstanding issues	There was total compliance.
3b. Protection of bees/pollinators	Spraying was done indoors only and at least 30 meters away from sensitive areas including beehives.	No outstanding issues	There was total compliance.
3c. Use of proper spray techniques	All 239 SOPs and 126 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.	There was a shortage of flashlights so not all SOPs had these in the first phase of the campaign.	The major issue noted was not adhering to a 2 cm overlap across insecticide swaths. However, the type of nozzle (8002E) that the NMCP recommends for use does not require an overlap. However our supervision checklist requires an overlap of 2 cm; hence, it was regarded as non-compliance. This will be changed in the checklist for the 2020 campaign.
3d. Indoor spraying only.	All 239 SOPs sprayed only the indoors of sleeping rooms. This included inner walls, ceiling, and some eaves of selected sleeping rooms.	No outstanding issues	There was total compliance. Rooms used for both sleeping and cooking, were sprayed given the epidemiological impact of leaving household members unprotected while sleeping.

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
3e. Maintenance of pumps	The 386 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.	No outstanding issues	Provision should be made for pump technicians to assess and service spray pumps well before the campaign begins. Pump technicians should be trained well before the spraying period
4a. Choose sites for disposal of liquid wastes, including mobile soak pit sites, according to PMI BMPs.	All 7 IRS campsites were provided with both permanent and large mobile soak pits for disposal of IRS liquid waste. All operations sites were inspected to ensure that they met BMP standards before they were certified for use. Also, SOP washing slabs were provided at all campsites to facilitate bathing.	No outstanding issues	There was total compliance.
4b. Maintain soak pits as necessary during season.	All 7 permanent soak pits and 10 large mobile soak pits were available and ready for use in Mudzi and Mutoko according to BMP standards. 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 or an alternative site in Harare, in collaboration with its South African partner. These facilities are certified by Environmental Management Agency. Incineration and recycling will be done in February 2020.	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. There was clear labeling of sacks / boxes for storing used nose masks, hand gloves, and all other waste that was generated. A total of 122 storekeeper performance monitoring visits were done during the course of the IRS season and no major incident of non-compliance was noted in storage and stock management.	No outstanding issues	There was total compliance.
4f. Monitoring disposal procedures post-campaign.	IRS waste from campsites was collected and stored at district storerooms and later transferred to the Mudzi Provincial warehouse. The waste will be sorted according to type and level of contamination in preparation for recycling and incineration. Waste disposal incineration will be done at Hwange Colliery, which has been inspected and meets WHO requirements for waste disposal. The ECO and MOHCC officials will monitor the post-spray campaign solid waste management procedures.	No outstanding issues	All solids including triple-rinsed empty Actellic 300 CS bottles were baled at Mudzi/Mutoko. Recycling completed in February 2020.
5a. Maintain records of all pesticide receipts, issuance, and return of empty sachets/bottles.	Records of all pesticide receipts, issuance, and returned empties were kept on stock cards with a back-up in a ledger books at the regional, district, and operations site-level. A total of 122 storerooms inspections were done with no incident of non-compliance noted.	No outstanding issues	.There was total compliance.
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, ECO and/or the COP performed a total of 3,274 supervision/ EC monitoring visits to sprayed houses to verify/confirm insecticide 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 supervision targets.
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. All storekeepers were advised to regularly update their inventories and improve on compliance. A total of 122 storerooms inspections were done	No outstanding issues	All inventory stock cards are available and were used for final inventory reconciliation.

ANNEX C. INVENTORY OF STOCK AND QUANTITIES POST-SPRAY

TABLE A-1. IRS 2019 INTERNATIONALLY PROCURED ITEMS

Item	Balance from 2019	Quantity procured	Total	Quantity used	Quantity damaged	Quantity remaining
Pesticide						
Actellic 300CS	20457	0	20457	20457	0	0
Fludora fusion	0	47970	47970	30428	0	17542
Boots						
Boots	144	324	468	440	340	28
Face Shield						
Face Shield	53	404	457	457	0	0
Face shield brackets						
Face shield brackets	744	0	744	380	97	647
Hand Gloves						
Hand Gloves	0	504	504	504	0	0
Respirators						
Respirators	0	14 040	14 040	12 930	0	1 110
Sprayers and Accessories						
Hudson (10 ltr)	412	0	412	255	76	336
Plunger spares	60	0	60	16	16	44
Plunger cylinder case Spares	89	0	89	24	24	65
Lance spares	108	0	108	62	62	46
Strainer housing spares	57	0	57	57	26	31
Valve, control flow & seal	0	278	278	278	0	0
Pump Spare parts Box	0	10	10	7	0	3

TABLE A-2. IRS 2018 LOCALLY PROCURED ITEMS

Item	Balance from 2019	Quantity procured	Total	Quantity used	Quantity damaged/ unusable	Quantity remaining
PPE						
Overalls	0	762	762	762	420	342
Hard Hat	356	398	754	461	208	546
Rain Coats	0	144	144	144	88	56
Hand Gloves	0	160	160	160	0	0
Apron	0	15	15	15	0	0

Item	Balance from 2019	Quantity procured	Total	Quantity used	Quantity damaged/ unusable	Quantity remaining
Cotton Socks	0	800	800	800	0	0
Head Torches	0	335	335	335	280	55
IRS Consumables						
Mutton Cloth	10	182	192	178	0	14
Towel	0	399	399	399	0	0
Bathing Soap	0	796	796	796	0	0
Sanitary pads	0	175	175	175	0	0
Washing Powder	0	900	900	395	0	505
Hand Brush	10	0	10	10	0	0
Thermometer	12	0	12	12	0	12
Calculator	25	0	25	16	6	10
Fire Extinguisher	14	0	14	14	0	14
Padlock	0	20	20	20	0	0
Mops	0	4	4	4	0	0
Brooms	0	4	4	4	0	0
Rinsing Cup	326	0	326	210	55	271
Laundry Bars	0	796	796	796	0	0
Tool Kit	0	4	4	4	3	1
Shovels	0	16	16	9	4	12
Plastic Water bucket 50 litres	42	0	42	33	15	27
Plastic Water bucket 10 litres	281	0	281	270	107	164
Plastic Taped Container 25 litres	0	6	6	6	0	6
Fans	0	12	12	12	0	12
Solar lamps	0	10	10	10	2	8
Solar Lamp	6	12	18	12	6	12
First Aid Kits	14	14	28	14	14	0
Loud Hailers	22	0	22	22	13	9
Lubricating oil 100ml	13	160	173	166	0	7
Batteries headtorch & loud hailers	0	672	672	586	0	86
Metal Bucket 10 litres	34	16	50	50	2	48
Tents	81	0	81	81	6	75
Nylon Rope	4	4	8	8	0	0
Fuel Drums 200 litres	0	10	10	10	2	8

Item	Balance from 2019	Quantity procured	Total	Quantity used	Quantity damaged/ unusable	Quantity remaining
Black Pvc Bins 50 Litres	4	0	4	4	0	4
Black polythene sheets	0	17	17	13	0	4
Padlocks	0	20	20	20	0	0
Print Materials						
Daily Spray Operator Notebook	25	250	275	250	0	25
Serialized insecticide tracker A4	0	250	250	250	0	0
Spills Response Procedures	0	22	22	22	0	0
Serialized insecticide tracker booklet	0	18	18	18	0	0
Team leader's daily form Booklet	0	20	20	16	0	4
Team leader's weekly form Booklet	0	20	20	16	0	4
Storerom Danger Warning Signs	0	10	10	9	0	1
Soak pit Danger Warning Signs	0	7	7	7	0	0
Temperature Recording Sheets	0	21	21	21	0	0
Motorcycle Log Book	0	25	25	22	0	3
Vehicle Hire Log Book	4	11	15	9	0	6
Mobile Phone For Reporting						
Smartphones	75	0	75	75	3	72

ANNEX D. SUMMARY OF 2019 VECTORLINK PSECA FINDINGS AND REMEDIAL ACTIONS

District	Findings	VectorLink Action
Mutoko	<ul style="list-style-type: none"> • 4 (100%) of the IRS campsites soak pits were in good condition with minor cracks on the wash slab. • Danger warning signs for the soak pits at the 4 sites were damaged. • Only one soak pit at each of the 4 sites was proposed for use in 2019 (total 4) and these were not adequate in relieving pressure and delays in cleaning of sprayers at the end of the spray day. • 4 (100%) of the IRS campsites had challenges with providing an adequate water supply: Kapondoro, Nzira, Kawere, and Chindenga. This necessitated repairs to the existing water supply facilities. • 4 (100%) sites had no storage facilities including the district hospital for IRS commodities. 	<ul style="list-style-type: none"> • Repaired all cracks at the soak pit wash slabs • Worked to repair and provide adequate water supply facilities and provided water tanks at those campsites without adequate water supply. • Provided large mobile soak pits at IRS camps with inadequate facilities. • Upgraded additional permanent soak pits at the IRS sites. • Identified and renovated rented storerooms at IRS sites for compliance. • 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.

District	Findings	VectorLink Action
Mudzi	<ul style="list-style-type: none"> • 3 (100%) of the IRS campsite soak pits were in a good state of repair with the exception of minor cracks which were on the wash slabs. • 3 (100%) of the IRS campsites had inadequate water supply: Makaha, Dendera, and Suswe. This required additional measures to get adequate water. • 3 (100%) sites had no storage facilities. 	