



U.S. PRESIDENT'S MALARIA INITIATIVE



THE PMI VECTORLINK PROJECT

MALAWI 2019 END OF SPRAY REPORT

**SPRAY CAMPAIGN:
OCTOBER 17 – NOVEMBER 22, 2019**

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REPORT

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ACRONYMS

ADC	Area Development Committee
AEHO	Assistant Environmental Health Officer
BMP	Best Management Practices
CFV	Control Flow Valve
CHAG	Community Health Action Group
CS	Capsule Suspension
DC	District Council
DCV	Data Collection Verification
DEC	Data Entry Clerk
DHIS2	District Health Information System 2
DHO	District Health Office
DOS	Directly Observed Spraying
ECO	Environmental Compliance Officer
FSP	Fixed Soak Pit
GVH	Group Village Head
HSA	Health Surveillance Assistant
IEC	Information, Education, and Communication
IRM	Insecticide Resistance Management
IRS	Indoor Residual Spraying
ITN	Insecticide-treated Net
MAC	Malaria Alert Centre
M&E	Monitoring and Evaluation
mHealth	Mobile Health
MOH	Ministry of Health
MOU	Memorandum of Understanding
MSP	Mobile Soak Pit
NMCP	National Malaria Control Program
PMI	President's Malaria Initiative
PMSP	Permanent Mobile Soak Pit
PMT	Performance Management Tracker
PPE	Personal Protective Equipment
PSECA	Pre-Season Environmental Compliance Assessment
SEA	Supplementary Environmental Assessment

SOP	Spray Operator
SPTS	Spray Performance Tracking Sheet
STTA	Short-term Technical Assistance
TA	Traditional Authority
TNM	Telekom Networks Malawi
TOT	Training of Trainers
USAID	United States Agency for International Development
WVI	World Vision International

EXECUTIVE SUMMARY

From October 17 to November 22, 2019, the President’s Malaria Initiative (PMI) VectorLink Project, Malawi, in collaboration with the Malawian government, conducted indoor residual spraying (IRS) in Nkhhotakota District targeting 116,948 structures across six traditional authorities using both the organophosphate Actellic® 300 Capsule Suspension (CS) and the clothianidin-based SumiShield® 50WG.

Below are the key project achievements and highlights:

- Across all cadres, 1,154 individuals were trained using PMI funds to support IRS activities in Nkhhotakota and Mangochi districts.
- VectorLink provided two technical advisors who worked full time to support the NMCP, World Vision International (WVI), and the Mangochi DHO with the planning, training, supervision and close out of IRS operations in Mangochi.
- In Nkhhotakota:
 - 2,822 community mobilization meetings conducted and 76,378 people reached directly with IRS information, education and communication (IEC) messages during community mobilization meetings.
 - 205 government staff, were engaged to support mobilization; 21 served as IEC Assistants and 184 served as mobilizers.
 - 102 Community Health Action Group members were also engaged to support mobilization activities.
 - 645 people were hired as seasonal staff, 46.7% (n=301) of whom were women.
 - 107,565 out of 121,167 structures found by spray operators (SOPs) were sprayed, for a coverage rate of 88.8%. In total, 441,375 residents received protection, including 74,173 children under 5 (16.8% of the population protected) and 11,182 pregnant women (2.5% of the population protected).
 - 42,767 bottles of Actellic® 300CS and 9,782 sachets of SumiShield® 50WG were used to spray 107,565 structures, for a utilization ratio of 2.0 structures sprayed per bottle/sachet.
 - SOPs sprayed on average 9.0 structures per day.
 - All IRS contaminated waste, including 245.8 kg of used masks and 9,782 empty insecticide sachets from SumiShield®, were incinerated at the Nkhhotakota District Hospital. A total of 42,767 empty Actellic® 300CS bottles, 1,616 visors, and 640.5 kg of uncontaminated carton boxes will be recycled. VectorLink Malawi will dispose of 427 damaged gloves and 2,040 used dry cell batteries, which will be encased prior to landfilling, at the Illovo dumping site.

TABLE ES-1: 2019 IRS CAMPAIGN SUMMARY RESULTS

Number of Districts Covered by PMI-supported IRS in 2019	1 District: Nkhhotakota
Insecticide used in 2019 IRS	Organophosphate (Actellic® 300CS) in 7 operations sites and SumiShield® 50WG in 2 operations sites
Structures targeted for spray in 2019	116,948
Structures found by SOPs in 2019	121,167
Number of structures sprayed by PMI-supported IRS in 2019	107,565
2019 spray coverage	88.8%

Number of Districts Covered by PMI-supported IRS in 2019	1 District: Nkhotakota
Population protected by PMI-supported IRS in 2019	441,375 (including 11,182 pregnant women and 74,173 children under 5 years of age)
Dates of PMI-supported IRS campaign	October 17, 2019–November 22, 2019
Length of 2019 campaign	32 operational days
Number of people trained with funds from the U.S. Government to deliver IRS in 2019**	565 (310 men, 255 women)***

** The PMI annual indicator for “people trained to deliver IRS” includes SOPs, team leaders, and supervisors; it excludes clinicians, data clerks, IEC mobilizers, IEC assistants, drivers, washers, porters, pump technicians, security guards, and storekeepers.

***This includes site managers, spray supervisors, team leaders, and SOPs.

I. COUNTRY BACKGROUND

In September 2017, Abt Associates was awarded a five-year malaria vector control contract, called the U.S. President's Malaria Initiative (PMI) VectorLink Project, funded by the U.S. Agency for International Development (USAID) through PMI. The PMI VectorLink Project builds upon the successes of the predecessor PMI Africa Indoor Residual Spraying (AIRS) Project. Its purpose is to support PMI in planning and implementing indoor residual spraying (IRS) and other proven life-saving malaria vector control interventions in 25 countries, including Malawi. It also supports PMI and local governments in planning and implementing an integrated vector control approach.

Malaria is the leading cause of morbidity and mortality in Nkhosakota District. According to District Health Information System 2 (DHIS2) data shared by the National Malaria Control Program (NMCP), malaria accounted for 32.0% of all outpatient visits in 2014/15, 48.5% in 2015/16, 51.7% in 2016/17, and 42.7% in 2017/18¹. A number of strategies, including vector control, case management, intermittent treatment of pregnant women, and information education and communication (IEC)/social behavior change (SBC), have been put in place to reduce the malaria burden.

Under PMI VectorLink, Malawi conducted one spray round in Nkhosakota District over the course of 32 days between October 2 and November 7, 2018, using the organophosphate insecticide Actellic® 300CS. Of the 118,355 structures found by spray operators (SOPs), 112,264 were sprayed, achieving a coverage rate of 94.9%. In total, 501,324 residents were protected, including 90,953 children under the age of 5 years (18.1% of the total population protected) and 11,066 pregnant women (2.2% of the total population protected).

Throughout the 2019 spray campaign, VectorLink Malawi worked closely with the Ministry of Health (MOH), the NMCP, the Nkhosakota District Health Office (DHO), the Nkhosakota District Council (DC), local nongovernmental organizations, and community leaders to implement IRS in Nkhosakota.

The project also provided technical support to the following activities that are integral to IRS:

- Logistics: Did logistics assessments, as well as procurement, shipping, delivery, and storage of all IRS materials.
- IEC/SBCC: Collaborated with the NMCP and other local partners to coordinate IEC activities to raise awareness and encourage acceptance of IRS.
- Monitoring and evaluation (M&E): Regularly tracked key M&E programmatic indicators and checked the quality of IRS data collection.
- Environmental compliance: Worked with the NMCP, DHO, and Environmental Affairs Department to ensure environmental compliance through inspections before, during, and after spraying.
- Capacity building: Used training, skill development, and advocacy at the national and district levels as a means of ensuring quality spray and achieving IRS sustainability; NMCP and district health teams were trained in coordination, implementation, and supervision of IRS activities.
- Technical assistance: Provided during planning and implementation of the Global Fund-supported spray conducted WVI and the NMCP in Mangochi District which ran from November 6 through December 19, 2019.
- Entomological support:
 - Comprehensive entomological monitoring activities: Carried out in 15 sentinel sites in seven districts by the Malaria Alert Centre (MAC) of the University of Malawi College of

¹ Data are reported by the Malawi government fiscal year, which runs from July 1 to June 30.

Medicine; insecticide resistance monitoring and advanced entomological analysis will generate critical data on the effectiveness of the spray program.

- Strengthening of the national Vector Control Technical Working Group (VCTWG).
- Gender mainstreaming: Continued to integrate gender equality and female empowerment into IRS planning and implementation in line with USAID's Gender Equality and Female Empowerment Policy and VectorLink's Gender Strategy.

2. IMPLEMENTATION OF IRS ACTIVITIES

2.1 IRS PLANNING AND PARTNER COLLABORATION

In 2019, VectorLink Malawi conducted IRS in Nkhotakota District, which PMI and the NMCP selected based on the following criteria: high malaria burden, demonstrated area of pyrethroid resistance, and a dense, non-urban population, which lowers the operational costs per household. Furthermore, Nkhotakota is one of 10 PMI focus districts receiving support for improving case management and routine epidemiological M&E systems, in order to better track the impact of IRS. Also, when selected, it was one of the seven districts where PMI already was supporting entomological monitoring, meaning baseline entomological data were available.

In 2019, VectorLink Malawi targeted approximately 116,948 structures across nine operations sites for spray. See Annex A for a map of Nkhotakota District with the operations sites and entomological monitoring sites mapped. The project developed the district spray schedule, which served as a roadmap during the 2019 spray campaign. VectorLink Malawi organized a one-day micro-planning meeting on September 3, 2019, with all stakeholders in Nkhotakota District to discuss and comment on the IRS operational plan and to agree on the roles and responsibilities of each partner. The issues discussed during the micro-planning meeting included: mobilization and strategies to increase IRS acceptance; spray quality and coverage; and insecticide pilferage. In total, 51 participants (43 men and 8 women) attended the micro-planning meeting.

VectorLink Malawi also intensified collaboration and coordination with key stakeholders in 2019. The project worked closely with the NMCP and the Nkhotakota DHO and DC during the planning and implementation of all IRS activities. The NMCP, DHO, and DC jointly planned and strategized to increase the percentage of women selected during the recruitment of seasonal workers.

Finally, VectorLink Malawi worked with the Nkhotakota DHO, through the Assistant Environmental Health Officers (AEHOs), to lead all trainings of SOPs, team leaders, and mobilizers as well as the supervision of spray activities at the operations site level.

2.2 IRS TRAININGS

VectorLink Malawi in close collaboration with the NMCP and WVI, the Global Fund's IRS implementing partner, conducted capacity-building workshops on environmental compliance, leadership, operations, and DHIS2 to enable the members of the central- and district-level task forces to assume leadership for management, planning, implementation, and monitoring of IRS campaigns in Nkhotakota and Mangochi districts.

Before IRS trainings, VectorLink Malawi reviewed and contextualized the standard training curriculum for all VectorLink countries. Across all cadres, 1,069 people were trained to support IRS. Table 1 gives a timeline and description of each training. Table 2 lists the people hired to support IRS in Nkhotakota District. See Annex B for full details on all people trained to support IRS.

TABLE 1: DESCRIPTION OF TRAININGS

Type of Training	Dates	Length (days)	Total Number of People Trained	Topics Covered
Workshop on Environmental Compliance	July 15–19, 2019	5	31	Developing an IRS Environmental Assurance Program; Elements of Geographical Reconnaissance for IRS; Siting of IRS Storerooms, Wash Areas, and Soak Pits; Identifying Sensitive Receptors and Ecosystems; Conducting Environmental Assessments; Personal Protective Equipment (PPE) for IRS; Worker and Resident Health and Safety; Pesticide Storage Requirements; Pesticide Transport; Effluent Waste Disposal, Including Construction and Use of Soak Pits; Solid Waste Disposal; End-of-Day Clean-up (Progressive Rinsing); Spill Response; Water Crossings; Use of Standard Checklists in Supervising Spray Operations.
Workshop on IRS Leadership and Operations*	August 5–10, 2019	6	34	IRS Overview; IRS Equipment (sprayer, PPE); Developments in Spray Equipment: Control Flow Valves (CFVs); PMI Seasonal Worker Training Package; The Power of Effective Training; Principles of Adult Learning; Training Techniques: Effective Demonstration; A Strong Foundation: Preparing to Spray (mixing insecticide, sprayer pressurizing, carrying and positioning); Target Setting for IRS Seasonal Workers; Developing the Spray Calendar; Training Techniques: Giving Feedback, Answering & Asking Questions; Supervision of Spray Activities; Supervision Checklists; Introducing Performance Tracking; Establishing Correct Spray Technique (distance, speed, pattern); Wall Spraying Demonstration and Practice; Explaining Warehouse Operations and Managing Inventory; Building Communication Skills for Community Mobilization; Training Techniques: Simulation and Role Play; M&E for IRS; Wall Spraying Demonstration and Practice; Conducting Field Simulation; Calibration of Compression Sprayer; Team Leader Training; Gender Inclusiveness and IRS; and Next Steps: Planning for the 2019 IRS Seasonal Worker Trainings.
Workshop on VectorLink Collect DHIS2 database	August 19–23, 2019	5	20	Introduction to the VectorLink Collect System (data entry, cleaning, analytics, and system troubleshooting). Twelve participants attended the workshop for two days to be oriented on the analytics skills to effectively use DHIS2 data; 13 participants attended an additional three days to obtain more advanced user skills.
Finance Assistants' Training	August 21–22, 2019	2	10	Overview of Project Financial Management; Roles and Responsibilities of Finance Assistants; Airtel Mobile Money Payment; and Ensuring Efficient and Effective Management of Attendance Sheets, Fuel, and Funds.
Environmental Compliance	August 26, 2019	1	10	Environmental Compliance Monitoring; Waste Management; Emergency Response, and Protocols for Transportation for IRS.
Health Worker/ Poison Control Training	September 2, 2019	1	17	IRS Overview and Insecticide Exposure Symptoms and Treatment.

Type of Training	Dates	Length (days)	Total Number of People Trained	Topics Covered
Logistics and Store Management	September 4–6, 2019	3	16	Role of the Storekeeper; Procedures for Opening the Spray Campaign; Storekeeper Safety; Spray Equipment Care and Maintenance; Solid Waste Management; Insecticide Waste Management; Inventory Management During the Spray Campaign; Filling Out Store Management Tools; Serialization of Insecticide Bottles and Sachets and the Insecticide Distribution Process; Serialized Insecticide Tracker and Insecticide Distribution Tools; Insecticide Spill Response; and Procedures for Closing the Spray Campaign.
IEC Training of Trainers (TOT)*	September 9–10, 2019	2	21	IRS Overview; Role of a Community Mobilizer; Promoting Acceptance of IRS; Data Collection and Reporting; Gender Inclusiveness; Supporting the Work of SOPs; Preparing the Community for Spray; Review of the Community Mobilization Calendar; Supervision and Facilitation of Mobilizer Trainings; Mobilization-Supervision Checklist; and Formation of Teams.
Mobilizer Training	September 12–13, 2019	2	286	IRS Overview; Roles of Community Mobilizers; Promoting Acceptance of IRS; Supporting the Work of SOPs; Preparing the Community for Spray; Facilitating Village Development Committee and Community Meetings; Facilitation Tool; Managing Refusals Using the Job Aid; Data Collection; and Finalization of the Community Mobilization Calendar.
Database Training	September 30–October 3, 2019	4	19	Database Management; Data Entry and Cleaning Protocols; and Secure Data Storage Using the VectorLink Collect DHIS2 Database.
M&E Assistant Training	October 4, 2019	1	10	Data Collection Field Supervision and Validation Activities, including the Data Collection Verification (DCV) Process.
Mobile Health (mHealth) Training	October 4, 2019	1	1	Smartphone-based Supervision Checklists, Performance Management Tracker (PMT) Application and DCV (How to navigate the smartphone platform, answer common questions, and to support seasonal workers who face issues related to the smartphone application)
Spray Operations TOT for Supervisors, Site Managers*	September 30–October 4, 2019	5	58	IRS Overview; Effectively Training Your Team; Gender Inclusiveness and IRS; IRS Operations and Campaign Design; Developing Competencies; Training Techniques; Effective Demonstration; Giving Feedback; Answering and Asking Questions; Familiarizing Trainees with Equipment (sprayer, PPE); Mixing Insecticide; Preparing to Spray; Correct Spray Technique; Sprayer Maintenance and Storage; Dealing with Incidents; Building Communication Skills for Community Mobilization; Environmental Compliance and Safety, Store Operations and Managing Inventory; Store Management Tools; Serialized Insecticide Tracker and Insecticide Distribution; Wall Spraying Demonstration and Practice, Data Collection; Reporting and Data Quality Assurance; House Marking for IRS Operations; Developing and Using the Spray Calendar; Tracking Performance; Supervising Spray activities; Conducting Field Simulation Training; Field Simulation; Progressive Rinse Techniques and Practice; Mobile Soak Pit Demonstration; Supervisory Role of Team Leaders, mHealth; and Planning for Seasonal Worker Training.

Type of Training	Dates	Length (days)	Total Number of People Trained	Topics Covered
Spray Operator Training*	October 7–11, 2019	5	507	Introduction to Malaria Prevention and IRS; SOP Safety Procedures (use of PPE, safety of population and environment, and insecticide exposure, spill, and treatment); Introduction to the Sprayer, Handling and Pump Maintenance; Insecticide Mixing Procedures; Beginning the Spray Day (morning assembly, checking equipment, and daily evaluation); Dress Rehearsal; Introduction to Spray Techniques; Spray Technique Practice; Working with the Community; Gender Awareness in IRS; Closing the Spray Day, Triple-rinse Practice; Cleaning of Nozzles, Filters, and CFVs; Recordkeeping for IRS (identifying eligible structures; marking houses, Daily Spray Record and Practice: completing the Daily Spray Operator Form); SOP Ethics; Comprehensive Skills Practice; Serialized Insecticide Tracker and Insecticide Distribution to SOPs; Performance Monitoring (SOP targets), and Field Simulation.
Team Leader Training	October 11–12, 2019	2	81	Team Leader Responsibilities; Leading your Team; Rewards and Challenges of Leading the Team; Giving and Receiving Constructive Feedback; Using the Directly Observed Spray (DOS) Checklist in supervising spray quality; Team Leader Data Collection and Reporting; How to Address the Following Spray Operations Challenges: <ul style="list-style-type: none"> ○ House preparation; ○ House marking and recording unsprayed structures; ○ Insecticide pilferage; ○ Improving spray quality in your team; ○ Data collection issues; ○ Coordination between spray teams and mobilizers.
Pump Technician Training	October 14, 2019	1	9	Understanding Pump Parts; Preparing Pumps for the Spray Campaign; Common Pump Problems and Solutions.
Washer Training	October 16, 2019	1	43	Role of the Washer; Safety of the Washer; Environmental Compliance and Daily Procedures; and A Day in the Life of the Washer.
Emergency Situation/ Security Training	October 1, 2019	1	18	Fire Safety; General Security Protocols for IRS Stores, and Handling Emergency Situations.
Driver Training	October 16, 2019	1	44	Safety Procedures for Transporting Insecticides and SOPs to and from the Field; Use of First Aid Kits; and Management of an Insecticide Spill.

* All gender inclusiveness training sessions covered issues related to sexual harassment.

2.3 SPRAY OPERATIONS AND SUPERVISION

VectorLink Malawi conducted the 2019 spray operations in 32 workdays. The Mwansambo operations site finished spraying in 30 days, per the original spray campaign schedule. One day was added to the schedule at four sites (Benga, Bua, Dwambazi, and Mkaika) and two days were added to another four sites (Boma, Chididi, Dwangwa, and Ngala). VectorLink, in consultation with the NMCP, DHO and PMI, added these extra days to help increase spray coverage and allow more time for spray operators to revisit areas that were able to be remobilized to accept IRS. Spray operations were structured so that spray teams would cover the remote and hard-to-reach areas at the start of the campaign, to ensure those communities were reached in

case rain cut them off later. Spray calendars were adjusted to accommodate progressive mop-up in villages that were not fully sprayed when teams first visited due to refusals and other reasons. This allowed for communities to be remobilized and revisited soon after the originally scheduled spray day.

Spray teams were provided a bottle of maheu (maize porridge) every morning, shortly after arriving at the site at approximately 5:00am, before they put on PPE. Morning assemblies were conducted at each operations site before spray teams departed for the field. The morning assemblies were used to communicate important announcements, feedback from field supervision and data review, and expectations for the day. Additionally, they were used to check the health of all spray team members to ensure that they were healthy enough to carry out the day's activities. Team leaders filled out daily health check forms for each SOP. After the SOPs retrieved the leftover insecticides from rinse barrels 1, 3, and 5, they departed to the communities for the spray work.

Each morning, before assigning SOPs to the villages to be sprayed that day, spray supervisors and team leaders met each village chief. This served as a community entry point and allowed teams to confirm the number of structures in each village so the SOPs could be properly allocated based on the number of targeted structures. Additionally, this meeting allowed teams to confirm village leaders' readiness and support in mobilizing the communities to accept IRS. This was vital to ensure SOPs were able to meet their daily individual spray targets and teams could meet their cumulative targets.

During the spray day, team leaders used the DOS checklist to supervise each SOP on their team at least once per day. Using this checklist enabled the team leaders to ensure that all SOPs in the field were adhering to high-quality standards for spraying, and to standardize spray quality supervision by team leaders and other supervisors. Team leaders conducted a total of 10,969 DOS inspections over the spray campaign period. Of these, 99.9% (n=10,962) raised no red flags. Team leaders corrected the few mistakes, and noted them on the form as red flags, in real time. The issues were discussed at the following day's morning assembly. The number of red flags observed was much lower than expected. VectorLink Malawi attributes this to team leaders providing corrective feedback but not documenting the issue on the DOS form. Hence, the DOS checklist served more as a job aid to guide team leaders in providing supervision and feedback than as a tool to highlight and aggregate project-wide issues as a whole. Supervisors used smartphone-based forms on Morning Mobilization, Homeowner Preparation, SOP Performance, and End-of-Day Clean-up for supervision.

In the field, all spray teams were provided bottles of water to drink, to avoid becoming dehydrated during the day. The water bottles were kept in the minibuses used to transport spray teams; drivers opened the bottles to avoid any contamination being introduced if SOPs or team leaders opened them.

At the end of each spray day, after spray teams returned to their operations sites, spray team leaders verified the data submitted in the Daily Spray Operator forms: they checked the forms for completeness, and accuracy of arithmetic, and corrected any errors found. They summarized all (corrected) SOP data on their Team Leader forms and submitted the forms to spray supervisors. The supervisors verified the data and submitted the forms to the site managers. The site managers used the summarized data to complete the Spray Performance Tracking Sheet that was posted at each operations site. Lastly, site managers handed over all spray data forms to M&E assistants, who further reviewed the data, and investigated any issues. Once forms were thoroughly checked, they were delivered to the data center by hired motorcycle drivers.

Supervision of 2019 spray operations was conducted by the staff from VectorLink Malawi, the PMI VectorLink home office staff during short-term technical assistance (STTA) trips, PMI Malawi, the NMCP, and the Nkhotakota DHO and DC.

To ensure supervision of the IRS campaign at all levels, the following structure was used:

- SOPs were divided into teams of five, with one team leader supervising each team.
- A spray supervisor supervised two teams. Spray supervisors reported directly to the site manager, who, in turn, reported to the VectorLink Nkhotakota District Coordinator, which is a permanent staff position.

- At each operations site, the Nkhhotakota DHO appointed an AEHO to provide daily leadership and coordination of all spray activities.
- VectorLink Malawi implemented a supervision plan to ensure coordination of supervision and clear communication and follow-up so that corrective measures were immediately implemented for any identified issues. During the campaign, a full-time VectorLink Malawi staff member was assigned to each site; s/he worked closely with the AEHOs, other stakeholders, and all supervisors to coordinate site management and routine daily supervision. VectorLink staff in the field met nightly during the campaign to share experiences and issues, and develop recommendations for campaign-wide implementation.
- VectorLink Malawi staff and government supervisors at both the NMCP and DHO level met in person twice a week to share observations, discuss challenges, and develop recommendations to be immediately implemented at all operations sites. Additionally, important issues were shared daily on a WhatsApp group so that VectorLink Malawi and government staff could act on them quickly across all operations sites.
- mHealth supervision checklists were used to assess the daily performance of SOPs and team leaders, as well as adherence to environmental compliance requirements and data collection protocols. This promoted real-time tracking and monitoring of issues observed by supervisors during spray operations.
- VectorLink Malawi introduced a revised spray performance tracking sheet (SPTS) across all nine operations sites during the 2019 IRS campaign. The revised SPTS calculates and presents two key performance indicators for the project: spray progress and spray coverage rates. It also now includes each operations site's spray target at the top. These revisions allowed site managers and supervisors to more actively manage spray operations against the key performance indicators at the operations site level, thereby providing necessary spray data for decision making at the site level, where IRS campaigns are most immediately managed and challenges resolved.

Additionally, VectorLink Malawi received supervision support from:

- VectorLink Ghana Environmental Compliance Officer (ECO) Abukari Yakubu. Abukari substituted for the VectorLink Malawi ECO, who resigned shortly before the campaign started. He provided orientation and training to the newly hired VectorLink Malawi ECO and support during the final Pre-Season Environmental Assessment (PSECA), final vehicle inspection, TOT, SOP and team leader trainings, and the first three days of 2019 campaign.
- Home Office VectorLink M&E Specialist Jillian Berkowitz oversaw the implementation of the VectorLink Collect DHIS2 database, and provided supervisory support to the M&E and spray operations activities.
- The VectorLink Vector Control Manager, Bradley Longman, provided technical assistance and supervisory support during spray operations with a focus on spray operations and supply chain management.
- The ECOS IRS Field Evaluator, Stella Siegel, conducted the IRS Environmental Compliance Field Evaluation.
- U.S. Ambassador to Malawi Robert Scott visited the Boma operations site, observed spraying, and advocated for IRS and the successful partnership between PMI VectorLink and government counterparts.

During VectorLink STTA visits, staff inspected wash areas, soak pits, and storerooms to ensure they complied with Best Management Practices (BMPs): They checked stock, reviewed records and carried out physical counts, particularly of insecticides. They also supervised IRS in the field to observe spray techniques, compliance with IRS protocols, and supervision provided by the site spray supervisors and team leaders.

STTA staff provided feedback for improving mobilization, especially strategies to address refusals that spray teams were encountering in the communities. More details are available in the respective STTA trip reports.

2.3.1 RECRUITMENT

VectorLink Malawi planned and conducted the recruitment of all seasonal workers in close collaboration with the NMCP, and the Nkhotakota DHO and DC. Before training began, all recruited SOPs, washers, storekeepers, spray supervisors, site managers, and team leaders had a medical examination in their respective health centers to ensure they were medically and physically fit to perform IRS activities. The health centers screened all women for pregnancy. Four women were found to be pregnant. Pregnancy tests were repeated 30 days after the initial test; no additional female seasonal workers were found to be pregnant. VectorLink Malawi assigned all pregnant women to the role of “household preparation assistants,” so they would not be exposed to insecticide. This role entailed mobilizing villages upon arrival and assisting households in preparing their homes for spray. In total, VectorLink Malawi recruited and hired 645 seasonal workers to carry out and support IRS operations in Nkhotakota District. Of these, 46.7% (n=301) were women (Table 2). Of the 471 people hired as SOPs and team leaders, 46.4% and 43.2%, respectively, were women.

TABLE 2: IRS SEASONAL SUPPORT STAFF, BY POSITION AND BY GENDER

Staff Position	Gender		Total	% Females Hired
	Male	Female		
Site Managers	8	1	9	11.1%
Spray Supervisors	27	16	43	37.2%
Spray Operators	209	181	390	46.4%
Team Leaders	46	35	81	43.2%
Data Entry Clerks	7	10	17	58.8%
M&E Assistants	5	4	9	44.4%
mHealth Coordinator	0	1	1	100.0%
Logistics Assistant	1	0	1	0.0%
Storekeepers	6	4	10	40.0%
Finance Assistants	8	2	10	20.0%
Pump Technicians	7	2	9	22.2%
Washers	7	36	43	83.7%
Security Guards	13	5	18	27.8%
Household Preparation Assistant*	0	4	4	100.0%
Total	344	301	645	46.7%

*Household preparation assistants attended the SOP training and are captured in that training figure.

2.3.2 OPERATIONS AND WAREHOUSE SITE PREPARATIONS

In 2019, VectorLink Malawi used 12 venues to support its IRS activities: nine operations sites during the spray campaign; two year-round central stores, one for goods and one for insecticides; and one temporary office/data center. Seven of the nine operations sites had been used during the 2018 spray campaign; the other two sites were newly opened in Ngala and Chididi to address the challenges of overcrowding at the Dwangwa and Boma, respectively, in 2018. Six of the 12 venues (the two warehouses and four operations sites) were provided free of charge, five by the Nkhotakota DHO and one by the Dwangwa Cane Growers Limited, a community association. The remaining six venues, two owned by community members and four by associations, were rented for the months before, during, and after the campaign.

The project refurbished all operations sites to ensure that they conformed to BMP standards. The two warehouses had been refurbished in 2018 and required only routine maintenance. Refurbishment included clearing brush, improving ventilation, repairing or installing window glass, screens, doors, and burglar bars, filling cracks in the floors, and construction of bathing areas and toilets where necessary. Permanent wash

areas and fixed soak pits (FSPs) were built at seven of the nine operations sites, the exceptions being Mkaika and Chididi. Mkaika is a relatively low-lying area and thus can flood during the rainy season. The Chididi operations site is in close proximity to an area with a borehole. To address the risk of flooding and to protect the borehole water, the project used permanent mobile soak pits² (PMSPs) at these two operations sites. To accommodate the 51 SOPs based at Mkaika, PMSPs were constructed with two temporary wash areas containing four mobile soak pits Is (MSP Is)³ in each. In Chididi, PMSPs were constructed using three MSP IIs⁴. In addition, VectorLink Malawi constructed one MSP II at both Mwansambo and Dwambazi to accommodate the extra SOPs who were using the FSPs at those sites. Annex C provides details on the wash areas and soak pits used per site.

2.3.3 PAYMENT OF SEASONAL WORKERS

VectorLink Malawi paid all seasonal staff, including IRS government support staff (i.e., IEC assistants and mobilizers, AEHOs, etc.), via Airtel Mobile Money transfer. Electronic mobile payment provided a safe and secure way for the project to transmit approximately 232 million Malawian kwacha in training stipends and wages to the workers and government counterparts. To process the mobile payments, VectorLink Malawi continued to work with Airtel Malawi Ltd., which the project had first contracted in 2018.

Before the spray operations began, the project met with Airtel Malawi Ltd to review issues with the payment in 2018 and to plan strategies and actions they could take to avoid a repeat of the issues in 2019. During those meetings, it was concluded that all seasonal workers would be required to have Airtel sim cards/phone numbers to facilitate payments transferred through Airtel Mobile Money. This would avoid the “roll backs” that happened frequently in 2018, mostly the result of seasonal workers using Telekom Networks Malawi (TNM)⁵ sim cards/phone numbers. The requirement for being paid via registered Airtel numbers was communicated to all seasonal workers during recruitment so that workers who did not have Airtel sim cards or were not registered on Airtel Money could do so before trainings. Additionally, due to the logistical challenges associated with managing five payments to seasonal workers in 2018, the number of payments was reduced to three – one for seasonal workers that supported IRS prior to the start of spray, one during spray and one after spray that was scheduled so that it captures days worked post spray to cover demobilization.

Before initiating any payment, finance assistants in each operations site ensured a thorough check and verification of each seasonal worker’s phone number to confirm that Airtel Money had it registered under the same person. The project established a payment plan that it strictly followed to pay all seasonal workers for their days worked according to the schedule of payment established in their contracts. After each payment, Airtel Malawi Ltd generated a system report as proof of payment; it also showed unsuccessful transmissions that required a repayment. Only two mobile payments required reissuing; one was the result of a system error, the other of an incorrect number provided by a SOP.

² A PMSP is comprises an established wash area at an operations site that utilizes MSPs, rather than a fixed soak pit, and is used for the duration of the campaign. It is secured to keep unauthorized people and all animals out of the area. Unlike the traditional MSPs, the MSPs used in a PMSP stay in the same place for the duration of the spray campaign; they are removed at the completion of the campaign, or in the case of rain. Once removed after the campaign, the retaining pit is backfilled.

³ An MSP is a portable wastewater filter that is used in areas where constructing an FSP is not efficient or feasible. An MSP consists of a bucket, and filter material, primarily activated granulated carbon, which removes the insecticide residue in waste water resulting from cleaning personal protective equipment (not including overalls) during the end of day clean up. A pit is dug to accommodate the MSP bucket. The area surrounding the MSP is covered with a plastic sheet or tarpaulin. At the end of each day, the bucket is removed and the pit backfilled before the spray team leaves the area of operations. A MSP I is made from a single 20-25 L capacity bucket and can be used by five spray operators.

⁴ A MSP II is made from a 45–60 L capacity bucket and can accommodate 15 spray operators.

⁵ Airtel and TNM are the providers of cell phone services in Malawi.

2.4 INSECTICIDE AND STOCK MANAGEMENT

During the 2019 spray operations, VectorLink Malawi used pirimiphos-methyl (Actellic® 300CS) in seven operations sites (Boma, Bua, Chididi, Dwambazi, Dwangwa, Mkaika, and Ngala) and clothianidin (SumiShield® 50WG) in two operations sites (Benga and Mwansambo).

Actellic® 300CS was used based on the tests conducted in 2018, which showed that the main malaria vector (*Anopheles. funestus*) in Nkhotakota District is susceptible to organophosphates, including pirimiphos-methyl. Additionally, the choice of pirimiphos-methyl (Actellic® 300CS) in Nkhotakota was based on the national guideline for using non-pyrethroid and long-lasting insecticides for IRS. It was decided that SumiShield® would be used in the other two sites due to the unexpectedly short residual life results of Actellic® 300CS observed in wall bioassays conducted after the 2018 spray round.

In 2019, VectorLink Malawi procured 38,439 bottles of Actellic® 300CS⁶ and 10,213 sachets of SumiShield®. The quantification was based on the 7,010 bottles of Actellic® 300CS left over from the 2018 spray campaign, the total number of structures found in 2018 (118,355) (assuming Lupachi would be included in the 2019 IRS campaign), the target use rate of 2.2 structures per bottle, and a 3% buffer stock. The buffer was to account for population growth, the extra stock needed to facilitate stock movement, and the project's assumption that more structures might be found in 2019 due to better knowledge of the Nkhotakota landscape.

VectorLink Malawi hired 10 storekeepers and one logistics assistant to manage the operations site stores and central warehouses. One storekeeper was based at each operations site store, and the tenth storekeeper facilitated the daily insecticide movement from Benga to Mkaika and vice versa since the low-lying conditions of the Mkaika site necessitated the site's insecticide stock be stored at Benga. Storekeepers updated and maintained inventory records (stock cards, ledger books, and insecticide tracking forms) and managed the requests for and fulfillment of IRS supplies. Site managers, government supervisors, and VectorLink staff regularly checked stock records and conducted physical stock counts, with a focus on insecticides, to ensure uniformity between delivery notes, stock cards, insecticide tracking forms, ledger books, and physical stock counts.

In 2019, VectorLink Malawi labeled all insecticides with a sticker containing a serial number and barcode. Before distribution to each operations site store, each bar code was scanned with a low-cost digital scanner at the central warehouse and entered into a master file. Across the nine operations stores, the project introduced the daily insecticide distribution booklet, which captured the serial numbers for insecticide distribution and returns between storekeepers and team leaders. Additionally, the project introduced the serialized insecticide tracker between team leaders and SOPs. This new tool allowed team leaders to track the serial numbers of the insecticide issued, and SOPs' full and empty returns on a daily basis. Every SOP was accountable to sign for any bottle/sachet of insecticide with a unique serial number handed over to him/her, first during morning distribution and again at end-of-day insecticide reconciliation before the spray day closed.

Finally, VectorLink Malawi piloted the use of an electronic system of insecticide distribution from the storekeeper to team leaders at the Chididi site store. The storekeeper used a digital barcode scanner to process insecticide distributed and returned. Scanned codes were entered automatically into a project-designed MS Excel spreadsheet that highlighted inconsistency in the data (i.e., unreturned bottles, etc.), which facilitated addressing any issues. Despite initial challenges related to a lack of computer literacy and familiarity with Excel and the scanning tools, as well as a lack of power at the operations site store, the system was used effectively by the storekeeper and it enabled him/her to quickly track and verify insecticide serial numbers distributed to and returned by team leaders. VectorLink Malawi will consider expanding this electronic system to all operations sites in 2020 after conducting a cost-benefit analysis of the system and further improvements.

⁶ An excess of approximately 250 bottles of Actellic® CS300 were ordered because the order was processed prior to the SumiShield order being determined. The "first expired, first out" rule was followed during insecticide distribution in 2019. Any leftover insecticide will be used in 2020.

2.5 IEC/SBCC ACTIVITIES AND OUTCOMES

In 2019, VectorLink Malawi restructured its communication strategy to focus mainly on community-level mobilization and mass media communication. The project engaged 21 IEC assistants, one per each health center catchment area in Nkhotoakota and 13 more than in Project Year 1. The number of IEC assistants was increased in order to more closely supervise the 184 Health Surveillance Assistants (HSAs) who served as mobilizers and 102 Community Health Action Group (CHAG) members who provided mobilization support and to better facilitate coordination between mobilizers and spray teams. To ensure consistency in IRS message delivery in 2019, VectorLink Malawi worked closely with the NMCP, the Nkhotoakota DHO, the Organized Network of Services for Everyone’s Health (ONSE) Project and the Health Communication for Life (HC4L) Project to develop and review a comprehensive package of messages about IRS that included the use of insecticide treated nets (ITNs).

2.5.1 COMMUNITY MOBILIZATION MEETINGS

Community mobilization meetings were held between September 17 and October 9, 2019. Each operations site had one to five IEC assistants who coordinated IEC activities under the guidance of the VectorLink IEC Coordinator and the AEHOs. Mobilizers conducted community mobilization meetings to disseminate messages on malaria prevention, IRS, and necessary household preparations and to address community concerns, fears, and misconceptions. The messages also highlighted the importance of using ITNs alongside IRS. Where villages had few residents, meetings were clustered and conducted at a central point convenient to the multiple villages. Clustering the meetings helped ensure that all community meetings were conducted within the specified time frame. VectorLink Malawi staff, in collaboration with NMCP and Nkhotoakota DHO counterparts including the District Health Officer, AEHOs, District Health Promotion Officer, and District Environmental Health Officer, were in charge of supervising and coordinating mobilization and other IEC activities at the district level. The supervision team ensured that mobilizers conducted all planned meetings and disseminated all relevant information to beneficiaries.

As shown in Table 3, a total of 2,822 community mobilization meetings were held; they reached a total of 76,378 adults (25,997 males (34.0%) and 50,381 females (66.0%)). An IEC assistant directly supervised 41.2% of all meetings held. A chief was in attendance at 89.4% of the meetings and a CHAG member at 66.7%.

TABLE 3: COMMUNITY MOBILIZATION MEETINGS CONDUCTED IN NKHOTAKOTA DISTRICT

Traditional Authority	Community Meeting Target	# of Community Meetings Conducted	% of Communities Mobilized	Adults Reached with IRS Messages	Females Reached with IRS Messages	Males Reached with IRS Messages
Kafuzira	197	174	88.3%	3,438	2,250	1,188
Kanyenda	525	446	85.0%	17,131	11,425	5,706
Malengachanzi	546	470	86.1%	16,748	11,745	5,003
Mphonde	305	244	80.0%	5,392	3,566	1,826
Mwadzama	1,246	1,022	82.0%	20,986	13,572	7,414
Mwansambo	503	466	92.6%	12,683	7,823	4,860
Total	3,322	2,822	84.9%	76,378	50,381	25,997

The data show that community meetings were held in 84.9% of villages targeted for IRS. The project conducted meetings with mobilizers and IEC assistants to investigate the issue of low coverage. It was found that mobilizers had challenges doing data collection, especially in clustered meetings. While some mobilizers followed the training provided and listed all villages that attended meetings at a central location and counted the adults reached with the IEC messages by village, others mistakenly recorded only the village that served as the central meeting location. Additionally, in 2018, the geographical hierarchy used for the IRS campaign was expanded based on feedback from local leaders and some HSAs did not recognize the names of some of the new villages. This problem was exacerbated by the fact that many HSAs do not reside in the areas they cover.

Furthermore, vacant HSA posts meant that some HSAs were selected to cover those posts in addition to their own; again, they lacked the necessary familiarity with the geography during data collection.

2.5.2 COMMUNITY DIALOGUE MEETINGS

Mobilizers used “community dialogue meetings” to sensitize and educate Nkhotakota residents about IRS and respond to concerns that the residents had about IRS prior to spraying. These were meetings held at community gatherings, such as meetings at antenatal care clinics, under 5 clinics, and health facilities. Prior to spray, a total of 156 community dialogue meetings were conducted that reached 10,609 people (2,085 men and 8,524 women) with IRS messages.

2.5.3 MOBILIZATION CONCURRENT WITH SPRAY

Mobilizers continued sensitizing communities regarding IRS throughout the spray campaign. Mobilization concurrent with spraying took place October 15–November 22, 2019. Two days before spraying concurrent mobilization began in a village. The day immediately before spraying, mobilizers collaborated with village chiefs to make announcements and to sensitize homeowners about the spray scheduled for their villages. This notice was to ensure that homeowners or their designate would properly prepare their homes for the spraying and would be available to support the spray teams. On the day of spray, IEC assistants, mobilizers, CHAG members, and chiefs linked spray teams to targeted communities for spray.

In 2019, the main mobilization challenge that the project faced was refusals linked to community demand for ITNs. In 2018, a mass net distribution campaign, supported by the Global Fund, was rolled out across Malawi. After registration was completed nationwide, organizers realized there were insufficient nets to cover all of Malawi. The MOH, through the NMCP, decided that, since Nkhotakota was receiving malaria prevention in the form of IRS, it would not also receive nets. Unfortunately, this rationale and decision were not communicated to Nkhotakota residents.

Due to the high levels of refusals that were noted in the first week of spray, all partners including the NMCP, Nkhotakota DHO and DC, senior and lower chiefs, and Area Development Committee (ADC) chairpersons joined to address community concerns. VectorLink held a district-level meeting with the six traditional authorities (TAs) to address the issue of refusals. Meeting participants decided that TAs would facilitate meetings that would cascade down to the Group Village Head (GVH) level and then to the Village Head and community level. VectorLink and the DHO attended meetings at the TA and GVH level to ensure messages were effectively transmitted to the lower levels. At the site level, site managers together with IEC assistants and mobilizers organized meetings to mobilize the chiefs and other influential local leaders to provide their full support in increasing community acceptance of IRS. On spray days, TAs, ADC chairs, GVH heads, village chiefs, CHAGs, Village Development Committee members, and other local leaders travelled with spray teams to help convince homeowners to accept IRS. This strategy was very successful in convincing homeowners who had initially refused to have their houses sprayed during the first visit by spray teams.

2.5.4 COMMUNITY LEADERSHIP ENGAGEMENT IN COMMUNITY MOBILIZATION, PRE- AND POST-CAMPAIGN

VectorLink Malawi in collaboration with the Nkhotakota DHO and DC organized and conducted eight ADC meetings on August 26–29, 2019, with local leaders in all the six TAs. These meetings were held before the community mobilization meetings started, to inform ADCs about IRS and ask for their support during IRS. After spraying, the project also conducted ADC meetings on November 25–29, 2019, with local leaders in all TAs to receive their feedback on the campaign and recommendations for improving mobilization and community acceptance in the future. A total of 263 people (213 men and 50 women) attended these ADC meetings before spraying, while 264 people (212 men and 52 women) attended the ADC meetings after spraying.

2.5.5 MASS MEDIA COMMUNICATION

VectorLink Malawi used a variety of mass media to explain and encourage acceptance of IRS in the community (Table 4). Radio spots, jingles, and interactive radio talk shows were broadcasted on Nkhotakota community radio to inform and interact with beneficiaries on IRS. Mass media communication activities emphasized key messages on the benefits of IRS and the role of communities before, during, and after spray. During spray, a specially prepared radio announcement was used to address community concerns that were contributing to IRS refusals. Additionally, to increase awareness of the spray schedule, nightly radio messages reminded listeners about which villages were targeted for spray the next day. Interactive radio talk shows were held every Thursday evening. During Week 2, an additional interactive talk show was held to address questions raised by the community on ITN distribution and its contribution to the large number of refusals encountered. Beneficiaries were invited to share their concerns and ask questions by telephone or text message. The weekly talk shows featured a rotating cast of key government partners such as NMCP officials, the District Commissioner, the District Health Officer, the District Environmental Health Officer, various AEHOs, and other members of the DC. IRS mass media communication efforts also included the production and distribution of printed IEC materials.

TABLE 4: MASS MEDIA COMMUNICATION ACTIVITIES

Dates	Type of IEC Activity/Material Produced	Frequency/Number		
		Subject	Frequency	Total # Aired
October 1– November 20, 2019	Radio spots and jingles (jingles were aired alone and concurrently with radio spots addressing IRS misconceptions and concerns)	IRS benefits and the roles of beneficiaries before, during, and after spray	Two times a day	102
		IRS misconceptions and concerns	Three times a day	153
		Jingle on home preparation	Five times a day	255
		Public service announcements	Announcing villages for spray each day	Twice a day
October 10– November 14, 2019	Radio talk shows	Talk shows were held a total of 6 times: Once every week, plus an additional show during Week 2.		
October 15–19, 2019	Road banners	Two road banners: Placed over the main intersections in Boma and in Dwangwa.		
October 14– November 22, 2019	Operations site and central warehouse banners	11 banners: 9 in operations site and 2 in central warehouse.		
October 14– November 22, 2019	Metal sign boards for the operations sites	Nine metal sign boards: 7 re-used from the 2018 campaign and 2 metal sign boards produced in 2019 for the 2 new operations sites.		
September 23– November 22, 2019	Two types of IRS posters	500 posters: 250 listing the steps households should follow before, during, and after IRS and 250 promoting IRS acceptance.		
September 23– November 22, 2019	Sexual harassment prevention posters*	18 posters: 9 in English and 9 in Chichewa.		

* Posters included information on how to report sexual harassment.

2.6 CAPACITY-BUILDING EFFORTS

VectorLink Malawi conducted capacity building in close collaboration with the NMCP, the Nkhotakota and Mangochi DHOs and DCs, and WVI to promote sustainability of IRS in the future. In Nkhotakota, the project worked closely with NMCP and Nkhotakota DHO staff to plan and implement all project activities (including recruitment, training, supervision, and monitoring), in this way providing on-the-job capacity building. In Mangochi, it included IRS campaign counterparts in all workshops, and provided full-time

technical support via two technical advisors. In 2020, VectorLink Malawi will finalize and implement the Malawi-specific Capacity Building Plan based on the capacity assessment carried out in 2019. Additionally, the project is continuing entomology-focused capacity building for MAC and the Vector Control Technical Working Group.

Below is information about the various capacity-building workshops conducted by VectorLink Malawi in collaboration with the NMCP and WVI. See Table 1 for topics covered under each workshop.

2.6.1 IRS CAPACITY-BUILDING WORKSHOP ON ENVIRONMENTAL COMPLIANCE

In response to PMI and Global Fund emphasis on environmental compliance, VectorLink Malawi conducted a five-day workshop (July 15–19, 2019) on Environmental Compliance to build the capacity of Nkhotakota counterparts and the NMCP, as well as members of the national- and district-level tasks forces that were established to support IRS in Mangochi. Thirty-nine participants (33 men and 6 women) were trained at the workshop.

2.6.2 CAPACITY-BUILDING WORKSHOPS ON IRS LEADERSHIP AND OPERATIONS

VectorLink Malawi organized and conducted the capacity-building master trainer workshop on IRS leadership and operations on August 5–10, 2019. The main objective of the workshop was to strengthen the capacity of the NMCP, WVI, and the Mangochi and Nkhotakota DHOs to plan, implement, supervise, and evaluate IRS operations at the district and operations site levels. Forty-eight participants (42 men and 6 women) were trained during the workshop.

2.6.3 CAPACITY-BUILDING WORKSHOP ON VECTORLINK COLLECT DHIS2

VectorLink Malawi conducted a capacity-building workshop on August 19–23, 2019, to orient government stakeholders from the NMCP and WVI, and counterparts from Mangochi and Nkhotakota districts on the VectorLink Collect DHIS2 database. The training covered fundamental DHIS2 concepts as well as concrete, task-based lessons to develop competencies in data entry, cleaning, and analysis, and in daily maintenance and tasks. Twenty-five participants (20 men and 5 women) were trained. Twelve participants participated in the first two days of trainings, which focused on analytical skills; the 13 trainees who were going to have more in-depth interactions with the system participated in the full five-day training to acquire more advanced user skills.

2.6.4 TECHNICAL ASSISTANCE TO GLOBAL FUND-SUPPORTED IRS CAMPAIGN

To support the planning and implementation of IRS in Mangochi under the leadership of the NMCP and WVI, VectorLink Malawi hired two full-time staff members, a Government Technical Advisor and Government Database Technical Advisor, to provide technical assistance to the NMCP, WVI, and the Mangochi DHO in planning, implementing, and monitoring the district's IRS campaign. The project also provided significant technical support in adapting the VectorLink Collect DHIS2 database system for the IRS efforts. The Governmental Database Technical Advisor is responsible for coordinating home office technical support during system set-up prior to spray, and during spray to ensure all data are captured and the system functions well.

2.7 GENDER MAINSTREAMING

As described below, VectorLink Malawi implemented a number of activities in support of gender mainstreaming.

- *Training:* VectorLink Malawi included gender awareness sessions in all IRS trainings, such as capacity-building workshops, TOTs, mobilizer trainings, SOP trainings, and M&E and data entry clerk (DEC) trainings.
- *Gender awareness guidelines and messages:* VectorLink Malawi produced sexual harassment posters in Chichewa, the dominant local language, and English and posted them at each operations

site to emphasize the project's commitment to a safe and respectful workplace for all. In addition, VectorLink Malawi prepared job aid messages on sexual harassment and disseminated them regularly to all seasonal workers throughout the spray campaign. A total 15 mass text messages on sexual harassment were disseminated to seasonal workers over the course of the campaign.

- *Increased recruitment of women:* VectorLink Malawi used all planning meetings with district counterparts to discuss and strategize on the importance of equal representation of men and women as seasonal workers in all IRS positions. Job advertisements for seasonal workers specifically encouraged women to apply for all positions. During the recruitment process, when a female candidate had equal merit to a male candidate, the woman was given priority. As a result, out of 645 people VectorLink Malawi hired as seasonal staff, 46.7% (n=301) were women; this was an increase from the 40.0% women hired in 2018. Of the 133 people hired in leadership positions such as team leaders, supervisors, and site managers, 39.1% were women; this was an increase from the 34.4% women hired in leadership positions in 2018.
- *Gender-friendly work environment:* VectorLink Malawi ensured the work environment was suitable for mixed-gender teams by constructing separate standalone double bathrooms and toilets for men and women at each operations site. Female security guards who were hired were considered for day-shift duties only in recognition of the security and cultural concerns about women working alone overnight.
- *Distribution of sanitary pads to women seasonal workers:* VectorLink Malawi distributed 309 packages of disposable sanitary pads to women seasonal workers during the 2019 spray campaign to eliminate the barriers that menstruation might have posed to female participation in IRS.
- *Alternative duties for pregnant IRS workers:* VectorLink Malawi ensured that no woman lost her job as a result of pregnancy. All four women who tested pregnant were assigned to support mobilization as household preparation assistants during spray.

3. ENTOMOLOGY

3.1 INSECTICIDE SUSCEPTIBILITY TESTS IN NKHOTAKOTA DISTRICT

At the time of reporting, Year 2 susceptibility tests have been conducted on wild mosquitoes collected from Nkhotakota District. Due to low numbers of *Anopheles* mosquitoes collected from this district, only three insecticides—the organophosphate pirimiphos-methyl 0.25% (n = 97) and the neonicotinoid clothianidin 13.2mg/paper (n = 109) using World Health Organization (WHO) tube tests; and permethrin 215µg/bottle (10X) (n = 88) using CDC bottle assays—were tested against *An. funestus* s.l. mosquitoes. This species was fully susceptible to pirimiphos-methyl 0.25% with 100% mortality after a 24-hour holding period, and it was fully susceptible to clothianidin 13.2mg/paper with 100% mortality after seven days. However, the CDC bottle assay test showed the vector was highly resistant to permethrin, with less than 10% knocked down after 30 minutes of exposure (Figure 1). These results indicate pirimiphos-methyl and clothianidin are effective against *An. funestus* s.l. in Nkhotakota District. Thus, as stated in the Malawi Insecticide Resistance Management Plan, these insecticides can be rotated in IRS programs in Malawi.

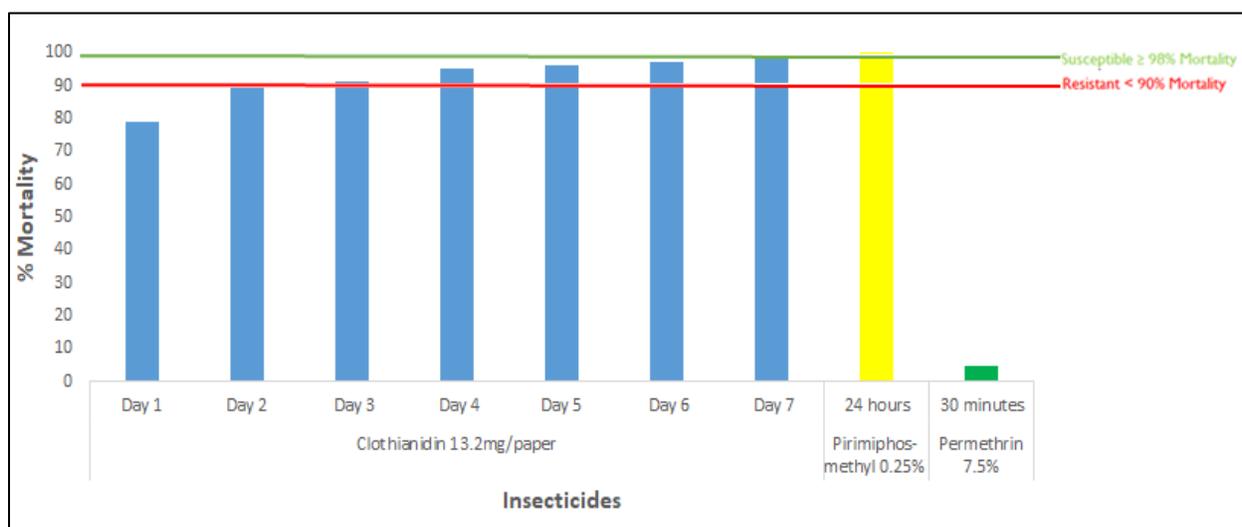


FIGURE 1: AN. FUNESTUS S.L. RESPONSE TO DIFFERENT INSECTICIDES IN NKHOTAKOTA DISTRICT

3.2 SPRAY QUALITY ASSESSMENT AND RESIDUAL EFFICACY MONITORING IN NKHOTAKOTA IRS DISTRICT

3.2.1 SPRAY QUALITY ASSESSMENT

The 2019 spray campaign began on October 17, 2019, in Nkhotakota District. VectorLink Malawi, in collaboration with MAC, conducted wall bioassays to check spray quality in eight randomly selected villages from October 17 to 25. Seven operations sites (Dwambazi, Dwangwa, Ngala, Bua, Boma, Chididi, and Ngala) were sprayed with Actellic® 300CS, two (Mwansambo and Benga) with SumiShield® 50WG. Malawi VectorLink, in collaboration with MAC, also conducted wall bioassay tests for spray quality check in 8 randomly selected villages 24 hours to one week after spray. The catchment areas covering 7 operational sites (OP) (Malombe, Lungwena, Nansenga, Mthiramanja, Namkumba, Monkey-Bay and Namiyasi) were sprayed with Actellic 300CS. The results of spray quality assessment and the fumigation effect of the two insecticides from Nkhotakota and Mangochi are presented in this report.

3.2.1.1 Spray quality assessment in Nkhotakota

As noted above, the spray quality assessment was conducted in eight randomly selected villages/sites in Nkhotakota District, namely: 1) Thung'unda [S 12°15' 43"; E 33° 57' 42"], 2) Mtete 1 [S 12°46' 23"; E 34° 14' 47"], 3) Chiwawula [S 12°26' 27"; E 34° 0' 54"], 4) Bulumuti 1 [S 12°52' 18"; E 34° 12' 52"], 5) Chimkwende [S 12°59' 2"; E 34° 18' 12"], 6) Ngalauka [S 13°17' 46"; E 34° 30' 15"], 7) Chitsulo 1 [S 13°13' 21"; E 34° 10' 49"]; and 8) Muyande [S 13°42' 82"; E 34° 27' 33"]. Cone bioassay tests were performed 24–48 hours after spray in all the sites. In six villages (Thung'nda, Mtete 1, Bulumuti, Chimkwende, Ngalauka, and Chitsulo 1) six structures with different wall surfaces (burned brick, cement plastered, and mud) were randomly selected at each site to conduct wall bioassays for the spray quality assessment. In Chiwawula, a village under the Ngala operations site sprayed with Actellic®, and Muyande, a village under the Benga operations site sprayed with SumiShield®, 12 structures were selected for the bioassays. Six structures in each of the two villages were deliberately selected as positive controls where spray was conducted under close supervision of the VectorLink Operations Manager and the Regional Entomology Advisor. The other six structures in each village were randomly selected, though chosen with the aim of representing the three wall types noted above.

3.2.1.2 Spray quality assessment in Mangochi

Spray quality assessment was conducted in 8 randomly selected villages/sites in Mangochi District namely: 1) Likulungwa 1 – Malombe OP [S 14°40' 37"; E 35° 19' 26"], 2) Moto - Lungwena OP [S 14°17' 5"; E 35° 15' 41"], 3) Piasi – Nansenga OP [S 12°26' 27"; E 34° 0' 54"], 4) Sawasawa – Mnthiramanja OP [S 14°36' 4"; E 35° 7' 22"], 5) Mpembena – Nansenga OP [S 14°44' 15"; E 35° 10' 22"], 6) Makokola – Namkumba OP [S 14°24' 16"; E 34° 19' 17"], 7) Mwenda – Monkey-Bay OP [S 14°08' 12"; E 34° 50' 45"] and 8) Chipoka – Namiyasi [S 14°19' 12"; E 35° 08' 27"]. Cone bioassay tests were performed within 24 hours to one week after spray in all the sites. In 6 villages (Likulungwa, Moto, Sawasawa, Mpembena, Malembo, Mwenda and Chipoka, six structures made of different wall surfaces brick, cement plastered and mud walls were randomly selected at each site to conduct wall bioassay tests for spray quality assessment. In Piasi village, 6 structures were randomly selected for the bioassay tests, while 6 were sprayed under close supervision of VectorLink Staff to serve as a positive control. Like in Nkhotakota, positive control structures were included due to the unusual residual life data observed in Malawi in 2018.

3.2.1.3 Test mosquitoes

Kisumu strain of *An. gambiae* s.s. (2–5 days old) reared at MAC's insectary were used for the wall cone bioassays.

3.2.1.4 Wall cone bioassay methodology

The test followed the WHO wall cone bioassay protocol. Three test cones and one control cone were used. The test cones were placed at three different heights (1.5 m, 1.0 m, and 0.5 m) on sprayed wall surfaces while two control cones, with at least 10 mosquitoes each, were fixed on unsprayed surfaces such as the walls of kitchens and bathrooms built outside sleeping houses. At least 10 non-blood-fed female *An. gambiae* s.s. (Kisumu strain) mosquitoes age 2–5 days were introduced in each cone. The mosquitoes were exposed to the walls for 30 minutes. After 30 minutes, the mosquitoes were transferred to insecticide-free holding paper cups. Knockdown was observed and recorded at 30 and 60 minutes and mortality was recorded after 24 hours for Actellic® 300CS. For SumiShield® 50WG, mortality was observed up to the Day 5 holding period. Test mortality was corrected using Abbott's formula when control mortality was between 5% and 20%.

3.2.1.5 Fumigation test

Twenty non-blood-fed female *An. gambiae* s.s. (Kisumu strain) were placed in a wire cage measuring 15 cm x 10 cm x 10 cm covered with netting as per WHO specification. The cage was placed 10 cm away from the sprayed walls. Mosquitoes were exposed for 30 minutes, knockdown was observed and recorded at 30 and 60 minutes, and mortality was recorded after 24 hours. The control wire cages containing equivalent number of mosquitoes were placed 10 cm away from unsprayed walls in kitchens and bathrooms built outside sleeping houses.

3.2.1.6 Results

Spray quality assessment in Nkhotakota

The spray quality assessment results from catchment areas sprayed with Actellic® 300CS in Nkhotakota were satisfactory: 100% mortality was recorded at all sites after 24 hours of observation. Similar results were obtained in catchment areas sprayed with SumiShield® 50WG: 100% mortality was recorded from 16 structures on Day 2 of observation. A 17th structure recorded 100% mortality on Day 5. Only one structure recorded 91.7% mortality on Day 5; however, this is above the WHO threshold of 80%. At T0, the fumigant effect of Actellic® 300CS had 100% mortality after 24 hours of observation in 40 structures out of 42 tested (95.2%). SumiShield® 50WG also showed a fumigation effect: 100% mortality was recorded on Day 5 from all the 18 structures assessed. Note, there were some protocol issues with the fumigation tests carried out at T0; in some tests some cages were put on the floor, different cages were not used for the houses sprayed with Actellic and SumiShield, and the nets on the cages were not also properly cleaned. These issues were subsequently addressed in T2 and T3. Fumigation tests were not done at T1 because of shortage of mosquitoes. Data at T2 showed that mortality from fumigation effect from SS was 100% in 10 out of the 12 houses and at T3, mortality rate was 100% in 11 out of the 12 houses tested. Thus, even after the protocol issues were addressed, the SumiShield fumigation effect was still observed in T2 and T3.

Spray quality assessment in Mangochi

The spray quality assessment from catchment areas sprayed with Actellic 300CS in Mangochi was satisfactory in all operational sites except Nansenga. A total of 54 structures were assessed for spray quality across Mangochi district, 18.5 % of the structures recorded <100% mortality after 24 hours of observation. Actellic 300CS showed a fumigant effect in most of the structures except in four villages in three IRS operational sites, Likulungwa (Malombe), Piyasi (Nansenga), Mpembena (Nansenga) and Chipoka (Namiyasi). Out of 54 structures assessed, 24.1% recorded <100 mortality after 24 hours of observation.

3.2.2 RESIDUAL EFFICACY TEST

Residual efficacy of Actellic® 300CS and SumiShield® 50WG was assessed one month (T1), two months (T2) and three months (T3) after spray in Chiwawula (positive control and normal spray houses), Chimkwende, Ngalauka, and Muyande villages in Nkhotakota district. Actellic® 300CS residual efficacy was also assessed at T1 and T2 in Mangochi district in the following villages; Piyasi, Makokola, Mwenda and Chipoka.

3.2.2.1 Results

T1, T2 and T3 results for Nkhotakota district are summarized in Table 5. Overall, mosquito mortality at T1 and T2 were above 80%, the WHO wall cone bioassay threshold, on all three wall types tested (burned brick, cement plastered, and mud). At T3 the average mortality rate from Actellic® 300CS was down to below the 80% WHO threshold in Chimkwende and Ngalauka villages.

Residual efficacy of SumiShield® 50WG was satisfactory at T1 –T3 with above 80% mosquito mortality (100% in most cases) occurring at day 5 or earlier (Table 5) and its fumigation effect was still above 90% at T3.

T1 and T2 results for Mangochi district are summarized in Table 6. At T1, residual efficacy of Actellic® 300CS in Mangochi district was above 80% WHO threshold in all the wall surfaces from all the four villages with the exception of mud walls in Piasi village which recorded less than 80% mortality. At T2, average mosquito mortality (all three wall types) recorded at Piasi and Mwenda villages fell below 80%. Test will continue at T3 in all sites.

TABLE 5: PERCENTAGE MOSQUITO MORTALITY ONE MONTH AFTER SPRAYING (T1) IN FOUR VILLAGES IN NKHOTAKOTA DISTRICT

N	Village	Insecticide*	Wall Type*	No. Mosquitoes Exposed at T1	% Mortality at T1		No. Mosquitoes Exposed at T2	% Mortality at T2					No. Mosquitoes Exposed at T3	% Mortality at T3		
					Day 1	Day 2		Day 1	Day 2	Day 3	Day 4	Day 5		Day 1	Day 2	Day 3
Ngala	Chiwawula (positive control)	Actellic® 300CS	CP	61	100	/	64	100	/	/	/	/	59	83.5	/	/
		Actellic® 300CS	BB	64	100	/	63	100	/	/	/	/	56	83.5	/	/
		Actellic® 300CS	Mud	62	95	/	59	100	/	/	/	/	63	76.0	/	/
	Chiwawula	Actellic® 300CS	CP	62	91	/	61	76.5	/	/	/	/	57	75.5	/	/
		Actellic® 300CS	BB	60	100	/	53	93.5	/	/	/	/	63	96.5	/	/
		Actellic® 300CS	Mud	59	80	/	62	97	/	/	/	/	60	78.0	/	/
Boma	Chimkwende	Actellic® 300CS	BB	90	100	/	94	100	/	/	/	90	78.0	/	/	
		Actellic® 300CS	Mud	89	95.7	/	96	87.7	/	/	/	89	51.1	/	/	
Mwansambo	Ngalauka	Actellic® 300CS	CP	62	97	/	61	62.5	/	/	/	67	3.0	/	/	
		Actellic® 300CS	BB	58	100	/	65	92.5	/	/	/	60	29.0	/	/	
		Actellic® 300CS	Mud	59	98	/	64	87.5	/	/	/	65	39.5	/	/	
Benga	Muyande (positive control)	SumiShield® 50WG	CP	56	93.8	100	65	68.3	68.3	90	90.9	90.9	66	95.0	100	
		SumiShield®	BB	58	100		56	100					62	100		
		SumiShield®	Mud	54	94.5	100	61	95.5	95.5	100			67	95.5	100	
	Muyande	SumiShield®	CP	42	100		62	100					61	95.0	95.0	100
		SumiShield®	BB	55	100		65	100					57	85.0	100	
		SumiShield®	Mud	53	95	100	61	61.2	94.8	100			61	100		

* Actellic® 300CS mortality was measured at 24 hours; SumiShield® 50WG mortality was read every 24 hours for 5 days or until 100% mortality is recorded

** CP = Cement plastered, BB = Burnt Brick

TABLE 6: PERCENTAGE MOSQUITO MORTALITY AFTER 24 HOURS WITHIN ONE WEEK AFTER SPRAYING (T0), ONE MONTH AFTER SPRAYING (T1) AND TWO MONTHS AFTER SPRAYING (T2) IN 8 VILLAGES IN MANGOCHI DISTRICT

OPERATION SITE	VILLAGE	Insecticide	Wall Type	No. Mosquitoes Exposed at T1	% Mortality at T1	No. Mosquitoes Exposed at T2	% Mortality at T2
Nansenga	Piasi (Positive control structures)	Actellic® 300CS	Cement plastered	62	98.5	62	69
		Actellic® 300CS	Burnt brick	64	91	66	83
		Actellic® 300CS	Mud	63	84.5	54	70
	Piasi	Actellic® 300CS	Cement plastered	60	98.5	63	63
		Actellic® 300CS	Burnt brick	60	88.5	62	90
		Actellic® 300CS	Mud	59	69	Not done	Not done
Namkumba	Makokola	Actellic® 300CS	Cement plastered	63	100	60	78.5
		Actellic® 300CS	Burnt brick	62	100	61	95.5
		Actellic® 300CS	Mud	61	100	60	98.5
Monkey-Bay	Mwenda	Actellic® 300CS	Cement plastered	29	100	32	91
		Actellic® 300CS	Burnt brick	60	81.5	62	50
		Actellic® 300CS	Mud	87	96.3	92	74.3
Namiyasi	Chipoka	Actellic® 300CS	Cement plastered	61	100	67	91
		Actellic® 300CS	Burnt brick	65	98.5	62	100
		Actellic® 300CS	Mud	64	100	65	97

3.2.3 DISCUSSION

The high percentage of mortalities recorded for Actellic® 300CS and SumiShield® 50WG after 24 hours and 48 hours of observation, respectively, from the bioassays on different wall heights in all sites suggests spraying was performed as per the standard application procedures in all 8 villages in Nkhotakota district. In Mangochi district, spray quality was compromised in 2 villages under Nansegwa operation site. Spray teams from this operation site were re-trained to improve the spray quality.

The two insecticides also exhibited a fumigant effect with mortalities up to 100% in most of the houses tested 24 and 48 hours after spraying. At T1 and T2, both insecticides showed a residual effect on all three different wall types assessed in Nkhotakota District. The overall mosquito mortality was $\geq 80\%$ the WHO threshold. The lowest mortality (80%) recorded at T1 on mud walls in Chiwawula (normal spray) could be attributed to uneven spray by the spray operator. The mortality rate at T2 on the same houses was higher (97%). Lower mortality rates were also observed at T2 on some cement plastered houses which were below 80% and monthly residual efficacy monitoring is continuing. At T3, the average mosquito mortality was below 80% in the two villages Chimkwende and Ngalauka. Monitoring will continue in these two villages at T4 to see if the trend will continue for two consecutive months. However, residual efficacy of SumiShield® 50WG at T3 remained high (100% in most cases)

In Mangochi district, average mortality rate at T3 was also below 80% in Piasi, including in the positive control houses and in Mwenda villages. Monitoring will still continue at T3 in all villages.

4. ENVIRONMENTAL COMPLIANCE AND SAFETY

VectorLink Malawi uses several documents to guide the project's work so that it complies with environmental regulations: The Supplemental Environmental Assessment (SEA) for PMI/USAID for 2018–2022, was developed with the NMCP and in accordance with the provisions of US 22 CFR (216), as well as documents required by the country's Environmental Affairs Department and internal guidelines. The approved SEA authorizes the use of three classes of pesticide (pyrethroids, carbamates, and organophosphates) and three new active ingredients/combinations (clothianidin, the clothianidin/deltamethrin combination, and chlorfenapyr). For the 2019 spray campaign, VectorLink Malawi prepared a Letter Report in August 2019 that highlighted the environmental compliance plan and the choice of insecticides for the campaign.

4.1 IRS CAMPAIGN ASSESSMENTS

4.1.1 PRE-SEASON ENVIRONMENTAL ASSESSMENT

Two PSECAs were conducted at the nine operations sites using the smartphone-installed checklist. After the initial PSECA, which identified renovations needed, VectorLink Malawi developed a work plan that the team used to address all the gaps prior to the start of the campaign. VectorLink Malawi conducted the final PSECA one week prior to the start. It confirmed that all issues identified by the initial PSECA had been remediated. With all sites and warehouses in compliance, the project greenlighted the IRS spray campaign.

4.1.2 MID-SPRAY ENVIRONMENTAL INSPECTIONS

The project and government partners conducted mid-spray environmental compliance assessments and supervision at all operations sites. Five standard IRS checklists loaded on ODK and CommCare were used: 1) End-of-Day Clean-Up; 2) Homeowner Preparation and Spray Operator Performance; 3) Spray Operator Morning Mobilization; 4) Spray Operator Transportation Vehicle Inspection; and 5) Storekeeper Performance. In general, the 2019 IRS campaign was conducted in compliance with the PMI Best Management Practices manual. The non-compliance issue mostly frequently observed in the field was pump leaks due to loose pump connections, and these were fixed immediately. Most of the reported red flags were due to user error. Some supervisors were accidentally making selections due to lack of familiarity with using the smartphones. Additionally, some supervisors were completing the checklists without clearly reading and understanding the questions which resulted in misreported red flags.

Post-Season Environmental Assessment

Post-Season Environmental Assessments were conducted at all nine operations sites from November 26–30, 2019, using the smartphone-based Post-IRS Environmental Compliance inspection form. All sites followed the post-spray environmental compliance procedures, which the project will maintain for the 2020 IRS campaign.

4.1.3 MEDICAL EXAMINATIONS

VectorLink Malawi and the Nkhotakota DHO ensured all SOPs and team leaders had a medical examination in September before being hired, to assess their level of fitness for the IRS operations. Pregnancy tests were administered to all female seasonal workers who might be exposed to insecticide, namely, SOPs, pump technicians, team leaders, spray supervisors, site managers, storekeepers, and washers. As noted previously, during the initial medical examinations, four seasonal workers were found to be pregnant and were assigned to support mobilization. Pregnancy tests were repeated 30 days after the initial test; no additional female seasonal workers were found to be pregnant.

4.1.4 TRANSPORTATION SAFETY

To minimize the risk of insecticide exposure and spillage, all vehicles that transported insecticide and/or SOPs underwent pre-contract vehicle inspections that certified them for operations according to BMP criteria for IRS transportation vehicles. The VectorLink Malawi ECO conducted the inspections with the support of the Ghana ECO. The project verified that all drivers had valid licenses, and all vehicles had valid insurance and Malawi government-required inspection documents. Additionally, the inspection focused on the condition of vehicles used for IRS operations as per the requirements of the Malawi road traffic guidelines. The ECO provided certificates of inspection for all vehicles that were approved for use in IRS operations.

To ensure maximum compliance with safety issues, the ECO and traffic police officers organized and offered a one-day training for the drivers. Each vehicle was provided with a first aid kit, material safety data sheets, accident/emergency procedure sheets, a vehicle inspection certificate, and a spill kit for spill management.

4.2 INCIDENT REPORTS

VectorLink Malawi in conjunction with Nkhonkhotakota DHO invited medical officers from all 21 health centers in the district to a poison management training to ensure that they were familiar with management procedures in case a seasonal worker or beneficiary was exposed to insecticide. Skin lotion containing Vitamin E was distributed for Benga and Mwanamambo, the two sites spraying SumiShield®; such lotions were recommended for any skin irritations caused from exposure to clothianidin. In the end, no such exposure was reported in Malawi in 2019.

Two incidents occurred during the 2019 IRS campaign period (Table 7): (1) an SOP from Bua operations site was exposed to the insecticide and (2) a pump technician suffered an eye injury at Boma site. This was a significant reduction from the 13 of incidents reported in 2018, a result of VectorLink Malawi working on the corrective actions recommended based on gaps identified during the 2018 IRS campaign.

TABLE 7: SUMMARY OF INCIDENT REPORTS AND CORRECTIVE ACTION TAKEN

Incident #	Incident Summary	Corrective Action(s) Taken
MLW-102519-001-Exposure	SOP sprayed self in left eye, temple, and cheek.	The SOP's eyes were thoroughly washed with clean water in the field. He was subsequently treated at the health center. All SOPs were reminded that the visors must always be down when spraying structures.
MLW-110619-002-Injury	Pump technician injured on the right eye, on the eye lid and below the eye, and on the cornea, as a result of attempting to repair a pump that had not been properly depressurized	The pump technician was treated at the district hospital. She is currently under ongoing referral at the Kamuzu Central Hospital in Lilongwe, with support from the project. Spray teams were briefed on proper communication and emphasis on depressurizing pumps before any maintenance work is undertaken and whenever they return from the field.

4.3 DEMOBILIZATION AND WASTE MANAGEMENT

Following completion of IRS operations, the site storekeepers updated their stock records and submitted them to the logistics coordinator. Subsequently, VectorLink Malawi transported all commodities from the operations site stores to the two central warehouses in Nkhonkhotakota District, the central goods warehouse and the central insecticide warehouse. The logistics assistant and the logistics coordinator updated stock records to show the remaining stock, including the commodities that were retrieved from the operations site stores. They also updated the central warehouses inventories accordingly.

The types of waste that VectorLink Malawi segregated, collected, and transported to the central warehouses included empty insecticide bottles and sachets, used masks, dry cell batteries, torn gloves, waste paper, and plastic visors. The project identified three key disposal methods—recycling, incineration, and landfilling—to be used according to the type of waste. VectorLink Malawi signed memoranda of understanding (MOUs) with plastic and paper recycling companies. The empty insecticide bottles and other plastic waste will be used

to produce air vents, plastic sheets, and electric conduits. Prior to delivery to the recycling companies, VectorLink removed all labels from bottles and punched holes at their bases to prevent improper re-use. Recycled waste paper will be used in the production of cardboard cartons and toilet tissue paper cores. The VectorLink ECO and other stakeholders will periodically supervise the recycling process to make sure it conforms to the terms and conditions stated in the MOUs.

Incineration was deemed a safe disposal method for all the contaminated empty insecticide sachets for SumiShield® and used masks. The DHO allowed VectorLink to use the Nkhotakota District Hospital incinerator. To prepare for landfilling at the Illovo dumpsite in Dwangwa, torn gloves will be shredded, and used dry cell batteries will be encased in concrete.

Table 8 lists the type and amount of waste and method of disposal that VectorLink Malawi will use for its wastes. Annex D contains the full Environmental Mitigation and Monitoring Report.

TABLE 8: SUMMARY OF 2019 IRS WASTE AND DISPOSAL METHODS

No	Item Description	Unit of Measure	Quantity	Disposal Method
1	Masks	kg	245.8	Incineration
2	Empty bottles	number	42,767	Recycling
3	Empty Sachets (SumiShield®)	number	9,782	Incineration
4	Plastic sheets	kg	125.5	Recycling
5	Visors	number	1,616	Recycling
6	Cardboards and papers waste	kg	640.5	Recycling
7	Gloves	number	427	Shredding and landfilling
8	Dry cell batteries	number	2,040	Encasement and landfilling

5. MONITORING AND EVALUATION

5.1 DATA COLLECTION/ENTRY/QUALITY ASSURANCE

5.1.1 DATA COLLECTION

During the 2019 IRS campaign, data were collected and verified using standardized forms designed to capture all core PMI indicators. Data flow started with the SOPs and mobilizers who served as primary data collectors; data that they collected were verified by team leaders and IEC assistants, respectively, who then completed relevant summary forms. All forms were verified to ensure appropriate sections were filled out correctly, and the corresponding supervisor signed the form to indicate that it was reviewed appropriately. Together with the M&E assistants, the IEC assistants and site managers worked to ensure that all the forms reached the data centers at the end of each day or the following day.

The VectorLink Malawi M&E team adopted the VectorLink M&E protocols and introduced modifications in the data collection tools based on feedback of 2018 spray campaign with support from project peers and the home office M&E Specialist. These improvements ensured collection, management, and reporting of high-quality data. The VectorLink Malawi team used the newly designed and configured VectorLink Collect DHIS2 database with improved functionalities from the 2018 spray campaign. The database, with its dynamic dashboards, and regular quality checks helped the M&E and operations teams to produce real-time reports for rapid feedback, provided data for supervision teams to follow up on spray quality and mop up, facilitated reconciliation of data collection errors, and helped to prevent additional errors in data collection and entry.

5.1.2 DATA ENTRY

During the 2019 IRS campaign, the project maintained one data center in the Boma in a rented office space. Data entry was done at one data center as opposed to two data centers in the previous campaign due to challenges of managing multiple data centers. At the data center, DEC's performed a final verification of data on the forms, checking for completeness and arithmetic, before entering the data into the database. To ensure timely generation of weekly client spray progress reports, DEC's worked to enter data by summary totals within 24 hours after spray, and by structure details within 48 hours after spray. Entering data both by "totals" and "details" served as a form of double data entry that allowed the project to clean data to ensure its accuracy. After data entry, DEC's filed daily SOP forms at the data center by operation site, team leader code, and date.

5.1.3 DATA QUALITY ASSURANCE AND VERIFICATION

To ensure data integrity, VectorLink Malawi used a standardized approach to data collection by providing standard tools and required training for all the data collectors and supervisors at each level. The project implemented supervisory tools for both spray and mobilization to ensure SOPs and mobilizers were following the procedures. The project employed nine seasonal workers as M&E assistants, one for each operations site. The main role of the M&E assistant was to observe and provide feedback on data collection in the field. The most common issue detected was the under-reporting of eligible structures. SOPs were not recording unsprayed structures, particularly those that refused spray, were locked, or had no one home on the day of spray. The M&E team provided corrective feedback regarding this error to SOPs, team leaders, and spray supervisors during morning mobilization and field supervision. The operations site team worked with local leaders to convince the community to allow SOPs to record data of their structures and house marking despite not being sprayed. The team emphasized that all eligible structures were part of the total structures found, whether locked or open. This issue was detected early in the spray campaign, which allowed for corrective action and continuous follow-up during the campaign. The DCV form, digitized and reported via the CommCare platform, was an important tool used to check the accuracy of data collection immediately following spray days. The M&E assistants visited villages after spraying was deemed complete in the area,

randomly sampled structures based on an established skip pattern, and compared the coverage represented in their small sample to the coverage reported by SOPs through the VectorLink Collect database. In total, 4,183 structures were visited via the DCV exercise. DCV data that indicated less than 85% spray coverage or that was above 85% coverage but had a 5% variance in comparison to SOP coverage raised red flags. The project was able to use DCV data to identify data collection issues and target mop-up. For the first time in VectorLink project history, the DCV data captured via CommCare was bulk imported into the VectorLink Collect DHIS2 system to allow for automated analysis through dynamic dashboards to guide investigations and to target mop-up.

For data entry quality assurance, the VectorLink Collect DHIS2 database provided quality checks in the form of data validation rules at point-of-entry and post-entry cleaning tools. The validation checks for data errors or potential outliers enhanced data quality.

5.2 MHEALTH

VectorLink Malawi partnered with Dimagi LLC to use the CommCare mHealth system in the 2019 campaign. The system facilitated supportive supervision and data verification at the household level through: the mobile supervisory forms and submission of daily high-level spray data by site via the PMT, and daily text message job aids that reminded seasonal workers of regulations and operational procedures. The use of mHealth for reporting and supervision streamlined the feedback process, enabling timely reporting of spray progress and issues, and the immediate rectification of issues.

The mHealth reporting tools for data collection and verification, which the project used throughout the campaign, included:

Performance Management Tracker. During spray operations, all site managers at the end of each day sent daily reports on four operational indicators to the gateway phone. The gateway phone then sent the data to the Telerivet system for processing and storage. The indicators included the total number of SOPs who worked, structures found by the SOPs, structures sprayed by the SOPs, and insecticide bottles/sachets used.

Supervisory application. Site managers, spray supervisors, and government supervisors used checklists on the mobile phones daily to supervise spray operations, including environmental compliance. At the end of each day, all supervisors submitted completed supervisory forms to the CommCare system. The CommCare system then sent the submitted reports to both the country and home office staff. The reports informed VectorLink Malawi in real time of the challenges encountered in the field. The reports helped the project to address gaps noted during supervision and flag issues for immediate action.

Job aid messages. All seasonal workers and district supervisors received different daily job aid messages on spray operations, as well as gender and sexual harassment issues. These messages regularly reminded the seasonal staff of important IRS issues, which in turn led to increased awareness of safety, and better spray quality and data collection.

Data Collection Verification. The M&E assistants used the DCV tool to collect structure-level information on the spray status of randomly sampled structures. This information was imported into and cross-referenced with data in the VectorLink Collect DHIS2 database for the same geographical location to highlight issues with over-reporting of spray coverage.

5.3 IRS RESULTS

During the 2019 spray campaign, 107,565 of the 121,167 structures found were sprayed, for a final spray coverage of 88.8%. A total of 441,375 people were protected, including 11,182 pregnant women and 74,173 children under 5 (Table 9).

TABLE 9: SUMMARY OF RESULTS FOR 2019 IRS CAMPAIGN

Traditional Authority	Total Structures Found	Total Structures Sprayed	Spray Coverage (%)	Total Population Protected	Pregnant Women Protected	Children <5 Years Protected
Kafuzira	11,065	10,181	92.0%	45,213	2,252	5,579
Kanyenda	36,787	33,844	92.0%	131,020	3,035	20,150
Malengachanzi	24,807	20,091	81.0%	90,990	2,104	16,061
Mphonde	10,452	9,559	91.5%	43,322	1,004	7,937
Mwadzama	28,125	24,707	87.8%	99,708	2,196	18,885
Mwansambo	9,931	9,183	92.5%	31,122	591	5,561
Nkhotakota District Total	121,167	107,565	88.8%	441,375	11,182	74,173

Comparatively, during the 2018 IRS campaign data, spray operators found 118,355 structures and sprayed 112,264 structures achieving a coverage rate of 94.9%. As discussed under the Mobilization Concurrent with Spray section and the section below, the reason for the large coverage differences were mainly due to refusals.

5.3.1 REFUSALS AND STRUCTURES NOT SPRAYED

In the 2019 VectorLink spray campaign, 13,602 structures (11.2% of total structures found) were not sprayed. The reasons for this were: refusals (44%), nobody at home (14%), locked structures (14%), sick person in the structure (13%), “other” reasons (9%), allergy (5%), and funerals (1%) (Figure 2).

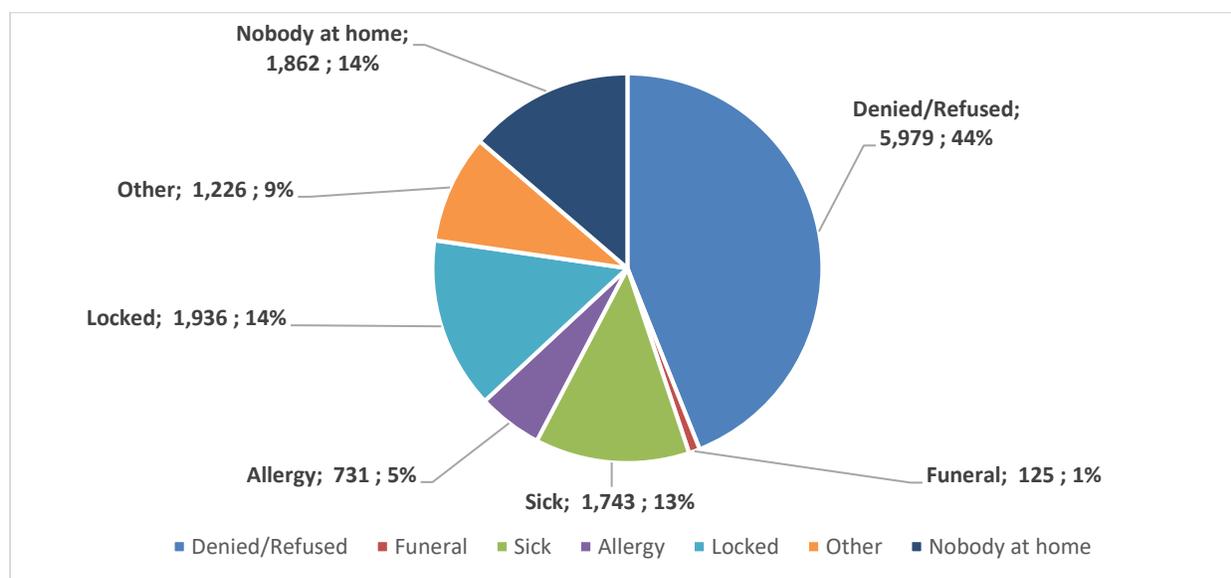


FIGURE 2: REASON FOR UNSPRAYED STRUCTURES

5.3.2 REVISITS

Due to the level of refusals encountered, VectorLink had to focus on revisits to increase coverage in the district. During the campaign, a total of 3,013 revisits resulted in households that had initially refused IRS accepting spray; 2.8% of sprayed structures were the result of revisits (Table 10).

TABLE 10: SUMMARY OF REVISITS FOR 2019 IRS CAMPAIGN

Traditional Authority	Number of Revisits Resulting in Spray
Kafuzira	261
Kanyenda	489
Malengachanzi	1,005

Traditional Authority	Number of Revisits Resulting in Spray
Mphonde	429
Mwadzama	752
Mwansambo	77
Nkhotakota District Total	3,013

5.3.3 INSECTICIDE USE AND STRUCTURES SPRAYED PER SPRAY OPERATOR

VectorLink Malawi used a total of 52,549 bottles of insecticide during the 2019 campaign, 42,767 bottles of Actellic® 300CS and 9,782 sachets of SumiShield®. On average, one unit of insecticide sprayed 2.0 structures (Table 10). Each SOP sprayed on average 9.0 structures per day.

TABLE 10: INSECTICIDE USE*

Operations Site	Structures Sprayed	Total Insecticide Used*	Average Number of Sprayed Structures per Bottle	Average Number of Structures Sprayed per day per SOP
Benga	7,340	5,095	1.4	6.2
Boma	10,384	7,861	1.3	6.8
Bua	9,075	5,061	1.8	7.1
Chididi	9,707	4,133	2.3	8.6
Dwambazi	10,181	5,005	2.0	10.4
Dwangwa	17,952	7,197	2.5	12.2
Ngala	16,376	7,110	2.3	9.0
Mkaika	17,367	6,400	2.7	11.3
Mwansambo	9,183	4,687	2.0	9.1
Total	107,565	52,549	2.0	9.0

*Insecticide use data are based on logistics records by operations site rather than data by TA via the VectorLink Collect system. This is due to the challenges SOPs had in recording insecticide correctly when they visited more than one village in a day. See below for further discussion on this issue.

6. CHALLENGES, LESSONS LEARNED, AND RECOMMENDATIONS

Despite the high level of IRS refusals in the community, VectorLink Malawi had a successful second IRS campaign. IRS acceptance was lower than during the 2018 spray campaign resulting in spray coverage of 88.8%. One TA, Malengachanzi, recorded under 85% spray coverage (81.0%). Malengachanzi, covered by Boma and Chididi operations sites, is an urban area with a high percentage of people who work outside of the home in non-agricultural professions. This, combined with a lack of leadership due to the fact that the Malengachanzi TA had passed away and not been replaced, led to a high percentage of refusals. In contrast, the most rural TA, Mwansambo, recorded the highest IRS acceptance and over 92.5% spray coverage; this TA had strong support from the TA officials. In 2019, VectorLink Malawi hired a larger percentage of female seasonal workers (46.7%) than in 2018 (40%). VectorLink Malawi's close collaboration with the NMCP and Nkhotakota DHO and DC facilitated capacity building and local ownership of the spray campaign in the future. That said, challenges and lessons learned from the Year 2 IRS campaign produced recommendations for improving IRS implementation in Year 3 (2020).

6.1 CHALLENGES AND RECOMMENDATIONS

Below are listed the types of challenges that VectorLink encountered in 2019, and how it resolved many of them.

6.1.1.1 Mobilization:

- **Mass net distribution campaign not covering Nkhotakota.** As discussed in the IEC/SBCC Activities and Outcomes section (4.5) above, a major reason for homeowners refusing IRS was that the nets they had been promised by the nationwide mass net distribution campaign in 2018 were not delivered. When the net campaign discovered it had insufficient nets to cover the whole country, Nkhotakota was left out because it was benefiting from IRS. However, this was not communicated to Nkhotakota communities. Communities assumed if they refused IRS, nets would be brought.
 - **Recommendations/Lessons Learned:**
 - If districts are registered for nets in the future, the NMCP and other stakeholders should require the implementing partner to procure and distribute the needed nets through the mass campaign. If this is not possible, the implementing partner should be held responsible for communicating this to communities at the village level, and how people can acquire nets through routine channels and protect themselves by accepting IRS.
 - VectorLink Malawi will continue working closely with senior chiefs, GVHs and village chiefs, and ADC chairpersons to encourage communities to accept IRS as another way of protecting them from malaria despite not having benefited from LLIN nets.
- **Community Refusals and Misconceptions:**
 - **Community perception that mosquitoes were not dying after the 2018 spray campaign;** hence, they saw no benefit of spraying their homes in 2019. Communities expected not to see any mosquitoes in their homes after the 2018 spray campaign.
 - **Misconception that IRS brings bedbugs.** Some households refused IRS believing it introduced bedbugs to their homes. Others acknowledged they had bedbugs in their

homes and refused spray because the insecticide would agitate the bugs, which would then bite them.

- **Recommendations/Lessons Learned:**
 - In 2020, VectorLink Malawi will intensify the pre-spray mobilization, radio programs and involvement of local leaders, especially TAs, GVHs, and ADCs. ADC meetings, like those held in 2019, will continue and meetings will be held with all GVHs at the TA level to engage their support for IRS acceptance in their communities. Their advocacy during the 2019 campaign proved to be very effective.
 - More resources will be allocated to mobilization activities in 2020. As noted above, meetings will be added to engage GVHs. The number of days allotted to facilitate community meetings will be increased. Additionally, instead of training a single member of each CHAG who is then tasked with training and engaging other members of their CHAG group, as was done in 2019, VectorLink will explore holding a one-day training for all CHAG members. VectorLink will also explore using roadshows in 2020 to sensitize communities on IRS messages.
 - Working closely with all partners, including the NMCP, the Nkhotakota DHO and DC, senior chiefs, GVHs and village chiefs, and ADC chairpersons, was essential to managing community concerns and misconceptions and addressing IRS refusals. This will be continued in 2020.
- **Mobilizers not consistently mobilizing villages the day before spray in vacant HSA post areas.** Mobilization was a challenge where the HSA post was filled by an HSA who was not familiar with the area. This resulted in communities unaware that they would be visited, poor household preparation, and structures where no one was home on the day of spray, which made it difficult for SOPs to carry out their work.
 - **Recommendations/Lessons Learned:**
 - VectorLink Malawi discuss with the District Environmental Health Office (DEHO) the option of engaging one active CHAG member or Village Development Committee (VDC) member to act as a mobilizer in the respective vacant catchment areas.
 - Daily feedback meetings between site managers and IEC assistants enhanced coordination and communication between mobilizers and spray teams and facilitated joint planning, follow-up, and supervision to ensure that villages to be sprayed on the following day were properly prepared and mobilized to accept IRS. These meetings will continue in 2020.

6.1.1.2 Logistics:

- Villages in hard-to-reach and remote areas that required spray teams to travel long distances on rough roads and on foot delayed the teams' timely return to operations sites. Though spray teams started very early in the morning, they faced IRS refusals in many remote areas and took more time to mobilize and convince the communities to accept IRS. As a consequence, some operations sites were delayed in completing end-of-day clean-up and closing. This was especially true early in the campaign when teams focused on remote areas.
 - **Recommendation/Lessons Learned:** The project will continue emphasizing starting spray operations with hard-to-reach villages to ensure those villages are covered before rains make it impossible or difficult to visit them later in the campaign. VectorLink Malawi will also ensure that mobilizers in hard-to-reach areas ensure that sure homeowners are informed about spraying at least a day before spraying. This will

improve house preparation and reduce the delays in completing end-of-day clean-ups and closing by spray teams.

- **New serialized insecticide distribution processes that delayed spray teams' departure for the field.** To prevent insecticide theft, in 2019 the project introduced the daily insecticide distribution booklet that contained the serial numbers of insecticide distributed by storekeepers and returned by team leaders. The project also introduced the serialized insecticide tracker for insecticide transfers between team leaders and SOPs. Although the project trained storekeepers and spray teams on the new processes for insecticide distribution, the processes consumed a lot of time during the first 1–2 weeks of spraying as storekeepers and spray teams became familiar with the system. Hence, there were delayed starts at the beginning of the campaign.
 - **Recommendation/Lesson Learned:** In 2020, VectorLink Malawi will reformat the insecticide distribution forms. Additionally, it will allocate more time during trainings to thoroughly cover the process of insecticide distribution and returns to/from team leaders and SOPs so that this is managed more efficiently. VectorLink Malawi will also consider expanding insecticide digital barcode scanning to all operations sites.

6.1.1.3 Operations:

- **Delays during the recruitment of seasonal workers.** Despite engaging the recruitment committee, composed of representatives from the NMCP and the Nkhotakota DHO and DC, during the shortlisting of seasonal workers, the project encountered resistance by district-level government leadership during recruitment, especially before interviews.
 - **Recommendations/Lessons Learned:** VectorLink Malawi will conduct recruitment planning meetings with the Nkhotakota DC prior to starting the process of recruitment of seasonal workers. Also, the project will start the process of recruitment early enough to ensure the smooth recruitment process in case of any eventuality during this exercise. Finally, VectorLink Malawi will conduct all recruitment activities in Nkhotakota in joint collaboration with the Nkhotakota DC, the DHO, NMCP and other key stakeholders. Seasonal workers who performed well in 2019 will be given preference for 2020 shortlisting.
- Due to high refusals in some communities, **house preparation took a significant amount of time** and was being done after spray teams had already arrived in the targeted villages; this impacted the performance of spray teams and made it difficult for them to meet their daily targets. Homeowners would often initially refuse IRS but, after being convinced by village chiefs and spray teams, they would accept and start preparing their houses. Additionally, in some sites, homeowners were not present early in the morning because they would first go to their farms and prepare their houses only after they returned, around 11:00 a.m. Both scenarios led to delayed starts and low spray team performance.
 - **Recommendation/Lessons Learned:** The issues of poor household preparation is linked to refusals. Hence, the recommendations above apply here.
- **Challenges related to distribution of SOPs:**
 - Poor performance of spray teams due to **poor planning by site teams and improper distribution of SOPs** in targeted villages. During the first week of spray operations, site managers and IEC assistants did not properly plan and allocate spray teams to villages based on expected structures to be sprayed. This also impacted the performance of spray teams.
 - **Discrepancies between the targeted structures from the spray calendar and structures found in the communities.** In 2019, the project conducted the geography validation meeting with group village heads. Based on the revised geography, the project adjusted the targeted number of structures per village using

ratios to maintain the overall target established by the number of structures found in 2018. This meant that in some villages, there were discrepancies between the expected structures and the found structures.

- **Recommendation/Lessons Learned:** VectorLink Malawi will ensure that site managers and IEC assistants allocate SOPs based on the number of structures found when they are physically in the village, i.e., adjust to what they are finding in person rather than figures from the spray calendar. Additionally, spray teams will continue to be required to meet with chiefs when they reach the communities so that they can confirm the structures to be covered every morning before allocating SOPs to targeted structures.
- Team leaders observed **spray technique errors** during supervision but did not always report them on DOS checklists as red flags. This was likely because the team leaders immediately corrected the errors during DOS supervision.
 - **Recommendation/Lessons Learned:** To improve team leader DOS reporting, VectorLink Malawi should strengthen supervision of team leaders and encourage them to report all issues/red flags they note in doing supervision, even if they have already corrected the erring SOP's behavior.
- **Issues with catchment boundary areas between Benga and Mkaika operations sites.** Benga, which used SumiShield®, and Mkaika, which used Actellic® 300CS, shared the same TA and there was some initial confusion regarding the catchment area boundaries during the first three days of spray operations. This impacted spray coverage and progress, as teams from Mkaika visited areas that were told they would be covered with SumiShield; hence, Mkaika teams had to find other areas to spray.
 - **Recommendation/Lessons Learned:** The project will clearly emphasize during the TOT and SOP trainings the boundaries of each operations site, especially those shared by the same TAs, to ensure proper planning, coordination, and mobilization of the targeted villages.
- **Low performance of spray teams in terms of the number of structures sprayed per SOP per day.** During the first half of the campaign, few operations sites had teams that averaged 10 structures sprayed per SOP per day. While 12 sprayed per day per SOP was the target communicated during trainings, SOP employment and the days of the campaign were based on an average of 10 structures covered per SOP per day.
 - **Recommendation/Lessons Learned:** VectorLink will work to ensure quality mobilization facilitates SOP performance; when villages are adequately mobilized, homeowners have prepared their structures and spraying goes more quickly. Additionally, ensuring the support of chiefs prior to spray team arrival in the villages improves acceptance and decreases the time SOPs need to mobilize and convince households to accept spray. Proper allocation of SOPs ensures that they are neither over- nor under-allocated, which also helps to improve spray progress. Finally, VectorLink Malawi will consider revising the SOP daily targets downward to nine structures per spray operator per day.
- **Low spray coverage.** VectorLink Malawi encountered high refusals that had a negative impact on spray coverage in 2019 compared with 2018. TA Malengachanzi had the lowest spray coverage (81.0%).
 - **Recommendations/Lessons Learned:**
 - Experience from 2019 showed that using the structure-level details data to highlight the unsprayed structures per village facilitated efficient mop-up in areas where refusals were high. Also, being accompanied by TAs and senior

chiefs increases beneficiary acceptance and improved both the spray progress and the spray coverage.

- Joint supervision by VectorLink, NMCP, DHO, and DC staff, and AEHOs, along with the regular coordination meetings and the WhatsApp group, were instrumental in addressing campaign issues in a timely manner across the whole district—especially the IRS refusals. This facilitated the smooth implementation of IRS and achievement of PMI-mandated spray coverage.
- **High insecticide burn rate.** The project estimated 2.2 structures/insecticide unit for procurement, based on geographic reconnaissance carried out in Nkhotakota District, plus a 3% buffer. The actual average burn rate in 2018 was 2.4 structures/insecticide unit, whereas in 2019 it fell to 2.0. In the Boma operations site, the rate was 1.3 due to the fact that the area is more urban and its many newly constructed homes are relatively large. Though the project had no stock-out during the spray campaign, stock levels and insecticide usage was closely tracked by VectorLink; had the spray coverage rate been higher a stock out was a strong possibility. VectorLink feels that the higher burn rates were due to spray operators adhering to proper spray techniques compared first year spray operators in 2018.
 - **Recommendations/Lessons Learned:**
 - VectorLink Malawi will use the 2019 burn rate of insecticide when calculating the 2020 insecticide procurement needs.
 - Strong spray operator training along with morning mobilization briefings, job aid messages, and close supervision were key tools in ensuring adherence to proper spray techniques.

6.1.1.4 M&E:

- **Challenges capturing structure data:**
 - **Household owners who refused IRS did not allow their structures to be marked nor did they accept IRS cards**, which made it difficult for SOPs to accurately record not-sprayed structures. This could have an impact during the post-spray data quality audit.
 - SOPs had problems accurately recording data during the first days of the spray campaign in areas where there were refusals. Homeowners refused to provide accurate data such as names, population, and number of rooms found.
 - **Recommendation/Lesson Learned:** VectorLink Malawi will continue to engage community leaders to reach out to community members to accept data collection of their structures and house marking despite not being sprayed.
- **SOPs and team leaders had problems capturing insecticide data across multiple villages that were sprayed in a single day.** SOPs would incorrectly report the insecticide on multiple data collection forms, and this over- or under-reporting of insecticide used was transferred to the VectorLink Collect system.
 - **Recommendation/Lesson Learned:** To prevent SOPs wrongly reconciling insecticide data, in Year 3, the project will emphasize training on recording insecticide on multiple Daily Spray Operator forms whenever SOPs spray in more than one village per day.
- **Challenges related to the geographical hierarchy.**
 - VectorLink Malawi conducted geographical hierarchy meetings with GVH heads in 2019 to collect the correct geography for use during the spray campaign. This was carried out in response to the gaps found in the geography used in 2018. As discussed above, the project encountered challenges during mobilization since **mobilizers did not always recognize some villages and ended up not reporting data for these**

villages or reporting data for them under villages that were familiar to them instead of using the new geography that VectorLink provided them. This created an issue since mobilization data looked to be under-reported though mobilizer and IEC assistants reported mobilizing all villages, i.e., not missing areas, through pre-spray community mobilization meetings.

- **Village changes impacted target setting at granular-level.** In 2019, despite having undergone a significant geographic hierarchy exercise, HSAs during mobilization suggested the addition of villages; these villages were added to VectorLink Collect since they needed to be in the system in order for the associated mobilization data to be entered. Additionally, during spray calendar development during the spray operations TOT, AEHOs and other participants recommended the addition of villages they felt were missing. Difficulties rectifying these multiple additions led to discrepancies between the geography used for VectorLink Collect and the spray calendar and thus impacted target setting. This required adjustments to be made after thorough review of the two sources of geography.
- **SOPs struggled to document geography correctly during revisits;** they sometimes recorded the geography differently than they did on the first visit. Some structures were marked as a revisit but under two different geographies. When discovered, the M&E team cleaned this, but if a SOP also recorded different names during the visits, for example the husband's name for the first visit and the wife's name for the second, it was impossible for the M&E team to determine if this was a true revisit or a duplication of an IRS number that resulted from mis-recording during data collection. Such challenges often occurred because of inconsistent understanding of geography at the village level and spray teams not using the list of villages that the M&E team provided to site managers and spray supervisors.
- **Recommendations/Lessons Learned:**
 - In 2020, VectorLink Malawi will intensify supervision of mobilization to ensure that data is captured that accurately reflects the VectorLink geography; This will be facilitated through use of a supervision tracking sheet as well engaging more district-level supervision of team members.
 - VectorLink Malawi will emphasize during mobilizer and SOP trainings the need for using one geography during data collection. The project will share the list of villages that are configured in VectorLink Collect DHIS2 before the trainings so that they can provide a comprehensive feedback that can be used to make adjustments to the existing list. The list will also help them to get familiar with ungazetted villages within their catchment area. The project will jointly work with local leaders and HSAs during both mobilization and spray to ensure use of a harmonized geography throughout the campaign.
 - Also, VectorLink Malawi will review the geography used in 2019; villages that had neither mobilization nor spray data collected in 2019 will be removed. In 2020, a single geography will be used for VectorLink Collect, the mobilization calendar, and the spray calendar. If changes are deemed necessary, the team will work jointly to make sure the changes are applied universally so that a single geography is used across the whole project.
- **The data center struggled with poor network connectivity.** The project increased the bandwidth procured from the 5Mbps in 2018 to 10Mbps in 2019 but the provider, Skyband, had cuts in service due to fiber cuts in- and outside of the country. While the desktop client worked offline for data entry, the network was needed for data syncing. Inconsistencies in connectivity resulted in untimely syncing of data. Data cleaning also require connectivity, and lack of continuous connectivity resulted in delays in data cleaning.

- **Recommendation:** In 2020, data entry continue will take place at a single data center located in Boma. The data center will have 10MBps internet bandwidth. While, connectivity still was a challenge it was much easier to manage by having a single data center.

6.1.1.5 mHealth:

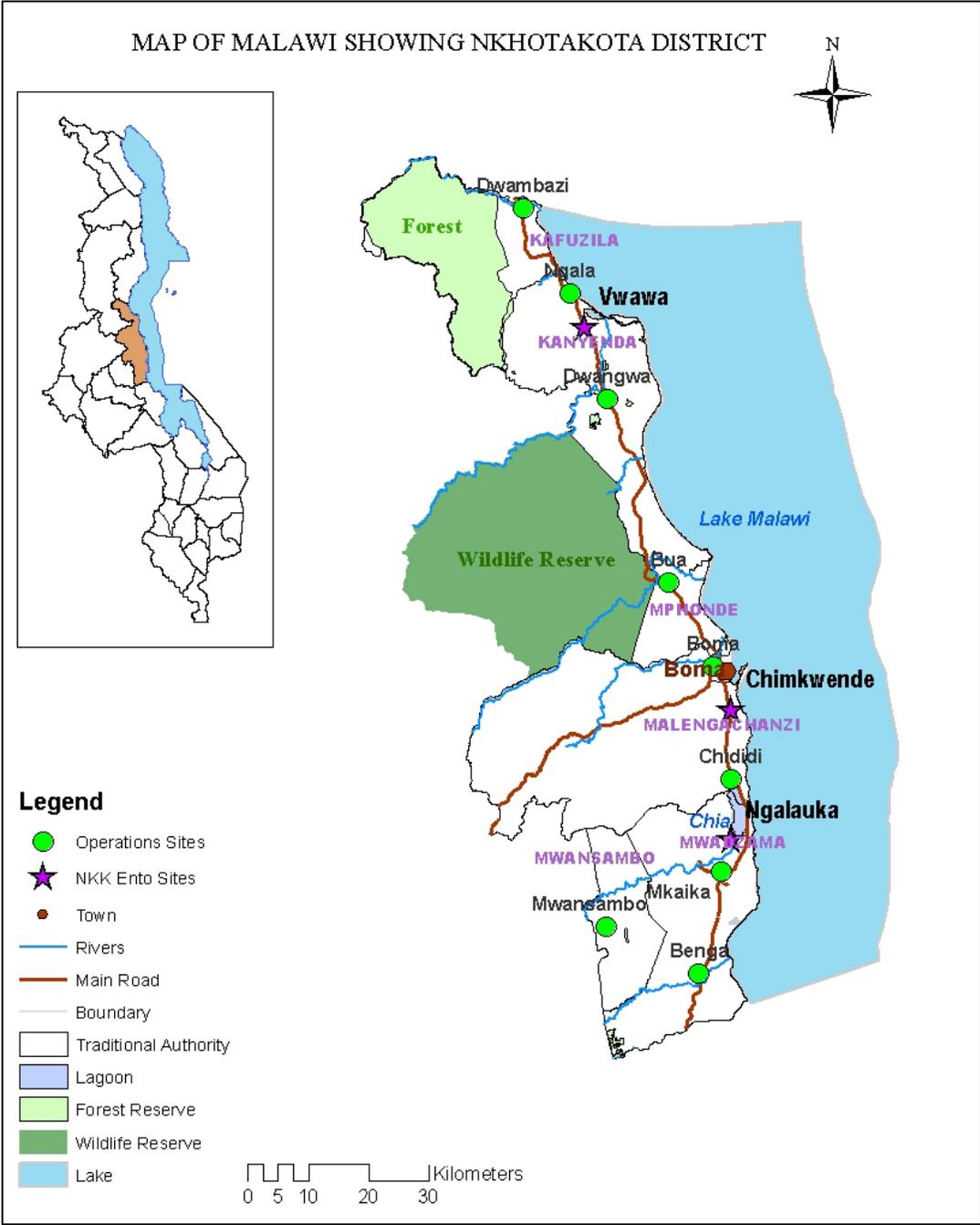
- Some questions on the supervisory checklists were not well understood by supervisors and this led to **incorrectly reported red flags**.
 - **Recommendation:** In Year 3, VectorLink Malawi should allocate more time for training on the supervisory checklists and navigation of the smartphone platform. More time for training was provided in 2019 and erroneous reporting decreased, but this can still be improved upon.
- **Site managers struggled with the PMT submissions**, because this reporting required their smartphones to have airtime, and they did not manage the airtime well. As a result, the VectorLink Nkhotakota District Coordinator generally had to collect these operations data manually to facilitate timely access to the data.
 - **Recommendation/Lesson Learned:** The project will organize a separate training for site managers on how to use the PMT and will investigate how, if possible, to remotely control airtime and data bundle use.

6.1.1.6 Gender:

Recommendations/Lessons Learned:

- VectorLink Malawi will continue to engage the NMCP, DHO, DC, and other key stakeholders in the recruitment of seasonal workers. Giving preference to well-performing seasonal workers from 2019 will help to maintain the high percentage of female seasonal workers hired in 2019.
- During future spray campaigns, VectorLink Malawi will continue to distribute disposable sanitary napkins to female seasonal workers.
- The project collected from site managers and AEHOs a list of high-performing staff that they would recommend for promotion in Year 3. VectorLink will review the list and specifically target high-performing women for promotion.

ANNEX A: MAP OF NKHOTAKOTA DISTRICT



ANNEX B: PEOPLE TRAINED TO SUPPORT IRS

Categories of Persons Trained	Training on IRS Delivery														Other Trainings																				
	Environmental Compliance workshop		DHIS2 Capacity-building workshop		IRS Operations and Leadership workshop		Training of Trainers		Spraying Operations		Data Capture		Logistics Training		Technical Maintenance		Structure Enumeration/ IEC TOT		Structure Enumeration/ IEC Training		Poison Control		Environmental Compliance		Coveralls Washing		Fire Security		Finance		Transport Security				
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F			
NMCP	0	1	2	1	3	1																													
MoH-Nkhotakota	10	1	2	1	11	1																													
MoH-Mangochi	13	2	6	2	11	2																													
World Vision IRS leadership	4	0	6	0	5	0																													
Site Managers							8	1																											
Spray Supervisors							31	18																											
Spray Operators									225	201																									
Team Leaders									46	35																									
Data Entry Clerks											9	10																							
M&E Assistants											6	4																							
mHealth Coordinator											0	1																							
Logistician													1	0																					
Storekeepers													9	6																					
Finance Assistants																														8	2				
Pump Technicians															7	2																			
IEC Assistants																	17	4																	
Mobilizers																			113	71															
CHAGs																			61	41															
Adverse Effects Teams (Clinicians)																					13	4													
District Environmental sub committee																							8	2											
Washers																									7	36									
Security Guards																											13	5							

Categories of Persons Trained	Training on IRS Delivery														Other Trainings																	
	Environmental Compliance workshop		DHIS2 Capacity-building workshop		IRS Operations and Leadership workshop		Training of Trainers		Spraying Operations		Data Capture		Logistics Training		Technical Maintenance		Structure Enumeration/ IEC TOT		Structure Enumeration/ IEC Training		Poison Control		Environmental Compliance		Coveralls Washing		Fire Security		Finance		Transport Security	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F		
Drivers																													44	0		
TOTAL M/F	27	4	16	4	30	4	39	19	271	236	15	15	10	6	7	2	17	4	174	112	13	4	8	2	7	36	13	5	8	2	44	0
TOTAL/Training	31		20		34		58		507		30		16		9		21		286		17		10		43		18		10		44	

ANNEX C: SOAK PITS AND WASH AREAS PER OPERATIONS SITE

No	Operations Site	Spray Operators	FSP	Wash Areas	MSP II	MSP I
1	Benga	39	1	2		
2	Boma	43	2	2		
3	Chididi	42			3	
4	Bua	48	1	2		
5	Dwambazi	32	1	1	1	
6	Dwangwa	51	2	2		
7	Ngala	50	1	2		
8	Mkaika	51				8
9	Mwansambo	34	1	1	1	
	TOTAL	390	9	12	5	8

* Each FSP can accommodate approximately 50 SOPs, each permanent wash area can accommodate 25 SOPs, MSP Is can accommodate 5 SOPs, and MSP IIs can service 15 SOPs.

ANNEX D: ENVIRONMENTAL MITIGATION AND MONITORING REPORT

Mitigation Measure	Status of Mitigation Measures	Outstanding Issues Relating to Required Conditions*	Remarks
Pre-contract inspection and certification of vehicles used for insecticide or spray team transport	The Malawi ECO with the assistance of the Ghana ECO inspected all vehicles planned and hired for use during IRS operations to see if they met IRS standard requirements by completing the Pre-contract Transport Vehicle Inspection form using a smartphone. 44 vehicles (40 minibuses, 3 land cruisers, and 1 van-type truck) were inspected and hired for the campaign upon meeting IRS BMP and local standards and a certificate issued for each for carrying insecticides and IRS staff.	No outstanding issues	Continuous inspections were conducted by the ECO and other VectorLink supervisors to verify if all the vehicles had their inspection certificates and to confirm continued compliance throughout the campaign period.
Driver training	44 drivers were trained on environmental compliance and safety issues. Upon successful completion of the training, each signed the PMI IRS Motor Vehicle and Driver Policy prior to the commencement of their work.	No outstanding issues	The ECO and other VectorLink supervisors assigned to each site verified throughout the campaign that the names of the drivers on the certificates matched drivers' licenses to ensure no untrained drivers were used.
Cell phone, PPE, and spill kits on board for all insecticide transporting vehicles.	All drivers always had their cell phones charged to ensure continuous communication, spill kits were put in each vehicle, and PPE was provided to all drivers. Spill and emergency response procedures were also put in each vehicle used to transport SOPs and insecticides. During the campaign, 791 Spray Operator Transport Vehicle Inspections were conducted and no noncompliance issues were recorded on this measure.	No outstanding issues.	During morning mobilization assemblies, continuous reminders about these requirements were provided to all drivers. All drivers and SOPs were trained on the emergency and spill procedures.

Mitigation Measure	Status of Mitigation Measures	Outstanding Issues Relating to Required Conditions*	Remarks
Initial and 30-day pregnancy testing for female seasonal workers serving in roles with potential insecticide exposure	All female seasonal workers with potential exposure to insecticide were given pregnancy tests prior to spray and 30 days after the initial tests. 4 women (prior to spray) were found pregnant. All 4 pregnant women were assigned to mobilization duties to avoid insecticide exposure.	No outstanding issues.	The DHO officials conducted all tests and submitted results to VectorLink.
Medical exams for all seasonal workers	SOPs and team leaders were given medical exams by the DHO to ensure they were fit to support spray operations.	No outstanding issues.	The DHO officials conducted all exams and submitted results to VectorLink.
Provision and distribution of PPE to seasonal workers; trainings on the use of PPE for all workers	Appropriate and adequate PPE was issued to all seasonal workers who might be exposed to insecticide. Trainings on the use of PPE, including dress rehearsals, were conducted for all seasonal workers. During the campaign, minor concerns were raised related to improper use of PPE by the SOPs. 9,847 smartphone inspections were conducted and approximately 0.5% instances of noncompliance with PPE use were recorded.	No outstanding issues.	Team leaders, team supervisors, AEHOs, VectorLink supervisors, and government counterparts continuously enforced proper use of PPE in the field.
Training on mixing of insecticide and proper use and maintenance of sprayers and management of associated materials.	All SOPs were trained on proper mixing of insecticide prior to the spray campaign. SOPs were advised to triple rinse empty insecticide bottles. During the campaign, 3,462 inspections were conducted to assess compliance with the requirement. Random checks in the field by supervisors made the following noncompliant observations: one regarding improper triple rinsing of insecticide bottle and three instances of tanks not shaken to mix the contents before pressurizing.	No outstanding issues.	The project emphasized the importance of triple rinsing of insecticide bottles during daily SOP morning mobilization assemblies.

Mitigation Measure	Status of Mitigation Measures	Outstanding Issues Relating to Required Conditions*	Remarks
End-of-day clean-up	Soap, water, and other supplies for washing were provided at every operations site to facilitate end-of-day clean-up. 1,037 smartphone-based end-of-day clean-up inspections were completed during the campaign. During supervisory inspections, the following instances of noncompliance were observed: Team leaders not supervising cleaning and wash-up at 0.2%, water in the collection barrel at the beginning of the clean-up, wastewater from the collection barrel not distributed to SOPs for the next day, and workers not washing their face and hands with soap and water all at 0.1%.	No outstanding issues.	VectorLink emphasized the requirement of team leaders to properly supervising end-of-day clean-up to ensure all protocols and safety measures were followed. Two non-applicable noncompliant observations were made (0.4%) noting that barrels of MSPs were not removed at the end of each day. In Nkhotakota, the MSP areas were fenced and doors locked. Additionally, the area was guarded 24 hours a day; thus, it was not necessary to remove the barrels at the end of each day. Instead, they were removed at the end of the campaign. Additionally, 0.2% of the observations were not applicable; they noted that coveralls were not transported to the main FSP to be washed at Chididi site. However, at Chididi, an MSP II was constructed to be used for washing of coveralls.
IEC campaigns to inform residents of responsibilities and precautions	The IRS IEC campaign was effectively carried through in-person community mobilization before and during the spray camping and through radio adverts, talk shows, printed materials, i.e., posters and banners. A total of 3,462 inspections were conducted on the requirement and only 0.2% of the total indicated that the residents were not informed in advance about the spray activities.	No outstanding issues.	In some cases, homeowners were reluctant to remove their household items due to the level of effort required. SOPs, team leaders, and supervisors were able to explain to households the importance of removing items as well as assist homeowners with emptying their structures.
Two-and-a-half-hour waiting period and exclusion from house after spraying	SOPs routinely informed residents that they must leave their homes closed for two hours and then open the doors and windows and wait another 30 minutes before entering and sweeping the structure and disposing of the swept-up material into the pit latrines or burying it. 3,462 smartphone-based inspections were conducted and no noncompliant issues were reported.	No outstanding issues.	SOP supervisors and VectorLink supervisors supported the requirements by conducting random and spot checks to ensure compliance and safety of homeowners.

Mitigation Measure	Status of Mitigation Measures	Outstanding Issues Relating to Required Conditions*	Remarks
Residents instructed to wash skin with soap and water after showing symptoms of insecticide exposure such as itchy skin	3,462 supervisory inspections were conducted and only once observed that residents were not instructed to go to a clinic if they didn't feel well after their house had been sprayed.	No outstanding issues	No reports of itchy skin by the residents was reported after entering the houses.
Indoor (controlled) spraying only	Supervisors emphasized the importance of indoor spraying only with the only exception of spraying of eaves. 3,462 supervisory inspections conducted during the campaign observed no cases of SOPs spraying outdoor surfaces or open spaces.	No outstanding issues	
Spray techniques	SOPs were trained in spraying techniques. The SOPs were closely monitored and during each day's morning mobilization assemblies were given feedback and corrections to address issues. 3,462 SOP performance inspections were conducted. Out of this total, approximately 0.1% noncompliant instances each were observed, either of SOPs not observing the 45 cm distance from the wall or not spraying at the correct speed.	No outstanding issues	Most supervisors commented on the high quality of the spray techniques observed in the field. This was the result of quality SOP trainings, which will again be a priority in 2020.
Insecticide sprayers (maintenance)	Each operations site had a pump technician to repair and maintain sprayers during the campaign. The pump technicians accompanied the spray teams to the field to assist with the fixing pumps problems, such as leaks. The technicians were also responsible for periodic application of oil to the pumps.	No outstanding issues	Faulty pumps were in most cases repaired immediately in the field; no outstanding issues were reported. To ensure proper performance, calibration of all the pumps was also conducted twice weekly.
Insecticide sprayers (care and storage)	During end-of-day clean-up, every sprayer was cleaned and kept in the storeroom. 1,037 supervisory inspections were conducted on the requirement. The campaign used Goizper sprayers and these sprayers are not required to be stored upside down after washing.	No outstanding issues.	Only Goizper sprayers are not required to be hung upside down at the end of each day according to the manufacturer's instructions. Consider updating checklist so that lack of hanging Goizper sprayers upside down does not trigger a red flag.

Mitigation Measure	Status of Mitigation Measures	Outstanding Issues Relating to Required Conditions*	Remarks
Choice of sites for disposal of IRS effluents	All FSPs were located away from flood-prone or waterlogged areas. In Mkaika, a flood-prone area, PMSPs were used and removed after the campaign. All soak pits and wash areas were closed down after spray; across all sites, there were no outstanding issues reported during the Post IRS Environmental Compliance inspections	No outstanding issues.	Refurbishment will be required to address these issues before the 2020 campaign.
Management of wash areas and soak pits and as required.	Liquid waste or effluent was disposed of in soak pits, both FSPs and MSPs. All FSPs were maintained from 2018; one FSP with 2 accessory wash areas was constructed at the new site of Ngala. MSPs were constructed and used at the various sites as detailed in Annex C. At Benga minor cracks developed in the wash area during the campaign period. To address this, a sheet of tarpaulin was used to cover the floor of the wash bay. Dwangwa and Bua had issues of wash water pooling in some sections within the wash bays rather than properly flowing down the drainage pipes. To address this, the washers were advised to sweep the water to the drain pipes using push brooms procured for this propose.	No outstanding issues.	Post-spray, all the soak pits were closed down. This involved removing PMSPs, locking FSPs with large metal covers, and covering wash areas with plastic sheets and a thin layer of soil to avoid exposure to animals and children.
Inspection of solid waste disposal sites before spray campaign	The ECO certified solid waste disposal sites before the spray campaign. These included sites for recycling, incineration, and landfilling. All waste disposal sites were in good condition including the incinerator at the DHO.	No outstanding issues.	
Monitoring disposal procedures during the post IRS campaign	All IRS waste disposal was managed by the ECO and logistics team. The ECO is working to ensure that waste was/is delivered to respective disposal sites in accordance with the MOUs. (In-process)	No outstanding issues.	IRS waste management and disposal requires monitoring visits to the disposal sites, such as incineration sites and recycling plants.

Mitigation Measure	Status of Mitigation Measures	Outstanding Issues Relating to Required Conditions*	Remarks
Maintain records of all issued and returned insecticide, including full and empty bottles.	During the campaign, 118 storekeeper performance inspections were conducted on smartphone-installed checklists including the monitoring of insecticide records. Out of the total number of inspections, approximately 16.9% instances of noncompliance were recorded of which the majority were the differences between the ledger books and stock cards balances.	No outstanding issues.	Some of the noncompliance issues were recorded in error – including the unavailability of separate stock cards for insecticides expiring during the spray campaign. This was not applicable to the campaign as no insecticide expired during the spray campaign.
Safety and security for warehouses	All the warehouses and storerooms were guarded 24/7 and had been fitted with fire extinguishers. No incidents related to burglary, fire, or spills were reported from any of the stores.	No outstanding issues	

*On many occasions, the supervisors issued erroneous red flags due to their lack of familiarity with the system.

NB: PMI VectorLink Malawi made efforts to follow up on any red flags raised reported via the smartphone checklists. In most cases, the users indicated that they had made a mistake when completing the checklists. There is a need to allocate more time for training on the various checklists in order to better familiarize trainees with the smartphone system.

ANNEX E: PMI VECTORLINK INDICATOR MATRIX

#	Performance Indicator	Global Project 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
Objective 1: Implementation of Malaria Vector Control (VC) Interventions														
1.1 Successfully Execute IRS and Other Integrated Malaria VC Activities														
1.1.1	Number and percentage of completed annual country work plans developed and submitted on-time	X	Project records Annually	Country										
1.1.2	Number of eligible structures targeted for spraying		Project records Annually	Country	118,000	118,355	116,948	121,167	TBD		TBD		TBD	
1.1.3	Number of eligible structures sprayed with IRS ⁷		Project records Annually	Country	100,300 ⁸	112,264	99,406 ⁹	107,565	TBD		TBD		TBD	
1.1.4	Percentage of total structures targeted for spraying that were sprayed with a residual insecticide (Spray Coverage)		Project records Annually	Country	85%	94.9%	85%	88.8%	85%		85%		85%	
1.1.5	Number of people protected by IRS		Project records Annually	Country Sex Pregnant women Children <5	408,308 ¹⁰	501,324 Pregnant women: 11,066 Children <5: 90,953	501,324 ¹¹	441,375 Pregnant women: 11,182 Children <5: 74,173	TBD		TBD		TBD	
1.1.6	Number and percentage of vector control project country programs submitting an EOSR within 45 days after the end of spray (including completing MEP and EMMR)	X	Project Annually	Country										
1.1.7	Number and percentage of IRS country programs that conduct a Post-Spray Data Quality Audit within 90 days of spray completion	X	Data Collection Forms Annually	Country										

⁷ Target based on 85% of estimated eligible structures in indicator 1.1.2

⁸ Target based on 85% of estimated eligible structures in indicator 1.1.2.

⁹ Target based on 85% of estimated eligible structures in indicator 1.1.2.

¹⁰ Target derived from recent HSA survey and represents 85% of total projected population in Nkhotakota District: 480,362.

¹¹ Target is based on the 2018 spray campaign

#	Performance Indicator	Global Project 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
1.1.8	Number of Insecticide Treated Nets (ITNs) distributed, by channel		Project Records Annually	Country Channel	0	0	5,139 ¹²	4,808 ¹³	TBD		TBD		TBD	
1.1.9	Number and percentage of countries completing ITN durability monitoring data collection as planned in a given project year	X	Project Records Annually	Country										
1.1.10	Number and percentage of PMI-funded durability monitoring surveys with reports submitted within 90 days of the end of data collection	X	Project Records Annually	Country										
1.2	Strengthen Capacity of NMCPs, VC Personnel, and Other Institutions to Implement and Manage IRS and Other VC Activities													
1.2.1	Total number of people trained to support VC in target areas		Project Training Records Annually	Country VC Intervention Sex Job Function	572 ¹⁴	575 ¹⁵ Female: 218; 37.9% Male: 357; 62.1%	572 ¹⁶	1089 ¹⁷ Female: 452; 41.5% Male: 637; 58.5%	TBD		TBD		TBD	
1.2.2	Total number of people trained to support VC in target areas with USG funds ¹⁸		Project Training Records Annually	Country VC Intervention Sex Job Function	N/A ¹⁹		572 ²⁰	565 ²¹ Female: 255; 45.1% Male: 310; 54.9%	TBD		TBD		TBD	

¹² This was based on the number of households registered in Lupachi and Chauma Island during the 2018 mass net campaign registration process.

¹³ Less nets were distributed than anticipated due to the fact that PSI found that in some areas more than one household member had been registered during the 2018 mass net campaign registration process.

¹⁴ 528 SOPs and team leaders; 44 spray supervisors

¹⁵ 526 SOPs and team leaders; 41 spray supervisors; 8 site managers

¹⁶ 513 SOPs and team leaders; 50 spray supervisors; 9 site managers; this was the target set in the 2019 work plan before the indicator was clearly defined in the new PMP

¹⁷ This includes 426 SOPs; 81 team leaders; 49 spray supervisor; 9 site manager; 19 data entry clerk, 10 M&E assistants; 1 mHealth coordinator; 1 logistician; 15 storekeepers; 10 finance assistants; 9 pump technician; 21 IEC assistants; 184 mobilizers; 43 washers; 18 security guards; 17 clinicians; 102 CHAGs; 10 DESC; 44 drivers; 20 ITN distributors. This does not include MoH, NMCP or World Vision persons trained.

¹⁸ For IRS programs, this includes SOPs, team leaders, and supervisors.

¹⁹ This indicator has been introduced in Year 2; it therefore was not part of Year 1 indicators

²⁰ 513 SOPs and team leaders; 50 spray supervisors; 9 site managers

²¹ 426 SOPs; 81 team leaders; 49 Spray supervisors; 9 site managers

#	Performance Indicator	Global Project 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
1.2.3	Number of people trained during the Master (National) Training and/or IRS Training of Trainers.		Project Training Records Annually	Country Sex Type of Training	61	49 Female: 13; 26.5% Male: 36; 73.5%	59 ²²	92 ²³ Female: 23; 25% Male: 69; 75%	TBD		TBD		TBD	
1.2.4	Total number of people hired to support VC in target areas.		Project Records Annually	Country VC Intervention Sex Job Function	965	634 ²⁴ Female: 256; 40.4% 378 Male; 59.6%	640 ²⁵	665 ²⁶ Female: 310; 46.6% Male: 355; 53.4%	TBD		TBD		TBD	
1.2.5	Number of VC project training workshops targeting NMCP and other host country staff		Project Training Records Annually	Country Technical Area Job Function	N/A	N/A	3	3 1 Boot Camps; 1 Environmental Compliance; 1 DHIS2 capacity building	TBD		TBD		TBD	
1.2.6	Number of NMCP and other vector control host country staff who have logged into VectorLink Collect		DHIS2 Logs Annually	Country Job Function	2	0	TBD ²⁷	1 ²⁸	TBD		TBD		TBD	
1.2.7	Number and percentage of technical assistance requests to support ITN distribution planning and/or implementation completed on time as planned in a given project year	X	Project Records Annually	Country Technical Area Channel										

²² This includes 9 site managers; 50 spray supervisors

²³ This includes 9 site managers; 49 spray supervisors; 4 NMCP; 12 MoH-Nkhotakota; 13 MoH-Mangochi; 5 World Vision International

²⁴ Includes: 396 SOPs; 80 team leaders; 40 spray supervisors; 8 site managers; 11 storekeepers; 41 washers; 17 security guards; 8 pump technicians; 18 DECAs; 8 M&E assistants; 6 finance assistants; 1 logistics assistant. 323 mobilizers/IEC assistants were engaged in supporting the IRS campaign, but were not formally hired due to their government employment.

²⁵ Includes: 390 SOPs; 81 team leaders; 43 spray supervisors; 9 site managers; 11 storekeepers; 41 washers; 18 security guards; 9 pump technicians; 18 DECAs; 9 M&E assistants; 10 finance assistants; 1 logistics assistant, 1 mHealth coordinator.

²⁶ Includes: 390 SOPs; 81 team leaders; 43 spray supervisors; 9 site managers; 10 storekeepers; 43 washers; 18 security guards; 9 pump technicians; 17 DECAs; 9 M&E assistants; 10 finance assistants; 1 logistics, 1 mHealth coordinator; 4 household preparation assistants; 20 ITN distributors.

²⁷ To be updated when the full scope of technical assistance to the NMCP spray programs is fully outlined.

²⁸ Based on User activity from Nkhotakota District-based government users only.

#	Performance Indicator	Global Project 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
1.2.8	Number and percentage of technical assistance requests to support operational routine monitoring systems for continuous ITN distribution completed on time as planned in a given project year	X	Project Records Annually	Country Channel										
1.3 Environmental Compliance and Safety														
1.3.1	Number of seasonal vector control personnel trained in environmental compliance and personal safety standards in vector control implementation		Project Training Records Annually	Country Sex (# and %) Job Function	637 ²⁹	641 ³⁰ Female: 244; 38.1% Male: 397; 61.9%	699 ³¹	725 ³² Female: 314; 43.3% Male: 411; 56.7%	TBD		TBD		TBD	
1.3.2	Number of health workers receiving insecticide poisoning case management training		Project Training Records Annually	Country Sex (# and %)	21	23 Female: 8; 34.8% Male: 15; 65.2%	24	17 Female: 4; 23.5% Male: 13; 76.5%	TBD		TBD		TBD	
1.3.3	Number of adverse reactions to pesticide exposure documented that resulted in a referral for medical care		Incident Report Forms Annually	Country Type of Exposure	0	2 ³³	0	1 ³⁴	0		0		0	
1.3.4	Number of SEAs and Letter Reports submitted at least 60 days prior to the commencement of VC campaigns	X	Project Records Annually	Country										
1.3.5	Number and percentage of permanent and mobile soak pits inspected and approved prior to IRS campaigns or before first use		Project Records - PSECAs Annually	Country	11 ³⁵ ; 100%	11; 100%	18 ³⁶ ; 100%	22 ³⁷ ; 100%	TBD; 100%		TBD; 100%		TBD; 100%	

²⁹ 400 SOPs; 80 team leaders; 40 supervisors; 40 drivers; 35 washers; 16 security guards; 9 storekeepers; 8 site managers; 1 logistics assistant; 8 pump techs

³⁰ 396 SOPs; 80 team leaders; 40 supervisors; 48 drivers; 41 washers; 17 security guards; 11 storekeepers; 8 site managers; 1 logistics assistant; 8 pump techs

³¹ 432 SOPs; 81 team leaders; 50 supervisors; 43 drivers; 41 washers; 18 security guards; 15 storekeepers; 9 site managers; 1 logistics assistant; 9 pump techs

³² 426 SOPs; 81 team leaders; 49 supervisors; 44 drivers; 43 washers; 18 security guards; 15 storekeepers; 9 site managers; 10 M&E assistant; 1 logistics assistant; 9 pump techs; 20

ITN distributors

³³ 1 exposure in Benga and 1 exposure in Dwangwa

³⁴ 1 exposure in Bua

³⁵ 9 fixed soak pits (central warehouse + 8 operations sites); 2 mobile soak pits

³⁶ 2 Boma, 2 Chididi, 2 Mkaika, 2 Benga, 2 Mwansambo, 2 Bua, 2 Dwangwa, 2 Ngala, 2 Dwambazi,

³⁷ 2 Boma, 3 Chididi, 8 Mkaika, 1 Benga, 1 Mwansambo, 1 Bua, 2 Dwangwa, 1 Ngala, 2 Dwambazi,

#	Performance Indicator	Global Project 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
1.3.6	Number and percentage of storehouses inspected and approved prior to IRS campaigns		Project Records - PSECAs Annually	Country Storehouse Type	9 ³⁸ ; 100%	10 ³⁹ ; 100%	11 ⁴⁰ ; 100%	11 ⁴¹ ; 100%	TBD; 100%		TBD; 100%		TBD; 100%	
1.4 Promote Gender Equality in all Facets of Planning and Implementation														
1.4.1	Number and percentage of women hired to support VC campaigns		Project Records Annually	Country Sex (# and %) Job Function	338; 35%	256; 40.4%	256; 40.4%	310 46.6%	TBD; 45%		TBD; 50%		TBD; 50%	
1.4.2	Number and percentage of women hired in supervisory roles in target areas for VC activities		Project Records Annually	Country Sex (# and %) VC Intervention Job Function	68 ⁴² ; 50%	48 ⁴³ ; 35.3%	68 ⁴⁴ ; 35.3%	60 ⁴⁵ ; 40.5%	TBD; 50%		TBD; 50%		TBD; 50%	
1.4.3	Number and percentage of trainees (permanent and seasonal) who have completed gender awareness training		Project Records Annually	Country Sex (# and %) Job Function	998; 100%	567 ⁴⁶ ; 87.1%	1,169 ⁴⁷	1089 ⁴⁸ Female:452; 41.5%; Male; 637: 58.5%						
1.4.4	Number and percentage of women in senior leadership roles in VectorLink country offices	X	Project Records Annually	Country Sex (# and %)										

³⁸ 1 central warehouse; 8 operations site storehouses

³⁹ 1 central goods warehouse + 1 central insecticide warehouse + 8 operations sites

⁴⁰ 1 central goods warehouse + 1 central insecticide warehouse + 10 operations sites

⁴¹ 1 central goods warehouse + 1 central insecticide warehouse + 9 operations sites

⁴² Supervisory roles include: supervisor, team leader, IEC assistant, site manager

⁴³ Supervisory roles include: 11 supervisors, 31 team leader, 2 site managers, 4 M&E assistants

⁴⁴ Supervisory roles include: 11 supervisors, 31 team leader, 2 site managers, 4 M&E assistants

⁴⁵ Supervisory roles include: 16 supervisors, 35 team leader, 1 site managers, 4 M&E assistants, 4 storekeepers

⁴⁶ This includes 40 spray supervisor, 80 team leaders, 8 site managers, 8 M&E assistants, 18 data clerks, 396 spray operators and 17 permanent VectorLink staff.

⁴⁷ All permanent staff and seasonal staff excluding drivers

⁴⁸ This includes 426 SOPs; 81 team leaders; 49 spray supervisor; 9 site manager; 19 data entry clerk, 10 M&E assistants; 1 mHealth coordinator; 1 logistician; 15 storekeepers; 10 finance assistants; 9 pump technicians; 21 IEC assistants; 184 mobilizers; 43 washers; 18 security guards; 17 clinicians; 102 CHAGs; 10 DESC; 44 drivers; 20 VL staff. This does not include MoH, NMCP, or World Vision persons trained.

#	Performance Indicator	Global Project 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
1.5	Implement and Support SBCC and Mobilization Activities													
1.5.1	Number of radio spots and talk shows aired		Project Records Annually	Country VC Intervention Talk Show or Radio Spot	160	349 ⁴⁹	349 ⁵⁰	572 ⁵¹	TBD		TBD		TBD	
1.5.2	Number of print materials distributed to or targeted at beneficiaries		Project Records Annually	Country VC Intervention	118,000	75,316 ⁵²	118,355	500 ⁵³	TBD		TBD		TBD	
1.5.3	Number of people reached with vector control and/or SBCC messages via door-to-door messaging		Project Records Annually	Country VC Intervention Sex	480,362	238,057 Female: 131,932; 55.4% Male: 106,125 44.6%	501,324 ⁵⁴	0 ⁵⁵	TBD		TBD		TBD	
2. Entomological and Epidemiological Data to Drive Decision-Making														
2.1	Vector Control Activities Monitored via Entomological and Epidemiological Data													
2.1.1	Number of project-supported entomological sentinel sites established to monitor vector bionomics (vector species, distribution, seasonality, feeding time, and location)		Entomological Reports Annually	Country VC Intervention	11	11	15 ⁵⁶	ongoing	TBD		TBD		TBD	
2.1.2	Number and percentage of vector bionomics monitoring sites measuring all basic entomological indicators (species composition, indoor and outdoor human biting rates, hourly human biting rates, indoor resting densities)		Entomological Reports Annually	Country VC Intervention	1; 9%	1; 9%	5; 33.3%	Ongoing	TBD; 100%		TBD; 100%		TBD; 10%	
2.1.3	Number and percentage of vector bionomics monitoring sites measuring the following all advanced entomological indicators: sporozoite rates and entomological inoculation rates		Entomological Reports Annually	Country IRS or Entomology Only Program	11; 100%	11; 36%	15; 100%	Ongoing	TBD		TBD		TBD	

⁴⁹ 344 radio spots; 5 radio talk shows

⁵⁰ 344 radio spots; 5 radio talk shows

⁵¹ 255 jingles; 257 radio spots; 56 public announcement; 6 radio talk shows

⁵² 200 posters, 75,000 leaflets, 100 fliers, and 16 sexual harassment posters

⁵³ 250 on IRS STEPS and 250 for the promotion of IRS acceptance

⁵⁴ This is total population protected from 2018 IRS Campaign, and target was set prior to removal of door-to-door community mobilization for the 2019 IRS campaign.

⁵⁵ The strategy changes from door to door to community mobilization in 2019 campaign

⁵⁶ 4 entomological monitoring sites were added in 2019, in addition to the existing 11 sites

#	Performance Indicator	Global Project 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
2.1.4	Number and percentage of insecticide resistance monitoring sites that tested all priority insecticides for the relevant local vector control intervention		Entomological Reports Annually	Country VC Intervention	5; 100%	5; 100%	7; 100%	ongoing	TBD; 100%		TBD; 100%		TBD; 100%	
2.1.5	Number and percentage of houses in which WHO cone bioassays were conducted within two weeks of spraying with greater than 98% test mortality recorded for IRS countries		Entomological Reports Annually	Country Insecticide Type	24; 100%	16; 67%	60; 100%	59;98.3%	TBD		TBD		TBD	
2.1.6	Number and percentage of sites that conducted WHO cone bioassays after the completion of spraying at monthly intervals until test mortality drops below 80% for two consecutive months for IRS countries		Entomological Reports Annually	Country Insecticide Type	16; 100%	12; 75%	16; 100%	ongoing	TBD		TBD		TBD	
2.1.7	Number of countries with an integrated vector control analytics dashboard created by PATH, available for decision-making	X	Project Reports Annually	Country										
2.1.8	Number of people trained (VectorLink and non VectorLink staff) in entomological monitoring		Project Records Annually	Country Sex (# and %)	2 ⁵⁷	2	2 ⁵⁸	0	TBD		TBD		TBD	
2.1.9	Number and percentage of sites in which WHO cone bioassays were conducted to evaluate bio-efficacy of bed nets		Entomological Records Annually	Country	N/A	N/A	N/A	N/A	TBD		TBD		TBD	
2.1.10	Number of nets in which WHO cone bioassays were conducted to evaluate bio-efficacy of bed nets		Entomological Records Annually	Country	N/A	N/A	N/A	N/A	TBD		TBD		TBD	
2.2	NMCPs Develop Country-Level IRS and Other Malaria VC Strategies													
2.2.1	Number and percentage of countries with an integrated malaria vector control strategy, including a plan for monitoring and managing insecticide resistance supported by the project	X	Project Records Annually	Country										

⁵⁷ Two entomological technicians, one from VectorLink Malawi, one from NMCP

⁵⁸ Two entomological technicians, one from VectorLink Malawi, one from NMCP

#	Performance Indicator	Global Project 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
2.2.2	Number and percentage of countries with a data and visualization dashboard complete for IRS and/or entomology data in VectorLink Collect for vector control decision making	X	Project Records Annually	Country										
2.2.3	Number of countries that implement sub-national insecticide rotation	X	Project Records Annually	Country										
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	Country Job Function Organization	N/A	N/A	N/A	N/A	4		TBD		TBD	
2.3.2	Number and percentage of targeted individuals that report using new analytical tools and/or skills in their planning, resourcing, implementation, or measurement activities		Capacity Assessments Thrice Over Project Life	Country Job Function Organization	N/A	N/A	N/A	N/A	100%		N/A		100%	
3. Procurement and Logistics														
3.1	Cost-Effective Procurement Mechanism Established													
3.1.1	Number and percentage of insecticide procurements that had a pre-shipment QA/QC test, done by a third party, at least 60 days prior to spray campaign	X	Procurement Records Annually	Country Insecticide Type										
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	Country Insecticide Type	1; 100%	1; 100%	1; 100%	2 ⁵⁹ ; 100%	TBD; 100%		TBD; 100%		TBD; 100%	
3.1.3	Number and percentage of targeted countries with international equipment procurements, including PPE, received on-time to allow for the initiation of vector control campaigns as scheduled	X	Procurement Records Annually	Country VC Intervention										

⁵⁹ The project receive 2 separate shipments, one for SumiShield and one for Actellic® 300CS

#	Performance Indicator	Global Project 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
3.1.4	Number of VectorLink staff trained on procurement	X	Project Records Annually	Country										
3.2	Robust Inventory Management and Logistics Systems Established													
3.2.1	Number and percentage of logistics and warehouse personnel (seasonal and full-time) trained in VC supply chain management		Project Training Records Annually	Country VC Intervention Sex Job Function	10 ⁶⁰ ; 100%	13 ⁶¹ ; 100%	15 ⁶² ; 100%	18 ⁶³ ; 100%	TBD; 100%		TBD; 100%		TBD; 100%	
3.2.2	Number and percentage of operations site warehouses where physical inventories can be verified by daily stock records		Inventory and Stock Records Annually	Country	9 ⁶⁴ ; 100%	10 ⁶⁵ ; 100%	11 ⁶⁶ ; 100%	11 ⁶⁷ ; 100%	TBD; 100%		TBD; 100%		TBD; 100%	
3.2.3	Number and percentage of IRS countries that successfully completed spray operations without an insecticide stock-out	X	Inventory and Stock Records Annually	Country Insecticide Type										
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	Country Type of Innovation	TBD	0	TBD	0	TBD		TBD		TBD	
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	X	Project Records Annually	Country Technical Area										
4.2.2	Number of individual members who use the Vector Learning Exchange	X	Project Records Annually	N/A										

⁶⁰ 1 central warehouse manager; 1 logistics assistant; 1 district warehouse manager; 7 storekeepers

⁶¹ 1 district warehouse manager; 1 logistics assistant; 11 storekeepers

⁶² 1 district warehouse manager; 1 logistics assistant; 11 storekeepers

⁶³ 1 district warehouse manager; 1 logistics assistant; 11 storekeepers; 5 ITN warehouse personnel

⁶⁴ 1 central warehouse; 8 operations site warehouses

⁶⁵ 1 central goods warehouse + 1 central insecticide warehouse + 8 operations sites

⁶⁶ 1 central goods warehouse + 1 central insecticide warehouse + 9 operations sites

⁶⁷ 1 central goods warehouse + 1 central insecticide warehouse + 9 operations sites

#	Performance Indicator	Global Project 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
4.2.3	Number of symposia and/or presentations submitted to and accepted at global conferences		Project Records Annually	Country Technical Area	TBD	1 ⁶⁸	TBD	0	TBD		TBD		TBD	
4.2.4	Number of success stories written or videos produced and shared on the VectorLink project website		Project Records Annually	Country	TBD	6 ⁶⁹	6 ⁷⁰	1 ⁷¹	TBD		TBD		TBD	
4.2.5	Number of peer-reviewed journal articles submitted and accepted	X	Project Records Annually	Technical Area										
4.2.6	Number of contributions to vector control global or country policy and/or guidance documents		Project Records Annually	Country Technical Area	TBD	1 ⁷²	1 ⁷³ ; 100%	1 ⁷⁴ ; 100%	TBD		TBD		TBD	
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	Country VC Intervention	TBD	0	TBD	1 ⁷⁵	TBD		TBD		TBD	
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	Country VC Intervention	N/A	N/A	N/A	N/A	1		1		1	
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	Country	TBD	0	TBD	0	TBD		TBD		TBD	

⁶⁸ VectorLink Malawi awaiting acceptance for an abstract submitted to the Women Deliver conference at time of reporting.

⁶⁹ 4 success stories and 2 Malaria Fighter Profiles

⁷⁰ 4 success stories and 2 Malaria Fighter Profiles

⁷¹ Malaria documentary

⁷² VectorLink-supported development of IRM plan

⁷³ VectorLink to support development of IVCS in Malawi

⁷⁴ VectorLink is supporting development of IVCS in Malawi

⁷⁵ Net distribution in Lupachi and Chauma