



U.S. PRESIDENT'S MALARIA INITIATIVE



GHANA END OF SPRAY REPORT 2018

SPRAY CAMPAIGN: APRIL 24- MAY 29, 2018.

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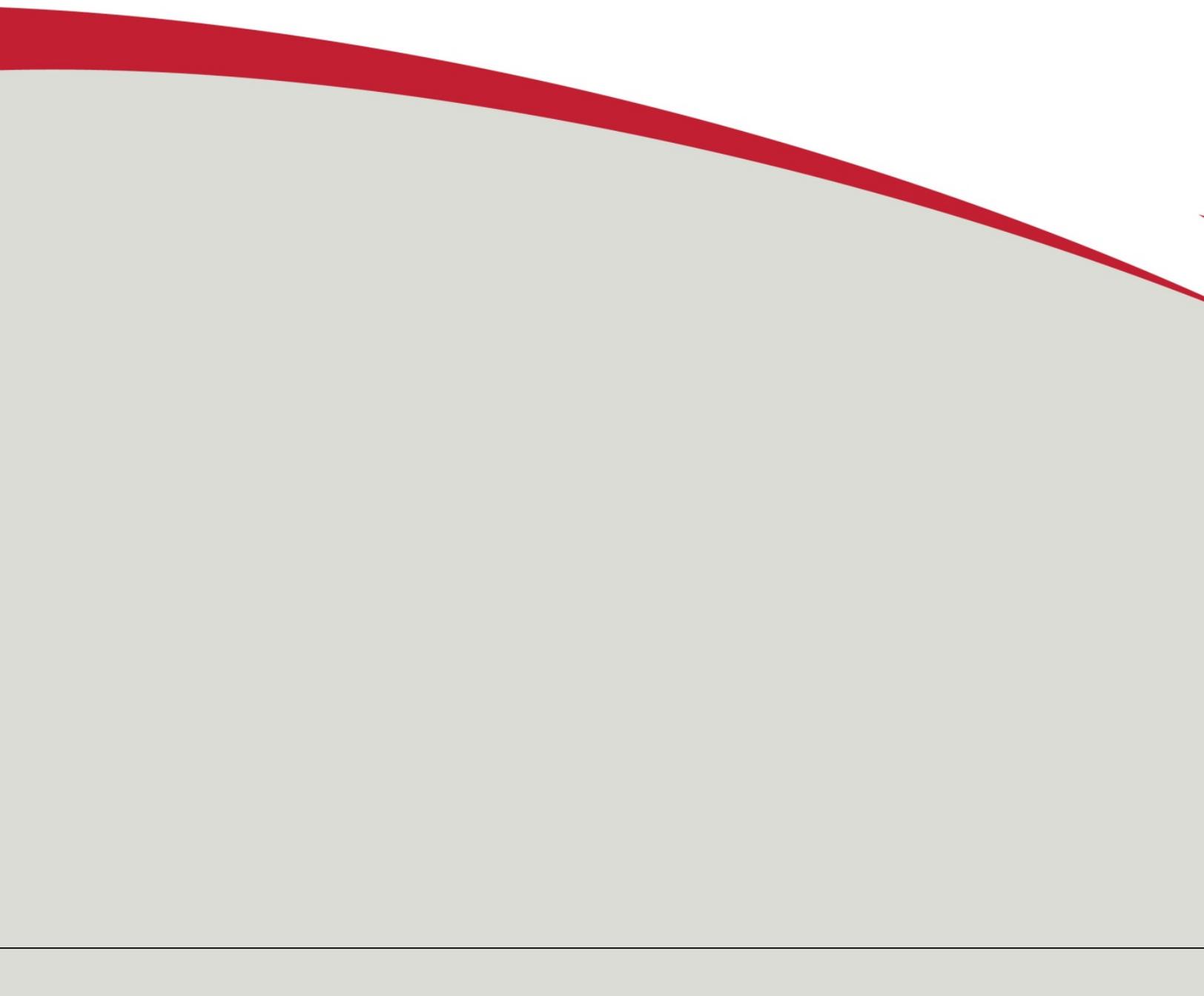


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ACRONYMS

AGAMal	AngloGold Ashanti Ghana Malaria Control, Ltd.
AIRS	Africa Indoor Residual Spraying (project)
BCC	Behavior Change Communication
BMP	Best Management Practices Manual
BYD	Bunkpurugu Yunyoo District
CDC	Centers for Disease Control and Prevention
COP	Chief of Party
DCV	Data Collection Verification
DEA	Data Entry Assistant
DEHO	District Environmental Health Officer
DOC	District Operations Coordinator
DOS	Directly Observed Spraying
EC	Environmental Compliance
ECO	Environmental Compliance Officer
EE	Error Eliminator form
EMD	East Mamprusi District
EPA	Environmental Protection Agency
FS	Field Supervisor
GAC	Granulated Activated Carbon
GHS	Ghana Health Service
HPO	Health Promotion Officer
GUD	Gushiegu District
IEC	Information, Education and Communication
IRS	Indoor Residual Spraying
KAD	Karaga District

KUD	Kumbungu District
M&E	Monitoring and Evaluation
MaVCOG	Malaria Vector Control Oversight Committee
MMD	Mamprugu Moaduri District
MSP	Mobile Soak Pit
NMCP	National Malaria Control Program
NMIMR	Noguchi Memorial Institute for Medical Research
ODK	Open Data Kit
PMI	President’s Malaria Initiative
PPE	Personal Protective Equipment
PSECA	Pre-Season Environmental Compliance Assessment
SEA	Supplemental Environmental Assessment
SOP	Spray Operator
TL	Team Leader
TOT	Training of Trainers
USAID	United States Agency for International Development
VL	VectorLink
WMD	West Mamprusi District

EXECUTIVE SUMMARY

The President's Malaria Initiative (PMI) has supported Indoor Residual Spraying (IRS) in Ghana since 2008. The aim of the initiative is to reduce the burden of malaria especially among pregnant women and children under the age of five years.

In October 2017, Abt Associates was awarded a five-year follow-on to the Africa IRS (AIRS) project. The PMI VectorLink (VL) project will continue to implement IRS and enhanced entomological monitoring in up to 23 African countries, including Ghana.

In 2018, VL Ghana implemented IRS in seven districts in the Northern region: Bunkpurugu Yunyoo (BYD), East Mamprusi (EMD), Gushegu (GUD), Karaga (KAD), Kumbungu (KUD), Mamprugu Moaduri (MMD), and West Mamprusi (WMD). In these targeted districts, the project aimed to spray over 300,000 structures and protect over 800,000 people. The spray campaign began on April 24 and ended on May 28 in five districts. In KAD, where rain and a higher than expected number of eligible structures had slowed progress, the campaign was extended by an additional day (May 29). In MMD, spraying took place May 7-June 9, due to the delayed receipt of SumiShield 50WG, a newly approved insecticide for IRS. Based on six-day work weeks, the 2018 spray campaign lasted for 30 operational days for six districts and 31 operational days in KAD over a period of 42 calendar days.

Prior to the spray campaign, VL Ghana recruited and trained seasonal employees for the campaign. The team conducted logistics and environmental compliance assessments to ensure that the proposed operational sites conformed to PMI's *Best Management Practices Manual*. The team collaborated with the Regional Health Directorate to use its health facilities across PMI IRS districts to conduct medical checks for all seasonal staff. About eight weeks before the start of the campaign, the project held stakeholder and community sensitization meetings to create awareness and stimulate involvement to ensure a successful spray campaign. During the campaign, district health counterparts and the VL Ghana team conducted regular field supervision. Two VL home office colleagues traveled to the Northern region to supervise spraying, observe application of the new insecticide in MMD, and support monitoring and evaluation. After the campaign, VL district teams conducted post-IRS evaluation meetings with communities and stakeholders at sub-district and district levels to share immediate results, hear community feedback on the process, and identify lessons learned for next year's campaign. VL Ghana demobilized the operations sites, and conducted a final inventory of insecticide, equipment, and spray materials. Table ES-1 presents summary results of the 2018 spray campaign.

TABLE ES-1. 2018 VL GHANA IRS SUMMARY

Number of districts covered by PMI-supported IRS in 2018	7 districts: Bunkpurugu-Yunyoo, East Mamprusi, Gushegu, Karaga, Kumbungu, Mamprugu Moaduri, and West Mamprusi
Insecticide used in 2018 IRS	Organophosphate (Actellic 300CS, 6 districts) and neonicotinoid (SumiShield 50WG, 1 district - MMD)
Structures targeted for spray in 2018 (structures found by spray operators in 2017)	324,115
Structures found by spray operators in 2018	324,704
Number of structures sprayed by PMI-supported IRS in 2018	298,701
Percentage of spray coverage 2018	92.0%
Population protected by PMI-supported IRS in 2018	836,376 (including 18,397 pregnant women and 148,627 children under 5 years)
Dates of PMI-supported IRS campaign	April 24–May 29, 2018 (six districts); May 7-June 9, 2018 (MMD)
Length of 2018 campaign	30 operational days (six districts); 31 operational days (KAD)
Number of people trained with funds from the US government to deliver IRS in 2018*	837 people (677 men, 160 women)

* This figure includes only spray personnel such as spray operators, team leaders, and supervisors. It excludes clinicians, data clerks, IEC mobilizers, drivers, washers, porters, pump technicians, and security guards.

The 2018 spray campaign achieved an overall 92 percent spray coverage. This coverage exceeds the PMI contractual and the National Malaria Control Program (NMCP) required coverage targets of 85 percent and 90 percent, respectively, although it is two percentage points less than the 94 percent coverage achieved in 2017. All districts met the PMI contractual spray coverage target and all except EMD met the NMCP target. Spray quality results, tested 1-3 days after spraying, demonstrated 100 percent mosquito mortality across all districts for the insecticides, pirimiphos-methyl and clothianidin.

The project experienced challenges, including (i) late household preparation in accordance with project standard prior to arrival of spray teams, (ii) more locked structures found in early stages of the campaign compared to 2017, and (iii) refusals by 18 communities (Karaga-6 and Gushegu-12) in shea nut-producing areas due to misinformation about IRS. VL Ghana, Ghana Health Service and District Assemblies worked with these communities to dispel the misinformation. As a result, the project sprayed in 17 out of 18 communities. Of 4,018 structures found which owners had initially denied access to spray, VL Ghana sprayed in 3,525 (87.7%). Among unsprayed structures, refusals due to misinformation accounted to 5.9 percent of households out of total number of refusals.

One community, Gbambu in GUD, did not consent to receive IRS by the end of the campaign. VL Ghana continued working closely with village chiefs, opinion leaders, assembly persons, and other influential people to manage refusals at both the household and community level.

During the campaign, the spray teams experienced four rainy days that affected the operations schedule. May 17 saw rain across the entire region, and thus no IRS was done; to make up for the time lost, the teams worked on a Sunday. Spottier rain in some districts on a few other days delayed spraying, but teams compensated by going to the field later in the day. In Gushegu district, the team switched the spray day from Saturday to Sunday in the final two weeks of the campaign, to avoid spraying on Saturday which is a market day in the targeted communities.

1. INTRODUCTION

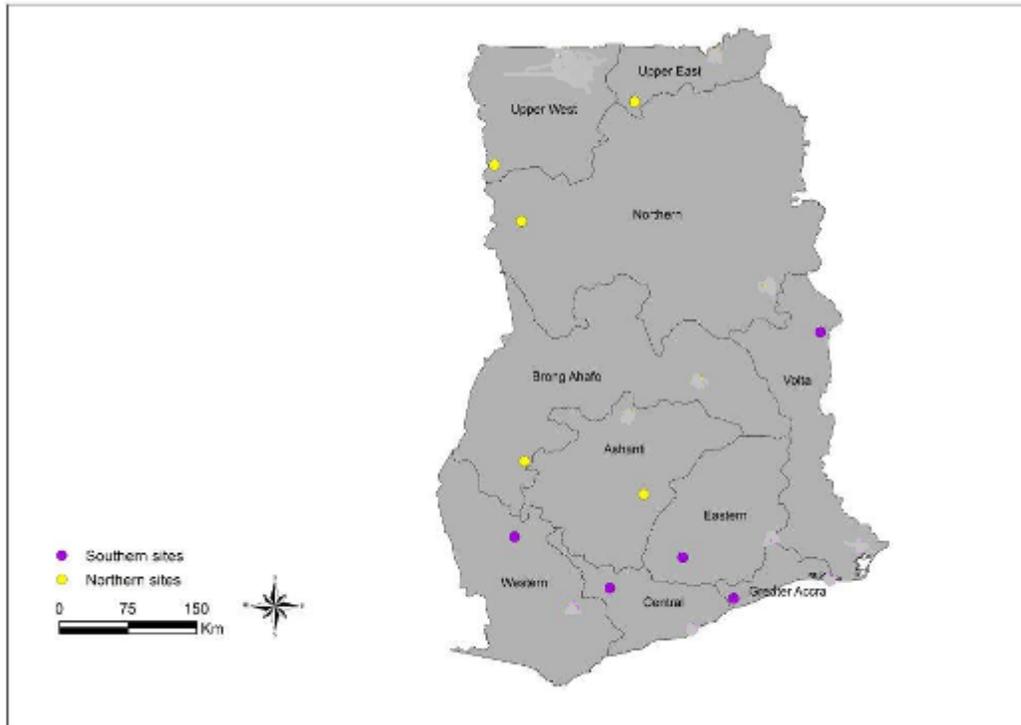
Indoor residual spraying (IRS) is a major part of Ghana’s malaria control strategy. The country’s National Strategic Plan for Malaria Control (2014-2020) seeks to protect at least 80 percent of the population at risk of contracting malaria by 2020 using universal coverage of insecticide-treated nets, IRS in areas of high parasite prevalence, seasonal malaria chemoprevention, larviciding, and prevention of malaria in pregnancy. Since 2008, the President’s Malaria Initiative (PMI) has supported the National Malaria Control Program’s (NMCP) goal of reducing the burden of malaria by funding IRS in the Northern Region.

1.1 OBJECTIVES OF THE 2018 IRS CAMPAIGN AND OTHER PROJECT ACTIVITIES

In the 2018 spray campaign, VectorLink (VL) Ghana worked in partnership with the Ghana Health Service (GHS), District Assemblies, and the NMCP to conduct IRS operations in seven districts of the Northern region: Bunkpurugu Yunyoo (BYD), East Mamprusi (EMD), Gushegu (GUD), Karaga (KAD), Kumbungu (KUD), Mamprugu Moaduri (MMD), and West Mamprusi (WMD). In the targeted districts, the project aimed to spray over 300,000 structures and protect over 800,000 people. The key objectives were:

- To achieve at least 85 or 90 percent spray coverage of eligible structures in the targeted districts in accordance with the VL PMI contractual and NMCP targets, respectively.
- To continue building capacity at all levels of the health system to ensure the proper implementation of IRS and the sustainability of IRS operations.
- To continue financial and technical support to the Noguchi Memorial Institute for Medical Research (NMIMR) in collecting insecticide resistance data at 10 sentinel sites (Figure 1) as part of the National Insecticide Resistance Monitoring Partnership (NIRMOP) and laboratory analyses of entomological specimens for both NIRMOP and the project entomological monitoring data.
- To fund and provide technical assistance and management oversight to the Malaria Vector Control Oversight Committee (MaVCOC).
- To coordinate two operational research activities: (1) “Effect of IRS on *Anopheles* vector behaviors and their impact on malaria transmission in the Northern region of Ghana,” and (2) Evaluation of pirimiphos-methyl efficacy in experimental huts when sprayed on half the usual surface area against natural populations of *An. gambiae* in Ghana.” The second study is funded by core funds.

FIGURE 1. MOSQUITO SAMPLING SITES FOR PMI-FUNDED NIRMOP INSECTICIDE RESISTANCE TESTING



1.2 ACHIEVEMENTS OF 2018 IRS CAMPAIGN

The project's 2018 IRS operations achieved the following specific results:

- All seven districts performed above the PMI spray coverage target of 85 percent.
- All districts exceeded the NMCP spray coverage target of 90 percent, except EMD (89.8%).
- A total population of 836,376 including 148,627 children under five years and 18,397 pregnant women were protected.
- Spray quality results demonstrated 100 percent mosquito mortality at 1-3 days after spraying across all districts for both insecticides (pirimiphos-methyl and clothianidin).

Other project achievements include technical support and entomological data sharing on insecticide resistance and mosquito behavior to the MaVCOC. This committee provides guidance on issues of malaria vector control in Ghana. MaVCOC is under the auspices of the NMCP and has representation from the GHS, NMIMR, MoFA, EPA, and partners such as VL Ghana and AngloGold Ashanti Ghana Malaria Control, Ltd. (AGAMaL Ltd.).

2. PRE-SPRAY ACTIVITIES

2.1 INSECTICIDE SELECTION

After the 2017 spray campaign, MaVCOC used the results on susceptibility of the local vectors and residual efficacy of insecticide to select the class of insecticides for the 2018 IRS campaign. All MaVCOC members agreed that pirimiphos-methyl (brand name Actellic 300CS), a long-lasting insecticide from the organophosphate class, remains efficacious and would be the most appropriate insecticide for use in the 2018 spray campaign in the Northern region. In addition, MaVCOC agreed to pilot a new insecticide product, SumiShield 50WG, in one district. SumiShield 50WG, which contains clothianidin as an active ingredient, is from the neonicotinoid class, which recently received World Health Organization (WHO) prequalification and Ghana EPA approval. Although, the project did not detect pirimiphos-methyl resistance in the selected district, the trial was to demonstrate feasibility of a rotation strategy when more than one insecticide option is available. AGAMaL Ltd, another implementer of IRS in Ghana, also used the new product in four districts: Obuasi in the Ashanti region and Nadoli, Jirapa and Sissala West in the Upper West region, where pirimiphos-methyl resistance has been detected.

2.2 MICROPLANNING

To effectively carry out a successful IRS operation and widen stakeholder participation, VL Ghana conducted microplanning meetings with stakeholders at the community, district, and regional level prior to the 2018 spray campaign. The GHS regional directorate, district health directorate, district assemblies, and some paramount community chiefs attended the meetings. The meetings strengthened project relations with stakeholders, increased local participation in the IRS campaign, and brought operational issues for consideration. Topics discussed at the meetings included:

- Recruitment of spray operators (SOPs) and team leaders (TLs).
- Support required from the GHS regional directorate to conduct medical exams for SOPs and TLs.
- Official launch of the 2018 campaign.
- Start date and duration of the campaign
- Information, Education and Communication (IEC) and behavior change communication (BCC) plans and strategies.
- Relocation of the project operation site at Yunyoo sub-district after the District Assembly set up its offices in the project-renovated space.
- Misconception of IRS insecticide usage, especially in organic shea nut farming districts of Karaga and Gushegu.

As part of joint IRS microplanning, VL Ghana together with the information and health promotion officers (HPOs) of the GHS regional directorate developed a communication and mobilization plan as well as supervision schedule.

2.3 LOGISTICAL NEEDS ASSESSMENT

The project conducted a logistical needs assessment to identify operations sites and determine supplies and materials that needed to be procured for the 2018 campaign. The team visited all proposed 21 operations sites within the IRS implementing districts and the central warehouse.

Out of 21 permanent operations sites, 19 sites were provided in-kind by government stakeholders, the respective community, and the Presbyterian Church. Facilities such as offices and stores in the remaining two sites (Kumbungu and Dalun sites in KUD) were rented from private individuals.

The project team quantified IRS supplies and materials based on the number of structures found in the 2017 IRS campaign, number of operational days, and the number of SOPs and other supporting staff to be hired, as appropriate.

The project used the assessment results to develop a logistics distribution plan and make decisions on local and international procurements, personnel needs, and hiring.

2.4 PROCUREMENT

VL Ghana distinguishes procurement of commodities into local and international procurements to ensure cost effectiveness and timely delivery of materials. VL Ghana team conducted local procurement of materials such as aprons, stationery, detergents, etc. The team completed the majority of the local procurement by the end of February 2018. This provided the team a buffer period of almost two months to complete final purchases before the start of spray operations.

International procurements were mainly the purchase of Actellic 300CS insecticide and donation of SumiShield 50WG, spray pumps and accessories, and key personal protective equipment (PPE). Based on insecticide usage in 2017, with the ratio of 4.5 structures per bottle of Actellic 300CS, VL Ghana calculated the need for 72,026 bottles to cover targeted 324,115 structures. With 4,471 bottles remaining from the 2017 campaign, VL Ghana estimated a procurement of 67,555 bottles. In the end, the project procured 67,560 bottles, which gave it enough to cover all targeted structures in all districts in case SumiShield 50WG was unavailable.

For the one district designated for the SumiShield 50WG pilot, the manufacturer donated 5,000 sachets of insecticide. VL Ghana used the ratio of one sachet of SumiShield 50WG as equal to one bottle of Actellic.

Initially, the spray campaign was scheduled to begin on April 10 for districts to be sprayed with Actellic and May 1 for the one district to be sprayed with SumiShield 50WG, but the start dates were postponed to April 24 and May 7, respectively, due to delays in insecticide delivery. The Actellic delivery was delayed by production and shipping issues, the SumiShield 50WG delivery delayed due to late receipt of a certificate of approval from the local Environmental Protection Agency (EPA).

In 2018, Ghana purchased additional Goizper pumps, which allowed the project to fully transition to use of Goizper pumps. The project also did international procurement of PPE items such as coveralls, hand gloves, nose masks, boots, and hard hats.

With the exception of the insecticides, all items were distributed to operations sites two weeks before the 2018 spray campaign began. Annex A lists all materials procured and quantities remaining after the 2018 spray campaign.

2.5 HUMAN RESOURCES: TRAINING AND RECRUITMENT

The IRS project cadre at the district level requires engagement of two categories of employees: 1) full-time staff (District Operations Coordinators [DOCs]), and 2) seasonal staff (IEC Assistants, Logistics Assistants, Monitoring and Evaluation [M&E] Assistants, Site Managers, Store Assistants, Field Supervisors [FS], TLs, SOPs, Washers, Water Fetchers, and Security Guards). In addition, the project engaged GHS officers and community mobilizers to carry out house-to-house mobilization and mosquito collectors and supervisors to assist with spray quality entomological activities.

2.6 TRAINING

IRS application is highly technical and demands rigorous and comprehensive training of personnel to ensure correct application on the walls to sustain the intended impact. VL Ghana conducted training for all staff prior to the implementation of the 2018 spray campaign. The project organized 11 trainings on various aspects of IRS implementation as demonstrated in Table 1.

In MMD, where the project used the new SumiShield 50WG insecticide, VL Ghana conducted a one-day refresher training for the spray teams especially since, as noted earlier, there was a two-week delay in the start the spray campaign. SOPs were taken through the proper procedures for mixing and applying the new insecticide.

TABLE 1: 2018 VL GHANA TRAINING PROGRAM

Type of Training	Dates	Length (days)	Location	Brief Description
IEC TOT	23-25/01/18	3	Tamale	Community mobilization strategies, including sensitization, structure identification, and household mobilization data collection. Training techniques for mobilizer training.
Mobilizer Training	19-21/02/18	3	All 21 operations sites	Community sensitization and household preparation.
Logistics and Store Management	28/02-02/03/18	4	Tamale	Record and stock keeping of all inventories.
Spray Operations TOT for Supervisors, Site Managers	20-27/03/18	7	Walewale	Spraying techniques, EC compliance, data capture, gender sensitization, supervisory tools including use of smart phones.
Training for SOPs and TLs	08-14/04/18	7	All 21 operational sites	Spraying techniques, household preparations, EC compliance, and data capture.
M&E and Data Entry Training for M&E, Data Entry and DCV Assistants	26-28/02/18	3	Tamale	Introduction to data entry protocols, use of the 2018 database for mobilization, spray data entry, data cleaning, storage, and security, and M&E tools.
Health Worker/ Medical Treatment Intoxication Training	22/02/18	1	Tamale	Insecticide poisoning management at the health facility.
Emergency Situation/ Security Training	5-21/04/18	1	All 7 districts	Emergency response, basic security management practices including operation of fire extinguishers and other steps to take in case of a fire incident.
Contract Drivers Training	21-23/04/18	3	Tamale	Defensive driving techniques, safety requirements while driving a vehicle with insecticides, and spill management.
Entomology Training	19-24/02/18	1	1 day at each of five selected sites	Mosquito collection, packaging, and shipment.
Finance Assistants	1-2/03/18	2	Tamale	Training on proper records keeping,

Training				petty cash handling, timesheet recording, and other financial management.
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Note: TOT=training of trainers; EC=environmental compliance; DCV=data collection verification

2.7 FIELD SIMULATION TRAINING

In 2018, VL Ghana conducted the practical “live fire” training session that was introduced last year. The purpose of the training is to expose spray teams to real-life situations they are likely to encounter during the spray campaign. This training session was conducted in both the Spray Operations TOT and SOP training. During the “live fire” practicums, FSs, Site Managers, and SOPs visited compounds within communities around the operations site to simulate the spray process from household preparation to actual spraying and data collection procedures. The intention is for trainees to apply skills and learning from all theoretical presentations in a real-life setting.



Household engagement during Live Fire training

A trainee demonstrates how to spray high walls

As shown in Table 2, the project trained a total of 2,360 people (2,027 males, 333 females). The table also includes trainees who qualify under the PMI indicator definition “number of people trained with USG [U.S. Government] funds to deliver IRS.”¹ In 2018, VL Ghana trained 837 people (677 men and 160 women) to deliver IRS under this definition (Indicator 1.4.1 of VL Ghana indicator matrix).

¹ These figures include only spray personnel such as SOPs (644), TLs (127), and supervisors (66). They exclude clinicians, data clerks, IEC mobilizers, drivers, washers, porters, pump technicians, and security guards.

TABLE 2. NUMBER OF PEOPLE TRAINED

Categories of Persons Trained	Training on IRS Delivery										Other Trainings										Total						
	TOT: Spray Ops		Spray Operations		Data Entry		Logistics & Store Management		TOT: IEC		IEC Mobilizers Training		Medical Treatment Intoxication Training		Fire/ Security Training		Driver's Training/Washer Training		Finance Training					Entomology			
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	TOTAL		
DOC	2	1																						2	1	3	
Disease Control Officers	7	0																							7	0	7
District Environmental Health Officers	5	0																							5	0	5
Environmental Protection Agency rep.	1	0																							1	0	1
District Information Officers					7	0																			7	0	7
District Health Promotion Officers								6	1																6	1	7
District Supply Officers							6	1																	6	1	7
Spray operators			517	127																					517	127	644
Team Leaders			100	27																					100	27	127
Data Assistants					15	10																			15	10	25
District M&E Assistants					11	2																			11	2	13
Logistics Assistants							5	2																	5	2	7
Store Assistants							7	17																	7	17	24
Clinicians													33	8											33	8	41
IEC Assistants									22	2															22	2	24
IEC Implementers, Mobilizers												1,033	110												1,033	110	1,143
Field Supervisors	60	6																							60	6	66
Site Managers	21	0																							21	0	21
Washers																	0	12							0	12	12
Drivers																	48	0							48	0	48

Categories of Persons Trained	Training on IRS Delivery										Other Trainings										Total						
	TOT: Spray Ops		Spray Operations		Data Entry		Logistics & Store Management		TOT: IEC		IEC Mobilizers Training		Medical Treatment Intoxication Training		Fire/ Security Training		Driver's Training/Washer Training		Finance Training					Entomology			
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	TOTAL		
Guards														47	0									47	0	47	
Finance Assistants																			3	4					3	4	7
Ento Data Collectors																					71	3			71	3	74
TOTAL M/F	96	7	617	154	33	12	18	20	28	3	1,033	110	33	8	47	0	48	12	3	4	71	3			2,027	333	2,360
TOTAL/ training	103		771		45		38		31		1,143		41		47		60		7		74		2,360				

2.8 NUMBER OF PEOPLE HIRED

In the 2018 spray campaign, VL Ghana engaged a total of 2,447 seasonal staff, 15.5 percent of whom were females. Table 3 provides a breakdown of the different categories of personnel hired to carry out and support IRS operations. Excluding packers, who were not trained for IRS, VL Ghana hired 2,307 out of the 2,360 people it trained. It also engaged Community-Based Surveillance volunteers during the campaign. These volunteers helped with announcements for one or two days (depending on the length of spraying in the volunteer's community).

TABLE 3. NUMBER AND TYPE OF TEMPORARY EMPLOYEES HIRED

Category	BYD		EMD		GUD		KAD		KUD		MMD		WMD		Tamale/ Regional		All			
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	Total	% Female
District Operations Coordinators	1	0	0	0	0	0	1	0	0	0	0	1	0	0			2	1	3	33.3%
Data Assistants	2	2	3	1	2	1	1	2	0	3	2	0	3	1			13	10	23	43.5%
Finance Assistants	1	0	1	0	0	1	0	1	0	1	0	1	1	0			3	4	7	57.1%
IEC Assistants	5	0	4	1	3	0	3	0	2	0	2	0	3	1			22	2	24	8.3%
Logistics Assistants	1	0	1	0	0	1	1	0	1	0	0	1	1	0			5	2	7	28.6%
Store Assistants	2	3	2	2	1	2	0	2	0	2	1	1	1	2	0	1	7	15	22	68.2%
Mobilizers	226	10	178	24	185	17	149	17	141	7	45	3	112	29			1,036	107	1,143	9.4%
Security officers	10	0	11	0	6	0	6	0	4	0	4		6	0			47	0	47	0.0%
Site Managers	5	0	4	0	3	0	2	0	2	0	2	0	3	0			21	0	21	0.0%
Spray Operators	74	26	91	34	66	19	66	9	62	8	26	11	90	20			475	127	602	21.1%
Supervisors	10	0	11	2	9	0	8	0	7	0	4	0	9	3			58	5	63	7.9%
Team Leaders	16	4	18	7	15	2	13	2	11	4	6	1	17	5			96	25	121	20.7%
Washers	0	12	0	12	0	8	0	7	0	4	0	4	0	10			0	57	57	100.0%
Water Fetchers	1	0	5	0			4	0	1	1	3	1	0	4			14	6	20	30.0%
M&E Assistants	1	0	1	0	2	0	2	0	1	1	1	0	2	0			10	1	11	9.1%
Packers	20	0	17	11	20	0	15	0	35	4	8	0	10	0			125	15	140	10.7%
Entomology	20	0	18	2	20	0	20	0	20	0	16	0	19	1			133	3	136	2.2%
Total M/F	395	57	365	96	332	51	291	40	287	35	120	24	277	76	0	1	2,067	380	2,447	15.5%
Total/District	452		461		383		331		322		144		353		1		2,447			

2.9 GENDER MAINSTREAMING

Gender mainstreaming has two main components: (1) integrating females into spray teams in ways that build their capacity to implement IRS, and (2) helping modify traditional views and perceptions of female involvement in IRS and showing other females that IRS implementation is not male-dominated.

This year, VL Ghana recruited its first female DOC, who served in MMD. The project will continue its grooming program to build capacity of females and enable them to perform excellently when they are promoted into supervisory roles. For this year’s campaign, gender-related messages were sent to all project staff during the spray campaign. The messages reinforced the PMI Anti-Sexual Harassment Guidelines and encouraged females to report any form of harassment encountered. Although cases of harassment may be difficult to report, staff was urged not to shield anyone harassing them. To complement the training and policies, the team conducted personal interviews with seasonal staff during the supervision rounds to actively check on this matter. No reports of harassment were made during these interviews and the project team noted that seasonal staff were aware of the phone number to report such incidents and could at least recall two statements from the guidelines.

In the 2018 campaign, the percentage of female SOPs decreased by 2.2 percentage points from 2017 (23.2 percent in 2017 and 21.1 percent in 2018). Despite deliberate project efforts encouraging female participation, female interest and participation in the IRS campaign has declined – again, in percentage terms – since 2015 (Table 4). The reasons for this are found in the gender study conducted in 2016², which showed that females often go on to marry/have a family or continue their education after earning some money from working on the project for one-two seasons.

TABLE 4. SUMMARY OF GENDER-RELATED INDICATORS, 2015–2018

Gender-related Indicators	2015		2016		2017		2018	
	#	%	#	%	#	%	#	%
Females trained to deliver IRS*	194	27.8%	210	30.3%	223	23.4%	169	18.5%
Females trained to support IRS**	292	18.9%	308	18.5%	358	15.5%	333	14.14%
Females hired to support IRS***	306	20.8%	319	21.4%	383	16.8%	380	15.5%
Females hired in supervisory roles†	27	15.5%	33	18.9%	39	16.3%	36	9.5%
Female SOPs hired	135	30.3%	147	33.3%	142	23.2%	127	21.1%
Female TLs hired	20	22.7%	24	27.3%	26	21.5%	25	20.7%

*1 DOC, 127 SOPs, 27 TLs, 6 FSs, 8 Medical Assistants

** All cadres of temporary female workers trained, including those trained to deliver IRS

***Includes washers who were not trained

† 25 TLs, 5 FSs, 2 IEC Assistants, 1 Me&E Assistant, 0 Site Managers, 1 DOC, and 2 Logistics Assistants

² PMI Africa IRS (AIRS) Project, Indoor Residual Spraying (IRS) 2 Task Order Six. March 2017. Gender and Spray Operator Performance: A Review of Data from Ghana and Zambia, Bethesda, MD, Abt Associates Inc.

The number of females who worked on the project this year will be used as a baseline to improve the proportion of females to males on the project.



Grace Ayijunu, female DOC for Mamprugu Moaduri district, meets with village chiefs, assembly persons, and other stakeholders

3. INFORMATION, EDUCATION, AND COMMUNICATION ACTIVITIES

Communication activities started on February 1, 2018, and were carried out simultaneously across all 21 operations sites of the project to prepare the communities for spraying. The VL project established a road map for this work through the Community Communication Work Plan developed at the beginning of the year with contributions from the district health promotion departments and community influencers. Main objectives of the 2018 communication and mobilization work of VL Ghana were focused on the following:

1. Inform and prepare homeowners for the 2018 spray campaign;
2. Enumerate and mobilize all targeted households using permanent metal plates prior to the start of the campaign; and
3. Enhance engagement and ownership of the community in the IRS process and awareness.

At the district level, the project communication team consisted of an IEC Assistant and mobilizers. The number of mobilizers varied by district based on the number of communities. IEC Assistants supervised the mobilizers and reported directly to the VL Ghana IEC Manager. The IEC Assistants' role was to ensure all communication activities were implemented according to established schedules and mobilizers carried out their duties (enumeration and house-to-house mobilization prior to IRS and house visits to notify households of actual spray date during actual spray period). IEC Assistants reported back to the IEC Manager through mobile-based forms. The communication team used various techniques including education and sensitization to resolve related issues and address IRS misconceptions among the targeted communities. These activities also helped inform communities about the new PMI VL Ghana project and its objectives.

The project designed the interpersonal and mass media communication strategies described below. The interpersonal strategies included door-to-door communication, meetings, and outreach events. Mass media strategies consisted of use of video shows on IRS and malaria, radio discussions with call-in segments, and use of information vans to conduct outdoor mass educational activities.

The strategies aimed to reach audiences at the household, community, sub-district, district, and regional levels. At each level, the project engaged GHS Health Promotion Officers (HPOs) trained on IRS to play a primary role in communicating key IRS-related messages during their routine work with the communities and other social groups. Engaging GHS HPOs was the project's way of involving government stakeholders in IRS communication efforts from the pre-spray through the spray campaign itself.

3.1 IMPROVING QUALITY OF COMMUNITY PARTICIPATION

Community participation is vital because IRS implementation calls for engaging every single household to spray its sleeping rooms. This year, the project worked on broadening and improving the quality of the participatory process by making district and regional GHS HPOs (trained on IRS) a key part of community-level engagement activities prior to and during the IRS campaign. GHS HPOs are considered trusted sources of information within their communities. Proactive involvement of the GHS officers secured the inclusion of IRS message in their regular outreach programs at various health facilities/communities, thus increasing the platforms where IRS is discussed. Coming from a trusted source, messages delivered by them helped the communities to be better informed and guided on the subject of IRS and malaria.

This year, the project continued working with community-level influencers such as chiefs, queen mothers, imams, pastors, regional, district and community health workers, district assembly staff, and other respected individuals. Many of them facilitated community meetings, educated their communities by disseminating information on IRS, and participated in media campaigns and video shows.

During the spraying, some community influencers worked as IRS program advocates and participated in the mobilization of their communities. They informed communities about spray dates and carried out visits to structures that were not sprayed during the first IRS visit to get such structures sprayed before the end of the campaign. In other communities, the project integrated chiefs' representatives into the spray team. They were tasked with observing and monitoring spraying within their communities and reporting back on progress.

3.2 PROJECT AND 2018 SPRAY CAMPAIGN LAUNCH

The GHS Northern Regional and Kumbungu District Health Directorates led the launch event on April 19, which was held at the forecourt of the Paramount Chief of Kumbungu Traditional Area. For the first time, the Overlord of the Mamprugu Traditional Area sent representatives to the launch, signifying the importance he attached to the IRS program. The Guest of Honor was Dr. Eric Tongren, Centers for Disease Control and Prevention (CDC) advisor to PMI in Ghana, who represented the USAID Mission Director. The launch solicited the support of the community leaders, health officials, and local government officials present in ensuring a successful campaign. Other participants included representatives from USAID Ghana, GHS, district assemblies (all targeted districts), District Health Management Teams (all targeted districts), traditional and religious leaders, Ghana Education Service, Ghana Security Services, NGOs, and VL Ghana staff, as well as selected community members.

After the ceremony, all dignitaries went to a room in the palace to observe the symbolic spraying of the first room, which signified the launch of the 2018 spray campaign. The household was taken through the homeowner preparations, and after-spray clean-up procedures. An SOP educated guests on how to mix the insecticide, sprayed the room, and reinforced clean-up messages the household had been given earlier to crown the end of a successful launch.



CDC's Dr. Eric Tongren, representing the USAID Mission Director, delivers a speech at IRS launch ceremony. Traditional leader (right) is preparing to offer a gift to the USAID delegate.

3.3 COMMUNITY MEETINGS

Community meetings began on February 1, 2018, and continued throughout the spray campaign across all 21 operations sites and sub-districts. The first set of meetings was held between the project staff and traditional leadership in the communities. The meetings informed the chiefs about the start of activities leading to the spray campaign and called on them to support these community-level activities.

The various community meetings provided opportunities for face-to-face interactions with community members, enabling the community to raise concerns and the project to directly address concerns, correct misconceptions about the insecticide, and explain the importance and effectiveness of IRS as a malaria control strategy. Having GHS officers at the meetings was particularly helpful in resolving misconceptions about IRS in communities where some women sell shea nuts to exporting companies. Table 5 lists the meetings held in all communities in the 21 sub-districts from February 1 to June 22, 2018.

TABLE 5. NUMBER OF COMMUNITY MEETINGS HELD AND NUMBER OF ATTENDEES, FEBRUARY 1- JUNE 22, 2018

District	BYD	EMD	GUD	KAD	KUD	MMD	WMD	Total
No. of Meetings	146	123	150	59	81	191	43	793
Total No. of Attendees	5,866	5,325	5,396	1,383	4,371	1,610	940	24,891

3.4 COMMUNITY EDUCATION

Each operations site had an IEC Assistant responsible for carrying out communication activities in their designated area. All IRS educational outreach events scheduled were part of the Community Communication Work Plan. This year, they carried out activities in collaboration with District HPOs who helped to educate community members on the risks posed by malaria, and the current malaria situation in the community (as recorded at their health facilities). IRS education was conducted at various forums and venues (Table 6). Community education enabled communities to understand IRS, how it works as a preventive intervention, the malaria cycle, and how malaria affects susceptible groups.

TABLE 6. NUMBER OF COMMUNITY EDUCATION EVENTS

Activity	BYD	EM D	GUD	KAD	KUD	MM D	WMD	Total
Door-to-door outreach for households with high number of locked structures	194	233	541	68	87	135	87	1,345
Information van (communities visited)	27	50	45	51	87	12	65	337
Educational outreach (primary schools, junior/ senior high schools, voc/ tech. schools visited)	73	30	49	33	11	36	30	262
Mosque and church outreach	79	96	155	45	30	134	99	638
Health outreach (antenatal clinics, Community Health Planning and Service compounds visited, etc.)	72	97	51	25	10	26	15	296

3.5 MASS MEDIA CAMPAIGN

VL Ghana contracted six community radio stations to air spots/jingles, announcements, and discussions to help reach large swaths of communities across all operation sites before and during the IRS campaign. Radio stations made announcements of communities scheduled to be sprayed in the evening prior to spray and early in the morning of the spray day throughout the spray campaign period.



VL staff and Environmental Health Officer for Kumbungu district discuss IRS on the radio

In addition, video shows aired to help address concerns and misconceptions, and improve understanding of malaria transmission cycle and the benefits of malaria interventions.

Overall, the media campaign (1) informed communities about spray team visits, (2) discussed issues and answered questions through call-in radio discussions held once a week, (3) addressed concerns and misconceptions, and (4) reminded homeowner of room preparations and after-spray clean-up procedures.

Printed materials were distributed early in March during the household enumeration. Mobilizers distributed posters in each of the 1,306 communities. The posters created awareness and drew the attention of communities about the beginning of the spray

campaign. VL Ghana printed and distributed a total of 8,000 posters.

The “gong gong” is a traditional community tool usually owned by the chief, who beats it to summon the community to meetings. Here, it was used as a local mass communication tool to inform community members about spray dates. Imams used megaphones, normally used for the call to prayer, to announce spray dates on the day before spray and early in the morning of the spray day.

Table 7 shows the number of materials produced and mass media events held during the communication campaign.

TABLE 7. MASS MEDIA CHANNELS USED TO SUPPORT SPRAY CAMPAIGN

Activity	Total Number
Radio spots; jingles	840
Radio programs (interactive shows)	24
Radio announcements	420
Video shows	36
IRS materials distributed (to public places)*	8,000
Gong gong beating	1,504

* Number of IEC posters distributed in public places during the house-to-house mobilization.

3.6 MOBILIZATION

The house-to-house mobilization was successfully conducted from February 26 through March 23. The project trained and engaged 1,143 mobilizers from the GHS. The main purpose was to enumerate households with a unique one-time household serial number, which will be used throughout the five-year period of the project. The project produced small but noticeable laminated metal plates, which had pre-printed unique numbers, and distributed them to each household along with an IRS Card for recording household data in that compound. Over the five-year period, households will be identified using this unique number.



IRS plate shows the unique number of a household

Prior to IRS, mobilizers delivered key messages such as roles and responsibilities of households before, during, and after the house was sprayed, how to pack rooms, and how to safeguard the IRS plate, which will be used over the next five years. In addition, mobilizers collected data on the number of people reached with IRS messages and reported back to the project if something was happening in the community that would affect scheduled spraying. Table 8 shows results of house-to-house mobilization.

TABLE 8. HOUSE-TO-HOUSE MOBILIZATION RESULTS, 2018

District	No. Households Visited	No. Households Sensitized	No. Adults Reached with IRS Messages			No. IEC/BCC Materials Distributed to Households
			Males	Female	Total	
Bunkpurugu Yunyoo	15,767	15,767	19,782	24,817	44,599	1,572
East Mamprusi	16,878	16,873	24,077	31,663	55,740	1,680
Kumbungu	8,861	8,861	15,296	19,621	34,917	862
Mamprugu Moaduri	4,295	4,295	6,746	7,706	14,452	442
West Mamprusi	12,772	12,772	23,742	28,538	52,280	1,280
Karaga	8,556	8,554	14,385	17,818	32,203	936
Gushegu	11,946	11,945	17,644	22,220	39,864	1,228
Total	79,075	79,067	121,672	152,383	274,055	8,000

Note: Number of households visited does not equal the number of the households sensitized in all districts because, in a small number of cases, no adults could be found in the compound during the mobilization visit.

3.7 INITIAL REFUSALS OF IRS IN SHEA NUT COMMUNITIES

The project experienced IRS acceptance challenges in some shea nut communities in Karaga and Gushegu districts. Fortunately, some members of the communities advised the project prior to spray that an exporter had warned these communities that the company would not buy their shea nuts should their community be sprayed. The exporting company agents contacted 18 communities (12 in Gushegu and 6 in Karaga and misinformed them about contaminating impact of IRS on the nuts). Thus, many women who sell the nuts to exporting companies mistakenly thought that IRS caused nut contamination.

Together with GHS' Northern Regional Directorate, the project conducted a fact-finding mission to ascertain the veracity of the accounts of misinformation and found them to be true. A copy of the mission's report was

handed over to the District Chief Executive and the District Assembly. The Karaga District Health Directorate organized a public meeting to (1) debunk the misinformation about IRS spread by the shea butter company, (2) reassure the community members about the safety of the insecticide approved by WHO and the national EPA for use for IRS, and (3) answer any other questions the community had on IRS.

Out of 18 communities, only one (6%), in Gushegu district, refused to meet with the GHS and VL Ghana team. In all communities, women who sold shea nuts were asked to set aside a room in which to keep their shea nuts if they did not already have a separate storage; this room would not be sprayed.

As a result of the VL Ghana and GHS sensitization work, spray coverage in 18 communities was slightly higher than in 2017. In Gushegu district, the number of structures sprayed in six communities increased, and the population protected was much higher in 2018. In Karaga district, there was no noticeable increase. Table B-1 in Annex B presents detailed results of IRS coverage and population protected in the 18 communities.

3.8 MONITORING OF IEC ACTIVITIES

Project staff, GHS and District Assembly officials, and community leadership participated in monitoring mobilization prior to and during spraying. Supervisors communicated in real time using a WhatsApp digital application over which they shared images of challenges encountered during the visits so that others could also be on the lookout for similar challenges.

Furthermore, VL Ghana modified and used two mobile phone-based supervisory tools developed under the AIRS project, namely: the Mobilization Supervision Form, and the Monitoring and Reporting Form. Regional officials assigned to supervise the enumeration process and IEC Assistants used the Mobilization Supervision Form, while the IEC Assistants used the Monitoring and Reporting Form.

The purpose of mobile tools is to quickly get reports from the field, feedback corrective actions in good time, and monitor overall progress of the enumeration process. Specifically, the Mobilization Supervision Form ensures that mobilizers are correctly sensitizing households and collecting accurate enumeration data. The Monitoring and Reporting Form allows IEC Assistants to record all activities they conduct during the pre-spray period including GPS coordinates of activity locations (e.g., community meetings). When challenges are reported, the mobile-based form enables the IEC Manager to see the data the same day and provide immediate feedback to address the issue. A total of 2,121 supervisory forms were submitted using the mobile application during the enumeration. Supervisors found that 99.63 percent of compounds visited had matching serial numbers on their IRS Plates and IRS Cards.

In addition, VL Ghana staff, FSs, TLs, and IEC Assistants supervise mobilizers during the spraying of the communities they work in. The supervisors use paper-based tracking sheets to verify that mobilizers actually showed up in the community, did their work each day and signed it at the end of the workday in their communities.

4. IMPLEMENTATION OF IRS ACTIVITIES

4.1 SPRAY CAMPAIGN

For the 2018 campaign, VL Ghana adapted and expanded the PMI AIRS Ghana approach of spraying remote and peri-urban areas from day one of the campaign. This year, many more peri-urban and hard-to-reach communities were sprayed first. The goal of this approach was (1) to start revisits to the peri-urban areas early in the campaign in order to reduce the number of refusals and locked structures to as few as possible, (2) to reach those communities that were likely to be cut off by rains, and (3) to spray houses of migrant farmers and fishermen before they left for work.

Spray operations ran for six days per week from Monday to Saturday according to a schedule jointly developed by VL Ghana and district partners prior to the campaign. Daily spray activities at each operations site began at 6:00 am with field departure at 7:00 am. Spray teams assembled at the operation site for breakfast before donning their PPE. Site Managers assigned spray teams to communities and allocated vehicles for transport. As part of the morning mobilization activities, Site Managers and FS held morning assemblies where they addressed SOPs and TLs on field findings and expectations for the day. The data team also addressed SOPs on data card errors. TLs filled out health check forms for each SOP to ensure that all team members were healthy for the day's operational activities. After the SOPs retrieved the leftover insecticides from barrels 1, 3, and 5 out of the seven barrels, they departed to the communities for the spray work.

In the field, FSs and TLs supervised the distribution of SOPs to compounds designated for spraying that day. TLs conducted Direct Observed Supervision (DOS) while FSs conducted homeowner preparation and SOP performance observations. SOPs recorded data using the SOP daily data collection form.

At the end of daily activities, TLs conducted data verification on forms submitted by SOPs to check arithmetical accuracy and other associated errors and make corrections. TLs summarized all SOP data and submitted them to FSs. The FSs further verified the data and submitted them to the Site Managers. Site Managers used summarized data to complete the Performance Tracking Sheet, which was posted on the walls in each operations site.

Lastly, Site Managers ensured all spray data cards were delivered to the data center at the end of each spray day for entry.

Rain interrupted spray operations for two days in 19 operations sites and four days in two operations sites in MMD. In particular, rain on May 17 suspended spray activities for the entire day; to make up for it, the project sprayed on Sunday, May 27 (that day's data is included with that from May 26 in Table 2). Morning rain delayed the start of spraying on May 28, the final spray day (Day 30) of the campaign – the teams sprayed but got a late start that reduced the day's output. The project decided not to extend the spraying in five districts. However, the KAD campaign was extended by one day, partly to make up for the lost hours but mainly to compensate for earlier low output. Thus, KAD spent 31 operation days and ended the campaign on May 29.

At the end of operations, six of the implementing districts were above both PMI and NMCP's respective coverage targets of 85 percent and 90 percent, respectively. EMD was the only district that fell short ((89.8 %) of the NMCP target, but by only 0.3 percent. A brief analysis indicated that EMD SOPs found and

recorded twice as many eligible structures this year as in 2017, 2,500 more. Possible explanations are the construction of new houses and improved data recording across all districts.

4.2 SUPERVISION OF IRS

VL Ghana maintained thorough monitoring and supervision at all levels – regional team, district team, and operations site levels – during the campaign. The VL Ghana technical team provided regional level of supervision. This included overall IRS operational and managerial support, and oversight to all districts. The district level monitoring team included DOCs, M&E Assistants, and District Logistics Assistants. The third, operations site level of the supervision included Site Managers, FSs, and TLs.

The Ghana team used PMI VL project monitoring and supervisory tools according to daily targets developed for all actors. The Table 9 describes the tools.

TABLE 9. SPRAY CAMPAIGN SUPERVISORY TOOLS

Supervisory Tool	Purpose and Person Responsible
Spray Operator Morning Mobilization and Vehicles Inspections	This tool is to ensure that the spray teams report to work on time, check SOP health status, donning of PPE, scoping of leftover insecticides, check of vehicle condition and transport compliance boarding vehicle and pump handling, etc. The persons responsible include: Site Managers, DOCs, ECO, COP, Operations Manager.
End-of-Day Clean-up	This tool is to ensure all SOPs observe all EC protocols and properly clean spray equipment, and account for all insecticides. The persons responsible include: Operations Manager, COP, ECO, Site Managers, and DOCs
Homeowner Preparations and Spray Operator Performance	This tool is to ensure that SOPs observe proper eligible room preparation, correctly handle insecticides, use proper spray techniques, and understand household's education procedures. The persons responsible include: FSs, ECO, COP, Operations Manager, and DOCs (when visiting the field for supervision)
Storekeeper Performance	This tool is to supervise and monitor Store Assistants to maintain best warehousing practices and to account for all inventory and equipment The persons responsible include: Site Manager, DOC, District Logistics Assistants, Logistics Manager, COP, Operations Manager, and any visiting staff
Directly Observed Supervision	This tool is to ensure the proper spray technique is used by observing the spray speed, overlapping, cut off at the bottom, and distance to the wall, all to ensure the correct amount of insecticides is deposited The persons responsible include TLs and supervisors

Note: ECO=Environmental Compliance Officer; COP=Chief of Party

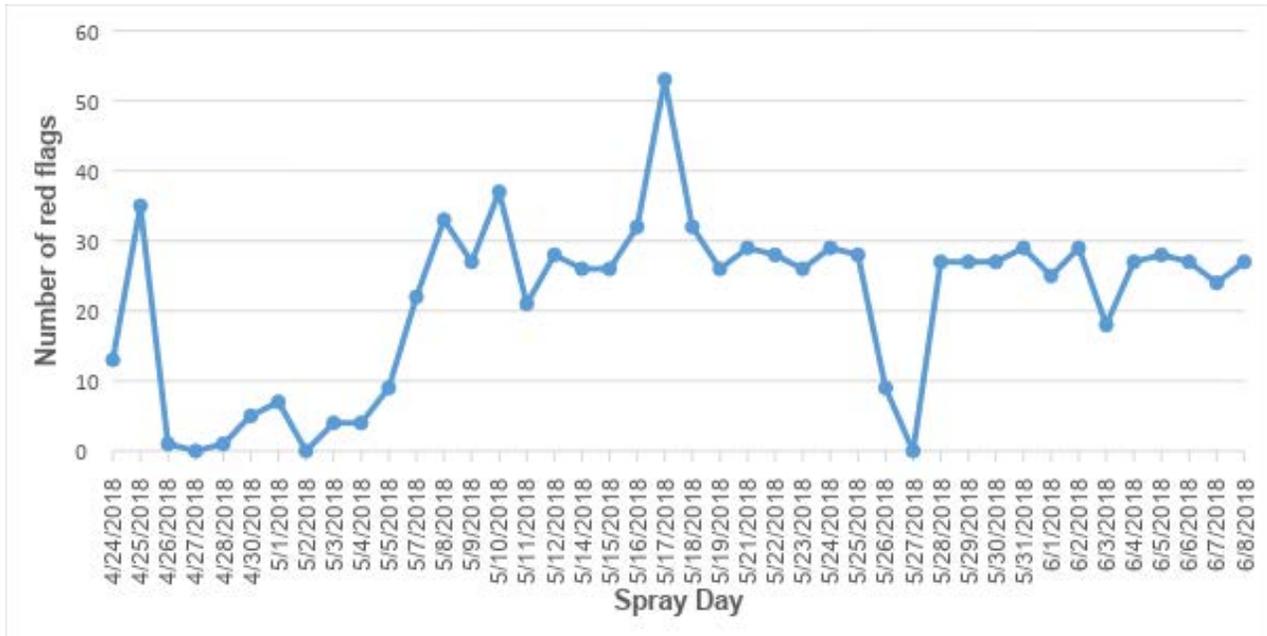
4.3 DIRECTLY OBSERVED SPRAYING

In 2018, VL Ghana continued the use of the DOS technique introduced in 2016. Its use was extended to include FSs. TLs had a target to observe and fill out five DOS and FS had a target of two DOS per day in addition to filling out other supervisory tools. DOS is conducted on a paper-based form. All TLs and FSs received training on how to use the DOS form during the TL and SOP training and at the Spray Operations TOT for Supervisors (for FS). Data Entry Assistants entered data captured on the DOS form into the DOS Database that AIRS Ghana designed in 2016.

In total, TLs and FSs conducted a total of 16,879 DOS inspections over the spray campaign period. Of these, 15,973 (94.6 percent) inspections did not raise any red flags. The remaining 906 (5.4 percent) inspections raised red flags. The TLs and FSs addressed these red flags on the spot. Figure 2 shows the day-to-day

occurrence of red flag incidents. Issues observed during DOS inspections were discussed every day at morning assemblies.

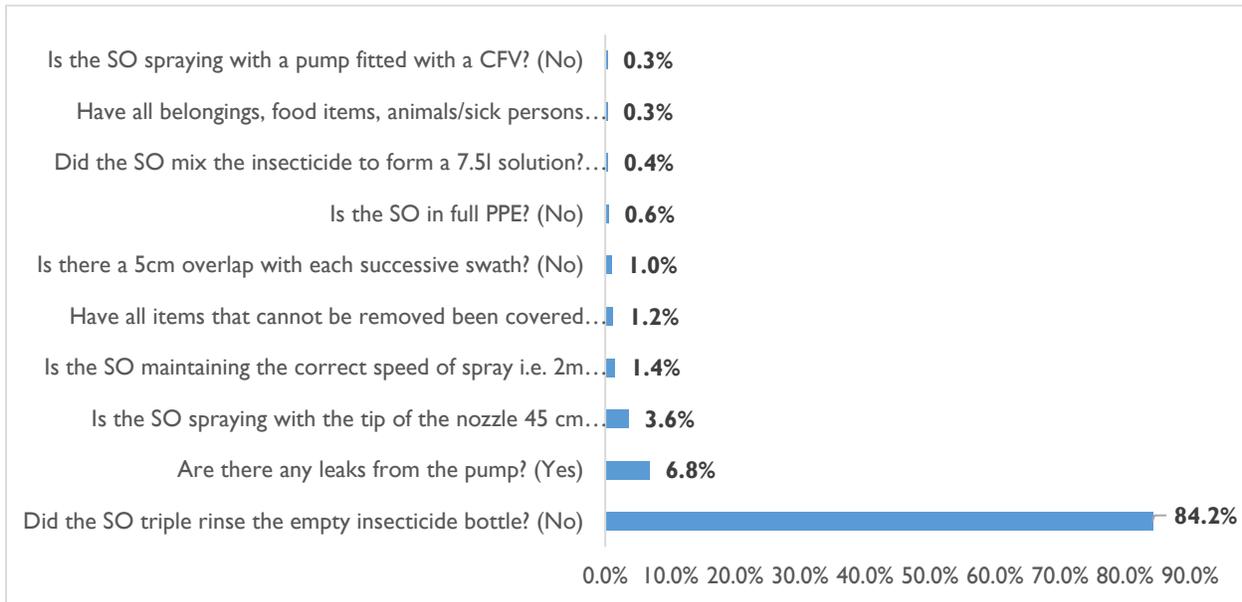
FIGURE 2. NUMBER OF RED FLAGS OBSERVED EACH SPRAY DAY



Analysis showed over 84 percent of the 906 red flag incidents was due to an error in recording the answer for one of the indicators (e.g., Did the SOP triple rinse the empty insecticide bottle?) on the DOS form. This error was due to a change in type of insecticide (from Actellic to SumiShield) in MMD.

Further analysis showed that a little over 6 percent of the 906 red flag incidents were due to some form of air leakage from the Goizper pumps. The leakage was not the type that leads to insecticide spillage but rather the seeping of air through some part of the spray pumps, mostly from around the neck of the plunger. The air leak meant only that the pumps lost pressure faster than usual and SOPs had to pressurize them frequently. Nevertheless, the pumps were repaired or replaced as soon as the problem was brought to the attention of a supervisor. Errors in data recording by the TLs are also possible as the response to the leakage question is different from the nine other questions in the list. In a few instances (0.6 percent), SOPs were not in full PPE during mixing of insecticide. Figure 3 shows the distribution of red flags about other issues.

FIGURE 3. DISTRIBUTION OF DOS RED FLAGS BY QUESTIONS ASKED



One of the major challenges the project faced during the implementation of DOS was that some TLs were observed not to be recording their DOS findings immediately after the observation was made but waiting instead until the end of the day to complete the form. The reason TLs provided was that they wait to record when there is no error/red flag to record. This issue was discussed and proper procedures – that the TL must fill out the DOS form as soon as the observation completed, and not at the end of the day – clarified daily at morning assemblies. VL Ghana also intermittently used the SMS platform to send out reminders on this to all TLs.

4.4 LOGISTICS AND STOCK MANAGEMENT

VL Ghana trained 22 Store Assistants and District Logistics Assistants to manage the district and operations site stores and central warehouse. They updated and maintained inventory (stock cards, ledger books, and insecticide tracking sheets) and handled movement and tracking of IRS supplies and materials. Project supervisors regularly checked stock records and conducted a physical stock count, mostly on insecticides, to ensure uniformity between stock cards, ledger books, and physical stock.

The District Logistics Assistants provided weekly inventory updates for each operations site in their respective districts. These updates formed the basis for supply requests to and for reconciliation of the records with the central warehouse in Tamale. To properly track materials' movement, all goods were accompanied with signed copies of material requests and delivery notes for each logistics transaction.

Store Assistants used insecticide tracking sheets to track quantities of insecticides that TLs received and returned daily at each operations site. At the close of each spray day, Store Assistants made a record of all empty bottles and sachets and all returned full bottles/sachets from the field in the same forms to reconcile the inventory. The VL Ghana Logistics team also worked closely with the M&E team to ensure that records of used insecticides on stock cards corresponded with insecticide data reported in the project database.

4.5 MOBILE DATA COLLECTION, MESSAGING, AND REPORTING

In the 2018 spray campaign, use of mobile phones for data collection and reporting continued. VL Ghana used mobile phones for data collection and messaging through technological platforms including CommCare, TextIt, and Open Data Kit (ODK).

4.6 JOB AID MESSAGING

VL Ghana continued the use of the SMS job aid system that was introduced in 2015 under the AIRS Ghana project. Table 10 provides examples of the job aid messages (including gender awareness) that were sent to spray teams over the 30-day campaign period. SOPs and TLs received the messages on their personal phones. As the campaign progressed, VL Ghana modified the messages based on the issues reported through supervisory forms and field observations. An example of such modified message was a reminder to SOPs about insecticide theft and the consequences associated with theft that VL Ghana sent to TLs, SOPs, and other actors. All messages were sent before 7:00 am.

TABLE 10. SAMPLE OF 2017 SPRAY CAMPAIGN JOB AID MESSAGES

Message	Group Sent To
Team leaders, please make sure your SOPs follow the rule of 5cm overlap and 45cm spray distance	TLs
Please remember to use your FULL PPE when mixing insecticide, during spraying and during end of day clean-up.	SOPs, TLs
Remember: Safety during operations and Zero Incidents are Paramount to IRS	All actors
Help your SOPs to spray ALL structures in EVERY compound! Talk to household tenants and help with packing!	TLs, FSs
The VectorLink project is creating a safe work environment free from harassment of any kind follow the guidelines and be part of this process	SOPs, TLs, FSs
Insecticides for IRS are not for pest control or for agricultural purposes; it is a criminal offense to steal and sell insecticides used for IRS	SOPs, TLs, FSs

4.7 FIELD SUPERVISION USING PHONE-BASED SUPERVISORY CHECKLIST

In the 2018 spray campaign, VL Ghana continued to use smartphone applications for supervisory checklists indicated earlier in Table 9. ECO used the EC checklists for pre-season storeroom, soak pit assessment, pre-contract transport inspection, and post-spray environmental inspection. Other supervisors mentioned below used the mobilization checklists. The tools were maintained on the ODK platform and managed by the Abt home office team. The remaining supervisory checklists were maintained on the CommCare platform managed by Dimagi.

The use of the smartphones in field supervision yielded quick feedback where issues of compliance were reported and immediate corrective and remedial actions were taken. All supervisory checklists were programmed on Android-based smartphones and used before, during, and after the campaign. FSs completed homeowner preparation and SOP performance checklists on phone. Site managers used phones to supervise morning mobilization, end-of-day clean-up, and storekeeper performance. The project technical team also used the CommCare supervisory forms to supervise all aspects of operations. The data were submitted to the server, and an email was generated with all issues and delivered to selected recipients (COP, Operations

Manager, ECO, and the Home Office team). This enabled the team to follow up on issues and take corrective action.

IT, M&E, and the Operations Data Coordinator resolved all technical and operational issues encountered with the mobile-based system. For example, some FS inadvertently deleted the CommCare app on their phone; it was immediately reinstalled by the Operations Data Coordinator. A Dimagi representative assigned to Ghana followed up with the team consistently throughout the 30-day campaign period.

Some red flags reported through the CommCare app were found to be false. For example, there were reports of pump leakage and food contamination. On verification, it was determined that the red flags were the result of incorrect response or misunderstanding of the questions. Where a red flag was verified as accurate, corrective action was taken and the issue was discussed the following morning during morning mobilization.

4.8 NOZZLE CALIBRATION

The nozzle tip is one of the most sensitive and important parts of the spray pump. It determines the amount of insecticide applied to a wall surface. VL Ghana continued its weekly nozzle calibration as was introduced in 2016 campaign. Nozzle calibration and testing were conducted in all sites every Sunday throughout the campaign. The FS and Site Managers were responsible for this exercise at their respective operations sites.

In the 2018 spray campaign, the project used 563 nozzles tips. Out of these, 26 tips were replaced during nozzle calibration due to out-of-range discharge. VL Ghana will continue to carry out nozzle test and calibration to ensure the correct discharge of insecticides for an effective IRS.

5. POST-SPRAY ACTIVITIES

5.1 POST-SPRAY STAKEHOLDERS MEETINGS

Stakeholders meetings were held at all operations sites. The project used this approach to engage stakeholders at each site in deliberation of issues unique to the communities covered by each site and to provide a platform for exchanging experiences.

Districts where Actellic 300CS was sprayed completed their campaigns early and held their meetings on June 11-15, 2018. In MMD, where SumiShield 50WG was piloted, the meetings were held on June 20-21, 2018.

The purpose of the meetings was to assess the spray campaign for the year and to discuss issues that arose during the campaign and potential solutions to the issues for the future. Specifically, the participants discussed SOP recruitment procedures, challenge with refusals of IRS, insecticides pilfering and its effects on community and households, and the need for community collaboration for effective and impactful IRS delivery. Spray coverage trends were also discussed, including ways to improve subsequent spray campaigns.

The stakeholders who attended the meetings included: District Chief Executives, local government staff, Directors of Health (and their staff), traditional and religious leaders, respected members of the communities, Assemblymen/women, leaders of community-based groups such as village savings and loan associations, farmers, traders, beauticians and hairdressers, youth, *Ataya* (tea-drinking groups), and people with physical disabilities.

The national post-spray evaluation meeting will be held at a later date to be determined by the project and NMCP. It will be held in Tamale, the capital of the Northern region. Participants attending this meeting will include: the Overlord of Mamprugu and Paramount Chiefs of Kumbungu, Gushegu, and Karaga; PMI, CDC, and USAID officials; NMCP and GHS officials; representatives of the EPA; Northern Regional Coordinating Council officials; research institutions such as NMIMR; other IRS implementing agencies such as AGAMal; all District Chief Executives and their Directors of Health; and other malaria-focused partners.

5.2 IRS DEMOBILIZATION

VL Ghana decommissioned all 22 sites and moved all logistics and spray equipment from the operations sites to the respective districts stores and to the central warehouse in Tamale within two weeks after the completion of the 2018 campaign. The project moved all contaminated waste materials (hand gloves, used nose masks, and empty insecticides bottles and sachets) to the main district stores and the central warehouse for proper disposal.

6. ENTOMOLOGY

VL Ghana conducted spray quality assessments using cone bioassays to test the quality of work by different spray teams working with the two types of insecticide used (pirimiphos-methyl and clothianidin). The project conducted the tests in randomly selected communities in each of the seven IRS districts within the first week of the IRS campaign. At the time of this reporting, VL Ghana also carried out one-month post-spray cone bioassays on each of the main types of sprayed surfaces (mud and cement walls, and wood from doors and windows) as part of the insecticide decay rate monitoring. Table 11 shows a summary of the results for these bioassays conducted April 26-June 14, 2018.

TABLE 11 SUMMARY OF WALL BIOASSAY RESULTS FOR QUALITY CHECK 1–3 DAYS AND ONE MONTH POST-SPRAY IN SELECTED SENTINEL SITES

Community	Insecticide Sprayed	Colony	24-hour Mortality Rate % (n)								
			T0			T1			T2		
			Cement	Mud	Wood	Cement	Mud	Wood	Cement	Mud	Wood
<i>Ento-Sentinel Sites</i>											
Bandaya (GUD)	Pirimiphos methyl	Kisumu	100% (60)	100% (56)	100% (40)	100% (58)	100% (60)	100% (38)			
		Wild	100% (60)	100% (60)	100% (40)	100% (58)	100% (57)	100% (37)			
Bunbuna (BYD)	Pirimiphos methyl	Kisumu	100% (60)	100% (60)	100% (40)	100% (60)	100% (60)	100% (40)	100% (60)	100% (55)	100% (40)
		Wild	100% (59)	100% (60)	100% (40)	100% (60)	100% (60)	100% (37)	98% (60)	97% (60)	100% (40)
Binduli (KAD)	Pirimiphos methyl	Kisumu	100% (60)	100% (60)	100% (40)	100% (60)	100% (30)	100% (30)			
		Wild	100% (60)	100% (60)	100% (40)	100% (60)	100% (28)	100% (30)			
Gbullung (KUD)	Pirimiphos methyl	Kisumu	100% (58)	100% (60)	100% (38)	100% (60)	100% (60)	100% (40)	100% (60)	100% (60)	100% (40)
		Wild	100% (58)	100% (57)	100% (37)	100% (60)	100% (60)	100% (40)	100% (60)	100% (60)	100% (39)
Katabanawa (WMD)	Pirimiphos methyl	Kisumu	100% (60)	100% (60)	100% (40)	100% (58)	100% (60)	100% (40)			
		Wild	100% (60)	100% (60)	100% (40)	100% (60)	96% (60)	100% (40)			
Wundua (EMD)	Pirimiphos methyl	Kisumu	100% (60)	100% (60)	100% (40)	100% (60)	100% (60)	100% (40)			
		Wild	100% (60)	100% (60)	100% (40)	98% (60)	97% (60)	100% (40)			
Yagaba (MMD)	Clothianidin	Kisumu	100% (120)	100% (60)	100% (60)						
		Wild	100% (120)	100% (60)	100% (60)						
<i>Randomly selected communities for spray quality tests only</i>											
Arigu (WMD)	Pirimiphos methyl	Kisumu	100% (60)	100% (60)	100% (40)						
		Wild	100% (60)	100% (60)	100% (39)						
Gushegu	Pirimiphos methyl	Kisumu	100% (60)	100%	100%						

(GUD)				(60)	(40)						
		Wild	100% (60)	100% (60)	100% (40)						
Karaga (KAD)		Kisumu	100% (60)	100% (60)	100% (40)						
		Wild	100% (60)	100% (60)	100% (40)						
Yapala (EMD)		Kisumu	100% (60)	100% (60)	100% (40)						
		Wild	100% (60)	100% (60)	100% (40)						
Dabozesi (MMD)	Clothianid in	Kisumu	100% (167)	-	100% (58)						
		Wild	100% (170)	-	100% (53)						
Licha (MMD)		Kisumu	100% (60)	100% (120)	100% (55)						
		Wild	100% (59)	99.1% (115)	98.3% (60)						

T0= Spray quality Tests performed within one week after houses were sprayed; at the beginning of the campaign; T1 = Tests performed 1 month post-spray; T2 = Tests performed 2 months post-spray.

Mud surfaces not tested in Dabozesi (MMD) because all surfaces had cement in the wall plaster material.

Bumbuna (BYD) & Gbullung (KUD) sprayed late April, 2018; Bandaya (GUD), Binduli (KAD), Katabanawa (WMD), and Wundua (EMD) sprayed in mid-May 2018; Yagaba (MMD) sprayed early June 2018.

7. ENVIRONMENTAL COMPLIANCE

7.1 PRE-SEASON ASSESSMENT

Passing a Pre-season Environmental Compliance Assessment (PSECA) is fundamental for ensuring effective and safe implementation of IRS. Specifically, a PSECA aims to ensure the safety of humans and guarantee appropriate handling of insecticides and waste. VL Ghana carried out the 2018 IRS campaign under the Supplemental Environmental Assessment (SEA) for 2015–2020 Amendment # 1. Because 2018 was not the first year in which the project used the organophosphate class of insecticides, as directed in the SEA, signature of the USAID Bureau Environmental Officer was not required for the Letter Report submitted. However, because the new neonicotinoid class insecticide, SumiShield 50WG, was to be used in one district, VL Ghana submitted an Amendment to the SEA on February 27, 2018, detailing environmental and safety conditions to be observed when using the new insecticide, and received PMI approval in time for the spray operations. The amendment also served as the Letter Report for spray campaign.

In addition, VL Ghana carried out the following activities as part of IRS campaign to make it fully compliant with standard EC protocols and procedures.

7.2 PRE-SEASON ENVIRONMENTAL COMPLIANCE ASSESSMENT AND RENOVATIONS

The VL Ghana ECO, with the support from Ghana’s EPA representative and District Environmental Health Officers (DEHOs) from all IRS target districts, visited all 22 operations sites (including a temporary site at Sandua, in KAD) in the seven districts to conduct the first round of PSECA.

The initial PSECA took place from November 27 to December 4, 2017. It assessed the existing stores and soak pits and identified where maintenance and repairs were required. Once it was finished, the ECO generated a worklist and shared it with the entire operations team to show how all the required repairs and maintenance would be carried out at each operations site. The main tasks were to fix minor cracks in wash areas, desilt and refill some soak pits, change locks for insecticide storage rooms, and do some painting. Site renovations started simultaneously across all 22 operations sites on January 29 and lasted through February 23, 2018.

Prior to the 2018 IRS campaign, the project rehabilitated an old soak pit at Sandua. VL Ghana also put up a storage facility on the land that the chief and community provided as their contribution to the campaign. The store was needed to avoid the long daily travel time from the community to the main operations site in Karaga for the end-of-day clean-up activities.



Storage facility construction in progress, Sandua site, Karaga district



Completed store, Sandua site

For the 2018 campaign, VL Ghana upgraded 11 of 22 soak pits (those that were identified to be reconstituted with charcoal and sawdust) in accordance with the new design standards recommended by the PMI VL Director of Environmental Compliance and Safety. Unlike the older soak pits, the new ones have the wash areas separated from the pit and connected via a pipe made of polymerizing vinyl chloride to the bio bed with a perforated section that ensures even distribution of effluent waste from the wash area. Before the 2019 campaign, the project will upgrade the remaining 11 soak pits to the new standard.



Old soak pit with wash area covered with tarpaulin



Improved soak pit with the bio-bed located outside the wash area

To avoid recurrent repair of cracks in the cemented soak pits, the project used thick tarpaulin sheets to cover the grounds of the wash areas to allow all effluent waste to flow freely into the bio-bed without escaping through the cracks. The project began using this technique in four soak pits in 2017 and expanded it to seven more in 2018 based on the renovation needs.

Also in 2018, the project continued to use safety posters aimed at reducing health risks in store management, especially when handling insecticides. Key messages include:

- Always wear full PPE. Never wear slippery footwear or loose clothes.
- Remember you are responsible for your own safety and for the safety of others.
- All accidents are preventable.
- If you are not trained, DO NOT handle insecticide.
- NEVER eat or drink while working with pesticide.

These posters will be updated in 2019 to reflect the new project name and will include any recommendations, if applicable, made during 2018 spray campaign.

The VL Ghana ECO together the EPA officials and DEHOs carried out final inspections and certification of the storage facilities and soak pits on April 8–15, 2018. The team confirmed that all repairs recommended by the initial PSECA had been completed and that each site was ready for spray operations. In light of this, the

Home Office EC Manager gave a green light for the commencement of 2018 IRS campaign at all operational sites.

7.3 USE OF MOBILE SOAK PITS

VL Ghana used 25 mobile soak pits (MSPs) in 2017. It reduced the number to 22 in 2018, although it made extensive use of only 17, in 10 sites. The reduced number of MSPs resulted from the renovation of a fixed soak pit at the Sandua temporary site. It and Zandua site (both in KAD) previously served as camp sites only and required 15 MSPs, one for each 15 camping spray teams. After the renovation at Sandua, VL Ghana assigned two teams to that site, and two teams using two MSPs to Zandua. The other 11 teams were assigned to two other permanent sites with fixed soak pits.

All seven districts used at least one MSP in 2018. As noted, the KAD team used two MSPs, at Zandua. The KUD team used five MSPs during a five-day camp at Singa site, while BYD and GUD teams piloted one MSP each, at Nabani and Kpatinga sites, respectively. The WMD team used three MSPs, the EMD team used four, and the MMD team used one.

The Site Managers and FSs installed the MSPs under the supervision of the ECO and DOCs. Prior to the installations, the ECO inspected all possible locations for the MSPs and storage facilities where IRS materials were to be stored. He recorded GPS coordinates to track the locations of the MSPs. The installation and use of MSPs was successful and posed no challenges. During the spray campaign, VL Ghana identified more potential locations for MSPs that can be used in the future.

At the end of the spray campaign, all MSPs were successfully uninstalled and the sites decommissioned according to the PMI Best Management Practices (BMP).



Setting up MSPs at Nagboo, East Mamprusi district



Restoring the MSP site at Nagboo to its original state

An MSP's lifespan is about 40 days -- its Granulated Activated Carbon (GAC) filter has been tested as able to effectively and efficiently support the filtration of effluent waste water for up to 40 days of use by five SOPs. Thus, all MSPs used in Ghana are due for rehabilitation and/or reconstruction. In accordance with the BMP Manual, all charcoal exhumed from fixed soak pits, and used GAC and damaged mesh and foam from MSPs will be incinerated with other contaminated IRS solid waste.

7.4 MID-SEASON ENVIRONMENTAL COMPLIANCE ASSESSMENTS

As part of the mid-season EC assessment, the VL Ghana ECO, together with other supervisors, visited all 22 permanent operations sites and 10 MSP sites to assist and support the district teams and ensure full EC. They used standard phone-based supervisory checklists to assess the safety of the IRS workers and community members, and the proper storage of insecticides, stock control, insecticide handling procedures in the field, effluent waste disposal, spill response procedures, and pump maintenance.



ECO fixes leaky Gozper pumps at Yigesi, Mamprugu Moaduri district

The ECO and Operations Data Coordinator followed up on all non-compliance issues whenever an email alert was received, especially when a possible accident/incident was reported. This was to verify and/or confirm any issue reported through the use of the supervisory checklists. Some reported issues turned out to be incorrect input made by FSs during data capture. In such situations, refresher trainings were organized for those supervisors to minimize inaccurate reporting.

Observers frequently reported leaking pumps at the onset of the campaign, so the project team instituted weekly pump servicing and calibration to minimize leaks. This ensured effective and efficient performance of the spray pumps. Repairs that needed technical assistance were inspected by the technical team to fix the problematic pumps.



VL Project Director Brad Lucas (third from left) and USAID representative Dominic Dery (fourth from left) meet with VL Ghana team during EC assessment in Mamprugu Moaduri district

Some of the common errors encountered during the campaign will be used to enhance future training, especially on the use of smartphones during inspection visits.

Mr. Dominic Dery, a Tamale-based representative from USAID Ghana, carried out USAID’s independent EC assessment. Over the course of the campaign, he visited six of the seven districts. During the mid-spray supervision, he joined Mr. Brad Lucas, the Home Office-based PMI VL Project Director, to observe SumiShield 50WG spraying in MMD during the week of May 15. During his visit to Ghana, Mr. Lucas met VL Ghana teams in four districts. Based on his observations, he made a few recommendations to help improve operations, for example, converting some MSP sites to fixed sites to expedite logistics and paperwork handling. These recommendations will be incorporated into future IRS campaigns.

7.5 DAILY SOP HEALTH CHECKS

The project introduced Daily SOP Health Checks in 2016 to ensure SOPs are in good health prior to starting the day’s spray activities. This daily check continued in 2018. TLs are responsible for performing the health checks every morning by interviewing their SOPs and filling out a five-question form. They are to report any identified health issues to the supervisors or Site Manager each morning. If an SOP has symptoms that prevent him/her from going to the field, they are still paid their daily wage. All completed health forms are filed and kept at the district level for future reference.

7.6 INCIDENTS

Over the years, the project has emphasized the importance of incident-free operations by ensuring safety of cars and motorbikes used as well as safe spray operations during IRS campaigns. In 2018, VL Ghana committed to ensuring safe driving by contracting Ghana Driver and Vehicle Licensing Authority (DVLA) personnel to assist in the initial inspections of the vehicles prior to contracting the vehicle for 2018 spray campaign.

In 2018, all supervisors came on board with their personal motorbikes, which were inspected by the DOCs at the district level. The supervisors signed a disclaimer absolving the project of any liability. All supervisors had basic driving skills and were licensed riders. In 2018, the project submitted eight incident reports, which are summarized in Table 12.

TABLE 12. 2018 VL GHANA INCIDENT REPORTS SUMMARY

District	Date	Operational Site	Description of Incident	Corrective Action Taken
KAD	11/04/2018	Karaga	IR2018 001; A rental car with a driver and a District Logistics Assistant hit a large rock on the side of a road and flipped into a ditch, landing on its roof. The driver had a few injuries, the logistics assistant minor scratches. The rental company took the car to a repair shop.	Project requested immediate replacement of the driver and the vehicle.
WMD	04/05/2018	Kpasenkpe	IR 2018 002; The front axle of a rented Benz bus decoupled while carrying SOPs from the operations site to communities for spraying, causing the bus to skid off the road. No injuries or insecticide spillage occurred.	The bus was fixed within 24 hours. The project will work to secure better-quality vehicles for the next IRS round.

District	Date	Operational Site	Description of Incident	Corrective Action Taken
BYD	05/05/2018	Nasuan	IR 2018 003; The connection between a lance and the pump strainer hose disconnected while an SOP was spraying a room. A small sack of groundnuts, which was with large items covered in the center of the room, got contaminated with insecticide as a result.	The project reimbursed (GHC 30) the owner for the lost groundnuts. VL Ghana reminded SOPs and TLs that they should check pumps on daily basis. It also reinforced the importance of checking the room prior to spraying to make sure all small items that can be moved are removed.
EMD	09/05/2018	Sakogu	IR2018 004; A lance detached from the pump joint with the trigger while an SOP was spraying a room. A crossed thread had made the contact loose. No property damage or human contact with insecticide occurred.	The lance was replaced and the pump resumed functioning well. The project re-emphasized that the site supervisor and SOPs should be more careful with assembling and checking pumps.
WMD	23/05/2018	West Mamprusi	IR 2018 005; A tricycle owned by a local resident collided with an IEC Assistant-owned motorcycle, causing the Assistant to fall off his bike.	No corrective action was taken since the vehicles involved were not project owned or hired.
EMD	23/05/2018	Nagboo	IR 2018 006; Eight seasonal workers were involved in three cases of data falsification in an attempt to hide attempted theft of insecticide.	All implicated seasonal staff were fired and project materials, equipment, and supplies (including 11 bottles of insecticide) were retrieved from them. All offenders are ineligible for rehire in future IRS campaigns. M&E Assistant reconciled the reported data with actual field results. The district IRS team informed all spray teams during morning mobilization of the infraction and ramifications of such behavior.
WMD	23/05/2018	Wungu	IR 2018 007; A TL asked one SOP to cover for an absent SOP by signing the latter's attendance record so he would not be reported as absent. The SOP used the opportunity to falsify data to cover up theft of two bottles of Actellic.	VL Ghana retrieved the two bottles of insecticide. The project dismissed the SOP and TL from the rest of the spray operations. The SOP will not be eligible for rehire in future IRS campaigns. The district IRS team informed all spray teams during morning mobilization of the infraction and ramifications of such behavior.
KUD	28/05/2018	Kumbungu	IR 2018 008; Eight seasonal workers falsified data and stole the equivalent of 12 bottles of insecticide.	The project retrieved the insecticide. All offenders are ineligible for rehire in future IRS campaigns. They did not receive their outstanding pay.

7.7 POST-SEASON ENVIRONMENTAL COMPLIANCE ASSESSMENT

VL Ghana closed down all storage facilities and soak pits according to PMI BMP Manual standards in all 22 operations sites within two weeks after completion of IRS. The project transported all solid waste (nose masks, gloves, etc.) to the district main stores and is working on transportation to the central store in Tamale and a larger district store in Langbinsi, EMD. The team has transported all empty and full insecticide bottles/sachets to the central store in Tamale. Post-spray EC inspections were conducted from June 25 to July 2, 2018. Storage facilities will remain locked, and all soak pit bio-beds will be covered with plastic sheets

and soil and guarded by security guards until the next spray campaign. The DOCs will make sure district storage facilities and all soak pits remain secured and clear of vegetation during the off-season.

7.8 WASTE DISPOSAL

The main forms of solid waste generated during the 2018 IRS campaigns are the following:

- Empty triple-rinsed bottles of Actellic CS; SumiShield 50WG empty sachets;
- Damaged and unrepairable Hudson and Goizper pumps;
- Used nose masks, torn hand gloves, and damaged rubber boots;
- Excavated charcoal and sawdust from repaired fixed soak pits;
- Used GAC from MSPs;
- Damaged MSPs, plastic buckets, meshes, and foams;
- Damaged plastic cover sheets, face shields, and hard hats;
- Uncontaminated cardboards/boxes.

VL Ghana will continue to partner with Cyclus Elmina Plastic Recycling Limited, ZOOMPAK, and/or Zoil Service Ltd to dispose of the IRS solid waste. All non-plastic IRS solid waste (used nose masks, excavated charcoal and sawdust, and used GAC from MSPs) have been packed into bags and are awaiting incineration at ZOOMPAK and/or Zoil Service Ltd in Accra or Takoradi in August 2018.

A total of 60,929 triple-rinsed Actellic 300 CS empty bottles and 4,615 sachets of SumiShield 50WG that were generated during the campaign will be sent in July or August to Cyclus Ltd and/or ZOOMPAK and Zoil Services Ltd for recycling and incineration. The VL Ghana ECO and a representative from the Ghana EPA will observe the recycling and incineration. VL Ghana will obtain a certificate of destruction from the companies for its records.

VL Ghana has not yet been able to identify a company to recycle the torn gloves, but it continues searching for alternative waste management companies that can do this. In the interim, the project donated the used gloves and aprons to Vision 1 Funeral Home & Mortuary at Aburansa near Cyclus Ltd for reuse in 2017, and it will do same in 2018.

The project has identified an agent for a paper recycling company who expressed interest in leftover uncontaminated cardboard, for recycling into toilet tissue inner cores. Contaminated cardboard will be incinerated along with other items due for incineration in accordance with PMI BMP Manual. The project will give away well-washed but damaged coveralls and rubber boots to best-performing SOPs for personal use. Table 13 provides detailed information on the solid waste accumulated during the spray campaign, which the project team aims to dispose of by the end of August 2018.

TABLE 13. 2018 GHANA WASTE INVENTORY SUMMARY

Waste Type	Amount of Waste	Disposal Method	Disposal Site
Empty bottles (Actellic 300 CS)	60,929 bottles	Recycle	Cyclus Elmina Plastic Recycling Limited
Damaged hard hats	89kg	Recycle	Cyclus Ltd
Damaged face shields	267kg	Recycle	Cyclus Ltd
Damaged Goizper pumps	284 pumps	Recycle	Cyclus Ltd
Plastic spread sheets	517kg	Recycle	Cyclus Ltd
Empty SumiShield 50WG sachets	4,615 sachets	Incineration	ZOOMPAK or Zoil Service Limited
Waste GAC	23kg	Incineration	ZOOMPAK or Zoil Service Limited
Spillage, sawdust, sand (fixed soak pits)	245kg	Incineration	ZOOMPAK or Zoil Service Limited
Exhumed charcoal (fixed soak pits)	51kg	Incineration	ZOOMPAK or Zoil Service Limited
Nose dusk masks	371kg	Incineration	ZOOMPAK or Zoil Service Limited
Damaged Hudson pumps	711 pumps	Recycle	Tema Steel Company Ltd.
Non-contaminated cardboard boxes, Actellic 300CS	5,077 boxes	Recycle	Fine Print Ltd.
Non-contaminated cardboard boxes, SumiShield 50WG	76 boxes	Recycle	Fine Print Ltd.
Damaged gloves and aprons	234kg	Re-use (donation)	Vision 1 Funeral Home & Mortuary
Goizper plastic accessories	140kg	Recycle	Cyclus Ltd
Cups and brush	13kg	Recycle	Cyclus Ltd
Coveralls, neck covers, spray bags, reflectors (unusable)	256kg	Donation /Landfill	Cyclus /Takoradi Landfill
Broken basins and cups	21kg	Recycle	Cyclus Ltd
Damaged boots (unusable)	116kg	Donation /Landfill	Cyclus/Takoradi Landfill

8. MONITORING AND EVALUATION

8.1 KEY OBJECTIVES AND APPROACH

The VL Ghana M&E systems have been improved based on previous years' experiences, lessons learned, and best practices that were shared across the project country programs.

As outlined in the 2018 work plan, the M&E approach is to use lessons learned to:

- Emphasize accuracy of both the data collection and the data entry processes through comprehensive training and supervision at all levels;
- Streamline and standardize data and information flow to minimize errors and facilitate timely reporting;
- Ensure IRS data security and storage for future reference through establishment and enforcement of proper protocols; and
- Communicate IRS data and information to stakeholders in a timely and clear manner.

8.2 DATA COLLECTION AND DATA MANAGEMENT

Data were collected using standardized data collection forms designed to capture all core PMI VL indicators. All data collection was preceded by training data collectors (mobilizers, SOPs, District M&E Assistants, etc.) on proper data capture procedures. Mobilizers collected mobilization data during house-to-house enumeration. During spray operations, SOPs collected all spray data, which were verified through data quality assessment processes. To ensure data integrity, VL Ghana also used a number of quality assurance and control tools (Table 14). An expanded list of quality assurance methods and tools that PMI VL Ghana used across all components of IRS operations is provided in Annex D.

TABLE 14. GHANA IRS 2018 DATA COLLECTION AND QUALITY ASSURANCE TOOLS

Data Collection Tool	Used by Whom and When
Training Participant Registration Form	Used by lead trainer at training workshop to capture category and number of people trained; disaggregated by gender.
IEC/BCC Mobilization Form	Used by mobilizers during pre-spray house-to-house mobilization/sensitization activities to collect data on number of households and people reached with IRS messages and the number of IEC/BCC materials distributed directly to households.
Daily SOP Form	Used by SOPs during spray operations to capture structures found, structures sprayed and not sprayed, population protected and not protected, and information surrounding mosquito net availability.
Error Eliminator (EE) Form	<p>Purpose: To check the completeness and correctness of data collected in the field by SOPs and highlight common data collection errors so they can be quickly identified, corrected, and further prevented through on-the-spot re-training.</p> <p>Used by: TLs, on a daily basis, to check completeness and accuracy of the forms filled by the SOPs under their supervision. Supervisors, DOCs, District M&E Assistants, Operations Manager, Database Manager, and M&E Manager also used the EE when visiting the field.</p>

Data Collection Tool	Used by Whom and When
DCV Form (via CommCare mobile application)	<p>Purpose: Used during randomized household visits to check the accuracy of data collected in the field by SOPs, i.e., to ensure that the data written on the Daily SOP Forms match the information reported by households and/or the data recorded on the IRS cards disseminated to households.</p> <p>Used by: District M&E Assistants, Database Manager, M&E Manager, and other supervisors as needed.</p>

In 2016, the project converted the DCV form from a paper-based tool into a mobile application that has been used since then. This year, VL Ghana recruited four additional M&E Assistants to conduct the DCV visits in the following districts: GUD, KAD, KUD, and WMD. The four team members and any external visitors used the original paper-based form. Tables 15 and 16 show the numbers of households visited as part of DCV and issues observed.

TABLE 15. NUMBER OF COMPOUNDS VISITED USING THE DCV FORM

District	Bunkpurugu Yunyoo	East Mamprusi	Gushiegu	Karaga	Kumbungu	Mamprugu Moaduri	West Mamprusi	Total
No. of Compounds Visited	57	79	214	46	241	169	86	892

TABLE 16. USE OF DCV FORM: ISSUES FOUND AND CORRECTIVE ACTIONS TAKEN

Errors/Issues Observed	Corrective Actions Taken
<i>Understatement of total number of eligible structures found by SOPs.</i> Some SOPs did not count all eligible structures in compounds as part of the total number of structures found.	It was emphasized to the operations team (SOPs, TLs, and FSs) to record all eligible structures found in every compound visited. When the spray teams found a locked structure, they were to probe further about its eligibility for spraying and revisit the structure accordingly to verify information received.
<i>Overstatement of total number of eligible structures found.</i> Some eligible rooms, food stores, and traditional shrines (sacred rooms) were considered as eligible structures by some new SOPs. Most of these observations were made in cases where the structures were locked at the time of visit. Some households tried to persuade a few SOPs to include structures under construction as eligible assuming they would be occupied shortly thereafter. Many of these structures were not completed at the time of the verification.	Spray teams were reminded of the definition of eligible structure and how to identify an eligible structure. The M&E team reiterated that the eligibility of a structure is based on evidence at the time of the visit, not on its expected future eligibility. Spray teams were advised to lead in the identification and count of eligible structures on the compound. TLs and FSs were asked to intensify spot checks of SOPs' daily forms.
<i>Overstatement of total number of eligible structures sprayed.</i> Some SOPs considered and counted sprayed rooms as structures. Thus, a single structure with more than one room sprayed had sprayed rooms reported as sprayed structures.	SOPs were trained to differentiate rooms from structures and cautioned about this even before IRS operations started. TLs and FSs intensified field spot checks to avoid the error. All affected compound data were corrected.
<i>Undercounting of number of structures sprayed.</i> This happened mainly in very large compounds made up of multiple courtyards. SOPs found it difficult to make their way through the courtyards to access all structures. They would lose count of some of the sprayed structures in the process.	The M&E team asked SOPs, TLs, and FSs to carefully count both eligible and sprayed structures, especially in large compounds with multiple courtyards. The SOPs were also advised to use an approach in such compounds whereby they sprayed one courtyard at a time and used chalk to mark each sprayed structure as "SP." TLs were also asked to assist SOPs in counting the structures.

8.3 DATA ENTRY

VL Ghana employed 23 Data Entry Assistants (DEAs) to enter data from house-to-house mobilization, spray, and DOS generated from seven districts. Five DEAs (from BYD, EMD, GD, KAD, and WMD) resigned for various reasons during the campaign and had to be replaced. Therefore, the total number of DEA trained and recruited for this year's campaign was 28, although only 23 were employed at any one time. The database set-up entailed using a server and workstations in each data entry center. The project team installed the 2018 version of the project database and the DOS database on 23 laptops to ensure simultaneous data entry across all districts.

PMI VL project data entry protocols dictate a two-step process for data entry. First, "Totals" data entry captures the summary totals from each spray operator form. It is completed within 24 hours of the SOP form reaching the data center. These data are used for quick reporting of ongoing spray progress. The second is "Details" data entry, where data for every line of the SOP form (each corresponding to one compound) is entered into the database. It is completed within 48 hours of the SOP form reaching the data center.

VL Ghana followed the same data entry protocols. However, both "Totals" and "Details" data were all entered into the database within 24 hours of SOP form receipt. The fast turnaround for data entry enabled IRS managers to use more accurate "Details" data for quick and critical operational decisions on a daily basis.

Data Cleaning

DEAs carried out data cleaning on a daily basis. The cleaning involved the following:

- Ensuring that all data cards were entered correctly by the two-step method described above;
- Comparing the Totals and Details data and ensuring that any corrections were made so that the two sets of data matched;
- Checking for and possibly removing duplicate records; and
- Identifying and entering missing records.

DEAs used the Microsoft Access-based IRS Cleaning/Reporting tool for the data cleaning. They cleaned both mobilization and spray data throughout the spray campaign, with final data cleaning completed within eight days of the end of the spray campaign.

8.4 DAILY AND WEEKLY PROGRESS REPORTS

Three reports were sent on a weekly and daily basis to the client, the project home office, and the operations team during the spraying period:

- **Weekly Progress Report:** submitted once a week to PMI/USAID and other partners (NMCP and GHS Northern Regional Directorate): This report provides a high-level summary of weekly spray progress toward operational targets.
- **Daily District Summary Report:** This report is sent to the project technical leads and DOCs for critical feedback and daily planning. DOCs especially need it to plan and redistribute or request for additional resources. The report provides information on structures found and sprayed, spray progress and coverage, insecticide use, number of SOPs who worked, and average number of structures sprayed per SOP for each operations site and district. It also provided information on the number of 'outstanding structures' (structures not yet found as per the target) and structures found but not sprayed which were to be revisited. These two data points were introduced for the first time in 2018 following requests from the IEC Manager to better target low-coverage areas for enhanced mobilization and revisits.
- **Daily Community Coverage Report:** This report presents daily community coverages to the site operations team. It is especially important after week one when revisits intensify. The report is also sent to technical leads and DOCs. The DOCs use it to track communities that have spray coverage below 85 percent. The report contains information for each community and a list of compounds in the community

where spray coverage is less than the target. A revisit plan for each community is formulated using the daily community coverage report. It is also used by the IEC Assistants for targeted follow-up messaging in specific communities and compounds.

8.5 RESULTS

A list of all program indicators for the 2018 spray campaign is presented in the M&E Plan matrix in Annex E. The following sections summarize the results for the core PMI indicators and other spray indicators.

8.6 SPRAY COVERAGE AND POPULATION PROTECTED

At the end of the 2018 spraying campaign, SOPs found 324,704 eligible structures and sprayed 298,701 of the total structures found. The campaign attained a total coverage of 92.0 percent across seven districts. Spray coverage for 2018 fell by 2 percentage points, from 94.0 percent in 2017, although the number of eligible structures found increased by 589. Details on the number of structures found, sprayed, and district spray coverages are presented in Table 17.

SOPs found a total 882,572 people living in the structures found, of which 94.8 percent (836,376) were protected from malaria through IRS. The population found includes 18,397 pregnant women and 148,627 children under five years of age.

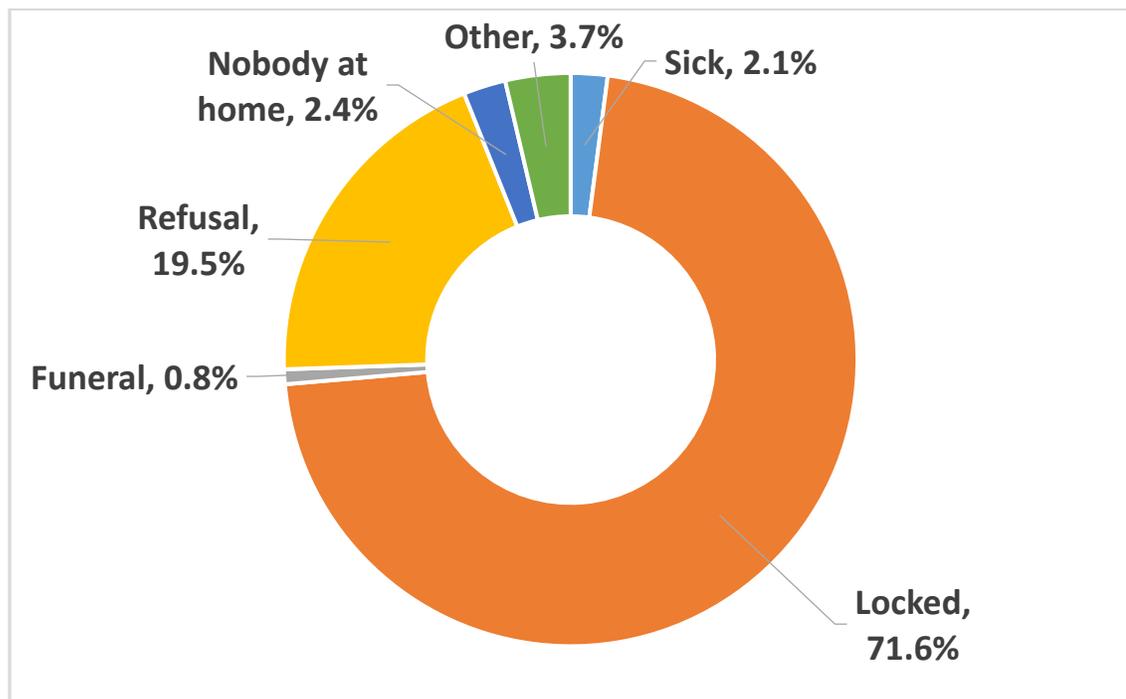
TABLE 17. SUMMARY OF 2018 SPRAY RESULTS

District	Structures			Population			Pregnant Women Protected		Children Under 5 Years Protected	
	Found by SOPs	Sprayed	% Sprayed	Protected	Not Protected	% Protected	#	%	#	%
Bunkpurugu Yunyoo	55,517	52,955	95.4%	131,809	4,551	96.7%	2,304	1.7%	18,321	13.9%
East Mamprusi	71,917	64,611	89.8%	180,503	12,695	93.4%	3,874	2.1%	31,174	17.3%
Gushegu	47,870	44,863	93.7%	137,492	5,093	96.4%	3,535	2.6%	27,695	20.1%
Karaga	36,037	32,960	91.5%	99,561	4,868	95.3%	2,579	2.6%	20,120	20.2%
Kumbungu	35,053	31,987	91.3%	88,637	5,363	94.3%	1,867	2.1%	15,859	17.9%
Mamprugu Moaduri	22,573	21,171	93.8%	58,901	2,871	95.4%	1,227	2.1%	10,802	18.3%
West Mamprusi	55,737	50,154	90.0%	139,473	10,755	92.8%	3,011	2.2%	24,656	17.7%
Total	324,704	298,701	92.0%	836,376	46,196	94.8%	18,397	2.2%	148,627	17.8%

8.7 REASONS WHY STRUCTURES WERE NOT SPRAYED

A total of 26,003 structures (8% of total) were not sprayed for the following reasons: (1) structures were locked at the time of SOP's visit (18,606 – 71.6%); (2) households refused IRS (5,066 - 19.5%, including 5.9% structures from shea nut communities³); (3) nobody was at home at the time of the SOP visit (621 – 2.39%); (4) a sick person was residing in the structure (539 – 2.1%); and (5) a funeral was being held in the compound at the time of the visit (217 – 0.08%). Other reasons included social events, such as outdooing of a newborn baby and a celebration of newlywed couples, accounted for the remaining 954 (3.67%) non-sprayed structures (Figure 4).

FIGURE 4. REASONS FOR NOT SPRAYING STRUCTURES

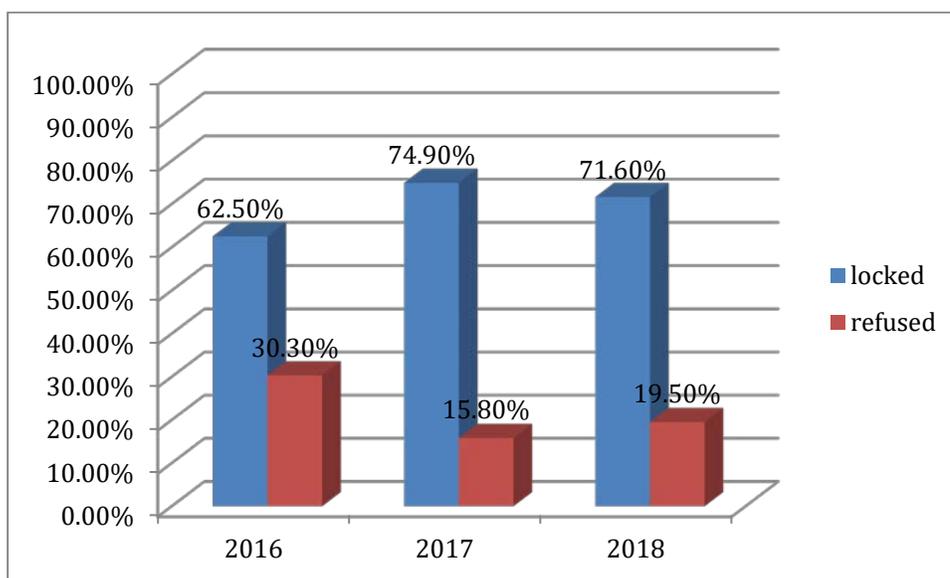


Locked structures and beneficiary refusal are the two main reasons for non-sprayed structures since the project started collecting such data in 2014 – they constituted 5.7 percent of the total structures found by SOP during the 2018 campaign. Structures were locked in the absence of the room's owner due to travel for short (farm work), protracted, or long periods of time (over three months as at the time of the campaign or even over a year). Some people who traveled for a short period returned during the campaign and had their structures sprayed during revisits, but many of the locked structures were never opened for spraying. Some refusals in the districts where Actellic 300CS was used were due to residents' complaints about the odor of the insecticide. Some male heads of households refused to spray their personal structures for no reason but allowed other members' structures within the compound to be sprayed.

3. 303 structures were not sprayed in shea communities. This included 97 structures representing an entire community of Gbambu, (GUD), which totally refused spraying in 2018.

Figure 5 compares structures that were locked or refused IRS as a proportion of the total structures found by SOPs over the last three years. While there was a large drop in refusals in 2017 and 2018 compared with 2016, locked structures increased after 2016 albeit with a slight decrease from 2017 to 2018.

FIGURE 5. THREE-YEAR DATA ON LOCKED STRUCTURES AND REFUSALS, 2016-2018



8.8 AVAILABILITY AND USE OF MOSQUITO NETS

Overall, 292,867 mosquito nets were reported as available across the seven IRS districts at the time of SOP visits. Among the population protected by IRS, a total of 14,369 (78.1 percent) pregnant women and 115,976 (78.0 percent) children under five years of age slept under a mosquito net the night before the SOP visit. Table 18 presents mosquito net indicators by district. Percentages are calculated using the total population of pregnant women and children under five protected.

TABLE 18. NUMBER AND USAGE OF MOSQUITO NETS

District	Total Mosquito Nets Found	Preg. Women Sleeping under Mosquito Nets the Previous Night		Children Under 5 Sleeping under Mosquito Net Previous Night	
		#	%	#	%
Bunkpurugu Yunyoo	47,317	1,884	81.8%	15,544	84.8%
East Mamprusi	63,570	3,167	81.8%	25,388	81.4%
Gushegu	37,198	2,379	67.3%	18,280	66.0%
Karaga	33,425	1,854	71.9%	14,542	72.3%
Kumbungu	33,564	1,703	91.2%	14,334	90.4%
Mamprugu Moaduri	21,512	944	76.9%	7,988	73.9%
West Mamprusi	56,281	2,438	81.0%	19,900	80.7%
Total	292,867	14,369	78.1%	115,976	78.0%

8.9 OTHER SPRAY INDICATORS

A total of 63,811 bottles of Actellic 300 CS were distributed to the six districts (BYD, EMD, GUD, KAD, KUD, and WMD) for the 2018 campaign: 60,929 were used to spray 277,530 structures and 2,882 bottles were returned to district stores. The average number of structures sprayed per bottle for the six Actellic districts was 4.6. As noted before, SumiShield 50WG was piloted in the seventh spray district, MMD. A total 4,860 sachets of SumiShield 50WG were sent to the district stores of which 4,615 were used to spray 21,171

structures, an average of 4.6 structures per sachets. The combined average bottle/sachet use for the seven districts is also 4.6. A grand total of 298,701 structures were sprayed across the districts. On average, 578 SOPs (out of 602 hired) worked each day. Each SOP sprayed an average of 17.2 structures a day (average 17.1 structures per SOP per day in the six Actellic districts and 19.1 in the SumiShield district). SOPs used an average of 3.7 bottles of Actellic 300 CS and 4.2 sachets of SumiShield 50WG per day. Table 19 summarizes insecticide tracking and usage information.

TABLE 19. INSECTICIDE TRACKING AND SOP PERFORMANCE

Indicator	District							Overall
	Bunkpurugu Yunyoo	East Mamprusi	Gushiegu	Karaga*	Kumbungu	Mamprugu Moaduri**	West Mamprusi	
Total bottles/sachets received from regional stores	12,564	15,096	9,948	7,015	7,704	4,860	11,484	68,671
Total bottles/sachets used	11,551	14,637	9,274	6,985	7,139	4,615	11,343	65,544
Total bottles/sachets damaged or lost	0	0	0	0	0	0	0	0
Total bottles/sachets leftover (returned to regional office)	1,013	459	674	30	565	245	141	3,127
Average number of structures sprayed per bottle/sachet	4.6	4.4	4.8	4.7	4.5	4.6	4.4	4.6
Average number of bottles/sachets per SOP per day	4.1	4.0	3.9	3.1	3.5	4.2	3.6	3.8
Average number of SOP worked per day	93	121	80	73	68	37	106	578
Average number of structures sprayed by SOP per day	19.0	17.8	18.7	14.6	15.7	19.1	15.8	17.2

* Karaga had 31 operational days, the other six districts 30 operational days.

**The MMD team used SumiShield 50WG; therefore, the counts are in sachets, not bottles as in the six Actellic districts.

In addition to the number of Actellic 300CS bottle used in the spray campaign, two bottles were used for spraying experimental huts and resistance testing in Weija. Furthermore, in addition to the SumiShield 50WG sachets used for the spray campaign, nine sachets were sent to other VL counties for insecticide resistance tests. Consequently, at the end of the campaign, the inventory reports and physical stock count showed a closing insecticide balance of 11,100 bottles of Actellic 300CS with expiry date of February 2020 and 376 sachets of SumiShield 50WG with expiry date of January 2021.

8.10 SUMISHIELD-BASED IRS SATISFACTION SURVEY

To understand community acceptance of the SumiShield 50WG product for IRS and key operational considerations for spray, VL Ghana adapted the survey protocol developed by the AIRS Tanzania team.

The cross-sectional beneficiary satisfaction survey was conducted within 72 hours post-spray. Data collectors used cluster sampling to select households to evaluate the level of beneficiary satisfaction. The operations surveys were conducted in parallel to understand the spray teams' experiences with SumiShield 50WG.

8.10.1 RESULTS

Overall, beneficiaries widely accepted SumiShield-based IRS. From the operational surveys, the existing procedures developed for IRS campaigns using Actellic 300CS worked well for the spray teams with SumiShield 50WG. Some spray team members reported issues with wall coating, presence of insect populations after spraying, and use of leftover insecticide the next day.

8.10.2 CROSS-SECTIONAL SURVEY

The M&E team randomly interviewed 135 beneficiaries across ten communities in MMD. A total of 51 compounds were visited with an average of 2.6 structures per compound. Of the 135 beneficiaries interviewed, the vast majority responded that they were satisfied with the state of their walls post-spray (85.9 percent, n=116). Of the remaining 19 respondents, five were not present for the spray application, three people were not satisfied, and one person was unsure. The majority of beneficiaries who were present for spray application (n=120) reported that there was no odor associated with the SumiShield 50WG product (81.7 percent, n=98).

After an average of 1.7 days post-spray application, 33.3 percent and 83.3 percent of beneficiaries present for spray application reported observing some change in the mosquito population and other insect populations, respectively. Of the beneficiaries present for spray, there were only two reports of complaints from household members after spraying with SumiShield. Both respondents were from the Licha community and reported that one household member in each structure experienced itching after spray application. Neither of those affected were children under five or pregnant women. Overall, all 120 respondents present for spray rated their experience with IRS in 2018 as ‘very satisfied’ (n=111, 92.5 percent) or ‘somewhat satisfied’ (n=9, 7.5 percent).

8.10.3 SUPERVISORY AND OPERATIONS SURVEY

The M&E team interviewed 20 SOPs, seven TLs, and four Site Supervisors across two operations sites in MMD. Of the 31 respondents interviewed, the vast majority responded that insecticide preparation with the SumiShield 50WG sachets did not pose any challenges. To understand the SumiShield 50WG spray experience, SOPs and supervisors responded to a series of spray-focused questions and were asked to provide an explanation for any challenges experienced. Neither SOPs nor supervisors reported experiencing a clogging event with the SumiShield 50WG product and generally confirmed easy end-of-day clean-up.

9. CAPACITY BUILDING

One of the mandates of the PMI VL Ghana project is to strengthen skills and knowledge of local partners in areas such as strategic planning, leadership, operating systems, advocacy, organizational management, and program development and management. The project continued its capacity building for the 2018 spray campaign.

This year, VL Ghana increased the number of GHS departments trained to implement IRS. The training took place in January-March 2018, in Tamale. In addition to Environmental Health Officers trained last year, officers from three departments (Health Promotion and Communication, Warehouse and Logistics, and M&E) of the regional and district levels participated in the program: GHS Regional and District HPOs (to work with the Communication Department); the Regional Warehouse Manager and District Supply Officers (to work with the Logistics Department); the Regional Surveillance Officer and District Information Officers (to work with the M&E Department). In total, the project trained 24 GHS officers. The regional officials also shared information on the latest malaria situation in the region and presented the organizational structure of their departments. The project will use this information to better identify opportunities for integrating IRS into routine work of these departments.

To further build their capacity, HPOs worked for 20 days alongside VL Ghana staff. To ensure that HPOs could fully supervise enumeration and sensitization for IRS implementation, they were listed in the Mobilization Supervision Form ODK application to enable them to submit reports to the project using the form. This also enabled the project to monitor their work in the field. As a result, HPOs submitted a total of 343 forms for the household mobilizations they supervised. During the spray campaign, they joined the communication team to help prepare communities for spraying, convince difficult households to spray, and gain access to some locked structures.

During the TOT, the NMCP, Disease Control Officers, and DEHOs in the targeted districts were also trained. They spent 20 days working alongside VL Ghana staff during the spray campaign. Disease Control Officers worked closely with the DOCs in the planning and supervision of spray operations. DEHOs worked closely with the DOCs and the project ECO to ensure household owners follow required home preparations and after spray clean-up procedures, and spray teams followed EC protocols during the 2018 spray campaign.

PMI through VL Ghana continued supporting the National Insecticide Resistance Monitoring Partnership (NIRMOP). The partnership brings together researchers and vector control implementers within Ghana to generate and monitor insecticide resistance data in the country, under the guidance of the NMCP's MaVCOC. NMIMR coordinates data collection and hosts the MaVCOC secretariat. A key area of the partnership has been to provide the framework for sharing data on insecticide resistance in a collaborative way so as to support disease control strategies, especially those that require the use of insecticides.

In response to the need to expand entomological monitoring across all IRS districts, VL Ghana established new entomological sentinel sites in EMD, GUD, KAD, MMD, and WMD and trained 64 mosquito collectors across these new sites. It also trained an additional 10 supervisors from the GHS to support the supervision of mosquito collections.

The project had planned to train two Community Health Nurses from each operational site. This could not be done due to the unexpectedly long time it took to complete the enumeration exercise due to a delay in completing production of IRS plates. To enable the nurses to gain firsthand experience in IRS implementation, they will be trained early next year, in time for the spray campaign.

VL Ghana will continue such mentorship opportunities to ensure that practical skills in the planning, implementation, and supervision of IRS and other vector control interventions (as prescribed by PMI) are properly transferred to NMCP and GHS staff for future campaigns.



The Regional Health Promotion Officer makes a presentation on BCC during IEC Assistant and HPO training

10. CHALLENGES AND RECOMMENDATIONS

VL Ghana encountered several challenges during the spray campaign. The team also learned some lessons and made recommendations for future campaigns.

10.1 CHALLENGES

1. VL Ghana had challenges in communities where the health volunteers assigned by the community as mobilizers could not read and write, a skill required to do household enumeration. (Mobilizers also prepare communities for spray and support SOP teams during the revisits.) Consequently, the project re-assigned health volunteers from elsewhere to these communities. The communities did not respond well to the re-assigned mobilizers, making it difficult for them to connect with the community members and get their cooperation for IRS preparations.
2. Most districts experienced rain, which slowed spray progress. MMD experienced morning rains during the last week of spraying, which reduced the daily spray output. All districts had to stop for one day due to heavy rains and use a Sunday to catch up.
3. The project encountered a high percentage of locked structures and refusals during the campaign. The most common reasons for the locked structures were the occupants' migration or farm work. Homeowners took advantage of the rains to go to their farms to do planting, which resulted in more locked structures.. Typical reasons for refusals included residents' claims of insecticide stains on walls and insecticide odor. These reasons were given especially by youths and those living in peri-urban areas.
4. Community political leaders and chiefs interfered with SOP recruitments. Some chiefs used recruitment of their people as a condition of accepting IRS in their communities.
5. There were recorded incidents of insecticide pilferage by spray team members. This happened toward the end of the campaign during revisits only. Monitoring and supervision during revisits are difficult because usually only one structure per compound needs to be sprayed. Consequently, supervisors are spread thin across a community, opening the door to delinquency.
6. Household preparation has long been a challenge. This is especially true in peri-urban communities, where residents have more possessions that need to be moved during spraying. Some residents refused spraying because of the burden of packing out and packing in after the required wait time. This situation forced the project to hire packers in all districts, which increased operating costs.
7. Encroachment of new construction close to operations site offices, soak pits, and storage facilities was a problem in EMD, and this problem is likely to spread to other sites in the future, meaning they will not pass PSECA requirements. In 2018, Sakogu and Langbinsi sites in EMD could not store insecticides because the sites no longer met PMI BMP Manual standards for distance from human residence or water sources. This forced the daily transport of insecticides, which delayed departure time to field. Other sites, like Yizesi in MMD and Nasuan in BYD, might not be compliant in the future due to the encroachment.
8. Other challenges included:
 - a. 10 days of the campaign coincided with Ramadan, which affected SOP productivity and beneficiary receptivity;
 - b. Sporadic ethnic conflict, which delayed spraying in six communities almost to the end of the campaign in GUD;
 - c. Spray operations coinciding with shea nut picking season; and

- d. Distances between some communities and operational sites.

10.2 LESSONS LEARNED AND RECOMMENDATIONS

1. This year, the one-time enumeration required detailed recording of household information which required that mobilizers had to read and write. Now that households have an IRS number plate by which they will be identified, mobilizer literacy is not required going forward. In 2019, the project will be able to work with health volunteers/mobilizers from each community regardless of their literacy level. Working with mobilizers from the same community will enhance commitment of the mobilizers to properly prepare the communities and help improve acceptance of IRS.
2. To avoid the rains, the project will consider starting spray operations before the onset of the rainy and planting season. Starting by the first week of April would allow for the completion of the spray campaign before the peak rains set in.
3. Communities and their leadership will be fully engaged in any BCC processes to find sustainable solutions to these issues. With enumeration out of the way, the project will be able to use that period to intensify its BCC efforts with sustainability in mind. Also, the strategy adopted on tracking locked structures and refusal cases based on structures found and sprayed has helped the project to monitor and work on targeted messages for these categories of non-sprayed structures. Data on low-coverage compounds and communities form the basis for project revisits and targeted IEC messaging to reduce the cases of locked structures.
4. VL Ghana will also revisit a discussion on spraying eligibility of long-term locked structures. If the owner of a structure is not coming back during the period of the IRS campaign, the structure might be considered ineligible. As one of the ways to assess return time of an owner of a locked structure, the project may test evaluation question(s) so that SOPs and others can interview the neighbors of locked household to decide on the structure's eligibility.
5. Despite the challenge of political and chief interference in SOP recruitment, VL Ghana will continue to base its recruitment on merit and required selection criteria. It will continue engaging with government partners and stakeholders during recruitment so that have a better appreciation of the system.
6. Regarding the theft of insecticide, the project's immediate remedial action was to sanction those responsible; their wages were garnished and they were declared ineligible for rehire in future IRS projects. Going forward, the project could also conduct a minimal background check on prospective spray teams i.e. ran a list of prospective seasonal workers by local police to see if they happen to be on police radar for any reason. The project will continue to do thorough supervision and monitoring during spray campaigns.
7. To address homeowner preparation for spraying in peri-urban communities, the project will continue to hire packers. Another strategy would be to continue to station spray teams in the peri-urban areas for the entirety of the campaign. This strategy was used during this year's campaign. Spray teams were stationed in Gushegu, Karaga, Nalerigu, Gambaga, Nasia, and Walewale towns in order to start revisits early in the campaign to accommodate beneficiaries' working schedules and time required for packing. The project could also intensify IRS communication to community members who need assistance to collaborate with the spray teams to pack. Another strategy is to ask households that have already sprayed to encourage others to prepare for spraying, pointing out the ultimate benefit of IRS.
8. VL Ghana would consider relocating affected operations sites to more appropriate areas that meet our BMP standards for future campaigns.
9. Responses to other challenges:
 - a. To avoid the spray campaign running into Ramadan and the shea nut picking season, the project could start the spray campaign earlier next year.
 - b. To spray communities which experienced civil conflict, the project should do timely intelligence gathering and have flexible dispatch plans to spray if/as soon as a truce is called.
 - c. To address shea nut community concerns about eligibility for organic certification of their harvest, the project will continue working with the NMCP and GHS to mitigate and resolve the situation with nut exporters, who in 2018 spread misinformation about IRS damaging nut crops.

- Specifically, as part of MaVCOC, NMCP created a committee that includes PMI, VL Ghana Project, GHS, AGAMaL, EPA, and MoFA to move the issue to a higher decision making levels in order to resolve it by the next spray season. The project is developing a situational statement to use as an initial roadmap document after it finalized with contributions from all committee members. In addition, the project will maintain friendly relations with affected communities over the course of the year so they will be aware and prepared for the 2019 campaign.
- d. To reduce distances from storage site to community, the project may convert the temporary site at Sandua to a permanent operations site. The Nagboo MSP, with 20 SOPs and five TLs, should be considered a permanent site. Kpatinga should be considered for permanent site status since it is far from both Galwei and Gushegu but has many catchment areas.
10. VL Ghana learned from the new dispatch strategy of spraying first remote and peri-urban areas in order to allow for more time for revisits in low-coverage communities. This strategy should be continued moving forward with appropriate adjustments. For example, VL Ghana will need to plan out from the start adequate distribution of SOPs between remote, peri-urban, and revisit areas. To make sure SOP teams do not have too much pressure, the project will have to draw a revisit plan alongside the regular spray calendar so DOCs can plan and prepare for revisits well ahead of the spray.

ANNEX A. INVENTORY OF STOCK AND QUANTITIES POST-SPRAY

TABLE A-1. IRS 2018 INTERNATIONALLY PROCURED ITEMS

Item Description	Unit	Opening Balance	Number Procured	Total Quantity in Stock	Quantity Used	Quantity Damaged	Quantity Available for Use
<i>INSECTICIDE</i>							
Actellic 300CS	Bottle	4471	67560	72031	60,931 ⁴		11,100
SumiShield 50WG	Sachet	0	5000	5000	4,624 ⁵		376
<i>PPE</i>							
Coverall	Pcs	1393	450	1843		99	1744
Face Shield	Pcs	1296	1500	2796	1705	1705	1091
Hand Gloves	Pair	1162	1728	2890	1710	1710	1180
Hard Hat	Pcs	633	192	825		96	729
Head Gear	Pcs	991	6	997		101	896
Heavy Duty Gloves	Pair	113	0	113		97	16
Nose Mask	Pcs	1830	27840	29670	28120	28120	1550
<i>SPRAY EQUIPMENT</i>							
Collar Seal (Plunger cap)	Pcs	30	200	230	23	0	207
Valve Check (chamber Valve)	Pcs	0	100	100	28	0	72

⁴ The project used 60,929 bottles for IRS, and two bottles for entomological activities (spraying experimental huts and resistance testing in Wejja)

⁵ For IRS, the project used 4,615 sachets and nine sachets were sent to other VL countries for insecticide resistance tests

Item Description		Unit	Opening Balance	Number Procured	Total Quantity in Stock	Quantity Used	Quantity Damaged	Quantity Available for Use
	Goizper Super Pump (10 Ltrs)	Pcs	515	150	665	665	0	665
	Handle (Triger)	Pcs	199	20	219	65	0	154
	Hose	Pcs	307	20	327	40	0	287
	Ik Super Service Kit	Set	45	20	65	17	0	48
	Lance Tube	Pcs	19	20	39	22	0	17
	Plunger	Pcs	17	20	37	26	0	11
	Pressure Regulator (Cfv)	Pcs	102	20	122	58	0	64
	Tube with Nuts 0.6m (Strainer)	Pcs	0	50	50	0	0	50
	Nozzle Protector	Pcs	0	50	50	0	0	50
	Nozzle Filter	Pcs	0	1000	1000	100	0	900
	Nozzle Tip	Pcs	1089	500	1589	113	0	1476
	Safety Valve	Pcs	0	50	50	0	0	50
	Tighten Chamber Tool	Pcs	0	7	7	0	0	7
<i>MOBILE SOAK PIT</i>								
	Activated Carbon (Charcoal 10 Kg)	Bag	8	13	21	0	0	21

TABLE A-2. IRS 2018 LOCALLY PROCURED ITEMS

Item Description		Unit	Opening Balance	Number Procured	Total Quantity in Stock	Quantity Used	Quantity Damaged	Quantity Available for Use
<i>PPE</i>								
	Apron	Pcs	104	23	127	127	5	122
	Boot	Pair	927	116	1043	976	128	915
	Cotton Socks	Pair	8	1638	1646	1618	0	28
	Life Jacket	Pcs	54	0	54	35	0	54
	Neck Cover	Pcs	1436	157	1593	1591	138	1455
<i>IRS REUSABLES</i>								
	Bathing Bucket	Pcs	76	8	84	73	25	59
	Calculator	Pcs	133	32	165	148	30	135
	Calibrated Cup	Pcs	22	0	22	21	3	19
	Danger Sign	Pcs	132	0	132	128	15	117
	Fire Extinguisher (Recharging)	Pcs	55	42	55	55	42	55
	Flash Light	Pcs	192	585	777	710	628	149
	Handwashing Bowl	Pcs	53	0	53	53	4	49
	Heavy Duty Brush	Pcs	42	14	56	43	30	26
	Megaphone	Pcs	21	3	24	24	1	23
	Mobilizers Vest	Pcs	0	900	900	798	159	745
	Public Address System	Set	15	0	15	15	1	14
	Pliers	Pcs	21	2	23	23	8	15
	Raincoat	Pcs	23	0	23	23	14	9
	Rinsing Barrels	Pcs	166	0	166	166	6	166
	Rope (Drying Line)	Pcs	33	0	33	33	4	29
	Sand Bucket	Pcs	28	0	28	28	0	28
	Screw Driver	Pcs	14	23	37	14	3	34
	Shifting Spanner	Pcs	25	0	25	23	3	22
	Shovel	Pcs	27	0	27	24	0	27
	Spray Bag	Pcs	451	377	828	724	55	773
	Spread Sheet	Pcs	95	728	823	676	676	147

Item Description		Unit	Opening Balance	Number Procured	Total Quantity in Stock	Quantity Used	Quantity Damaged	Quantity Available for Use
	Stop Watch	Pcs	18	3	21	21	0	21
	Tape measure	Pcs	21	0	21	21	4	17
	Thermometer	Pcs	23	9	32	29	3	29
	Wash Basin	Pcs	83	6	89	89	15	74
	Water Cup	Pcs	479	153	632	602	109	523
	Water Filter	Pcs	550	0	550	336	58	492
	Water Jug	Pcs	97	14	111	89	18	93
	Whistle	Pcs	54	8	62	40	20	42
	SAMSUNG CH@T 222	Pcs	5	0	5	0	0	5
	SAMSUNG GALAXY Pocket	Pcs	30	0	30	0	0	30
	HUAWEI Y3	Pcs	10	0	10	0	0	10
	HUAWEI Y5	Pcs	52	14	66	0	2	64
<i>IRS CONSUMABLES</i>								
	Antiseptic (Carmel 250ml)	Bottle	96	924	1020	1009	0	11
	Atropin Injection (1 Amp)	Pcs	0	470	470	430	0	40
	Bar Soap (Key Soap)	Pcs	24	704	728	698	0	30
	Bathing Soap (Geisha)	Pcs	129	1860	1989	1936	0	53
	Batteries (Dry Cell)	Pair	504	2068	2572	2087	0	485
	Chalk	Pck	4134	0	4134	3577	0	557
	Empty Sack	Pcs	166	94	260	134	0	126
	First Aid Kit	Set	22	88	110	96	0	14
	Liquid Soap	Pcs	56	74	130	44	0	86
	Nozzle Brush	Pcs	52	706	758	605	0	153
	Powdered Soap (Omo)	Sachet	114	860	974	889	0	85
	Sanitary Pad	Set	93	700	793	603	0	190
	Towel	Pcs	0	862	862	862	0	0
	Vitamin E Cream	Pcs	0	720	720	720	0	0

Item Description	Unit	Opening Balance	Number Procured	Total Quantity in Stock	Quantity Used	Quantity Damaged	Quantity Available for Use
<i>PRINT MATERIALS</i>							
Daily Spray Operator Card	Pcs	5107	20715	25822	22447	0	3375
Daily TL Summary/ DOS Form	Pcs	0	5520	5520	2534	0	286
Data Collection Verification Form	Pcs	150	800	950	312	0	638
Delivery Book	Booklet	23	26	49	24	0	25
Error Eliminator	Pcs	1148	9582	10730	5601	0	5129
Goods Receipt Note	Booklet	10	0	10	0	0	10
IEC IRS Brochure	Pcs	0	0	0	0	0	0
IEC IRS Steps Poster	Pcs	0	4,000	4,000	4,000	0	0
IEC Malaria Free Poster	Pcs	0	4,000	4,000	4,000	0	0
IRS HH ID No. Card and Plate	Pair	0	90,000	90,000	83,483	0	6,517
Ledger Book	Pcs	0	29	29	28	0	29
Mobilizer Card	Pcs	1700	5800	7500	6935	0	565
MSDS	Set	48	0	48	46	0	45
Performance Tracker	Pcs	0	21	21	21	0	0
PMI/AIRS Anti Sexual Harassment	Pcs	18	11	29	24	6	23
Request Book	Booklet	10	27	37	32	0	5
Spray Operator's Guide	Booklet	183	539	722	602	384	338
Storekeeper's Guide	Booklet	37	0	37	0	0	37
Spill Response Procedure	Set	49	0	49	42	7	42
Stock Card	Pcs	796	2239	3035	2685	0	350
Team Leader Guide	Booklet	258	0	258	48	36	222
USAID/ PMI Sticker	Pcs	0	1000	1000	250	0	750
Vehicle Log Book	Booklet	27	0	27	10	0	17
WD Storekeeper Poster	Pcs	0	0	0	0	0	0
				0			

Item Description		Unit	Opening Balance	Number Procured	Total Quantity in Stock	Quantity Used	Quantity Damaged	Quantity Available for Use
<i>MOBILE SOAK PIT</i>								
	Brush	Pcs	23	0	23	17	3	20
	Hoe	Pcs	11	0	11	11	1	10
	Mobile Soak Pit Carrier	Pcs	32	0	32	16	0	32
	Mobile Soak Pit Bucket (25ltrs)	Pcs	30	0	30	16	16	14
	Napkin (Wash Cloth)	Pcs	24	60	84	84	84	0
	Shovel	Pcs	12	0	12	12	0	12
	Tarpaulin (4mx4m)	Pcs	26	0	26	22	2	24
	Wash Basin (Boot Wash)	Pcs	31	0	31	29	1	30
	Water Barrel (60 Ltrs)	Pcs	72	0	72	59	4	63
	Water Cup	Pcs	25	0	25	25	2	23
	Waste Barrel (100 Ltrs)		17	0	17	17	0	17

ANNEX B. IMPACT OF BCC ON SHEA NUT COMMUNITIES

TABLE B-1. RESULTS OF IRS IN SHEA NUT COMMUNITIES, 2017 AND 2018⁶

District	Community	Structures Found		Structures Sprayed		Population Protected		Pregnant Women Protected		Children <5 Protected		Spray Coverage	
		2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018
Gushegu	Bulugu	433	392	386	363	1,204	1,226	27	29	257	244	89.10%	92.60%
Gushegu	Gbagu	215	217	192	216	565	656	13	14	118	142	89.30%	99.50%
Gushegu	Gbambu	97	0	68	0	272	0	9	0	77	0	70.10%	0.00%
Gushegu	Kpugi	358	316	283	306	974	934	21	28	221	184	79.10%	96.80%
Gushegu	Nakunga	467	489	358	433	1,270	1,416	42	40	262	282	76.70%	88.50%
Gushegu	Nawuni	56	49	51	33	191	124	5	2	42	20	91.10%	67.30%
Gushegu	Nayugu	620	434	531	348	1,688	1,070	44	37	391	211	85.60%	80.20%
Gushegu	Sugu	73	60	60	56	236	231	4	6	52	58	82.20%	93.30%
Gushegu	Vinli	80	35	67	26	189	59	4	0	32	16	83.80%	74.30%
Gushegu	Wantugu	347	380	275	352	993	1,139	15	28	222	199	79.30%	92.60%
Gushegu	Yawungu	252	204	142	191	556	598	11	12	116	109	56.30%	93.60%
Gushegu	Yishie	292	266	250	262	916	917	15	34	183	164	85.60%	98.50%

⁶ Following the communication intervention by GHS, DA and VL Ghana staff in the 18 communities, 17 decided to accept IRS. Only one community, Gbambu in GUD, made up of 97 structures declined IRS completely. Since behavior change takes time, both GHS and VL Ghana will continue working with these communities to allay worries they may still have in the coming year.

		Structures Found		Structures Sprayed		Population Protected		Pregnant Women Protected		Children <5 Protected		Spray Coverage	
Karaga	Komoayili	488	443	485	374	1,511	1,381	32	34	296	264	99.40%	84.40%
Karaga	Kpasablo	183	161	181	98	610	306	16	9	124	53	98.90%	60.90%
Karaga	Kuduli	25	28	25	22	70	57	0	0	18	10	100.00%	78.60%
Karaga	Nyengbolo	198	223	184	166	639	488	22	15	129	127	92.90%	74.40%
Karaga	Nyingali	232	209	210	173	725	539	11	11	147	130	90.50%	82.80%
Karaga	Shebo	134	112	118	106	383	361	6	6	72	75	88.10%	94.60%
Grand Total		4,550	4,018	3,866	3,525	12,992	11,502	297	305	2,759	2,288	84.97%	87.73%

ANNEX C: IRS ENVIRONMENTAL MITIGATION AND MONITORING REPORT

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
1a. Pre-contract inspection and certification of vehicles used for pesticide or spray team transport.	Pre-contract inspection and certification of vehicles for the 2018 spray campaign was conducted from April 21-23, 2018. All 48 vehicles contracted met all pre-contract criteria. Drivers' documents were also inspected to ensure that they met all requirements. All vehicles and drivers were certified.	99% of the Benz buses had problems with the speedometer and/or fuel gauge.	In future, VL Ghana will carry out initial vehicle inspections earlier in the preparation stage to have time to make needed repairs, especially with the Benz buses.
1b. Driver training	The project trained 48 contract drivers of rented vehicles in Tamale on April 22-23, 2018. Training topics included the driver's responsibility, and Abt Policy on Motor Vehicle Usage. The practical session involved spill response procedures and proper use of the vehicle log sheet.	No outstanding issues	VL Ghana trained and certificated 48 contract drivers and engaged them for the spray campaign period.
1c. Cell phone, personal protective equipment (PPE) and spill kits on board during pesticide transportation.	All 48 drivers had cell phones as a prerequisite for renting their vehicles. The drivers were given a set of PPE after the training to be used when transporting insecticides. Each vehicle was equipped with a spill response kit. Out of 591 morning mobilization and vehicle inspections conducted during the 2018 spray campaign, there were 97 instances of non-compliance. Corrective actions were taken before the vehicles were dispatched to the field.	No outstanding issues	Spill response kits, PPE, incident report forms, and Material Safety Data Sheet (MSDS) were provided after certification and training. Missing items were replaced prior to the end of the campaign. All drivers signed the Abt Policy on Motor Vehicle Usage during IRS and copies were kept in the vehicles throughout the campaign.
1d. Initial and 30-day pregnancy testing for female candidates for jobs with potential pesticide contact.	On April 3-6, 2018, prior to recruiting SOPs, the project conducted pregnancy tests for 227 female candidates for the positions of SOP, washer, and TL in six districts. The project conducted pregnancy tests on June 2, 2018, in MMD.	No outstanding issue	The second pregnancy test was conducted for MMD teams and the result was negative. The records are available on file.

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
1e. Health fitness testing for all operators.	Passing general physical fitness and medical examination is required for spray personnel. All potential candidates went through such examinations on April 3-6, 2018. Of the 848 candidates examined, 6 did not pass the exam and were declared unfit to undergo the training. The medical examination records are available on file.	No outstanding issue	The medical examinations were conducted by trained Medical Assistants from government health facilities in all seven IRS districts.
1f. Procurement of, distribution to, and training on the use of PPE for all workers with potential pesticide contact.	Both international and local procurements for PPE were done on time except for insecticides (Actellic and SumiShield). The PPE were received and distributed to all operational sites on March 30-April 3, 2018, prior to the start of spray. Also, all candidates with potential pesticides contact were completely trained on correct use of PPE and were subsequently given a complete set of PPE for use throughout the spray campaign.	No outstanding issues	The project did training on the use of PPE in handling pesticide before hiring: 22 storekeepers, 7 logistics assistants, 48 contract drivers, 120 TLs, 62 FSs, 21 Site Managers, 602 SOPs, and 56 washers. All these cadres had some contact with insecticides, and were provided with a complete set of PPE and trained.
1g. Training on mixing pesticides and the proper use and maintenance of spray pumps.	At the TOT and SOP trainings, DOCs, Supervisors, Site Managers, TLs, SOPs, and government officials in the targeted districts were trained on appropriate mixing of SumiShield 50WG and triple rinse of Actellic 300 CS bottles. The facilitators demonstrated the proper use and maintenance of spray pumps.	No outstanding issue	VL Ghana trained 103 people (DOCs, DEHOs, Site Managers and Supervisors, and Disease Control Officers) at the TOT, and 848 at SOP & TLs training on how to mix pesticides and maintain spray pumps.
1h. Provision of adequate facilities and supplies for end-of-day cleanup.	All 22 operational sites including the temporary site (Sandua) had adequate storage facilities that were either provided by District Assemblies or rented from an individual. Of all 527 end-of-day inspections of facilities, only 97 incidents of non-compliance were reported.	Sandua site is recommended for permanent site status.	All facilities were Inspected and met PMI BMP standards prior to the start of the spray campaign.
1i. Enforce spray and clean-up procedures.	All supervisors and site managers supervised end-of-day clean-up procedures throughout the spray campaign. Supervisors and TLs ensured that their teams washed up at the end of each day. Out of 527 end-of-day inspections conducted, there were only 7 instances of clean-up procedures not being observed by the TL. This was corrected by supervisors.	No outstanding issues	The COP, Operations Manager, ECO, DOCs, and site managers supervised clean-up procedures daily throughout the campaign.

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
2a. IEC campaigns to inform homeowners of responsibilities and precautions.	Prior to the start of spray campaign, IEC Assistants sensitized communities and households to their roles and responsibilities and the precautions they need to take, using house-to-house mobilization, community meetings, radio discussions, and jingles. Community mobilizers and SOPs were trained to inform homeowners about their roles and responsibilities before, during, and after spray, and protocols for household safety.	No outstanding issues	Mobilizers reminded homeowners about their responsibilities and precautions. Few households did not know some of the post-spray requirements. These issues were adequately addressed by the supervisors.
2b. Prohibition of spraying houses those are not properly prepared.	The 2018 trainings emphasized the importance of well-prepared rooms and spray technique. With the introduction of DOS, TLs increased inspections of structures before spraying was done. The VL Ghana team also helped to ensure proper preparation of structures before spraying through supervision and physical spot checks. Corrective measures were taken on unprepared rooms. SOPs were given two plastic spread sheets to cover bulky items that could not be moved out.	No outstanding issues	A total of 6,322 inspections of homeowner preparation and SOP performance were conducted. Inspectors observed only 38 instances of improper preparation of structures before spraying. Some food items were not removed or were not covered. These were corrected before spraying was done.
2c. Two-hour exclusion from house after spraying.	The SOPs reminded households to wait two hours after spraying before opening the rooms, and for circulation of air for at least 30 minutes before cleaning. Again, households were advised to mop their rooms, and wash their hands with soap and water after cleaning, and to bury dead insects and water used to mop the floor.	No outstanding issues	This message was repeatedly stressed in radio discussions and jingles played throughout the 2018 campaign.
2d. Instruct homeowners to wash itchy skin and go to health clinic if symptoms do not subside.	All homeowners were instructed to wash with plenty of water and soap if any household member experienced itchy skin, and report to the nearest clinic if itching persisted.	No outstanding issues	Forty two Medical Assistants including EPA staff were trained on insecticide poison management on March 22, 2018. In addition, VL Ghana supplied an antidote to all the health facilities except those in MMD, where SumiShield 50WG was used; there, MSDS was shared with the clinics
3a. Indoor spraying only.	The SOPs were trained to spray indoors and only eligible surfaces of sleeping rooms. These include behind the doors, inner walls, ceiling, and eaves (where applicable) of all sleeping rooms.	No outstanding issues	Spraying of recommended indoor surfaces only was stressed in all trainings. VL Ghana also sent out job aids at least three times a week to all SOPs and Supervisors on recommended spraying of surfaces.

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
3b. Training on proper spray technique.	VL Ghana continued to use a white cloth as an unmarked background wall for practical spray exercises for trainees to master the spray technique. During the TOT and SOP trainings, the project created obstacles for SOPs to maneuver around in spraying the rooms and still maintain perfection. Field simulation or "Live Fire" is a practical section in which SOPs practice the spray technique in a "real" structure that is identical in all features to the structures that will be sprayed during the spray campaign.	No outstanding issues	Trainers and supervisors emphasized the importance of keeping one meter distance from the sprayable surface; adherence of the nozzle tip at 45cm from the sprayable surface; spraying at the correct speed of 5 seconds for 2 meters of wall; and 5cm overlap of a swath.
3c. Maintenance of pumps.	At the TOT and SOP trainings, Supervisors, Site Managers, and TIs were trained in pump maintenance. Spray pumps were checked daily before use. Parts of spray pumps that were found to be faulty were replaced. Weekly lubrication and calibration of the spray pumps were carried out throughout the spray campaign.	No outstanding issues	Site managers and supervisors serviced and calibrated all pumps weekly. Each operational site had at least three spare pumps as a buffer.
4a. Choose sites for disposal of liquid wastes, including mobile soak pit sites, according to PMI BMPs.	The ECO visited and inspected all 22 operational sites including Sandua temporary site to ensure that they had met PMI BMP standards before certifying the sites for use. The ECO also inspected all 10 MSPs site locations prior to their installations.	No outstanding issues	A team of inspectors including the ECO, EPA representatives, and DEHOs participated in the certification of all sites.
4b. Construct fixed and mobile soak pits with charcoal to adsorb pesticide from rinse water.	The project maintained 23 MSPs during the campaign. All MSPs were stacked with GAC to absorb pesticide from the end-of-day clean-up. Also, all fixed soak pits were constructed with five layers of sawdust, charcoal, bigger stones, smaller stones, and gravel as the top layer in the appropriate dimensions of 2 ×1×1 meters. The wash areas were all sloped toward the bio bed. All construction was supervised by the ECO and EPA.	Eleven of the fixed soak pits are due for rehabilitation in 2019. They will be converted into the improved soak pits with pipe lines connected to the bio bed that has even distribution of affluent waste.	All MSPs were properly uninstalled and decommissioned at the end of the spray campaign. The GAC of these MSPs will be incinerated since they are at the end of an MSP life span.
4c. Maintain soak pits as necessary during season.	All soak pits were rehabilitated and properly maintained before and throughout the spray campaign. In old soak pits, where the bio bed is located in the middle of the wash area, tarpaulins were spread on the wash area to ensure that all liquid waste flowed into the bio bed. There were puddles and stagnant water reported in Bunkpurugu and Janga soak pits. These problems were fixed by the	Soak pits in Bunkprugu and Janga created puddles during the 2018 spray season; even though these were worked on, they are due for rehabilitation in 2019 among others.	Eleven soak pits are due for rehabilitation in 2019. These shall be converted to the new version with pipe lines connecting the wash area to the bio beds.

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
	ECO and DOCs.		
4d. Inspection and certification of solid waste disposal sites before spray campaign.	Site inspection visits will be made in July 2018 to the waste management companies to ascertain their status and readiness before making final selection of a service provider for 2018 solid waste disposal. The companies are Cyclus Elmina Plastic Recycling Ltd, ZOOMPAK Ltd, Zoil Services Ltd, Tema Steel Co Ltd, and other companies that recycle paper.	No outstanding issues	VL Ghana will ensure that the recycling companies have the capacity to recycle and incinerate all 2018 solid wastes.
4e. Monitoring waste storage and management during campaign.	All store assistants clearly labeled sacks/boxes for collecting used nose masks, hand gloves, and all other waste. Contaminated materials were bagged separately from non-contaminated items, in accordance with BMP standards. The team stored and managed all solid waste generated during the spray campaign.	All triple-rinsed empty bottles and sachets were stored at Langbinsi site (EMD) and the central warehouse in Tamale. In August 2018, the project will move the waste to the identified certified waste management companies for final disposal.	VL Ghana retrieved and accounted for all bottles and sachets using insecticide tracking sheets, and reconciled the results with the TLs. VL Ghana signed a memorandum of understanding (MOU) with two waste management companies to recycle these solid waste.
4f. Monitoring disposal procedures post-campaign.	The ECO and EPA representative will supervise and monitor the post-spray campaign solid waste disposal procedure. Waste disposal most likely will be done at Cyclus and/or Zoil Services Ltd.	This is anticipated to be done in late August.	The project signed an MOU with these companies
5a. Maintain records of all pesticide receipts, issuance, and return of empty sachets/bottles.	All logistics assistants and store assistants kept records of all insecticide receipts, issuance, and returned empties on stock cards with a back-up in a ledger book at the regional, district, and operational site stores.	No outstanding issues	All ledger and stock cards were always updated and verified by the ECO and other Regional supervisors during monitoring and supervision.
5b. Reconciliation of number of houses sprayed vs. number of sachets/bottles used.	The average number of structures sprayed per bottle/sachet was 4.6. This was calculated every day throughout the spray campaign to ensure that insecticide usage was consistent with number of structures sprayed.	No outstanding issues	The number of structures sprayed per bottles/sachets used was tracked using the Performance Tracking Sheet and the database on daily basis.

Mitigation Measure	Status of Mitigation Measures	Outstanding issues relating to required conditions	Remarks
5c. Visual examination of houses sprayed to confirm pesticide application.	The regional team, district M&E team, TLs, and FSS performed regular spot checks in sprayed houses to verify and confirm insecticide application. This was mainly done through visual examination of sprayed walls, eaves, and ceilings.	In MMD where SumiShield was sprayed, unlike Actellic, evidence of spraying on wall is not visible. SumiShield does leave a residue on the wall. SumiShield was somewhat visible on painted walls, very faint traces can be seen on mud surfaces and, nothing or almost nothing on cement walls	All supervisors were key in checking the quality of spray by direct observation (DOS) of the SOPs.
5d. Perform physical inventory counts during the spray season.	ECO and other supervisors conducted regular physical counts of randomly selected inventory items by using the storekeeper performance checklist to verify the stocks. In all, 44 store inspections were carried out during the campaign. Only five “red flags” were raised in 2018.	No outstanding issues	All items stored had stock cards. ECO and Logistics and Procurement Coordinators checked and verified the stock cards and used the data for final inventory reconciliation.

ANNEX D: DATA QUALITY ASSURANCE AND CONTROL METHODS

Issue	Method/Tools for Quality Assurance
Mobilization data integrity	<ul style="list-style-type: none"> • Use of standardized data collection forms. • Comprehensive training for mobilization data capture. • Multiple levels of supervision. • Household visits for spot checks. • Database designed with locks and validation checks. • Use of EE to ensure complete and accurate data collection.
Spray data integrity	<ul style="list-style-type: none"> • Use of standardized data collection forms. • Comprehensive training for spray data capture. • Multiple levels of supervision. • SOPs supervised directly by their TLs. • Supervisors monitored the TLs and verified SOP forms. • M&E Manager, Database Manager, and District M&E Coordinators monitor and verified data captured by SOPs, TLs, and Supervisors. • Structure spot checks to cross-check daily spray data captured by SOPs. • Database designed with locks and validation checks. • Use of EE and DCV forms to ensure complete and accurate data collection. • Compared number of compounds sprayed with number of compounds mobilized, to address any issues with missed compounds.
Spray data entry and management	<ul style="list-style-type: none"> • Data entry training for all Data Entry Assistants. • Prompt (daily) field data entry and transfer. • Data entry via double-data-entry method: • Initial data entry of totals per data collection form within 12 hours after spray • Follow-up entry of details data, i.e., data per individual household/compound, within 24 hours after spray • Data scan for irregularities by Database Manager and IRS supervisory staff. • Use of Microsoft Access-based IRS Cleaning/Reporting tool to clean data daily.
Data security	<ul style="list-style-type: none"> • Data collection forms printed on durable sheets. • Paper data collection forms filed systematically in arc files. • Database designed with passwords to restrict unauthorized entry. • Databases backed up daily on the server laptop, Dropbox, and external drives.

ANNEX E. 2018 VL GHANA INDICATOR MATRIX

	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
1.1	<i>Successfully execute IRS and other malaria vector control programs</i>												
1.1.1	Annual country work plan developed and submitted on time	Project records Annually		Completed	Completed	Completed		Completed		Completed		Completed	
1.1.2	Number of eligible structures targeted for spraying	Project records Annually		324,115 ⁷	324,704 ⁸	TBD		TBD		TBD		TBD	
1.1.3	Number of eligible structures sprayed with IRS	Project records Annually		275,498 ⁹	298,701	TBD		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		85%	92.0%	85%		85%		85%		85%	
1.1.4b	Percentage of total structures targeted for spraying that were sprayed with a residual insecticide, per Ghana NMCP guidelines ¹⁰	Project records Annually		90%	92.0%								

⁷ Based on structures found during 2017 AIRS spray campaign

⁸ Based of structures found by SOPs in 2018

⁹ Based on 85% of 1.1.2

¹⁰ Ghana-specific indicator; added per NMCP coverage threshold established for IRS implementing partners; as this is a Government of Ghana (non-PMI) indicator, VectorLink is not contractually obligated to meet this threshold

	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
1.1.5	Number of people protected by IRS	Project records Annually	Sex Pregnant women Children <5	874,608 ¹¹	836,376 18,397 pregnant women 148,627 children <5	TBD		TBD		TBD		TBD	
1.1.6	EOSR submitted within 45 days after the end of spray (including completing MEP and EMMR)	Project Annually		Completed	Completed	Completed		Completed		Completed		Completed	
1.1.7	Post-spray Data Quality Audit conducted within 90 days of spray completion	Data Collection Forms Annually		N/A	N/A	Completed		N/A		Completed		N/A	
1.1.8	Number of Insecticide Treated Nets (ITNs) distributed, by channel	Project Records Annually	Channel	N/A	N/A	TBD		TBD		TBD		TBD	
1.1.9	Conducted at least one process assessment of the quality of ITN distribution planning, the quality of household registration, and/or ITN distribution implementation during a mass ITN distribution campaign	Project Records Annually	Channel	N/A	N/A	TBD		TBD		TBD		TBD	
1.1.10	Operational routine monitoring systems for continuous ITN distribution established and disaggregated by channel	Project Records Annually	Channel	N/A	N/A	TBD		TBD		TBD		TBD	
1.1.11	ITN durability	Project		N/A	N/A	TBD		TBD		TBD		TBD	

¹¹ Made up of population protected (840,438) and population not protected (34,170) during the 2017 AIRS spray campaign.

	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
	monitoring data collection completed on time as planned in a given project year	Records Annually											
1.2	<i>Provide technical assistance and planning support for IRS and other integrated malaria vector control activities</i>												
1.2.1	Number of VC project training workshops targeting NMCP and other host country staff	Project Training Records Annually	Technical Area Job Function	N/A	N/A	TBD		TBD		TBD		TBD	
1.2.2	Number of NMCP and other vector control host country staff accessing DHIS2	DHIS2 Logs Annually	Job Function	N/A	N/A	TBD		TBD		TBD		TBD	
1.3	<i>Ensure safe and judicious use of insecticides and other malaria vector control products</i>												
1.3.1	Number of vector control personnel trained in environmental compliance and personal safety standards in vector control implementation	Project Training Records Annually	Sex (# and %) Job Function	893 ¹²	874 ¹³ 713 male, 161 female	TBD		TBD		TBD		TBD	
1.3.2	Number of health workers receiving insecticide poisoning case management training	Project Training Records Annually	Sex (# and %)	42	41 33 males (80.5%); 8 females (19.5%)	TBD		TBD		TBD		TBD	
1.3.3	Number of adverse reactions to pesticide exposure documented	Incident Report Forms Annually	Type of Exposure	0	0	0		0		0		0	
1.4	<i>Strengthen capacity of NMCPs, vector control personnel, and other institutions to implement and manage IRS and other vector control activities</i>												
1.4.1	Total number of people	Project	Sex (# and %)	856 ¹⁴	837 ¹⁵			TBD		TBD		TBD	

¹² SOPs (660), Team Leaders (132), Field Supervisors (64), Site Managers (21) Disease Control Officers & DEHOs (14), EPA Rep (2)

¹³ SOPs (644), Team Leaders (127), Field Supervisors (66), Site Managers (21), DOCs (3), Disease Control Officers (7), DEHOs (5), EPA Rep (1)

¹⁴ SOPs (660), TLs (132), Field Supervisors (64); IRS only

	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
	trained to support VC in targeted areas	Training Records Annually	Job Function VC Intervention Type		677 male, 160 female	TBD							
1.4.2	Number of people trained during IRS Training of Trainers	Project Training Records Annually	Sex (# and %)	106	103 96 males (93.2%) 7 females (6.8%)	TBD		TBD		TBD		TBD	
1.4.3	Total number of people hired to support VC in target districts	Project Records Annually	Sex (# and %) Job Function VC Intervention Type	2,248 ¹⁶	2,447 ¹⁷ 2,067 males (84.5%) 380 females (15.5%)	TBD		TBD		TBD		TBD	
1.4.4	Number of government/district officials who acted as supervisors during VC campaigns	Project Records Annually	VC Intervention Type	43 ¹⁸	22 ¹⁹	TBD		TBD		TBD		TBD	
1.5	<i>Promote gender equality in all facets of planning and implementation</i>												
1.5.1	Number of women hired to support VC campaigns	Project Records Annually	% of Returning female seasonal workers hired in a more senior	773; 20%	380; 13% ²⁰⁾	TBD		TBD		TBD		TBD	

¹⁵ SOPs (644), TLs (127), Field Supervisors (66); IRS only

¹⁶ Refer to indicator 1.4.1 less Gov staff (83), buffer(45) Drivers (48) and Security Guards (45)

¹⁷ DOCs (3), Data Entry Assistants (23), Finance Assistants (7), IEC Assistants (24), Logistics Assistants (7), Store Assistants (22), Mobilizers (1,143), Security Officers (47), Site Managers (21), SOPs (602), Field Supervisors (63), TL (121), Washers (57), Water Fetchers (20), M&E Assistants (11), Packers (140), Entomology Assistants (136)

¹⁸ District Information Officers (7), District Communication/Health Promotion Officers (7), District Entomology Team (5), DEHOs (7), District Store Officers (7), Disease Control Officers (7), EPA-national (1), National Malaria Control (1) and GHS Regional Directorate (1)

¹⁹ DEHOs (6), EMD DEHO did not work, Disease Control Officer (IRS and Entomological Supervision; 7), Environmental Protection Agency (1), District Communication/Health Promotion Officers (7) and Community Health Nurse (Entomological Supervision; 1)

²⁰ Hired in a more senior capacity: 11 SOPs to TLs, one DEA to M&E Assistant, and one Store Assistant to Logistic Assistant.

	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
			capacity										
1.5.2	Number and percentage of women hired in supervisory roles in target areas for vector control activities	Project Records Annually	VC Intervention Type Job Function	51 ²¹ ;16%	36 ²² ;14.2%	TBD		TBD		TBD		TBD	
1.5.3	Number and percentage of staff (permanent and seasonal) who have completed gender awareness training	Project Training Records Annually	Sex Job Function	864 ²³ ; 100%	874 ²⁴ 713 males (81.6%) 161 females (18.4%) 101.2%	TBD; 100%		TBD; 100%		TBD; 100%		TBD; 100%	
1.5.4	Number and percentage of women in senior leadership roles in VectorLink country offices	Project Records Annually	Sex (# and %)	N/A	N/A	N/A		N/A		N/A		N/A	
1.6	<i>Implement and support social behavioral change communication and mobilization activities</i>												
1.6.1	Number of radio spots and talk shows aired	Project Records Annually	VC Intervention Type	900	840	TBD		TBD		TBD		TBD	
1.6.2	Number of print materials disseminated	Project Records Annually	VC Intervention Type	4,000 ²⁵	8,000 ²⁶	TBD		TBD		TBD		TBD	
1.6.3	Number of people	Project	VC Intervention	437,304 ²⁷	274,055	TBD		TBD		TBD		TBD	

²¹ 20% of total anticipated supervisors. Total expected for supervisory role is 256 (District Operations Coordinators 7, Information, Education Communication Assists 24, Team Leaders 120, M&E Assistants 11, Field Supervisors 66, Logistics Assistants 7 and Site Managers 21)

²² DOC (1), M&E Assistant (1), IEC Assistants (2), TLs (25), Field Supervisors (5), Logistic Assistant (2); Total Supervisors hired (254)

²³ For TOT, TL and SOP trainings

²⁴ DOCs (3), Disease Control Officers (7), DEHOs (5), EPA Rep. (1), Field Supervisors (66), Site Managers (21), TLs (127), and SOPs (644)

²⁵ For IRS only

²⁶ For IRS only

	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
	reached with vector control and/or SBCC messages via door-to-door messaging	Records Annually	Type Sex		121,672 males (44.4%) 152,383 females (55.6%)								
1.6.4	Number and percentage of people who feel that the proposed action (sleeping under an ITN/accepting IRS) will reduce their risk of malaria	Project Records Annually		N/A	N/A	TBD		TBD		TBD		TBD	
1.6.5	Number and percentage of people with a favorable attitude toward the practice/product (i.e., ITNs, IRS)	Project Records Annually	VC Intervention Type	N/A	N/A	TBD		TBD		TBD		TBD	
1.6.6	Number and percentage of people who believe that the majority of their friends and community members practice the behavior	Project Records Annually	VC Intervention Type	N/A	N/A	TBD		TBD		TBD		TBD	
1.7	<i>Environmental compliance</i>												
1.7.1	SEA (with EMMPs) or Letter Report submitted at least 60 days prior to the commencement of vector control campaigns	Project Records Annually		Completed	Completed	Completed		Completed		Completed		Completed	
1.7.2	Number and percentage of permanent and mobile soak pits	Project Records	Soak Pit Type	39; 100% PSP: 22 ²⁸ ; MSP: 17 ²⁹	39;100% PSP: 22	TBD; 100%		TBD; 100%		TBD; 100%		TBD; 100%	

²⁷ Targeting 50% of population found (ref indicator 1.1.5) in 2017

²⁸ 21 Permanent Soak Pits (PSP), one in each operational site; one temporary soak pit at Sandua camping site (KAD)

	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
	inspected and approved prior to IRS campaigns	Annually			MSP: 17								
1.7.3	Number and percentage of storehouses inspected and approved prior to IRS campaigns	Project Records Annually	Storehouse Type	22 ³⁰ ; 100%	22;100%	22 ³¹ ;100%		TBD; 100%		TBD; 100%		TBD; 100%	
1.7.4	Number and percentage of fixed soak pits that are compliant with PMI's Best Management Practices	Project Records Annually		22 ³² ; 100%	22;100%	TBD; 100%		TBD; 100%		TBD; 100%		TBD; 100%	
2.1	<i>Vector control activities monitored via entomological and epidemiological data</i>												
2.1.1	Number and percentage of project-supported entomological sentinel sites established to monitor vector bionomics and behavior (vector species, distribution, seasonality, feeding time, and location)	Entomological Reports Annually	VC Intervention Type	20; 100%	Ongoing ³³	TBD; 100%		TBD; 100%		TBD; 100%		TBD; 100%	
2.1.2	Number and percentage of entomological monitoring sentinel sites measuring all five basic PMI entomological monitoring indicators	Entomological Reports Annually	VC Intervention	7 ³⁴ ; 35%	Ongoing	TBD		TBD		TBD;		TBD	

²⁹ BYD (1), EMD (4), WMD (3), MMD (1), KD (Singa camping site; 5), GD (1) and KAD (2)

³⁰ 21 stores in all operational sites plus 1 Sandua (KAD) camping site store

³¹ Same as above

³² Ref to 1.7.2

³³ For IRS only

³⁴ For IRS only; 7 out of the total 20 sites will measure all five basic PMI entomological indicators

	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
	(i.e., species composition, abundance, and seasonality of malaria vector; insecticide susceptibility and resistance intensity; mechanism of resistance; quality assurance and residual efficacy monitoring of IRS programs; or vector behavior: feeding time & location)												
2.1.3	Number and percentage of entomological monitoring sentinel sites measuring at least one advanced PMI indicator (i.e., identification of mosquito infectivity; parity rates; or blood-meal analysis)	Entomological Reports Annually	VC Intervention	20; 100%	Ongoing ³⁵	TBD; 100%		TBD; 100%		TBD; 100%		TBD; 100%	
2.1.4	Number and percentage of insecticide resistance testing sites that tested at least one insecticide from pyrethroid, organophosphate, carbamate, clothianidin, and chlorfenapyr insecticides	Entomological Reports Annually	Insecticide Type	14; 100%	Ongoing	TBD; 100%		TBD; 100%		TBD; 100%		TBD; 100%	
2.1.5	Number of wall bioassays conducted within 2 weeks of spraying to evaluate the quality of IRS	Entomological Reports Annually		56	72	TBD		TBD		TBD		TBD	
2.1.6	Number and percentage	Entomological		56 ³⁶ ;100%;	72; 100%	TBD		TBD		TBD		TBD	

³⁵ For IRS only

	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
	of cone bioassays conducted within two weeks of spraying with greater than 98% test mortality recorded	Reports Annually											
2.1.7	Number of wall bioassays conducted after the completion of spraying at monthly intervals to evaluate insecticide decay	Entomological Reports Annually	Insecticide Type	224 ³⁷	64 ³⁸	TBD		TBD		TBD		TBD	
2.1.8	Number of vector susceptibility tests for different insecticides conducted in selected sentinel sites	Entomological Reports Annually	Insecticide Type	56 ³⁹	9 ⁴⁰	TBD		TBD		TBD		TBD	
2.1.9	Integrated vector control analytics dashboard available for decision making	Project Records Annually		N/A	N/A	TBD		TBD		TBD		TBD	
2.1.10	Number of staff (VectorLink-contracted or non-VectorLink) trained in entomological monitoring	Project Training Records Annually	Sex (# and %) Job Function	80 ⁴¹	74 ⁴² 71 males (95.9%) 3 females (4.1%)	TBD		TBD		TBD		TBD	

³⁶ Refer to Indicator 2.1.5

³⁷ 7 Communities, 4 test per community for 8 months (7x4x8)

³⁸ Number of conducted tests as of July 11, 2018; testing is ongoing at the time of report submission. All T1 & T2 tests done are for Actellic 300cs, T1 tests for Clothianidin yet to be completed.

³⁹ 14 sites, 4 tests per site, one insecticide per each of four classes

⁴⁰ Tests are done in the rainy season for: 4 Pirimiphos methyl 0.25% (4), 3 Alpha-cypermethrin 0.05% (3), 1 Bendiocarb 0.1% (1), and Clothianidin 13.2µg (1); testing is ongoing at the time of the report submission.

⁴¹ Non-project staff

⁴² Entomology data collectors (74)

	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
2.2	<i>NMCPs develop country-level IRS and other malaria vector control strategies</i>												
2.2.1	Developed an integrated malaria vector control strategy, including a plan for monitoring and managing insecticide resistance supported by the project	Project Records Annually		1	in progress	TBD		TBD		TBD		TBD	
2.2.2	Completed integrated data and visualization landscaping for vector control decision making	Project Records Annually		N/A	N/A	TBD		TBD		TBD		TBD	
2.2.3	Implemented sub-national insecticide rotation as part of an IRM strategy	Project Records Annually		N/A	N/A	TBD		TBD		TBD		TBD	
2.3	<i>Build capacity of NMCPs and local institutions to collect, analyze, and use data for strategic malaria control decision-making</i>												
2.3.1	Number of individuals trained from NMCPs and national institutions to review and interpret data for integrated vector control decision making	Project Training Records Annually	Job Function Organization	TBD	N/A	TBD		TBD		TBD		TBD	
2.3.2	Proportion of targeted individuals who report using new analytical tools and/or skills in their planning, resourcing, implementation, or measurement activities	Capacity Assessments Thrice Over Project Life	Job Function Organization	N/A	N/A	TBD		TBD		TBD		TBD	
3.1	<i>Cost-effective procurement mechanism established</i>												
3.1.1	Number and percentage of insecticide procurements that had a pre-shipment QA/QC test at least 60 days prior	Procurement Records Annually	Insecticide Type	1; 100%	1; 100%	TBD; 100%		TBD; 100%		TBD; 100%		TBD; 100%	

	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
	to spray campaign												
3.1.2	Number and percentage of insecticide procurements received on-time to allow for the initiation of spray operations as scheduled	Procurement Records Annually	Insecticide Type	3 ⁴³ ; 100%	1 ⁴⁴ ; 33.3%	TBD; 100%		TBD; 100%		TBD; 100%		TBD; 100%	
3.1.3	Number and percentage of international equipment procurements, including PPE, received on time to allow for the initiation of vector control campaigns as scheduled	Procurement Records Annually	VC Intervention Type	2 ⁴⁵ ; 100%	3 ⁴⁶ ; 100%	TBD; 100%		TBD; 100%		TBD; 100%		TBD; 100%	
3.1.4	Number and percentage of local procurements for PPE received on time to allow for the initiation of spray operations as scheduled	Procurement Records Annually		4 ⁴⁷ ; 100%	4; 100%	16; 100%		TBD; 100%		TBD; 100%		TBD; 100%	
3.1.5	PPE procured according to workforce composition	Procurement Records Annually		N/A	N/A	Completed		Completed		Completed		Completed	
3.2	<i>Robust inventory management and logistics systems established</i>												
3.2.1	Number and percentage	Project	VC Intervention	31 ⁴⁸ ; 100%	31 ⁴⁹ ; 100%	TBD;		TBD;		TBD;		TBD;	

⁴³ 1 procurement (Actellic CS300) arriving in two shipments; 1 donation (i.e., not procured by VectorLink Ghana) of SumiShield 50WG

⁴⁴ 1 shipment of Actellic CS300 arrived on time to allow for the initiation of VL campaign. 2nd shipment of Actellic CS300 and SumiShield 50WG arrived during the course of the campaign

⁴⁵ IRS only; Goizper (1), PPE (1)

⁴⁶ IRS only; Goizper pump and Accessories (1), PPE (1) and Activated Charcoal (1)

⁴⁷ Rubber boot (1), Neck cover (1), Apron (1) and Cotton socks (1)

⁴⁸ IRS only; Store Assistants (24) and Logistics Assistants (7). SumiShield 50WG was stored at the 2 MMD stores. Actellic was stored in the rest of the 20 stores

	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
	of logistics and warehouse managers trained in vector control supply chain management	Training Records Annually	Type Sex (# & %)		12 males (38.7%) 19 females (61.3%)	100%		100%		100%		100%	
3.2.2	Number and percentage of operations site warehouses where physical inventories can be verified by daily stock records	Inventory and Stock Records Annually	Insecticide Type	22 ⁵⁰ ; 100%	22; 100%	TBD; 100%		TBD; 100%		TBD; 100%		TBD; 100%	
3.2.3	Successfully completed spray operations without an insecticide stock-out	Inventory and Stock Records Annually	Insecticide Type	Completed ⁵¹	Completed	Completed		Completed		Completed		Completed	
4.1	<i>Conduct operational research or monitoring to scale up new tools, methods, and approaches</i>												
4.1.1	Number of operational research studies on promising new tools or new methods/approaches to existing tools that are implemented	Project Records Annually	Type of Innovation	1 ⁵²	In progress	TBD		TBD		TBD		TBD	
4.2	<i>Create and share knowledge through dissemination of best practices and lessons learned</i>												
4.2.1	Number of innovations, best practices, and other data or lessons learned	Project Records	Technical Area	1 ⁵³	1 ⁵⁴	TBD		TBD		TBD		TBD	

⁴⁹ Logistic Assistant 7 (Female 2), Store Assistant 24 (Female 17)

⁵⁰ Actellic 300 CS (20); Sumishield 50WG (2).

⁵¹ Actellic 300CS (0 stock-outs); Sumishield 50WG (0 stock-outs)

⁵² CORE-funded operational research on partial spraying of wall surfaces

⁵³ BCC

⁵⁴ Presentation of the project BCC-driven impact on acceptance of IRS at the International SBCC summit at Indonesia in April 2018

	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
	shared with other partners or international institutions for global reporting on the Vector Learning Exchange	Annually											
4.2.2	Number of individual members who use the Vector Learning Exchange	Project Records Annually	N/A	3	3	TBD		TBD		TBD		TBD	
4.2.3	Number of symposia and/or presentations submitted to and accepted at global conferences	Project Records Annually	Technical Area	1	TBD ⁵⁵	TBD		TBD		TBD		TBD	
4.2.4	Number of success stories written or videos produced and shared on the VectorLink project website	Project Records Annually		1	In progress	TBD		TBD		TBD		TBD	
4.2.5	Number of peer-reviewed journal articles submitted and accepted	Project Records Annually	Technical Area	0	0	TBD		TBD		TBD		TBD	
4.2.6	Number of critical guidance, standards, or plans that incorporate disseminated findings/best practices	Project Records Annually	Technical Area	N/A	N/A	TBD		TBD		TBD		TBD	
4.3	<i>Develop and deploy cost-savings approaches</i>												
4.3.1	Number of innovative or novel approaches implemented to achieve cost savings in IRS and integrated malaria vector	Project Records Annually	VC Intervention Type	1 ⁵⁶	1 ⁵⁷	TBD		TBD		TBD		TBD	

⁵⁵ PAMCA (entomology) abstract submission pending

⁵⁶ IRS only

⁵⁷ One-time in project lifetime installation of a metal plate with IRS identification number at each targeted household

	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation(s)	Annual Targets and Results									
				Year 1		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
	control programs												
4.3.2	Number of cost effectiveness assessments of existing approaches in the implementation of IRS and integrated malaria vector control programs	Project Records Annually	VC Intervention Type	N/A	N/A	TBD		TBD		TBD		TBD	
4.4	<i>Cultivate public-private partnerships</i>												
4.4.1	Number of private sector entities engaged with to establish public-private partnerships to increase the quality and coverage of malaria vector control activities globally	Project Records Annually	Private Sector Organization	0	0	TBD		TBD		TBD		TBD	