



U.S. PRESIDENT'S MALARIA INITIATIVE



THE PMI VECTORLINK PROJECT ANNUAL REPORT

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ACRONYMS

AGAMal	AngloGold Ashanti Malaria Control Limited
AIRS	Africa Indoor Residual Spraying Project
BAO	BAO Systems
CDC	U.S. Centers for Disease Control and Prevention
CI	Côte d'Ivoire
COP	Chief of Party
CS	Capsule Suspension
CSRS	Swiss Center for Scientific Research
DDT	Dichlorodiphenyltrichloroethane
DFID	Department for International Development UK
DHIS2	District Health Information Software 2
DRC	Democratic Republic of the Congo
ECO	Environmental Compliance Officer
ELISA-CSP	Enzyme-linked immunosorbent assay circumsporozoite protein
EOSR	End of Spray Report
HLC	Human Landing Catch
HBR	Human Biting Rate
HQ	Headquarters
IEC	Information, Education, and Communication
IRD	Research Institute for Development
IRS	Indoor Residual Spraying
INRB	National Institute of Biomedical Research
IPD	Institut Pasteur de Dakar
IRB	Institutional Review Board
IRM	Insecticide Resistance Management
IVCS	Integrated Vector Control Strategy
LIBR	Liberia Institute for Biomedical Research
LLIN	Long Lasting Insecticide-treated Net
MOP	Malaria Operational Plan
MOH	Ministry of Health
MOPDD	Malaria and Other Parasitic Diseases Division
M&E	Monitoring and Evaluation
NgenIRS	Next Generation Indoor Residual Spray
NMCP	National Malaria Control Program
NMEP	National Malaria Elimination Program

PAMCA	Pan African Mosquito Control Association
PBO	Piperonyl-butoxide
PMI	President's Malaria Initiative
PSECA	Pre-spray Environmental Compliance Assessment
PSC	Pyrethrum Spray Catch
PSI	Population Services International
SBCC	Social and Behavior Change Communication
SOP	Spray Operator
STTA	Short Term Technical Assistance
UCAD	University Cheikh Anta Diop
USG	U.S Government
USAID	United States Agency for International Development
WHO	World Health Organization
VL	VectorLink
VLE	Vector LearningXchange
ZAMEP	Zanzibar Malaria Elimination Program

EXECUTIVE SUMMARY

The U. S. President's Malaria Initiative (PMI) VectorLink Project, funded by the United States Agency for International Development (USAID) through PMI, was awarded to Abt Associates on September 30, 2017. The PMI VectorLink Project (VL) builds on the indoor residual spraying (IRS) campaigns and entomological monitoring activities implemented under the predecessor PMI Africa Indoor Residual Spraying (AIRS) project in 17 African countries with an expanded scope to implement integrated malaria vector control activities. In Year 1 (October 1, 2017 to September 30, 2018), VL transitioned 18 countries from the AIRS mechanism to VL with no interruptions, restarted IRS operations in Malawi and Burkina Faso, and began entomological monitoring activities in five new PMI countries (Cambodia, Cameroon, Côte d'Ivoire, Niger, and Sierra Leone).

In Year 1, VL successfully implemented IRS campaigns in Benin, Burkina Faso, Ethiopia, Ghana, Madagascar Mali, Rwanda, and Uganda. More than 12 million people were protected from malaria during this period. Details regarding all monitoring and evaluation (M&E) outcomes by country are reported in Annex A.

TOP-LINE RESULTS FROM IRS CAMPAIGNS, OCT 2017-SEPT 2018

- 93.6% spray coverage
- 3,647,656 structures sprayed
- 12,407,591 people protected from malaria including:
 - 339,501 pregnant women
 - 2,022,752 children under 5 years of age
- 25,468 people trained to deliver IRS using United States Government funds

HIGHLIGHTS FROM THIS REPORTING PERIOD

- Successfully implemented eight IRS campaigns, including VL Burkina Faso's first IRS campaign since 2012, protecting more than 12 million people cumulatively.
- Began using a new insecticide for IRS, SumiShield (clothianidin, which is in the neonicotinoid class), and provided initial residual efficacy data.
- Engaged with Digital Globe to use satellite imagery in Ghana and Zimbabwe to improve spray coverage.
- Facilitated a regional entomology training for 16 technical managers and one NMCP representative of each of the new PMI countries (Côte d'Ivoire, Sierra Leone, Niger, Cameroon).
- Identified key barriers in Mozambique, Zambia and Zimbabwe that have led to documented challenges with mobilization for and/or refusals of IRS and proposed strategies to mitigate them.
- Conducted long-lasting insecticide-treated net (LLIN) distribution assessments in Burkina Faso, Cameroon and Niger and prepared for LLIN durability monitoring studies in Madagascar and Niger.
- Launched VL data analytics and visualization with Zambia as the first project country.
- Participated in and helped with the coordination of three regional NgenIRS workshops on forecasting and quantification of insecticide needs for 15 countries for the 2019 IRS campaigns.

I. COUNTRY HIGHLIGHTS

I.1 BENIN

TABLE 1: VL BENIN AT A GLANCE

Number of districts covered by PMI-supported IRS	Eight districts in three departments: Donga (Djougou, Copargo, Ouaké), Atacora (Kérou, Péhunco) and Alibori (Kandi, Gogonou, Segbana)
Insecticide	Actellic 300 CS
Number of structures sprayed by PMI-supported IRS	400,997
Number of structures found by PMI-supported IRS	442,548
Spray coverage	90.6%
Population protected by PMI-supported IRS	1,321,758 (58,086 pregnant women; 269,164 children under 5 years old)
Dates of PMI-supported IRS campaign	April 30 – May 23, 2018 (Djougou, Copargo, Ouake, Kerou and Pehunco) May 10 – June 02, 2018 (Kandi, Gogonou and Segbana)
Length of campaign	21 operational days
Number of people trained with U.S. government funds to deliver IRS*	2,229

*This is based on the PMI indicator definition. It includes only spray staff such as spray operators, team leaders, supervisors, and clinicians. It excludes data clerks, IEC mobilizers, drivers, washers, porters, pump technicians, and security guards.

I.1.1 PROGRAM HIGHLIGHTS

- The PMI AIRS Benin program transitioned to VL on January 1.
- The 2018 spray campaign was conducted over 21 operational days in eight districts. The project used 62,841 bottles of Actellic to spray 400,997 structures in eight IRS districts, with a utilization ratio of approximately 6.4 structures sprayed per bottle of insecticide.
- Global Environmental Management Services conducted an environmental compliance audit in May 2018. The audit found no significant environmental compliance or management issues within the program.
- A review meeting with district level authorities was organized (September 12-14) in Kandi and Djougou to present and discuss the 2018 IRS campaign results at the departmental level. The meetings provided an opportunity to share lessons learned and make recommendations for the 2019 IRS campaign.
- A prototype of Goizper IK-Smart Light, a device to guide spray operators during training and IRS in order to acquire the correct spray technique and to verify their performance, was tested in April 2018 using a group of 10 spray operators. Within one hour of training, all of the spray operators improved their spray techniques and used the correct spray speed and distance.
- Results of the wall bioassay tests conducted one week after spraying with Pirmiphos-methyl showed good results (100% mortality of the sensitive strain exposed to the treated surface) regardless of the position of the cones on the treated walls in the sampled villages of the sprayed areas; this indicated good spray quality. However, residual efficacy fell below 90% mortality, three months after spraying, in August 2018.

1.2 BURKINA FASO

TABLE 2: VL BURKINA FASO AT A GLANCE

Number of districts covered by PMI-supported IRS	Three districts (Kampti, Kongoussi and Solenzo)
Insecticide	Actellic CS300 (Kongoussi and Solenzo) and SumiShield WG (Kampti and Solenzo)
Number of structures sprayed by PMI-supported IRS	258,766
Number of structures found by PMI-supported IRS	266,765
Spray coverage	97%
Population protected by PMI-supported IRS	766,374 (14,183 pregnant women; 125,206 children under 5 years old)
Dates of PMI-supported IRS campaign	June 5 – July 11, 2018
Length of campaign	30 operational days
Number of people trained with U.S. government funds to deliver IRS*	2,227

*This is based on the PMI indicator definition. It includes only spray staff such as spray operators, team leaders, supervisors, and clinicians. It excludes data clerks, IEC mobilizers, drivers, washers, porters, pump technicians, and security guards.

1.2.1 PROGRAM HIGHLIGHTS

- PMI VectorLink began activities in Burkina Faso on January 1. VL restarted spray operations in Burkina Faso for the first time since 2012. The 2018 VL spray campaign was conducted over 30 operational days in three districts, protecting 766,374 people.
- The project used 24,427 sachets of SumiShield and 29,098 bottles of Actellic to spray 258,766 structures in three districts, with a utilization ratio of approximately 4.8 structures sprayed per insecticide bottle/sachet.
- The national end-of-spray evaluation workshop to discuss overall implementation of the spray campaign was conducted August 20, 2018 and included 65 participants from the Ministry of Health’s National Malaria Control Program (NMCP), including regional and district authorities, Ministries of Agriculture and Environment, PMI Burkina Faso, the VL team and other malaria program partners.
- In August 2018, through core partner PSI, VectorLink conducted a qualitative review of LLIN continuous distribution in Burkina Faso and presented results to stakeholders.
- Wall bioassays conducted within two weeks of spraying to assess quality of spraying in the target districts recorded mortalities of susceptible *An. gambiae* Kisumu strain at 100% with both insecticides Actellic CS300 and SumiShield 50 WG.
- Cone bioassay with an insectary susceptible strain of *An. gambiae* and wild *An. gambiae* s.l. produced 100% mortality in all sites, two months (August 2018) after spraying with both insecticides.
- During the first four months (June, July, August and September), the efficacy of each treatment (SumiShield® 50WG and Actellic® 300CS) in terms of mortality rate was 98-100 percent for the susceptible “Kisumu” and wild *An. gambiae* (s.l.) mosquitoes
- Monthly entomological data was collected during the rainy season from June to August 2018 to determine the impact of IRS in Kampti, Solenzo and Kongoussi. Data collected included: indoor and outdoor biting rates via human landing catch (HLC); anopheline indoor resting densities by pyrethrum spray catch (PSC); population age structure by parity rate; and *P. falciparum* sporozoite infection rates in malaria vectors.

- From June to August 2018, *An. coluzzii* was the main malaria vector collected by all trapping methods in Solenzo and Kongoussi, while in the southern area of Kampti, *An. gambiae* s.s. was the predominant vector species.

1.3 BURUNDI

1.3.1 PROGRAM HIGHLIGHTS

- PMI AIRS Burundi transitioned to VL on December 1.
- As an ento only country, entomological surveys were conducted monthly at the eight sentinel sites of Cankuzo, Gihofi, Kiremba, Mabayi, Matana, Mpanda, Nyanza-Lac and Vumbi. Data collected included vector bionomics and susceptibility to insecticides. *An. gambiae* s.l. was the predominant malaria vector, representing 51% of the total *Anopheles* mosquitoes collected. The average human biting rate (HBR) of *An. gambiae* s.l. varied among the eight sentinel sites and ranged 0.88 bites/person/night to 14.58 bites/person/night from April to September 2018.
- The susceptibility of *An. gambiae* s.l. to insecticides was determined at seven sites. The vector was susceptible to pirimiphos-methyl and bendiocarb at Cankuzo, Gihofi, Kiremba, Mabayi, Mpanda, Nyanza-Lac, and Vumbi (98-100%). *An. gambiae* s.l. was also susceptible to chlorfenapyr at Mpanda sentinel site (100%). Resistance to permethrin and alpha-cypermethrin was observed at the sentinel sites with mortalities ranging from 67-84%.
- The project held a five-day training for 16 health promotion technicians from the eight sentinel sites and six Chief Health District Medical Officers in Bujumbura from June 25-29, 2018. The refresher training primarily covered morphological identification of *Anopheles* mosquitoes, ovary dissection and reporting.
- VectorLink Burundi also supported a TV documentary on malaria vector surveillance and insectary activity shown on the National Radio and Television of Burundi in July 2018.

1.4 CAMBODIA

1.4.1 PROGRAM HIGHLIGHTS

- VL home office entomologist conducted a technical start-up trip to the new PMI VL country of Cambodia from February 24 – March 8, 2018. This involved meeting with international and local organizations currently in malaria related research and implementation as well as the National Malaria Control Program and PMI Cambodia to discuss project activities, areas where capacity strengthening is needed, and division of labor for project activities.
- VL home office began financial and operations start up activities; such as opening bank accounts, staff recruitment, etc. while the country was in startup.
- Prepared a detailed year work plan following discussion with National Center for Parasitology and Malaria Control (CNM), the Centers for Disease Control and Prevention (CDC), USAID Mission and PMI, which received final approval on November 28, 2018.
- Began recruitment for Cambodia staff and hired a finance and procurement officer in August and the COP and entomology technician in September.
- Completed the procurement of entomology supplies and equipment.

1.5 CAMEROON

1.5.1 PROGRAM HIGHLIGHTS

- Cameroon is a new PMI VL country and started operations May 1. VL support includes entomological monitoring in five selected sentinel sites and assessing the routine distribution of LLINs through partner Population Services International (PSI).
- Participated in the FY 2018/19 Malaria Operational Plan (MOP) meetings organized by NMCP and PMI Cameroon in September and presented the project's plans for 2018-2020 at the

implementing partners' meeting. VL was asked to support the 2019 mass distribution campaign of LLINs in the Extreme North.

- Organized a national entomology training for October 2018 in Yaoundé. Representatives from NMCP and the three research institutes active in-country have been invited to harmonize susceptibility testing protocols and to reinforce the capacity of the field data collectors.
- In July and August 2018, VectorLink conducted a scoping mission and review of LLIN distribution systems in the North and Extreme North regions of Cameroon. After a kick-off meeting jointly coordinated by PMI, NCMP, and VectorLink, the team assessed Cameroon's LLIN distribution processes at each level and shared preliminary observations and recommendations with PMI and the NMCP in early August.

1.6 CÔTE D'IVOIRE

1.6.1 PROGRAM HIGHLIGHTS

- Côte d'Ivoire (CI) became a PMI country in 2017. VL had its first start-up trip in January 2018 with the COP starting March 26.
- Conducted entomological monitoring with the objective of collecting baseline entomological data to inform strategic vector control decision making.
- From January to June 2018, conducted start-up activities, including a capacity assessment short-term technical assistance (STTA), an operational STTA, colocation with an Abt Associates project funded by PEPFAR, recruitment of a COP, Finance and Administration Manager, and Technical Manager.
- Organized a national training on July 5-6 for NMCP and four research institutes; The Swiss Center for Scientific Research (CSRS), CEMV, INHP and IPR to harmonize procedures and technical approaches for insecticide susceptibility testing following new WHO standard guidelines. In total, 20 participants were trained, including four women.
- Hosted a regional entomological training August 20-25. Details in core section.
- Initiated vector susceptibility testing for potential IRS and LLIN insecticides in four sites targeted for IRS (Jacqueville, Sakassou, Bocanda and Gagnoa). High resistance to various insecticides was recorded in all sites. Susceptibility to organophosphates was observed only in Gagnoa. Mortality of *An. gambiae* s.l. to all pyrethroids following pre-exposure to piperonyl-butoxide (PBO) remained low, suggesting that mechanism(s) other than P450 enzymes were involved in the observed resistance. Susceptibility to clothianidin was observed in all four sites and represents a potential candidate for IRS in CI with potential for a rotation strategy with pirimiphos-methyl in Gagnoa. *An. gambiae* s.l. from Jacqueville and Sakassou was resistant to chlorfenapyr but susceptible in Gagnoa and Bocanda.
- CSRS was subcontracted after a competitive request for proposals to carry out the entomological studies outlined in the 2018 work plan.
- Following the NgenIRS insecticide forecasting workshop in Benin, a meeting was held September 5-6 with CI stakeholders who recommended Sakassou and Gagnoa for IRS in 2019. Subsequently, during the MOP meeting held in CI from September 10-21, PMI decided to postpone IRS until 2020.

1.7 DEMOCRATIC REPUBLIC OF THE CONGO

1.7.1 PROGRAM HIGHLIGHTS

- PMI AIRS DRC transitioned to VL on December 1.
- Through the National Institute of Biomedical Research (INRB), entomological monitoring activities were conducted in 11 provinces: Haut Katanga, Haut-Uele, Kasai, Kinshasa, Kongo Central, Mai-Ndombe, Sankuru, Sud Kivu, Sud Ubangi, Tanganyika, and Tshopo. Routine entomological activities, including PSC and HLC collections, were conducted in two sites across two provinces – Kalemie (Tanganyika) and Kabondo (Kongo Central), while insecticide susceptibility testing to permethrin, deltamethrin, alpha-cypermethrin, and pirimiphos-methyl was conducted in all 11 sentinel sites.

Chlorfenapyr susceptibility was determined in four sites – Kalemie, Kapolowe, Kinshasa, and Kimpese.

- The team documented moderate to high level resistance for all three pyrethroids with *An. gambiae* s.l. survivors at the 5x concentration and 10x concentration. Bottle bioassays with various doses of chlorfenapyr were conducted in Kalemie, with the higher concentrations of 50, 100, and 200µg/bottle, killing 99–100% of wild, pyrethroid-resistant *An. gambiae* s.l.
- *Anopheles gambiae* s.l. was the predominant malaria vector in all four sites (Kimpese, Inongo, Pawa and Karawa) where VL monitored vector bionomics three times a year, with *An. funestus* s.l. captured at a higher density indoors than outdoors in Kimpese using PSC.
- Conducted monthly vector monitoring in Kabondo (Tshopo) and Kalemie (Tanganyika), which showed high *An. gambiae* s.l. biting rates both indoors and outdoors in Kabondo (mean >25 bites per person per night). In comparison, nightly *An. gambiae* s.l. mean HBRs in Kalemie (Tanganyika) were low with zero (indoor) and six (outdoor) *An. gambiae* s.l. bites per person per night.
- Conducted vector mapping (1 night of HLC and PSC) in Kwango Province across 10 sites during the dry season (July 2018). The most commonly captured species was *An. gambiae* s.l., followed by *An. funestus* s.l., which was captured in seven sites (Kitenda, Feshi, Popokabaka, Dinga, Kasongolunda, Kajiji and Kenge). *An. paludis* was captured in Feshi, Dinga, Kasongo-lunda, Mukata, Kisanji and Kenge; *An. hancocki* and *An. nili* were caught at Kenge. The greatest diversity of *Anopheles* species has been found at Kenge.
- INRB team and NMCP field supervisors received training in South Africa and Benin for capacity and competence building in molecular entomology and morphological mosquito species identification.
- Built and inaugurated a container “village” at INRB for office space and as a new insectary.

I.8 ETHIOPIA

TABLE 3: VL ETHIOPIA AT A GLANCE

Number of districts covered by PMI-supported IRS	44 in three regions (Benishangul-Gumuz, Gambela, Oromia)
Insecticide used	Actellic 300 CS
Number of structures sprayed by SOPs (Spray Operators)	472,569
Number of structures found by SOPs	485,358
2018 spray coverage	97.4%
Population protected by PMI-supported IRS	Total population: 1,264,189 (Pregnant women: 28,944; Children under five: 213,459)
Dates of PMI-supported IRS campaign	May 21–July 31, 2018
Length of campaign	60
Number of people trained with U.S Government (USG) funds to deliver IRS*	2,413

*This is based on the PMI indicator definition. It includes only spray staff such as spray operators, team leaders, supervisors, and clinicians. It excludes data clerks, IEC mobilizers, drivers, washers, porters, pump technicians, and security guards.

I.8.1 PROGRAM HIGHLIGHTS

- The Ethiopia program transitioned to VL on January 1.
- Conducted IRS in 44 target districts in three regions: Benishangul-Gumuz (20 districts in total, 12 of which were new in 2018), Gambela (14 districts, all new in 2018), and Oromia (10), targeting 595,618 structures. The campaign in Gambela went from May 21-June 14, and mop-ups were conducted in two districts from July 2-7. Spraying in Oromia and Benishangul-Gumuz (June 11-July 31) was later than planned due to civil unrest causing interruptions in many districts.
- 114,897 bottles of Actellic were used to spray 472,569 structures, resulting in 97,467 remaining bottles. The insecticide need was overestimated because 26 of the districts were completely new and

the targets were estimated based on IRS data provided by the government of Ethiopia. The remaining bottles, which expire in March 2020, will be used in the 2019 campaign.

- Cone wall bioassays conducted within one week of IRS resulted in 100% mortality to *An. arabiensis* on all surfaces in the four sentinel sites except in Bambasi, where mortality on a mud surface was 95.8%. One month after IRS, mortality on mud surfaces was 97.5% in Bambasi but ranged from 99.2% to 100% in the other three sites. Mortality of *An. arabiensis* declined to 72.7% and 48.8% at month two and three after IRS, respectively, in Lare. Mortality of *An. arabiensis* two months after IRS was 100% in Goro but ranged between 97.5-100% in Bambasi.
- Conducted longitudinal vector surveillance in three sites. *Anopheles gambiae* s.l. was the dominant vector in two sites, Lare (Gambela) and Abaya (Oromia), while in Bambasi (Benishangul-Gumuz) *An. funestus* appeared as the dominant vector. Vector resting and biting densities in all sites were generally very low.
- The susceptibility of *An. gambiae* s.l. to insecticides was determined at seven sites, and the vector was susceptible to bendiocarb in all seven sites, propoxur in 6/7 sites, and pirimiphos-methyl in 7/7 sites but resistant to deltamethrin in 7/7 sites, permethrin in 7/7 sites, and alpha-cypermethin in 3/3 sites.
- Conducted an *Anopheles stephensi* survey from August to November 2018 in ten sites: Diredawa (Diredawa town), Erer-Gota (Somali regional state), Jigjiga, Kebridehar, Degahabour and Goday (Somali regional state), Awash Sebat Kilo, Gewane, and Semera (Afar regional state) and Bati (Amahara regional state) and detected the vector in all the sites surveyed.
- The 2018 IRS campaign faced numerous challenges related to staffing and supervision, which compromised spray quality, particularly in the new regions of Gambela and Benishangul-Gumuz. After two weeks of the campaign in Gambela, the VL team quickly conducted a small sample data quality assessment, developed a short- and long-term action plan to strengthen supervision and inventory control, deployed additional staff to the field for support and supervision, and increased the number of squad leaders in Benishangul-Gumuz by 50%.
- Long distances and poor road conditions in sparsely populated regions, and unstable security conditions due to civil unrest in the target regions, resulted in delays and interruptions to the spray campaign, extending the duration of the campaign. VL Ethiopia leadership took appropriate precautions and leveraged strong working relationships with local authorities to ensure the safety of all IRS actors through the completion of the campaign.

1.9 GHANA

TABLE 4: VL GHANA AT A GLANCE

Number of districts sprayed by PMI-supported IRS	7 districts: Bunkpurugu-Yunyoo, East Mamprusi, Gushegu, Karaga, Kumbungu, Mamprugu Moaduri, and West Mamprusi
Insecticide	Actellic 300CS (6 districts) and SumiShield 50WG (1 district - Mamprugu Moaduri)
Number of structures found by SOPs	324,704
Number of structures sprayed by SOPs	298,701
Spray coverage	92.0%
Population protected by PMI-supported IRS	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 (one district)
Length of campaign	30 days (six districts); 31 (one district)
Number of people trained with U.S Government (USG) funds to deliver IRS*	837 people (677 men, 160 women)

*This is based on the PMI indicator definition. It includes only spray staff such as spray operators, team leaders, supervisors, and clinicians. It excludes data clerks, IEC mobilizers, drivers, washers, porters, pump technicians, and security guards.

1.9.1 PROGRAM HIGHLIGHTS

- AIRS Ghana transitioned to VL on January 1. VL Ghana successfully sprayed seven districts, protecting 836,376 people, despite delayed delivery of insecticide that pushed back the start of the spray campaign by two weeks.
- Successfully introduced SumiShield 50WG in Mamprugu Moaduri District. A follow-up assessment revealed 85.9% beneficiary satisfaction post-spray and no operational challenges encountered by spray teams.
- Installed one-time metal plates with unique identification numbers for each household in all sprayed districts, which improved data collection and verification. VL expects that the plates will last for up to five years and be cost-effective throughout the life of the project.
- Spray quality test results demonstrated 100% mosquito mortality at 1-3 days after spraying across all districts for both insecticides used during 2018 IRS (pirimiphos-methyl and clothianidin).
- Interpersonal and mass media communication strategies kept refusal rates low by actively engaging regional health promotion officers from Ghana Health Services to support mobilization for IRS.
- Completed all environmental compliance inspections using smartphones in a timely manner. VL Ghana installed 17 mobile soak pits when spraying in remote areas and 21 fixed soak pits to ensure safety and environmental compliance.
- Recycled 5,200 kg of plastic including 60,929 bottles of Actellic 300CS; 2,840 kg of metal (old damaged Hudson pumps) and 8,600 kg of cardboard boxes.
- VL Ghana's Environmental Compliance Officer (ECO) traveled to Malawi to assist the country team with preparations for its first IRS campaign.
- In July 2018, VL lent 6,000 bottles of Actellic to AngloGold Ashanti (Ghana) Malaria Control Ltd. (AGAMal) to ensure adequate insecticide to complete their spray campaign. AGAMal returned this stock to VL in October 2018.
- To assess the impact of the IRS intervention on vector transmission indices, entomological surveys were conducted across all seven IRS districts in comparison with three unsprayed districts.
- At the time of reporting, VL Ghana has completed decay rate monitoring of sprayed insecticides, Actellic 300CS in six districts for four months and SumiShield in one district for three months. So far, data showed the insecticide remained effective (above the cut-off mortality level of 80%) on all surfaces in the tested districts.
- *An. gambiae* s.l. remained the dominant species across all sites, constituting about 87.8% of all (35,577) *Anopheles* collected. Results from insecticide susceptibility tests done so far, using the WHO tube test indicate that *An. gambiae* s.l. from all sites remain susceptible to pirimiphos-methyl 0.25% but resistant to alpha-cypermethrin 0.05% and bendiocarb 0.1%. CDC bottle bioassays also show that *An. gambiae* s.l. is susceptible to clothianidin across all the sites that have been tested so far.
- Continued data collection from the two operational research studies that started in 2017. The first study seeks to assess the effect of IRS on *Anopheles* vector behaviors and their impact on malaria transmission. The second study is an evaluation of pirimiphos-methyl efficacy in experimental huts when the inner surface areas are partially versus fully sprayed.
- To address 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 they have a better appreciation of the system.

- In response to recorded incidents of insecticide pilferage by spray team members towards the end of the campaign during revisits, VL Ghana sanctioned those responsible, garnishing their wages and ensuring that the workers were declared ineligible for rehire in future IRS projects.
- Going forward, the project will explore conducting a minimal background check on prospective spray teams and continue to do thorough supervision and monitoring during spray campaigns.
- To address shea nut community concerns about eligibility for organic certification of their harvest, the project under the leadership of NMCP established a cross-sector working group as part of Malaria Vector Control Oversight Committee MaVCOC. The working group drafted an issue statement, which NMCP will share with the Ministry of Food and Agriculture to mitigate and resolve the situation with nut exporters, who in 2018 spread misinformation about IRS damaging nut crops. In addition, the project will maintain relations with affected communities over the course of the year so they will be aware and prepared for the 2019 campaign

1.10 KENYA

1.10.1 PROGRAM HIGHLIGHTS

- Transitioned from AIRS Kenya to VectorLink on July 1, 2018.
- Supported NMCP Malaria Program Review, providing technical assistance for vector control review and leading strategy recommendations for vector control to Kenya's National Malaria Strategy.
- Completed 2019 IRS Planning Workshop from July 17-19. Outcomes included 2019 IRS start dates, quantifications, implementation plans and inspection timelines, including the Race to the Starting Line.
- Met with Homa Bay and Migori County Health Management Teams to kick-off 2019 IRS planning
- Led IRS geographical reconnaissance and site repairs (as necessary) in Homa Bay County during the week of August 13 and in Migori County during the week of August 20.
- VL Kenya ECO led first round Pre-spray Environmental Compliance Assessments (PSECAs) in Migori from September 17-21 and Homa Bay from September 24-Oct 5.
- USAID Mission issued guidance to all implementing partners on August 15 explaining that with immediate effect, all USAID-funded projects in Kenya are no longer exempt from VAT, duty and/or customs fees as a result of the expired bilateral agreement between USAID and the Government of Kenya, resulting in an increase in the cost of IRS operations.
- Selected vendors for local IRS commodity procurements. Deliveries scheduled by November 1.
- VL Kenya Procurement Officer led venue sourcing for VL Global Conference in February 2019.
- VL Kenya Technical Manager circulated a first draft publication to all co-authors on August 17. The publication *Entomological Impact of Indoor Residual Spraying with Pirimiphos-methyl (Actellic 300CS®) in Migori County, Western Kenya* presents 2017 IRS results.
- Conducted evaluation of outdoor mosquito collection methods to identify suitable method for routine outdoor mosquito collection. Results included in the 2018 Annual Entomological Monitoring Report.

1.11 LIBERIA

1.11.1 PROGRAM HIGHLIGHTS

- The Liberia program transitioned to VL on December 1, 2017.
- VL Liberia and the NMCP conducted monthly malaria vector monitoring in three sentinel sites: Tomato Camp (Bong County), Jeneta (Margibi County), and Frank Town (Montserrado County) to assess vector composition, behavior and density using three methods of collection.

Mosquitoes were collected monthly at each site using CDC light traps and PSC; and every two months using HLC.

- From the October 2017 to September 2018 collections in the three sentinel sites, the most abundant vector was *An. gambiae* s.l. (93%), followed by *An. funestus* (7%).
- In May 2018, a transect study was conducted to monitor the vector composition, feeding and resting behavior in 10 sites across four counties: Nimba, Bong, Margibi and Montserrado.
- From the transect study a total of 1,381 female *An. gambiae* s.l., and 356 *An. funestus*, were collected. The abundance of *An. funestus* was important in some of the collection sites, resulting in the selection of these as new sites for vector monitoring and/or insecticide resistance testing in year two.
- Insecticide resistance and intensity assays were conducted in different sites (Saint John/Bassa; Gbedin/Nimba; CARI/Bong; Jackson Town/Margibi; 15 Gate/Montserrado; Harper/Maryland; Tubmanburg /Bomi and Big Fantin Town/Grand Bassa). Tests were done using the diagnostic concentration (1X) and 2X, 5X, and 10X of the diagnostic doses of deltamethrin and alpha-cypermethrin. PBO was used for synergist assay with deltamethrin and/or alpha-cypermethrin.
- Synergist assays conducted indicated that PBO did not restore full susceptibility to pyrethroids in the populations of *An. gambiae* s.l., suggesting the existence of mechanisms of resistance other than oxidases.
- Following a capacity building training on enzyme-linked immunosorbent assay circumsporozoite protein (ELISA-CSP) conducted in country by CDC Atlanta in April 2018, sampling processing for sporozoite detection was done at Liberia Institute for Biomedical Research (LIBR) by NMCP and LIBR staff.
- Since laboratory processing started in May 2018, a total of 4,107 *An. gambiae* s.l. mosquitoes collected from 2015 to 2017 were analyzed using ELISA-CSP. The overall sporozoite rate was 5.09% (209/4,107).

1.12 MADAGASCAR

Number of districts sprayed by PMI-supported IRS	9 districts
Insecticide	Actellic 300CS and SumiShield 50WG
Number of structures found by SOPs	586,768
Number of structures sprayed by SOPs	548,789
Spray coverage	93.5%
Population protected by PMI-supported IRS	2,232,097 (including 85,821 pregnant women and 328,092 children under 5 years)
Dates of PMI-supported IRS campaign	July 23 to August 20, 2018 in four districts in the South East (Farafangana, Vohipeno, Manakara and Mananjary); September 3 to September 29, 2018 in three districts in the East Coast (Brickaville, Fénériver Est, and Tamatave II); September 17, 2018 to October 17, 2018 in two districts in the South West (Sakaraha and Tulear II)
Length of campaign	24 operational days
Number of people trained with U.S Government (USG) funds to deliver IRS*	7,589

*This is based on the PMI indicator definition. It includes only spray staff such as spray operators, team leaders, supervisors, and clinicians. It excludes data clerks, IEC mobilizers, drivers, washers, porters, pump technicians, and security guards.

1.12.1 PROGRAM HIGHLIGHTS

- AIRS Madagascar transitioned to VL on January 1.
- Began spray operations in nine districts: South East (Farafangana, Vohipeno, Mananjary, Manakara) on July 23, 2018; in the East (Tamatave, Fenerive East and Brickaville) on September 3, 2018; and in the South West (Tulear II and Sakaraha) on September 17, 2018.

- Participated in a four-day workshop to finalize the 2019-2020 MOP with NMCP, PMI, and Roll Back Malaria partners from May 7-11, 2018.
- To assist the NMCP/Direction Nationale de Lutte Contre le Paludisme (DLP) in using part of its insecticide that is set to expire in 2019, the DLP and PMI approved the transfer of 50,000 bottles of Actellic 300 CS, free of charge to VL Madagascar program for the 2018 spray campaign. The approved 2018 work plan was revised to spray additional districts in the East (Brickaville, Fenerive East and Tamatave II).
- Entomological data collected from April 1-September 30, 2018, indicates *Anopheles gambiae* s.l., *Anopheles funestus*, and *Anopheles mascarensis* as malaria vectors, and one potential vector, *An. coustani*, in various sentinel sites. *Anopheles gambiae* s.l. is the main vector in the East Coast and the South East. Results of the WHO susceptibility tests indicate susceptibility of *Anopheles gambiae* s.l. to pirimiphos-methyl in all the sprayed areas.
- Actellic 300CS in Mananjary and Manakara and Sumishield 50 WG in Vohipeno and Farafangana were the two insecticides selected for the 2018 spray campaign. The residual efficacy two months after spraying showed 100% mortality in all the sites as at end of September 2018.
- Baseline data was collected at all sentinel sites: end of June in the South East, early August in the East and mid-August in the South West. Cone bioassay for IRS quality assessment was done in July in the South East, early September in the East, and mid-September in the South West for the 2018 campaign.
- Through core partner, PSI, preparations conducted for the baseline round of the DawaPlus durability monitoring study in three districts: Maintirano (Melaky region), Bekily (Androy region), and Farafangana (Atsimo Atsinanana region) were completed during this reporting period. Training was completed in August and data collection began in September (67% completed by the end of the reporting period). In Maintirano District, data collection was suspended to ensure safety of the field teams (11 of 15 planned Fokotany were surveyed). In support of the baseline round, the study design and questionnaire were completed following PMI review. Ethical approval for the study was granted by the PSI Institutional Review Board (IRB) under a ceding agreement with Abt and the local Madagascar IRB issued a non-human subjects research determination.

I.13 MALAWI

I.13.1 PROGRAM HIGHLIGHTS

- VectorLink opened a new country office and started operations in Malawi in April 2018. PMI/NMCP decided to target 118,000 eligible structures in Nkhotakota District for IRS with the aim of protecting an estimated 480,362 people in 2018 spraying with the organophosphate, Actellic 300 Capsule Suspension (CS).
- Project start-up activities were completed, including hiring and training 16 full time staff, locating and setting up an office, and establishing the project financial systems.
- Malaria Consortium was subcontracted to support the development of a country IRM plan by early 2019. In July, a senior technical specialist traveled to Malawi to present and obtain key stakeholder feedback on the proposal for the development of the IRM plan during the quarterly Vector Control Working Group meeting. A consultant was identified to conduct a desktop review of entomological surveillance, resistance monitoring and other country data. The situation analysis resulting from the consultancy will feed into the IRM plan.
- All spray campaign preparations, including procurement of all spray operations materials; refurbishment of eight operations sites, construction of nine permanent soak pits and eight mobile soak pits, and the training of seasonal workers, were completed in time for the October 1, 2018 launch.

- First VectorLink country program to roll-out the new, DHIS 2-based VectorLink Collect M&E system in support of a door-to-door mobilization campaign. The VectorLink Collect DHIS 2 system was also configured for, and will be used during, the October IRS campaign for spray data for the first time on the VectorLink project.
- House-to-house mobilization was initiated across the whole of Nkhotakota District September 12-30th.
- Subcontracted the Malaria Alert Centre to conduct routine entomological monitoring in 11 sentinel sites in five districts, including two districts receiving PBO LLINs.
- CDC light trap, PSC, and HLC collections were carried out across all 11 sentinel sites and used to monitor monthly vector bionomics and sporozoite infections within *Anopheles* species, and to assess the impact of PBO nets.

1.14 MALI

TABLE 5: VL MALI AT A GLANCE

Number of districts covered by PMI-supported IRS in 2018	4 (Mopti, Bandiagara, Bankass and Djenne)
Insecticide	Organophosphates (Actellic 300 CS and SumiShield 50WG) in all districts
Number of structures targeted for IRS	205,612
Number of structures found by spray operators	167,598
Number of structures sprayed by spray operators	160,723
2018 spray coverage	78.2%*
Population protected by PMI-supported IRS in 2018	665,581 (20,992 pregnant women and 93,968 children under 5)
Dates of PMI-supported IRS campaign	August 30 – October 2, 2018
Number of people trained with U.S. Government funds to deliver IRS**	824

* Due to an insecticide shortage, the Mali IRS campaign concluded earlier than anticipated preventing spray operators from visiting all targeted areas. The reported "coverage" reported, in this case, corresponds to the number of structures sprayed as a function of structures found (typically referred to as "progress") in order to reflect the proportion of the target area that was indeed covered by IRS.

**This is based on the PMI indicator definition. It includes only spray staff such as spray operators, team leaders, supervisors, and clinicians. It excludes data clerks, IEC mobilizers, drivers, washers, porters, pump technicians, and security guards.

1.14.1 PROGRAM HIGHLIGHTS

- The Mali program transitioned to VL on January 1.
- In collaboration with regional and district authorities, VectorLink Mali conducted IRS in 46 health areas across four target districts in the Mopti region: Mopti, Bandiagara, Bankass and Djenne.
- The 2018 IRS campaign was originally scheduled to begin on July 9. Due to increasing frequency of security incidents within the IRS target area leading up to and following the July 20th presidential election, the campaign was postponed until August 30. The team modified their approach and began operations in 10 most central health areas (seven in Mopti and the three other district capitals). After two days of smooth implementation, and after consulting with local health authorities, VL leadership deemed 36 of the 37 remaining health areas were stable enough to begin IRS operations, and did so on September 4. The campaign ended on October 2 in all health areas due to higher than expected consumption of insecticide, resulting in a shortage.
- All seasonal IRS personnel were paid through Orange Money, a convenient and widely accepted mobile money system, which eliminates the need for large-scale cash transfers.

- Met with Komana Mining Company officials on April 2 to explore an opportunity for partnership between NMCP, Komana Mining Company and VectorLink Mali.
- Hosted the USAID/PMI Mission supervisory visit to IRS sites in Mopti District from September 25-27, including meetings with the Regional Directorate of Health, the Reference Health Center and the administrative authorities.
- Monthly entomological monitoring activities of HLC and PSC were carried out in seven sites among which there were four IRS sites (Djenne, Mopti, Bandiagara and Bankass), one former IRS site (Koulikoro) and two control sites (Kati and Tominian).
 - *An. gambiae* s.l. was the major species. From June to September in IRS sites *An. gambiae* s.l. mean biting rates ranged from 0.2 bites/person/night in Bandiagara to 7.8 b/p/n in Mopti.
 - Fourteen sites selected for the nationwide insecticide resistance study were surveyed. WHO susceptibility tube tests showed a high intensity of resistance to pyrethroids in most sites as mortality rates were <98% with X10 the diagnostic dosage.
 - Implication of mixed function oxidases in resistance to deltamethrin and permethrin was also observed.
 - Cylinder testing carried out with clothianidin revealed susceptibility (mortality rates ≥ 98%) on days three and four, respectively, for Djenne and Mopti, and day 5 for Bandiagara and Bankass.
 - Quality assurance cone bioassays performed after spraying showed 100% mortality regardless of the type of wall (mud, painted mud, cement, painted cement) for Actellic CS and SumiShield WG.

I.15 MOZAMBIQUE

I.15.1 PROGRAM HIGHLIGHTS

- VL Mozambique operations began March 1. The work plan covers IRS in six districts of Zambezia Province, entomology activities, and technical support for NMCP entomology and IRS in Nampula Province activities.
- Participated in the 2018 World Malaria Day celebrations which were held at district levels and led by the District Health Directorates of each district.
- In July 2018, VL Mozambique, in collaboration with the NMCP, conducted a barrier analysis in two high IRS refusal districts in Zambezia Province. VL collected data and analyzed results to generate a behavior change framework to target the most influential determinants of IRS acceptance and design more appropriate SBCC campaigns or mobilization strategies. The barrier analysis revealed key themes and recommendations that will be incorporated into the planning and implementation of the 2018 IRS campaign.
- Supported NMCP preparations for IRS campaign in Nampula Province, including PSECA of the eight operation sites for the eight IRS districts in May 2018. Provincial training of trainers to support IRS implementation was held August 13-19, 2018.
- Conducted entomological monitoring in three intervention districts: Milange, Maganja da Costa and Mopeia, which is the operational research study district. The control district is Lugela. In Mopeia, entomological monitoring data was collected using CDC light traps and HLC. In Milange, Maganja da Costa and Lugela, data was collected by PSC, CDC light trap and HLC methodologies.
- The most abundant mosquito species collected were *An. funestus* s.l. and *An. gambiae* s.l., which were observed to contribute to 86% and 12%, respectively, of all the *Anopheles* mosquitoes collected in each district by the three methods.
- The data on residual efficacy indicated that Actellic 300CS insecticide was found to effectively persist on sprayed surfaces for four months (in Mopeia) and five months (in Morrumbala).

I.16 NIGER

I.16.1 PROGRAM HIGHLIGHTS

- Niger was added to PMI's country portfolio in 2017. Two start-up visits were conducted by members of the VL Senegal team in February and March to assess existing entomological monitoring capacity and establish an administrative presence in country.
- Conducted entomological monitoring only with the objective of collecting baseline entomological data to inform future vector control decision making.
- The COP joined the project in mid-July. Regional Senior Entomologist, Joseph Chabi, traveled to Niamey to provide the COP orientation and technical assistance to start up the Vectorlink Niger activities.
- Organized an entomological training August 7-8 for local partners (NMCP and Center for Medical Research and Health) for field data collections in order to harmonize practices and procedures.
- A first round of entomological data collection was completed from August 29 to September 7 in the five selected sentinel sites (Agadez, Balleyara, Gaya, Tessaoua and Niamey V (Saguia)).
- Preparations for the baseline round of the Olyset durability monitoring study in Gazaoua (Maradi Region) and Madaoua (Tahoua Region) were completed during this reporting period. Training and study dates were finalized with input from the NMCP, both falling in the next reporting period. The NMCP entomology unit identified four staff to participate as data collectors and one entomology technician to support training. As it is not currently possible to conduct cone bioassay tests in Niger, requests for quotes were sought from qualified laboratories in the region.
- In support of the baseline round, the study design and questionnaire were completed following PMI review, and ethical approval for the study was granted by the PSI IRB under a ceding agreement with Abt. Training materials were prepared, and Stephen Poyer from PSI travelled to Niamey to co-facilitate the training.
- A qualitative review of LLIN continuous distribution in Niger was conducted in July 2018 to better inform NMCP and VL Niger activities. The assessment was designed to provide the NMCP, PMI, and key LLIN partners with information to reinforce strategically planned and executed continuous distribution of LLINs, informed by global best practice. Results have been disseminated to partners. In October, findings from this assessment were used to develop a national LLIN continuous distribution operational guide and list of proposed next steps with the NMCP and LLIN stakeholders.

I.17 NIGERIA

I.17.1 PROGRAM HIGHLIGHTS

- The Nigeria program transitioned to VL on January 1.
- In July, VL Nigeria expanded entomological surveillance and insecticide resistance activities from six to nine sentinel sites. The team visited the newly-added Plateau state with PMI and engaged Principal Investigators in Plateau, Zamfara, and Benue to support the sites.
- Supported the National Malaria Elimination Program (NMEP) to conduct a National Entomological Review meeting in Lagos. VL also accompanied NMEP staff on advocacy visits to the three new Global Fund sentinel sites, and procured materials to support surveillance and insecticide resistance activities.
- Engaged and developed a subcontract for the Nigeria Institute for Medical Research. The contract was approved by PMI and fully executed on September 1, 2018.
- Data collected from April to June indicated that *An. gambiae* s.l. was the dominant malaria vector at all sites, representing 91.3% of the total *Anopheles* mosquitoes collected. *An. gambiae* s.l. was

found to be resistant to pyrethroids at 10x the diagnostic dosage in Ebonyi and Oyo (the rainforest) sites. Pre-exposure of pyrethroid-resistant *An. gambiae* s.l. mosquitoes to PBO did not fully restore susceptibility in mosquito populations in Oyo, but did restore susceptibility in Ebonyi. These findings have operational significance for planned vector control activities including LLINs or IRS.

I.18 RWANDA

TABLE 6: VL RWANDA AT A GLANCE

Number of districts covered by PMI-supported IRS	Two districts (Kirehe and Nyagatare)
Insecticide	Actellic 300 CS
Number of structures sprayed by PMI-supported IRS	208,026
Number of structures found by PMI-supported IRS	208,687
Spray coverage	99.7%
Population protected by PMI-supported IRS	831,735 (12,131 pregnant women; 117,878 children under 5 years old)
Dates of PMI-supported IRS campaign	September 10 th – October 2 nd , 2018
Length of campaign	20 days
Number of people trained with U.S. government funds to deliver IRS*	1,710

*This is based on the PMI indicator definition. It includes only spray staff such as spray operators, team leaders, supervisors, and clinicians. It excludes data clerks, IEC mobilizers, drivers, washers, porters, pump technicians, and security guards.

I.18.1 PROGRAM HIGHLIGHTS

- The Rwanda program transitioned to VL on March 1.
- Implemented an IRS spray campaign using a combination of walk to work and vehicle transport service strategies in all 34 operational sites in an effort to reduce vehicle costs associated with transporting spray operators during operations. This strategy also reduces the project's carbon footprint, promotes health benefits through physical activity and mitigates risks associated with motor vehicles accidents.
- Following a successful pilot of two new soak pits, which were constructed in Kirehe and Nyagatare Districts in 2017 using a concrete sloped wash area that pipes effluent to a separate soak pit, VL Rwanda rolled out the construction of the mentioned soak pits in 32 operational sites in both districts. If well-maintained, the new soak pits are expected to last more than five years.
- In June 2018, the Operations Manager became a third country national supporting the new IRS project in Malawi. As a result, the Logistics Manager was promoted to Operations Manager and a District Coordinator to Logistics Manager reducing the administrative footprint of the project.
- Senior Finance Administration Manager provided STTA to VL Uganda (March–April 2018), and Country Operations Manager and M&E Manager provided STTA to VL Burkina Faso (April 2018).
- Provided technical support to Malaria and Other Parasitic Diseases Division (MOPDD) of the Ministry of Health to support Global Fund-supported IRS districts namely Bugesera and Gatsibo in the area of M&E, focusing on data collection, data cleaning and reporting during the implementation of the spray operations.
- Adopted an electronic banking and mobile money payment system during 2018 spray campaign. All transport allowances for meetings and trainings were paid using mobile money payments. Salaries for team leaders, spray operators, washers, guards and mobilizers were paid through

mobile money payments. Salaries for IRS supervisors and payments to vendors were done by electronic banking.

- Assessment of quality of spraying in both districts conducted following September 2018 spray campaign showed 100% mortality of susceptible *An. gambiae* s.s., which indicated that the quality of spraying was very good.
- PSCs and HLCs were conducted during the reporting period in three IRS districts (Bugesera, Kirehe, and Nyagatare) and one non-IRS (control) district, Ngoma. Morphological identification showed *An. gambiae* s.l. was the major vector collected in all sites. Proportionately, very few *An. pharoensis*, *An. ziemanni*, *An. coustani*, *An. maculipalpis* and *An. funestus* were also collected. A molecular analysis conducted on samples of *Anopheles gambiae* s.l. showed that 64% were *Anopheles arabiensis*.
- From May 1- 5, VL in collaboration with MOPDD and CDC conducted a refresher training of 30 sentinel site technicians on testing insecticide resistance intensity and detection of metabolic resistance using CDC bottles and PBO.

1.19 SENEGAL

1.19. PROGRAM HIGHLIGHTS

- PMI AIRS Senegal transitioned to VL on January 1.
- Currently only entomological surveillance is being conducted in Senegal. Under the oversight of VectorLink and NMCP, implementation of field and laboratory activities is completed through the Vector and Parasite Ecology Laboratory of University Cheikh Anta Diop (UCAD) in collaboration with the Research Institute for Development (IRD) and Institut Pasteur de Dakar (IPD).
- Facilitated a workshop with partners' staff (UCAD, IRD, IPD and NMCP) to plan the 2018 entomological surveillance including the review of entomological SOPs, the organization of the field collection teams and the frequency of the field surveys.
- The PMI database was updated to include WHO susceptibility test data.
- Procured entomological supplies to support lab activities at UCAD, IRD, and IPD.
- Met at UCAD on July 2, 2018, to share the updates on recent WHO guidelines about insecticide resistance monitoring.
- Initiated the 2018 field entomological monitoring activities in 20 sentinel sites across 11 districts including Koumpentoum, Kounghoul, Nioro, Malem Hodar, Ndothane, Kaffrine, Tambacounda, Diourbel, Kédougou, Velingara, and Dioffor. Supervision was performed by VectorLink COP.
- From January to August 2018, *An. gambiae* s.l. was the main species collected through HLC and PSC in all districts except Ndothane, where *An. funestus* was predominant.
- HBR is particularly high in the Sudanese area (south of the country). Diourbel, located in the Sahelo-Sudanese area, has relatively high malaria incidence (as reported by NMCP) and slightly higher biting rates than Sudanese-Sahelian sites.
- *An. arabiensis* remains the predominant vector in the country except in the Sudanese area where *An. gambiae* s.s. is the main species of the complex. An increase in the proportion of *An. coluzzii* in former IRS areas, Kounghoul and Koumpentoum, was noted compared to 2017.

1.20 SIERRA LEONE

1.20.1 PROGRAM HIGHLIGHTS

- A new PMI country program, VL Sierra Leone (an ento only country) started operations in March to generate information on vector bionomics and insecticide resistance from eight sentinel sites in four districts.

- VL Sierra Leone’s PSC and HLC collections began in May in four sentinel sites. Routine monitoring of vector bionomics was conducted in all eight sentinel sites in Kamaranka, Masongbo, Teikor, Sori Town, Lagon, Gerihoun, Sand Sand Water and Tombo from June to September.
- *An. gambiae* s.l. was the predominant malaria vector, representing 98.5% of the total *Anopheles* mosquitoes collected using HLC and PSC. *An. gambiae* s.l. was biting more indoors (53.0%) than outdoors (47.0%). The highest mean indoor HBR of *An. gambiae* s.l. was recorded in June with overall average HBR of 73.4 bites per person per night.
- *An. gambiae* s.l. was resistant to deltamethrin, permethrin and alpha-cypermethrin at all tested sites, but fully susceptible to pirimiphos-methyl.
- VL established a functional insectary in a space provided in Makeni at the Neglected Tropical Disease building. Kisumu colony transported from VL Ghana is now being maintained at the new Makeni insectary.
- 12 environmental health officers (three per targeted district) and two NMCP staff were trained on entomological monitoring, including mosquito identification.
- A total of 64 community health workers were trained on HLC, PSC and larval collection methods.

1.21 TANZANIA

1.21.1 PROGRAM HIGHLIGHTS

- AIRS Tanzania transitioned operations to VL on July 1, 2018.
- Project staff conducted regional and district advocacy meetings and district micro-planning meetings in the seven mainland IRS implementation districts.
- Received approval from National Environmental Management Council to go ahead with scoping for an Environmental Inspection Assessment for Kakonko, which is a new district.
- 161,374 sachets of SumiShield insecticide were delivered to the Mwanza warehouse and were distributed to the Geita (52,225) and Kagera (70,092) stores. 39,051 sachets remained in the Mwanza warehouse, while six sachets were sent to Tropical Pesticides Research Institute for quality analysis.
- VL Tanzania recruited 1,876 temporary field personnel for the mainland IRS campaign with an estimate of 35% being female.
- The project completed servicing of pumps, printing of forms, and pre-spray environmental compliance assessments in preparation for the October IRS campaign.
- In collaboration with the Zanzibar Malaria Elimination Program (ZAMEP), VectorLink Tanzania conducted a Zanzibar IRS planning meeting and agreed on an IRS start date of February 23, 2019.
- SumiShield decay rate assessment showed residual duration was at least five months on the majority of wall substrates (including mud and cement), based on mortality rates up to 72h after exposure. There were signs that residual efficacy is shortest on painted walls. Testing stopped five months after spraying due to a change in contractual mechanisms for entomological monitoring services.

1.22 UGANDA

TABLE 7: VL UGANDA AT A GLANCE

	Department for International Development UK (DFID)	PMI
Number of districts covered by PMI/DFID-supported IRS	5	10

Insecticide used	Organophosphate (Actellic 300 CS)	
Number of structures found by spray operators	361,196	1,008,109
Number of structures sprayed	341,370	950,939
2018 spray coverage	94.5	94.3
Population that PMI/DFID-supported IRS protected	Total Pop:	932,115
	Children < 5:	175,842
	Pregnant Women:	21,971
Length of campaign (total days)	25 days	25 days
Dates of PMI and DFID-supported IRS campaign	April 9–May 12, 2018: DFID 3 districts; PMI – 5 districts June 11 – July 14, 2018: DFID 2 districts; PMI – 5 districts Sept 3 – 18, 2018: PMI –2 sub-counties Lira district	
Number of people trained with U.S/DFID government funds to support vector control activities*	2,187 (201 supervisors, 335 team leaders, and 1,651 spray operators)	6,276 (739 supervisors, 932 team leaders, and 4,605 spray operators)

*This is based on the PMI indicator definition. It includes only spray staff such as spray operators, team leaders, supervisors, and clinicians. It excludes data clerks, IEC mobilizers, drivers, washers, porters, pump technicians, and security guards.

1.22.1 PROGRAM HIGHLIGHTS

- PMI's Uganda IRS bilateral program transitioned to VL on December 1.
- VL Uganda conducted a two-phased IRS campaign in 15 districts using Actellic 300CS, with each phase lasting 25 operational days. USAID/PMI funds supported spraying for 10 of these districts, while the United Kingdom's Department for International Development (DFID) funds supported spraying in the other five. The project sprayed the eight Phase I districts, Alebtong, Amolatar, Budaka, Butaleja, Butebo, Dokolo, Namutumba and Pallisa, on April 9–May 12, 2018, and the seven Phase II districts, Bugiri, Kaberamaido, Kibuku, Lira, Serere, Otuke and Tororo, on June 11–July 14, 2018. Spraying in two sub counties of Amach and Agali in Lira District was delayed until September 3–18 to allow for organic farming activities to occur in these areas. VL collaborated with district and national Ministry of Health (MOH) staff in providing supportive supervision during the trainings and spray campaign.
- Sprayed a total of 1,292,309 structures out of 1,369,305 structures found by spray operators in the 15 IRS target districts, accounting for a coverage rate of 94.4%.
- Protected 4,436,156 people, including 892,390 children under five and 121,590 pregnant women.
- The project used a total of 554,568 bottles of Actellic 300CS, with a utilization ratio of approximately 1:2.3 (bottles to structures sprayed), leaving a balance of 32,724 bottles at the end of the spray round.
- Contracted with Green Label Ltd, a private incineration plant in Iganga District, to incinerate all IRS insecticide-contaminated wastes, including used masks, damaged gloves and worn-out boots. Gentex Enterprise was contracted to recycle solid wastes, including empty bottles and assorted plastics, while Pulp and Paper Mills Ltd will recycle paper cartons.
- Conducted wall bioassays within one week of spraying to assess the quality of spraying in the target districts, and these recorded 100% mortalities for susceptible *An. gambiae* s.s. The average mortality at one and two months post spray was 100%. This implies that the quality of spraying was satisfactory.
- Of the five bionomics study sites monitored, *An. gambiae* s.l. was the predominant vector in the three current IRS districts (Bugiri, Otuke, and Tororo) while *An. funestus* s.l. was predominant in the IRS-withdrawn district (Apac) and the non-IRS district (Soroti).
- *An. gambiae* s.l. were resistant to alpha-cypermethrin, deltamethrin, and permethrin in Gulu, Lira, and Soroti and Bugiri, but susceptible to pirimiphos-methyl and bendiocarb in all four sites.

- Pre-exposure to PBO fully or partially restored susceptibility to pyrethroids (mortality 79–100%), indicating involvement of oxidases (P450s) in the phenotypic resistance of *An. gambiae* s.l. to pyrethroid insecticides in all the four test sites.
- Susceptibility studies conducted in Bugiri, Gulu, Lira, Soroti, Apac, Bugweri, Katakwi, and Dokolo showed that *An. gambiae* s.l. was fully susceptible to clothianidin and chlorfenapyr.
- Recruited an M&E Manager and Database Manager during the reporting period.

I.23 ZAMBIA

I.23.1 PROGRAM HIGHLIGHTS

- VL Zambia started on April 1, 2018, with the recruitment of project key staff, including the COP, Deputy Chief of Party, and Finance and Administration Manager.
- In preparation for the 2018 campaign, VL worked with the NMEP and relevant District Health Offices to conduct logistical needs assessments in the 29 PMI-supported districts. Provincial microplanning meetings were conducted in July/August and resulted in targeted number of structures in each district.
- Finalized a subcontract with Akros for utilization of mSpray in Eastern Province.
- Participated in an IRS guideline review workshop facilitated by the NMEP. Based on this meeting, VL will engage community-based volunteers as both mobilizers and spray operators to support IRS acceptance.
- The environmental compliance letter report was submitted to and approved by PMI, and pre-season environmental compliance assessments were conducted in all the 29 PMI-supported IRS districts.
- The project (through its core partner, PATH) also began working with PMI and National Malaria Elimination Centre stakeholders this year to compile, analyze, and visualize existing data to guide malaria vector control decisions and strategies at the national level. The activity, which is ongoing, will also work to inform the pre-elimination decision-making in Eastern province, and is discussed further in the core section of this report.
- Entomological surveillance was conducted in 12 sentinel sites (Nsalamba, Namyala, Kalonga, Simeo Mwaba, Mbalani, Robert, Lunga, Miyambo, Shibesa, Chebele, Chibobo, and Chishi) in six districts (Isoka, Kasama, Katete, Milenge, Mwense, and Serenje) in Zambia. *Anopheles funestus* s.l. remained the most abundant malaria vector collected at all sentinel sites accounting for more than 97% of vectors. WHO cone bioassays were concluded in all sentinel districts (Kasama, Isoka, Milenge, and Mwense) by July 2018 with average efficacy of 5.6 months (range 4-7 months). The shortest efficacy was in Kasama and the longest in Katete.

I.24 ZIMBABWE

I.24.1 PROGRAM HIGHLIGHTS

- AIRS Zimbabwe transitioned to VL March 1.
- VectorLink is transitioning out of implementing IRS in Manicaland districts and into other high-prevalence areas, specifically Mudzi and Mutoko districts in Mashonaland East province. However, the project is continue to provide technical assistance and work with provincial and district health officials in the four districts in Manicaland province to allow for a phased withdrawal and smooth transition to NMCP management of spray operations.
- Received most of the internationally and locally procured spray supplies and equipment for use during 2018 IRS campaign. All IRS commodities received to date were dispatched to Marondera provincial warehouse. As a part of government contribution, Mashonaland East Province provided three lorries and 22 motor cycles to VectorLink for use during the 2018 IRS campaign.

- Supported the national IRS level 1, as well as the provincial level 2, training of trainers in both Manicaland and Mashonaland East provinces. Technical support for level 3 training for SOPs was provided to the four districts in Manicaland.
- Completed Pre-IRS Environmental Assessments at IRS campsites in Mudzi and Mutoko districts of Mashonaland East Province, as well as Mutasa, Mutare, Nyanga and Chimanimani districts of Manicaland Province. Defects were noted during the assessment in both provinces. A plan of action to mitigate against noted defects was developed and activated for compliance measures.
- An SEA Amendment was produced to cover the technical assistance provided to Manicaland, which switched from organophosphates to dichlorodiphenyltrichloroethane (DDT) for IRS in 2018, and the two new districts in Mashonaland East Province.
- Constructed eight soak pits, 16 latrines and bathing rooms in Mudzi and Mutoko districts of Mashonaland East to enhance environmental hygiene and sanitation and promote gender inclusion.
- Trained 36 guards, storekeepers and drivers on safe management of insecticide especially DDT, as well as safe transportation of spray teams. VL also supported training of 35 clinicians in insecticide poisoning and management and other IRS related emergencies.
- Received technical support from VL Home Office and supported Manicaland Province for the training of 33 IRS supervisors and managers in handling of DDT, including its liquid waste management. The training included techniques on construction and installation of DDT mobile waste management facilities.
- Conducted stakeholder sensitization meetings in both Manicaland and Mashonaland East provinces and carried out ward-level community mobilization meetings in the four districts in Manicaland.
- Delays in NMCP procurement of Manicaland IRS materials adversely affected level 3 training. VectorLink helped to close the gap by providing extra material leftover from the 2017 campaign.
- At the request of the NMCP, VL supported malaria communication and social mobilization activities for the IRS campaign. Preparations began for road show drama group trainings and promotional material development (posters, hats, t-shirts).
- Some activities were suspended in July during the political campaigns for the harmonized elections which were held on July 30, 2018. The delay did not negatively impact operations.
- Delays in delivery of imported Granulated Activated Charcoal affected roll out of the mobile soak pits for DDT in Manicaland. Manicaland provincial leadership located some supplemental charcoal in the interim until the charcoal was delivered. All mobile soak pits are currently operational.
- Continued entomological monitoring through monthly adult mosquito collections, cone wall bioassay tests, and insecticide susceptibility tests at sentinel sites across Zimbabwe.
- *Anopheles funestus* s.l. was the predominant species at all three sentinel sites in Manicaland. *Anopheles gambiae* s.l. was found in low density at Chakohwa and Vumba sites. Other species found include *An. pretoriensis*, *An. coustani*, *An. rufipes*, and *An. maculipalpis*. There is generally a paucity of traditional malaria vectors at the four sites in Mashonaland East that could be attributed to the low population densities during the dry season.
- Mosquito indoor resting densities as determined through the pyrethrum spray catches and prokopack aspirator collections were very low at all sites. However, CDC light trap collections showed that light traps set outdoors consistently caught more *An. funestus* s.l. per trap per night at all sentinel sites. Also, inclusion of pit shelters has enhanced the average number of mosquitoes collected at most sites.
- Continued to support laboratory capacity at African University including establishing procedures for mosquito samples and data reporting to VectorLink Zimbabwe and the NMCP and procuring laboratory supplies, stationery, and cleaning materials.

- Continued to work on establishing an insectary at African University as well as support two insectary technicians.

2. CORE

2.1 OPERATIONS RESEARCH

Evaluation of pirimiphos-methyl efficacy in experimental huts when sprayed on half the usual surface area against natural populations of *Anopheles gambiae* s.l. in Ghana

The main objective of this study is to determine the efficacy of spraying pirimiphos-methyl in terms of percentage mortality in experimental huts partially sprayed (top or bottom half of the walls, with and without spraying ceilings), as compared to huts fully sprayed and negative controls that are not sprayed. The study continued for a second year due to low number of mosquitoes collected in the previous year.

A total of 5,685 *An. gambiae* s.l. mosquitoes were collected in 10 rounds of post-spraying collections each with 12 nights in the reporting period. The results after spraying in year two indicated that fully sprayed experimental huts showed the highest mortality (80%) of mosquitoes in total from the morning collections and after 24-hour holding periods, followed by huts with upper wall and ceiling sprayed (73%) and lower wall and ceiling sprayed (72%). The mortality from huts sprayed only on the upper wall and the lower wall were 51% and 50%, respectively. Data collections will continue up to November and detailed analysis will be carried out on the final datasets at the end of the study period.

2.2 COST EFFICIENCY

VL examined potential cost efficiencies in all country site offices while transitioning 16 countries from AIRS to VL and starting operations in an additional eight countries. In Malawi, Cote d'Ivoire, Benin, Senegal and Nigeria, VL found shared office space with other Abt projects, thereby reducing overhead costs for rent, security and utilities and allowing VL to share administration and finance staff across projects. In Cameroon and Niger, VL collaborated with core partner PSI to share office space. These moves build on the trend set in Zimbabwe, Madagascar and Ghana under AIRS where project offices already share space with other Abt projects, and in Liberia, Tanzania and DRC where site offices are imbedded in government space or local subcontract partners.

2.3 DATA ANALYTICS

VL launched the data analytics and visualization component in 2018 with Zambia as the first project country. In Zambia, the project is working with PMI and National Malaria Elimination Centre stakeholders to compile, analyze, and visualize existing data to guide malaria vector control decisions and strategies. Datasets include Health Management Information System malaria case data, entomological monitoring and insecticide resistance testing data, intervention coverage data (IRS and LLINs), and climatological data. The team is accessing coverage data from AIRS/VL as well as government and other implementing partners to provide a complete picture of vector control implementation in Zambia.

VL is using data from 2014-2018 to examine historical trends. Interactive data dashboards are being created using Tableau Software to meet the needs of target users. Key stakeholder interviews were conducted to inform dashboard development, and these stakeholders continue to be involved throughout the development process to ensure maximum relevance of the end product.

2.4 M&E

The Monitoring and Evaluation (M&E) team configured, tested, iterated, and trained staff on the new global database VectorLink Collect. The database, an instance within the District Health Information Software 2 (DHIS 2) platform, was built in collaboration with subcontractor, BAO Systems. The iteration of the instance was exclusively focused on IRS campaign data entry and analyses, with entomology to be

incorporated after the reporting period. Of the four countries targeted for deployment in year one (Kenya, Malawi, Tanzania, and Zambia), only Malawi deployed during the reporting period.

VectorLink M&E Home Office staff as well as BAO Systems staff hosted a five-day regional DHIS 2 training in Lusaka, Zambia, from August 5-11. M&E and database managers from these countries and Uganda (as it will be the first country to deploy the new system in year two) attended the training, which introduced M&E teams to the new software, from its basics of configuration to the nuances of managing the specific VectorLink instance, with an emphasis on practical exercises and adaptation to specific country contexts.

Additionally, work began on migrating legacy AIRS spray data from existing repositories to the new DHIS 2 instance for the four year-one countries. Similarly, work began on the configuration of the entomology module for the same DHIS 2 instance. In conjunction with BAO and the VL entomology team, the M&E team is accelerating the timeline of the creation and iteration of this module to align with PMI requests and the creation of a WHO entomology-only DHIS 2 instance.

M&E teams continued to backstop the legacy AIRS and country-specific databases in countries that were not targeted for DHIS 2 deployment in year one. These countries, however, are being primed with updates to data collection materials to mirror the DHIS 2 configuration and ease the transition to the new platform.

2.5 GENDER

The project welcomed and oriented new gender focal points in Burkina Faso, Malawi, Tanzania, Zambia and Uganda. The project's gender advisor worked closely with EnCompass to integrate gender issues into the new Bootcamp curriculum to build sustainable local capacity for gender-integrated IRS. Across the project, innovative approaches led by field-based staff advanced the project's gender mainstreaming and female empowerment goals, and the project continues to disseminate results to inform the global dialogue. The project's previously published paper "Equal Opportunity, Equal Work" on gender in IRS was cited in a presentation at the Social and Behavior Change Communication (SBCC) Summit in Indonesia in April. The project hosted a webinar on Building Capacity for Gender Integration in the Fight against Malaria in April, attended by project staff and several other implementing partners. Two project staff, Helen Amegbletor and Zeddy Bore, were named as members of an authorship group in the recently published paper, "Increasing women's engagement in vector control: a report from the Accelerate to Equal project workshops."

2.6 REGIONAL ENTOMOLOGY TRAINING

VL held a regional entomology training for 16 participants, including technical managers and one NMCP representative of each of new PMI countries (Cameroon, Côte d'Ivoire, Malawi, Niger, and Sierra Leone). The training was facilitated by the VL home office, PMI/CDC, and PMI/USAID. The main objective was to strengthen capacities of VL technical staff and their government counterparts. The training, which was conducted in Abidjan, Côte d'Ivoire, August 20-25, covered mosquito sampling methods, morphological identification, ovary dissection and examination, how to preserve and ship mosquito samples (pinning mosquito samples), insecticide resistance (WHO tube tests and CDC bottle assays), cone bioassay tests, PMI entomological indicators, analysis and interpretation of entomological data, reporting, and PMI's approach to entomological monitoring. Pre- and post-tests were given to the participants. An average score of 59% was obtained on the pre-test, which was improved to 81% on the post-test.

2.7 MALARIA CONSORTIUM

In Malawi, Malaria Consortium is supporting the development of the country's insecticide resistance management (IRM) plan. The initial 12-month timeline for development of the plan has been brought forward to end in March 2019.

Desk-based reviews of documents relevant to the country's already developed integrated vector control strategy (IVCS) and IRM plans were carried out, including publications on new developments in malaria vector control, global recommendations and guidance, and strategies developed for specific countries.

Specific focus was given to current developments around the impact of pyrethroid resistance and the potential use of LLINs containing pyrethroids and the synergist PBO and criteria for selecting target areas to deploy the nets. A draft outline of the IVCS framework was developed and preparation of specifications for customized geographic information system (GIS) maps relevant to IVCS and IRM plans initiated. Malaria Consortium proposed to incorporate a dynamic stratification tool and a decision tool to help countries adjust their vector control strategies according to changes in morbidity trends, transmission risk factors, coverage of interventions and resources available, which is under review.

The work plan to develop Malawi's IRM plan was presented and discussed at a national Vector Control Technical Committee meeting in Lilongwe in July 2018. Several national and international partners and stakeholders were represented at the meeting. Feedback was received including the importance of a comprehensive baseline data and spatial mapping, expansion of entomological surveillance sites, optimal combination of interventions for resistance management, potential stakeholders to feed into the IRM plan development process, and the need to specify anticipated new tools and products relevant to resistance management in the country. Several unpublished and published documents have been reviewed in relation to insecticide resistance in Malawi as well as southern Africa. A consultant entomologist has been recruited and is working on the situation analysis report which will provide important background information in the IRM plan development. Contact has been established and relevant data obtained from some of the identified stakeholders in Malawi, including the DHIS 2-generated health facility data from the NMCP.

2.8 ENVIRONMENTAL COMPLIANCE AND SAFETY

VL is now using a streamlined version of supervisory forms deployed on two different platforms to allow for different functionality of the forms for government and VL supervisors, respectively. The new forms have been rolled out in all IRS countries. In addition, a revised and improved reporting system and template is now in place for incident reports. Improvements to the incident reporting system and template continued.

VL Home Office environmental compliance staff traveled to Uganda and Zimbabwe to provide technical assistance for the country programs. In Uganda, the STTA was geared towards introducing VL Uganda to VL's environmental compliance standards and to train and assist the new Environmental Compliance Office on the activities needed to prepare operation sites for the spray campaign. In Zimbabwe, technical assistance from Home Office was needed for the transition of Manicaland Province to spraying with DDT, since VL will loan IRS materials and provide training on environmental compliance elements.

In addition, VL prepared, submitted, and received approval for two Supplemental Environmental Assessments (for Burkina Faso and Malawi) and five Supplemental Environmental Assessment Amendments (for Ethiopia, Mali, Madagascar, Mozambique and Zimbabwe) for the use of SumiShield® and Fludora Fusion for nationwide IRS use.

2.9 LLIN DISTRIBUTION AND NET DURABILITY MONITORING

2.9.1 LLIN DISTRIBUTION

VL provided technical assistance and training to country NMCPs and other malaria partners to ensure that continuous LLIN distribution through routine and other channels is strategically planned and implemented. Through comprehensive assessments of current LLIN distribution channels, gaps and opportunities for improvement were identified. These process evaluations, conducted in coordination with NMCPs, other MOH departments involved in LLIN distribution through routine services, PMI, Global Fund, and other partners, used document review, semi-structured key informant interviews, and observations at the national, regional, district, and health facility level. Findings from Year 1 assessments are being used to make strategic recommendations for future LLIN activities, to explore expansion of continuous distribution channels to maintain LLIN coverage, and to develop national guidelines. Please see the country level updates for specific activities.

2.9.2 DURABILITY MONITORING

VL began preparations for LLIN durability monitoring studies in collaboration with NMCPs and PMI to provide evidence on LLIN survivorship, physical durability, and insecticide effectiveness. During the reporting period, VL reviewed and revised the open data knowledge (electronic) version of the durability monitoring questionnaire, adding internal logic and validity checks to strengthen data quality assurance during fieldwork. Staff also began planning for the transition of ongoing VectorWorks-led studies to VL, providing input on a handover memo and identifying potential country-level leads to manage future study rounds. Please see the country level updates for specific activities in Madagascar and Niger.

2.10 SBCC

SUMMARY

VL identified key barriers that have led to documented challenges with mobilization for and/or refusals of IRS and proposing strategies to mitigate them. Please see the country level updates for specific activities.

2.11 CONFERENCES

- VL submitted eight abstracts to the American Society of Tropical Medicine and Hygiene 2018 Conference. Two were accepted as oral presentations and six were accepted as poster presentations.
- The project had one abstract accepted to the 2018 PAMCA conference. VL Rwanda Entomological Coordinator presented the abstract paper titled “*Plasmodium* sporozoite infection rates among primary and secondary malaria vectors in Rwanda” at the conference.
- Four VL staff presented the following sessions at the Multilateral Initiative on Malaria in Dakar, Senegal, in April:
 - Environmental Compliance Concerns and Solutions that Arise from Malaria Control via IRS.
 - Technology and Vector Control: How Real-time Data, Mobile tools, and Mapping Can Improve Operations and Results
 - Capacity Building for IRS in Africa
 - The Impact of IRS on Measures of Malaria Transmission and Incidence

2.12 COMMUNICATIONS

During this reporting period, four success stories and two Malaria Fighter profiles were posted on the project and PMI websites, and distributed via the PMI VectorLink quarterly e-letter (see Annex B). VL distributed two e-letters (April and August), and five e-alerts (April for World Malaria Day, August for World Mosquito Day, and an alert each month in June, July, and August to promote the Vector LearningXchange (VLE)) to nearly 4,000 global health professionals. Resources, tool kits, trainings, and videos were added to the VLE and two webinars were hosted on the VLE (Gender Mainstreaming in IRS and Digital Tool Use for Surveillance and Decision Making). Please see Annex B for Google Analytics on Twitter and the VL website.

Four Tech Talks (VL Integrated Data Analytics & Visualization, LLINs, Legal/HR protocols) were held with all COPs. New COPs participated in an additional four Tech Talks covering various technical areas of the project, including an introduction to the Project, M&E, Gender, and Entomology).

2.13 NGENIRS

In 2018, VL Director of Project Operations and Procurement and Logistics Manager liaised with NGenIRS on all activities. This included participation in stakeholder meetings with other relevant PMI VL colleagues, monthly coordination meetings, and regular communication on insecticide forecasting and orders. All PMI spray programs implemented through VL participated in the NgenIRS project in 2018.

Actellic and SumiShield procurements were co-paid to Abt's net price of \$15 per Actellic bottle and SumiShield sachet. SumiShield co-payments include: Burkina Faso, Ethiopia, Madagascar, Mali, Tanzania, and Kenya. Actellic co-payments include: Benin, Burkina Faso, Ethiopia, Ghana, Kenya, Madagascar, Malawi, Rwanda, Uganda, Zambia, and Zimbabwe.

NGenIRS carried out three regional insecticide forecasting workshops for VL staff, NMCP and other malaria stakeholders. See Table 8 for details. Workshop achievements included:

- Allocation of funds for each country validated;
- Estimated insecticide volumes for 2019 spray campaigns determined with NMCPs and linked to funding sources;
- Countries developed their specific shipment plans;
- Information gathered informed minimum volume guarantee negotiations between NGenIRS and suppliers.

TABLE 8: NGENIRS REGIONAL WORKSHOPS

Venue	Dates	Countries in attendance	No. of Participants
Lusaka, Zambia	July 30-31	Malawi, Mozambique, Rwanda, Zambia, Zimbabwe	22
Accra, Ghana	August 6-7	Kenya, Tanzania, Zanzibar, Uganda, Ethiopia	34
Cotonou, Benin	August 16-17	Benin, Burkina Faso, Cote D'Ivoire, Madagascar, Mali	26

ANNEX A:

M&E RESULTS SUMMARY

Country	# Structures Sprayed	# Structures found	Spray Coverage	Total Population Protected	Children Under Five Protected	Pregnant Women Protected	# People Trained
Benin	400,997	442,548	90.6%	1,321,758	269,164	58,086	2,229
Burkina Faso*	258,766	266,765	97.0%	766,374	125,206	14,183	2,227
Ethiopia*	472,569	485,358	97.4%	1,264,189	213,459	28,944	2,413
Ghana*	298,701	324,704	92.0%	836,376	148,627	18,397	837
Rwanda*°	214,802	215,467	99.7%	885,060	127,688	13,459	1,710
Madagascar*°	548,789	586,768	93.5%	2,232,097	328,092	85,821	7,589
Mali*°	160,723	205,612‡	78.2%	665,581	93,968	20,992	824
Uganda*	1,292,309	1,369,305	94.4%	4,436,156	716,548	99,619	8,463
TOTAL	3,647,656	3,896,527	93.6%	12,407,591	2,022,752	339,501	25,468

*Indicates countries for which the EOSR has not been finalized

°Indicates countries where IRS campaigns concluded shortly after the reporting period.

‡Due to an insecticide shortage, the Mali IRS campaign concluded earlier than anticipated preventing spray operators from visiting all targeted areas. The structures reported here as "found" are, in fact, the total targeted structures for the campaign

ANNEX B: COMMUNICATIONS

SUCCESS STORIES:

<https://pmivectorlink.org/2018/07/31/the-container-store/>

<https://pmivectorlink.org/2018/08/03/record-reductions-in-malaria-cases-in-irs-districts/>

<https://pmivectorlink.org/2018/09/30/forging-partnerships-for-progress-in-malaria-prevention/>

<https://pmivectorlink.org/2018/08/17/world-mosquito-day-a-story-of-strength-and-progress-as-told-through-photos/>

MALARIA FIGHTER PROFILES:

<https://pmivectorlink.org/2018/08/01/malaria-fighter-peace-dellor/>

<https://pmivectorlink.org/2018/04/24/world-malaria-day-2018/>

GOOGLE ANALYTICS

APRIL 1-SEPTEMBER 30, 2018 *

PMI VECTOR LEARNINGXCHANGE

Users	817
New Users	817
Sessions	1,167
Page Views	3,155
New Visitors	87.7%
Returning Users	12.3%

PMI VECTORLINK

Users	4,436
New Users	4,436
Sessions	6,284
Page Views	20,492
New Visitors	84%
Returning Users	16%

PMI VECTORLINK TWITTER

Tweets	228
Tweet Impressions	120.25k
Profile Visits	1,1475
Mentions	92
New Followers	188

*Google Analytics were not conducted except during this time period.