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2019 BENIN

END OF SPRAY REPORT

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2019 VECTORLINK BENIN

END OF SPRAY REPORT

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ACRONYMS

BMP	Best Management Practices
CDC-HAB	Departmental Coordination for Hygiene and Basic Sanitation (*Coordination D*épartementale *Composante Hygiene et Assainisssement de Base*)
CFV	Control Flow Valve
CISE	Social and Environmental Engineering Company (*Compagnie d'Ingénierie Sociale et Environnementale)*
CREC	Entomological Research Center of Cotonou (*Centre de Recherche Entomologique de Cotonou)*
DAGRI	Directorate of Agriculture (*Direction de l'Agriculture*)
DCAM	Community Development and Environmental Sanitation (*Développement Communautaire et Assainissement du Milieu)*
DCV	Data Collection Verification
DDCVDD	Departmental Directorate of Living Environment and Sustainable Development *(Direction Départementale du Cadre de Vie et du Développement Durable)*
DDEHU	Departmental Directorate for the Environment, Habitat and Urbanism (*Direction Départementale de l'Environnement, de l'Habitat et de l'Urbanisme)*
DDS	Departmental Health Directorate (*Direction Départementale de la Santé*)
DEC	Data Entry Clerk
DHAB	Directorate of Hygiene and Basic Sanitation (*Direction de l'Hygiène et de l'Assainissement de Base*)
DOS	Directly Observed Spraying
ECO	Environmental Compliance Officer
GHES	Hygiene, Environment and Safety Department (*Générale de l'Hygiène, de l'Environnement et de la Sécurité)*
GOB	Government of Benin
ICC	Inventory Control Card
IEC	Information, Education and Communication
IRS	Indoor Residual Spraying
LLIN	Long-Lasting Insecticide Net
MAEP	Ministry of Agriculture, Livestock and Fishing (*Ministère de l'Agriculture, de l'Elevage et de la Pêche)*
M&E	Monitoring and Evaluation
mHealth	Mobile Health
MOH	Ministry of Health
NMCP	National Malaria Control Program (*Programme National de Lutte Contre le Paludisme*)
PMI	President's Malaria Initiative
PPE	Personal Protective Equipment
PSECA	Pre-Spray Environmental Compliance Assessment
RSL	Race to the Starting Line
SEA	Supplemental Environmental Assessment
SHAB	Hygiene and Basic Sanitation Department (*Service de l'Hygiène et de l'Assainissement de Base)*
SOP	Spray Operator
ToT	Training of Trainers
USAID	United States Agency for International Development

EXECUTIVE SUMMARY

In September 2017, Abt Associates was awarded a five-year vector control task order, the U.S. President's Malaria Initiative (PMI) VectorLink Project, to support vector control activities including the implementation of Indoor Residual Spraying (IRS) in up to 24 countries, including Benin. The purpose of the PMI VectorLink project is to support PMI in planning and implementing IRS programs and other proven life-saving malaria vector control interventions with the overall goal of reducing the burden of malaria in Africa.

VectorLink Benin successfully completed its 2019 IRS campaign well within the scheduled timeframe designated by the National Malaria Control Program (NMCP), and Abt provided IRS related commodities procurement and logistical services; planning, organization, management, and IRS implementation. The project successfully conducted indoor residual spraying (IRS) campaign in six districts of Northern Benin (Kandi, Gogounou and Segbana in Alibori department, and Djougou, Copargo and Ouake in Donga department) using the organophosphate pirimiphos-methyl (Actellic 300CS®) from May 6 to May 29, 2019. The project completely withdrew IRS from the two districts of Atacora department (Kérou and Péhunco) in accordance with the National Insecticide Resistance Management Plan, which recommends the withdrawal of IRS in areas where the same insecticide is used for three successive campaigns. The spray area was thus reduced from eight districts in 2018 to six districts in 2019. During this IRS campaign, the project targeted 348,978 structures with a goal of protecting 1,112,610 people. The VectorLink Benin project collaborated with districts and the NMCP / Ministry of Health (MOH) staff in providing supportive supervision during the trainings and spray campaign. The project benefited from the support of the UNITAID-funded Next Generation IRS (NgenIRS) project in the procurement of insecticide and from Dimagi LLC in the use of mHealth supervisory tools for the campaign.

The followings are project achievements and key highlights of the 2019 spray campaign, which lasted 21 operational days (see Table 1 for more details):

- The project sprayed a total of 335,207 structures out of 387,711 structures found by spray operators (SOPs) in the six IRS target districts, accounting for a final spray coverage rate of 86.5 percent.
- The project protected 1,077,411 people, including 243,648 (22.6%) children under five years old and 51,872 (4.8%) pregnant women.
- The project trained 1,623 individuals, using U.S. government funds, to support vector control activities in the six districts. Of these, 1,278 (1,095 males and 183 females) were spray operators, 256 were team leaders (212 males and 44 females), and 89 were supervisors (66 males and 23 females). Overall, 15.4% (n= 250) of all trained IRS personnel with U.S. government funds for the 2019 spray round were female.
- A total of 50,856 bottles of Actellic were procured and shipped to Benin in 2019. This quantity was added to the leftover insecticide of 3,678 bottles from the 2018 spray campaign, which brought the total insecticide quantity to 54,534 bottles available in-country at the start of the 2019 IRS campaign. The project used 53,504 bottles to spray 335,207 structures in six IRS districts, with a utilization ratio of approximately one bottle for 6.3 structures. Two bottles of Actellic were used for quality control by the national laboratory upon arrival in Benin; thus, the remaining insecticide quantity at the end of the 2019 spray campaign is 1,028 bottles of insecticide, set to expire in January 2021.
- The project will incinerate all insecticide-contaminated wastes, including used nose masks at "Hopital de l'Ordre de Malte", a hospital serving Djougou, Copargo and Ouaké districts. "Hopital de l'Ordre de Malte" will also handle damaged gloves and worn-out boots. Other non-contaminated solid wastes, including triple rinsed empty bottles and assorted plastics, will be recycled at Cise Recycle Plant, while paper cartons will be recycled at GHES Inter S.A.R.L.

The Entomological Research Center of Cotonou (CREC) conducted wall bioassays to assess the quality of spraying in the target districts. According to CREC's report, 36 sprayed houses were randomly selected for this assessment, seven days after the spray started in the communes of Kandi, Gogounou, Copargo and Djougou. Bioassays recorded 100 percent mortality for susceptible *An. gambiae* s.s. The average mortality at one and two months post-spray was 100 percent. This implies that the quality of spraying was not underdosed.

VectorLink Benin implemented the 2019 IRS campaign in close collaboration with PMI/Benin and with several Beninese governmental partners, notably: NMCP, MOH, Ministry of Agriculture, Livestock and Fisheries (MAEP), Ministry of Environment, Beninese Environmental Agency, National Directorate of Agriculture, National Directorate of Hygiene, Department of Administrative Authorities of Donga and Alibori, and the Departmental Directorate of Health for Alibori and Donga.

As the primary partner, the NMCP was involved in all of the main activities, including the development of the operational plan, macro and microplanning meetings, seasonal staff recruitment and training, and the environmental compliance assessment. Furthermore, the NMCP had more responsibility in directly supervising IRS activities implementation in Copargo, Gogounou, Kandi, and Segbana districts.

Table 1: VectorLink Benin 2019 IRS Campaign Summary

	Donga Department: Djougou, Copargo, Ouaké	Alibori Department: Kandi, Gogonou, Segbana	Total
Dates and length (in days) of PMI-supported IRS campaign	May 6 to 29, 2019		21 operational days in each department
Insecticide used	Organophosphate (Actellic 300 CS)		
Total targeted structures	188,022	160,956	348,978
Cumulative structures found by SOPs	221,515	166,196	387,711
Cumulative structures sprayed	188,536	146,671	335,207
Population in sprayed structures: Total Population:	551,157	526,254	1,077,411
Pregnant women	28,703	23,169	51,872
Children under five years old	123,424	120,224	243,648
Bottles of insecticide used	28,509	24,995	53,504
Spray progress (%) based on targeted structures	100.3	91.1	96.1
Spray coverage (%) (based on structures found by SOPs)	85.1	88.3	86.5
Total number of people trained with USG funds to support IRS in targeted areas*	873	750	1,623
Male	742	631	1,373
Female	131	119	250
Number of clinicians trained	3	3	6
Male	3	3	6
Female	0	0	0

**This is based on PMI indicator definition and only includes Spray Operators, Team Leaders and Supervisors.*

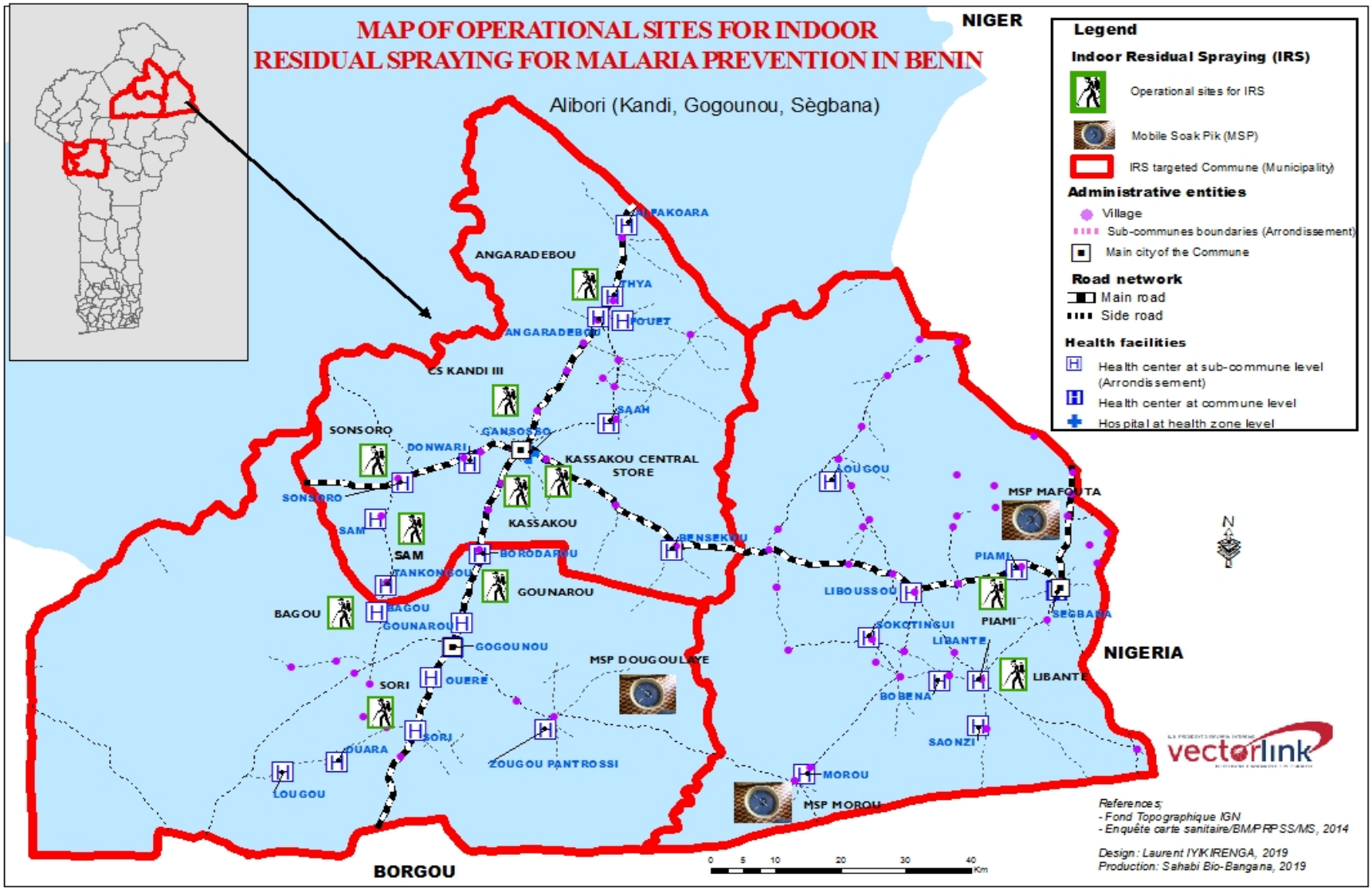
1. COUNTRY BACKGROUND

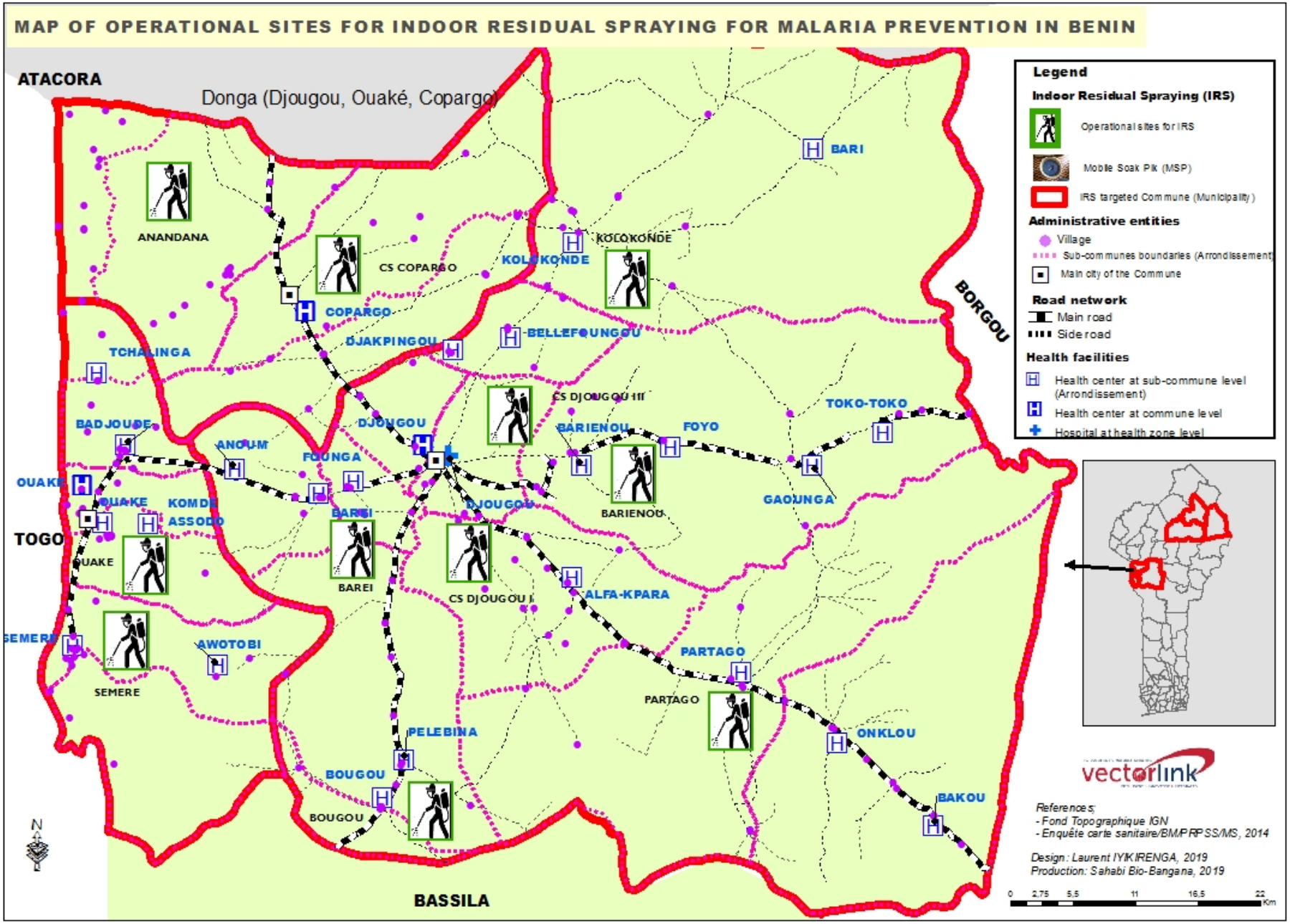
Given its geography, Benin is a country characterized by various tropical pathologies with a predominance of endemic and epidemic diseases including malaria. Pregnant women and children under five are the most vulnerable groups and are exposed to severe forms of the disease. All age groups are also affected by malaria.

The epidemiological profile of malaria transmission in the Northern Region is seasonal, with a dry season (November to June) and a rainy season (July to October) during which malaria incidence rates are highest. In this part of the country, *Anopheles gambiae* s.l. is the predominant vector and *Anopheles funestus* with a minor role in transmission. Recent entomological monitoring revealed *An. gambiae* s.l resistance to pyrethroids (permethrin and deltamethrin), and suspected resistance to carbamate (bendiocarb) among wild mosquito vector populations. Organophosphates (pirimiphos-methyl) have been used against *An. gambiae* s.l. in the same area since 2015 and remains globally effective. According to the national insecticide resistance management plan, the time has come to switch to another insecticide class in order to preserve the effectiveness of organophosphates.

Benin's 2017-2021 National Malaria Strategic Plan highlights the need of adapting malaria control strategies to the specificities of the different epidemiological facies and integrating multiple prevention methods, including sleeping under long-lasting insecticide nets (LLINs), indoor residual spraying (IRS) with long-lasting insecticides, and other vector control measures.

Figure 1: Operational Sites for Indoor Residual Spraying For Malaria Prevention in Benin




MAP OF OPERATIONAL SITES FOR INDOOR RESIDUAL SPRAYING FOR MALARIA PREVENTION IN BENIN
ATACORA
Donga (Djougou, Ouaké, Copargo)
BORGOU
TOGO
BASSILA
ANANDANA
CS COPARGO
COPARGO
KOLOKONDE
KOLOKONDE
BARI
DJAKPINGOU
BELLEFOUNGOU
TCHALINGA
CS DJOUGOU III
TOKO-TOKO
BADJOUDE
DJOUGOU
BARIENOU
FOYO
ANOUM
FOUNGA
OUAKE
OUAKE
KOMDE
ASSODO
BAREI
DJOUGOU
BARIENOU
GAOUNGA
OUAKE
BAREI
CS DJOUGOU I
ALFA-KPARA
SEMERE
AWOTOBI
SEMERE
PARTAGO
PARTAGO
PELEBINA
ONKLOU
BOUGOU
BOUGOU
BAKOU
N
Legend
Indoor Residual Spraying (IRS)
Operational sites for IRS
Mobile Soak Pit (MSP)
IRS targeted Commune (Municipality)
Administrative entities
Village
Sub-communes boundaries (Arrondissement)
Main city of the Commune
Road network
Main road
Side road
Health facilities
Health center at sub-commune level (Arrondissement)
Health center at commune level
Hospital at health zone level
vectorlink
References:
- Fond Topographique IGN
- Enquête carte sanitaire/BMPPRPSS/MS, 2014
Design: Laurent IYKIRENGA, 2019
Production: Sahabi Bio-Bangana, 2019
0 2.75 5.5 11 16.5 22 Km

As stated in the 2019 VectorLink Benin work plan, the three objectives for the 2019 spray campaign included:

- Cover at least 85 percent of eligible structures found in six districts of Donga and Alibori departments.
- Increase national and local capacity in planning, implementing and supervising IRS.
- Implement cost-efficient activities to save funds and ensure ease of management.

Given these objectives, VectorLink Benin aimed to cover approximately 348,978 structures in the six targeted Districts of Donga and Alibori departments, and to protect as many of the estimated 1,112,610 people living in these communities as possible.

To achieve these objectives, VectorLink worked with several partners including the Ministry of Health (MoH) and NMCP, whose activities included: 1) validation of IRS management tools, including information, education, and communication (IEC) tools, data collection and verification forms, report forms, checklists, etc.; 2) support with planning the IRS campaign; 3) training IEC mobilizers and spray operations (SOPs); 4) supervision during the IRS campaign; and 5) support with validating data collected.

Table 2: Estimated Population in Targeted Districts of Donga and Alibori Departments

Department	District	Targeted Structures	Targeted Population	Area (km²)
Donga	Copargo	25,646	69,582	868
	Djougou	130,806	386,876	3,928
	Ouaké	31,570	79,652	741
Alibori	Gogounou	52,402	190,636	4,937
	Kandi	73,556	264,877	3,591
	Ségbana	34,998	120,987	4,359
Total		**348,978**	**1,112,610**	**18,424**

2. PRE-SEASON ACTIVITIES

2.1 IRS CAMPAIGN PLANNING

The VectorLink Benin project developed the Race to the Starting Line (RSL) document and an IRS operational plan, and disseminated these documents to all stakeholders for review in planning for the IRS campaign. The RSL calls for a nine-week pre-spray countdown, and shows deadlines for activities leading to the spray campaign. The IRS operational plan ensured harmonization of spray schedules to protect vulnerable populations during historic peak transmission seasons based on malaria morbidity data trends collected through the health information system. The operational plan identified schedules for geographical reconnaissance of the intervention area, procurement, advocacy, micro planning meetings, recruitment and launch of the IRS campaign. The operational plan also included logistics arrangements, materials distribution, start date in Alibori & Donga departments, and the environmental compliance assessment, among other spray-related tasks.

Initially scheduled to begin on April 30, 2019, the campaign was rescheduled to start on May 6, 2019 following the election of parliamentarians at the national level that took place during the last week of April 2019. The 2019 IRS campaign lasted 21 operational days in each of the six districts.

Table 3 summarizes the activities planned and organized by the project for the 2019 IRS campaign

Table 3: IRS Activities Planning

Dates	Activities	Participants or Stakeholders	Comments
December 2018 - January 2019	Finalize the development of the 2019 PMI VectorLink Benin work plan	VectorLink Benin, VectorLink-Home Office	Meetings were held with NMCP on the scope of work of the VectorLink project, specific aspects of the 2019 IRS campaign, including the target districts to be directly managed by NMCP, and lessons learned and recommendations from the 2018 IRS campaign. PMI/Benin and PMI/Washington provided guidance, leading to a final approved work plan in January 2019.
December 2018 - March, 2019	Field visits for geographical reconnaissance and needs assessment	VectorLink Benin, NMCP, Health Department Directorate (DDS) Atacora, Donga and Alibori, technical working group (vector control), and other IRS stakeholders	VectorLink Benin staff met regularly between December and March to review the organization and planning for the IRS campaign, and made changes as needed. Several meetings were held with PMI / Benin to discuss the possibility of giving more responsibilities to Benin NMCP in the implementation of IRS operations.

Dates	Activities	Participants or Stakeholders	Comments
April 3-5, 2019	Microplanning workshop of the 2019 IRS campaign	NMCP, Entomological Research Center of Cotonou (CREC), Vectorlink Benin, USAID PMI Benin, DDS Donga and Alibori	A workshop held in Cotonou allowed all parties involved to review IRS micro-plans with stakeholders and share responsibilities for the implementation of the 2019 IRS campaign. The role of the NMCP in supervision has been strengthened in four districts: Kandi, Segbana, Gogounou and Copargo.
February 1-March 31, 2019	Recruitment of seasonal staff and trainings	VectorLink Benin, NMCP, CREC, DDS Atacora, Donga, Alibori.	Recruitment of seasonal staff was essentially done by the health system; the project was involved in the recruitment of site coordinators and project staff's assistants. The project organized and coordinated all trainings.
April 30 – May 04, 2019	Advocacy and awareness raising for local authorities on IRS implementation	Departmental officials of Atacora, Donga and Alibori, DDS Donga and Alibori staff, district medical doctors, health zone coordinators, eight mayors of target districts, district chiefs, religious leaders, and other health system partners	These meetings aimed to: • Present the scope of work and specificities of the new VectorLink Project • Discuss stakeholders roles in the IRS campaign • Reinforce participants' knowledge about IRS • Draw up an action plan for authorities to support social mobilization • Gain endorsment by the six district mayors, DDS, district medical doctors, and health zone coordinators to conduct IRS • Share the overall campaign plan and methodology with local authorities.

As part of capacity building, NMCP coordinated and provided operational oversight in both departments.

2.2 Logistics Planning and Procurement

VectorLink Benin conducted a logistics needs assessment in November 2018 to develop the logistics and procurement plan that considered:

- Spray data based on the 2018 IRS performance
- Available stock of materials, consumables, and equipment
- Transport arrangements for distribution of equipment, materials and supplies
- Estimation of insecticide, personal protective equipment (PPE), and other spray equipment required to fill any gaps.

2.2.1 Personal Protective Equipment and Insecticide Procurement for the 2019 IRS Campaign

Most of the personal protective equipment (PPE) and sprayers used during the 2018 IRS campaign remained in good condition and available for use in 2019. VectorLink Benin identified additional needed materials and developed a list for all items to be procured locally and internationally. A full list of PPE procured for the 2019 IRS campaign is included in Annex A. The inventory count revealed that 3,678 bottles of pirimiphos-methyl CS were in stock at the end of the 2018 spray campaign. This quantity was deducted from the 2019

spray campaign insecticide usage forecast of 54,534 bottles. The project procured a total 50,856 of bottles of pirimiphos-methyl CS. VectorLink Benin also received quality control test results via CEM Analytical Services Ltd. (UK) for the batches of organophosphates shipped to Benin. The results showed that all batches were of good quality and effective during this campaign.

2.2.2 Planning Logistics and Transportation for the 2019 IRS Campaign

Prior to the start of the spray campaign, the VectorLink Project staff conducted several field visits with NMCP and appropriate DDS staff. During field visits, meetings were held with local authorities for geographical reconnaissance. An evaluation of the rehabilitation of operational sites was also carried out.

To achieve greater than 85 percent spray coverage in the 21 days planned for the 2019 IRS campaign, the intervention areas were subdivided into fixed operational sites that take into account the administrative subdivision (villages, arrondissements and districts), the number of structures to be treated, the number of days planned for the campaign, spray operators per site, and the existence of a building that could be used to store insecticides and other IRS equipment. Environmental safety standards outlined in the PMI Best Management Practices (BMP) Manual for IRS updated in February 2015 were also considered (e.g., insecticide warehouse located more than 30 meters of crops, animal pens, bee hives, dwellings or public buildings such as schools, and away from groundwater or surface water areas).

An operational site is serviced by the establishment of the following infrastructures: a soak pit with carbon filter layers to collect and treat effluents from the washing of the equipment used during the IRS operations, a rinsing area, toilets, a site warehouse or store, showers and locker rooms for men and women, water storage tanks, danger signs and orientation posters. Ideally, an operational site should serve a maximum of 10 teams, with each team comprised of five SOPs and one team leader.

Based on a need of 21 operational sites according to the standards described above, the project was able to identify only 19 existing operational sites due to an insufficiency in infrastructures meeting appropriate standards in the current intervention area. However, the NMCP provided one container to the operations sites where the team could not obtain physical office space. This container served as both warehouse and office at the operational sites where soak pits were also constructed.

2.2.3 Training

During the preparation phase, the VectorLink Project, in collaboration with NMCP, prepared and reviewed IRS training documents, forms, guidelines, and practical assessments. VectorLink Benin shared final training materials among staff and national facilitators, who later facilitated their respective components. The key topics covered during the training included the following: IRS concepts and planning, environmental compliance and personal safety, monitoring and evaluation of IRS, gender awareness, social behavior change concepts, communication and information transfer techniques, management of operational sites, insecticide and equipment handling, spray techniques and proper use of PPE, logistics, storage, and management of IRS equipment. Training sessions were conducted by VectorLink Benin staff and government counterparts, including staff from NMCP, DDS, Community Hygiene and Sanitation Service (SHAB), and Departmental Directorate of Living Environment and Sustainable Development (DDCVDD). Staff from the Entomological Research Center of Cotonou (CREC) and local firefighter units also helped in leading some specific training sessions. A total of 2,633 people of whom 2,121 (80.55%) were men and 512 were women (19.45%) attended the trainings. Table 4 below provides details of the types of training and key topics covered.

Table 4: IRS Topics Covered during Trainings to Improve Spray Quality

Type of Training	Participants trained	Key Topics Covered	Dates
Master training (training at district level)	21	Overview of malaria epidemiology and prevention strategies, insecticide selection; logistics, storage, safe handling, and environmental compliance in IRS; IEC and community mobilization; compression sprayer components, use and maintenance of sprayers (Goizper® brands); spray techniques; monitoring and supervision; data quality assurance; gender awareness; IRS leadership and management by objectives. This training was completed three weeks before the start of the IRS campaign in Donga department.	April 16-17, 2019
Training of trainers (ToTs) for operations	112	Compression sprayer components, use and maintenance (Goizper® brands) of the sprayers; spray techniques, filling out SOPs' data collection form, safety issues in IRS, and providing IEC messages through an interpersonal communication approach; gender inclusion and sexual harassment awareness.	April 18-20, 2019
One-day dedicated training for Team Leaders	256	Team Leaders' roles and responsibilities as first line supervisors of IRS operation, time keeping, daily health checks for SOPs, proper handling of spray equipment and materials, team and spray operator performance targets, use of PPE, household mobilization and safety, supervising insecticide mixing and pressurizing the sprayer, supervising spray techniques, direct observation of spraying, triple rinsing procedure, first aid, repair and maintenance of sprayers in the field, and supervision of end-of-day clean-up.	May 4, 2019
Spray Operators	1,278	Insecticide and equipment handling, PPE usage; hazard management; environmental risk awareness; spray techniques; end-of-day clean-up; triple rinsing procedure; data collection; waste management; gender awareness.	May 2-3, 2019
Community mobilizers	413	Interpersonal communication and information transfer techniques, key IRS concepts; human health and environmental safety, behavior change concepts; IEC/BCC; M&E (filling out IRS and mobilization data forms).	April 29-30, 2019
Storekeepers and store assistants	32	First expired/first out arrangement; stock card management; PMI IRS Best Management Practices (BMPs) on warehousing; Key IRS indicators, environmental compliance and safety issues; managing operational sites. Storekeepers were also trained on mobile technology for sending IRS data to the CommCare platform.	Avril 3-4, 2019

Type of Training	Participants trained	Key Topics Covered	Dates
Pump Maintenance Technicians	65	Sprayers handling and preventive maintenance; calibration of spray equipment; assembling and maintenance of control flow valves; end-of-day clean-up; triple rinsing procedure.	Donga department: April 25-27, 2019; Alibori department: May 1-3, 2019
Washers	132	Environmental and personal safety during washing of coveralls.	April 24 - May 3, 2019
Security Guards	36	Security and safety of IRS equipment and premises	Donga department: May 5, 2019; Alibori department: May 5, 2019
Drivers	139	Management of the operational sites' terrain; safe handling and transport of insecticides and spray teams; health and environmental safety; handling IRS commodities; spillage management	Donga department: May 5, 2019; Zone 2: May 5, 2019
Finance Assistants	4	Effective payment of field staff; monitoring of vehicle fuel consumption; payment tracking and documentation	April 12, 2019
Data Entry Clerks	42	Database error checking methods; data entry, validation, search / edit functions	Donga department: May 4, 2019; Alibori department: May 6, 2019
Medical & Health staff	86	Physiological mechanisms involved in intoxication, insecticide poisoning management; poisoning prevention and practices; health hazard and side-effect management mitigation	May 4, 2019
Seasonal IEC and journalists from contracted radios	17	IEC / SBCC for IRS, specificities of 2019 IRS campaign and social mobilization strategies, update on malaria situation in Benin, sharing of experience on previous campaigns	April 24 to 25, 2019

3. IMPLEMENTATION OF IRS ACTIVITIES

3.1 SPRAY CAMPAIGN LAUNCH CEREMONY

The 2019 IRS campaign launch ceremony took place in Ouaké district on May 7, 2019 and was marked by various speeches that recalled the burden of malaria in Benin, the country's commitment to control the disease by the year 2030 and the commendable support of the US Government in the health sector in Benin through USAID / PMI.

The speeches were delivered by the Mayor of Ouaké, the Prefect of Donga, and the PMI / Benin Representative, Dr. Fortune Dagnon who highlighted the continued partnership between the United States Government and the Government of Benin (GOB) for malaria control.

Other attendees of the launch ceremony included VectorLink Project Director (Bradford Lucas), VectorLink Benin Chief of Party (Laurent Iyikirenga) and other VectorLink Benin Senior staff, Officials from the MoH / NMCP, officials from the different districts and departments, DDS staff, staff from health centers, beneficiaries and other local leaders.

Figure 2: The Prefect of Donga (Left) and the USAID Representative (Right) Delivering their Speeches during the Launch Ceremony.

3.2 SHORT-TERM TECHNICAL ASSISTANCE

The VectorLink Project Director and the Regional Environmental Compliance Manager provided short-term technical assistance to support the VectorLink Benin project staff in the implementation of the 2019 IRS campaign. The short-term technical assistance activities included:

- **Technical / management oversight**
  - Support and observe the implementation of IRS operations by VectorLink Benin
  - Conduct chain of command and evaluate supply chain integrity
  - Visit and inspect the central warehouse in Natitingou
  - Meet with relevant stakeholders such as the NMCP and PMI mission to address spray related matters

- Ensure that all gender-related guidelines are followed
- Ensure that the team is compliant with supervisory tools including direct observed spraying (DOS).
- Conduct a review of VectorLink Benin management with country leadership – Chief of party and other senior staff

➢ **Environment Compliance**

- Participate in the Final PSECA and Greenlighting of operational sites
- Inspect some soak pits and storerooms to ensure they are environmentally compliant.
- Participate in the inspection of vehicles with the smartphone and also the driver training with the baseline driver training and the updated Motor Vehicle and Driver Policy, which must be read and signed by all drivers prior to contracting.
- Supervise the insecticide supply chain management: transport, storage, manipulation, empty bottles management, records systems with stock cards, ledger register and spray performance. This includes physical counts of stock at the storerooms and ensuring all insecticide sachets are tracked in and out daily by the store manager and team leader.
- Supervise the morning activities preparing the operators mobilization, including breakfast, and monitoring the health of spray operators on a daily basis.
- Supervise homeowner preparation and the spray operator performance.
- Supervise end of day activities such as the triple rinsing and handling of contaminated items
- Supervise spray operations in all districts; propose appropriate mitigating solutions to challenges as necessary.
- Ensure spray quality measures are implemented in compliance with program policies and standards.
- Review Environmental compliance and supervisory tools (mHealth and ODK) utilized by the project to ensure sound oversight of the program.
- Check for correct marking on household
- Meet with relevant stakeholders such as PMI to address spray and other miscellaneous project matters

The following key factors were recommended at the end of STTAs:

- Strengthen data verification and regularly identify / address factors that can lead to data falsification
- Ensure a well-prepared house before spraying
- Analyze regularly the reasons for non-spraying to adjust mobilization strategies during the campaign
- Monitor daily the performance of SOPs
- Strengthen field supervision and remind supervisors and team leaders about their responsibility on data quality / accuracy with adequate tools
- Share and correct the progressive rinsing protocol with all concerned IRS actors
- Provide daily reminders on the correct marking of structure to SOPs

3.3 SPRAY OPERATION AND SUPERVISION

3.3.1 SPRAY OPERATIONS

Based on the malaria burden in Northern Benin and the available financial resources, VectorLink, in collaboration with Benin NMCP and USAID/PMI Benin, selected six districts (Djougou, Ouaké and Copargo in Donga department and, Kandi, Segbana & Gounou in Alibori department) for the 2019 IRS campaign. Spray operations began in the six selected districts on May 6, 2019 and ended on May 29, 2019. The campaign lasted 21 operational days. In each department, the project deployed a permanent VectorLink staff as the department coordinator.

The health system (DDS and NMCP), at the departmental level, recruited all spray personnel (SOPs, team leaders, mobilizers, coordinators, supervisors, storekeepers, etc.) based on recruitment criteria provided by

the project. The number of spray operations teams was based on the number of structures found during the 2018 IRS campaign and the daily performance assigned to each SOP. VectorLink Benin provided all technical (training, monitoring, etc.) and logistical (store, soak pit, PPE, equipment supply, insecticide, consumables, transport, etc.) support required for the spray operations in the six districts. The VectorLink project staff and NMCP supervisors were deployed to the departments during the implementation phase to provide supervision support.

Implementation Logistics

The Logistic Coordinator and the central warehouse manager were in charge of managing stock at the central warehouse and provided overall supervision for the 27 Storekeepers. The distribution of IRS materials and supplies from the central warehouse to the IRS operations stores was conducted in a timely manner. Each secondary store was managed by a Storekeeper. All IRS commodities were stored according to the standard PMI BMPs for storage of IRS commodities. All sprayers were fitted with control flow valves (CFVs) to ensure the quality of spraying. To enhance tracking of insecticide usage, the IRS Daily Insecticide Usage Register and Stock Control Cards were used to account for the quantity issued, quantity used, and quantity returned on a daily basis. The document register was also used to account for the number of empty bottles and reveal any possible discrepancy between the number of bottles used and the empty bottles brought by the SOPs. Table 5 below shows the total number of bottles of Actellic 300CS used by each district.

Table 5: Number of Bottles of Actellic 300CS Used by Each District

Districts	Eligible structures sprayed 2019	Quantity procured during the 2019 IRS campaign	Quantity remaining	Quantity used	Ratio structures per bottle of insecticide
Ouaké	**33,855**	**5,160**	**27**	**5,133**	**6.6**
Djougou	**128,460**	**20,020**	**520**	**19,500**	**6.6**
Gogounou	**47,221**	**8,916**	**60**	**8,856**	**5.3**
Copargo	**26,221**	**4,008**	**132**	**3,876**	**6.8**
Segbana	**31,533**	**4,812**	**97**	**4,715**	**6.7**
Kandi	**67,917**	**11,616**	**192**	**11,424**	**5.9**
Total	**335,207**	**54,534***	**1,028**	**53,504**	**6.3**

** Two bottles were deducted from this total and sent to the laboratory for quality control;*

Household Preparation and Resident Safety

This phase of IRS operations consisted of assigning spray areas to SOPs and instructing them about the actions to be taken before, during and after the house spraying as previously explained by IEC mobilizers, including:

- Move out household items furniture, cooking materials and all food prior to spraying
- Move all furniture that cannot be moved from the home to the center of the room and cover it with a tarpaulin sheet
- Advise occupants to stay outside the home during spraying for two and a half hours after spraying
- If people are unable to be removed from the house, postpone the spraying of this structure for the mop-up period if possible
- Keep children and domestic animals far from structures

Supervisors ensured that house preparation was performed efficiently and to the desired standards.

Directly Observed Spraying (DOS)

VectorLink Benin continued to use the DOS approach for supervision. The DOS form represents a tool used by team leaders to evaluate the insecticide mixing and spray techniques performed by SOPs based on standard procedures. Team leaders use the form during the spray campaign to ensure that their spray teams mixed the insecticide well and used high quality spraying techniques. Each spray day, team leaders were expected to observe the mixing of insecticide and spraying technique of each SOP under his/her supervision and recorded their findings, related to specific key criteria (e.g., insecticide mixing, triple rinsing of the bottle, wearing of PPE, presence of a control flow valve on the sprayer, house preparation, spraying techniques, sprayer integrity, etc.). This allowed for on-the-spot corrective actions when necessary.

Daily Health Team Leader Checklist

The daily health team leader checklist was used to track SOPs' health status at the beginning of each spray day. The tool allows the team to monitor the health status of SOPs to perform spraying, including verifying that they have eaten breakfast, the presence of certain symptoms like fatigue and dizziness, weak performance of the SOP the previous day, and proper use of PPE.

Daily Performance Tracking

The project team explained the importance of the daily performance tracking tool to site supervisors, SOPs, and team leaders during the ToT and training of SOPs. At the end of each day, team leaders completed the sheet with nine indicators to gauge overall performance. The indicators recorded included: number of SOPs who worked, number of structures found, number of structures sprayed, number of insecticide bottles used, insecticide stock balance, average number of structures sprayed per bottle of insecticide, average number of structures sprayed per SOP, number of SOP supervisions completed, and number of red flags / issues recorded. This performance tracking tool enabled the VectorLink and NMCP supervision teams to strengthen the capacity of team leaders.

Structure Marking

Structure marking during the spray operations aims to provide information related to the spray date / the district code (three digits) / the code of the SOP who sprayed the structure / household code (eight digits) and the spraying status of the structure (P: sprayed, NP: not sprayed or X: awaiting spraying during mop-up). SOPs conducted this marking, and supervision allowed them to ensure it was properly done (Figure 3).

Figure 3: Structure Marking

Marking structures with chalk during the spray campaign was extremely helpful for mop-up operations as it was easy to erase the previous marking according to the new spraying status (sprayed/unsprayed/) of the house.

Operational Site Coordination

Fourteen site supervisors and six district coordinators were hired to manage spray operations in the six targeted districts. Large sites, requiring strong leadership, were managed by district coordinators; others,

with relatively smaller geographical area, were led by site supervisors. In both cases, the coordination tasks were similar.

Table 6: Operations Site Coordinators and Supervisors per District

District	Operational Site	Total Supervisors / Coordinators	Role
Copargo	Copargo center	1	Coordinator
	Anandana	1	Supervisor
Ouaké	Ouaké center	1	Coordinator
	Sèmèrè	1	Supervisor
Djougou	Djougou3	1	Supervisor
	Djougou1	1	Coordinator
	Barienou	1	Supervisor
	Kolokonde	1	Supervisor
	Partago	1	Supervisor
	Bougou	1	Supervisor
	Barei	1	Supervisor
Kandi	Kassakou	1	Supervisor
	Angaradebou	1	Coordinator
	Sonsoro	2	Supervisor
			Supervisor
Gogounou	Sori	1	Coordinator
	Borodarou	1	Supervisor
	Bagou	1	Supervisor
Segbana	Piami	1	Coordinator
	Libante	1	Supervisor
Total Number of Supervisors/ Coordinators		20	

mHealth Use

In partnership with Dimagi LLC, the VectorLink Benin Project used the CommCare mobile health (mHealth) and ODK system for the 2019 IRS campaign. Using the mHealth and ODK system, VectorLink Benin staff, NMCP staff and district supervisors were able to conduct routine standard supportive supervision, access real-time spray data, conduct data collection verification (DCV) at the household level, and remind spray teams about regulations and operational procedures through daily job aid messages. The system enabled real-time sharing of data and facilitated results-based decision-making. The team monitored operational site - level spray progress through daily SMS. The mHealth reporting tools for data collection and verification, which Vectorlink-Benin used throughout the spray campaign, included:

Data Collection Verification (DCV):

VectorLink Benin collected information through data collection verification (DCV) forms at the household level on household spray status. Households were randomly selected to provide a sample population. The project then verified this information with households' information as entered into the VectorLink database by tracking IRS card numbers. After filtering households' data from the database, monitoring and evaluation assistants compared them with DCV form findings to match head of household, structures and rooms found,

and spray status. DCVs enabled greater accuracy of data reported by SOPs and facilitated the mopping-up process. Anomalies found were compiled during the evening meetings and used to relay feedback messages and corrective actions by spray teams. The DCV was housed in the same CommCare platform as the supervisory forms.

Performance monitoring tracker:

After a day of spray activities, team leaders summarized spray results of their respective teams on team leader forms. Performance reports were generated based on the team leader forms. Storekeepers aggregated performance monitoring tracker daily reports on four operational indicators and sent them daily to the gateway phone linked to the Telerivet system. The indicators were: total number of SOPs who worked that day; total number of structures found by SOPs; total number of structures sprayed; and the total number of insecticide bottles used at the operational site. The gateway phone then sent the data to the Dimagi LLC server for processing and storage. The performance monitoring tracker information was shared daily during the debriefing meeting with supervisory staff from NMCP, DDS and VectorLink Benin. Performance monitoring tracker data provided a spray progress overview and timely information for decision making purposes through a dashboard developed for this purpose.

Job Aid Messages:

VectorLink Benin sent out daily SMS messages to supervisors, SOPs, team leaders, and storekeepers to remind them about topics such as compulsory breakfast, wearing personal protective equipment, gender awareness, the daily number of targeted structures, avoiding consuming food while on duty, and any other instructions preventing the recurrence of an anomaly observed on previous days. Throughout the same channel, updates were made to spray teams based on the supervision observations.

Composition and Management of spray teams

In each operational site, the composition of IRS staff included the following seasonal cadres: one coordinator or supervisor depending on the size of the operation site to manage the spray teams in the field, a storekeeper, a pump technician, site guards, washers, water fetchers, and team leaders heading teams of SOPs and mobilizers. Each team had an average of five SOPs. SOPs reported directly to the team leader, who in-turn reported to the proximity supervisor. Every proximity supervisor oversaw two teams and reported to the site supervisor or coordinator (See Figure 4 below).

During the campaign period, the project deployed spray teams from Monday to Saturday while Sundays were reserved for a weekly review meeting with site managers and to repair spray equipment. The 1,278 SOPs recruited were divided into 256 spray teams. Each team had between five to six SOPs and was supervised by a team leader. The number of spray teams per district was determined by the estimated number of targeted eligible structures found in each district using the 2018 IRS campaign data. See Table 7 for more detail.

Figure 4: Sites' Organization Chart:

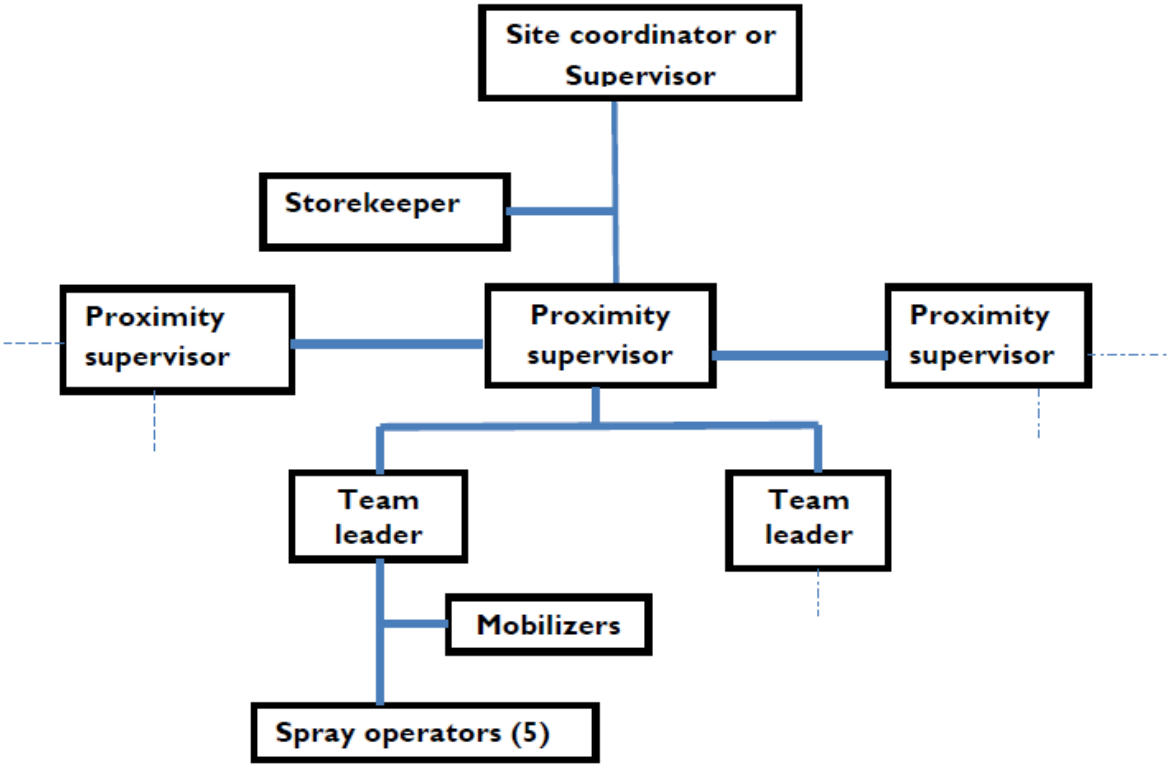


Table 7: Distribution of Spray Teams by District

Districts	No. of spray teams	No. of eligible structures found by SOPs in 2019
Alibori Department		
Kandi	54	76,068
Gogounou	38	54,179
Segbana	26	35,949
Subtotal 1	118	166,196
Donga Department		
Djougou	96	150,880
Copargo	19	29,936
Ouake	23	40,699
Subtotal 2	138	221,515
Grand Total	**256**	**387,711***

**The decrease in the number of structures found in 2019 compared to 2018 is partially due to the fact that the project has totally withdrawn from the Atacora department (387,711 found in 2019 versus 442,528 found in 2018).*

3.3.2 SPRAY SUPERVISION

Supervisory Tools

Supervisors filled out the CommCare and Open Data Kit (ODK) application forms related to morning mobilization and transportation, household preparation and SOPs performance, storekeeper's performance and end of day clean-up. These forms were filled out and submitted to the CommCare system and provided information on field activities, spray performance and red flags during the campaign. Some of the red flags raised were weak household preparation, refusals by communities, triple rinsing poorly done, which were all addressed during the campaign. In total, the VectorLink Benin supervision team used five supervisory forms in addition to the DVC.

IRS Campaign Supervision by VectorLink Benin Staff

To ensure adequate supervision, VectorLink Benin staff, including the chief of party, operations manager, environmental compliance officer (ECO), logistics coordinator, health zone coordinators and M&E manager moved to Djougou and Kandi with the seasonal assistants during the IRS campaign. Following the supervision plan, VectorLink Benin technical staff and counterparts from NMCP, DDS, and USAID/PMI Benin traveled every day to the field to provide supportive supervision to seasonal staff using smartphones with CommCare or ODK applications to ensure that IRS campaign activities were performed properly. Supervision activities included but were not limited to:

- Observing SOP performance: household preparation, spray practices by direct observation in eligible structures, house marking, filling forms and compliance to other instructions
- Evaluating the support provided to SOPs by team leaders and proximity supervisors, and the proper filling of forms and checklists
- Evaluating the performance of storekeepers in the management of commodities, equipment and products
- Assessing compliance to instructions regarding the handling of insecticide and other contaminated equipment, including PPE
- Addressing concerns raised by beneficiaries, seasonal staff, and other individuals involved in IRS operations
- Addressing cases of refusals
- Checking the performance of each SOP team using the daily performance tracking sheet
- Ensuring that IRS operations in sites managed by the NMCP, namely Copargo (Donga Department) Kandi, Gogounou and Segbana (Alibori), were performed appropriately
- Ensuring the quality of community mobilization and resolve the problems of refusal or demobilization by advocacy and awareness with the support and involvement of political, religious and administrative authorities

The VectorLink Benin staff, NMCP, DDS and PMI representatives followed field activities and daily spray progress closely using daily updates that the district coordinators and site supervisors sent via SMS. These messages noted the number of structures sprayed each day (based on the site coordinator's review of the spray cards turned in daily) and any issues that arose in the field. This reporting allowed the VectorLink Benin team to track progress against the IRS schedule, and to identify any campaign issues that needed quick action from the team.

Every two days at around 5 p.m. during the campaign period, the VectorLink team staff and supervisors from NMCP and DDS at the national and departmental level in Djougou and Kandi organized a coordination meeting for supervision debriefings. The meetings provided a forum for VectorLink Benin and government

counterparts to update each other on IRS campaign progress, discuss various issues / adjustments that needed to be addressed and resolved, and determine what new daily reminders would be sent out in the six districts. These meetings were chaired alternately by the government counterparts and the project staff (Figure 5). These meetings were accompanied by recommendations that were implemented the next morning in the field by each member of the coordination team.

Figure 5: Supervisors participating in a debriefing and coordination meeting


IRS Campaign Supervision by Beninese Government Staff

About 113 government officials contributed to the supervision of the campaign. This year, NMCP led the supervision of the spray campaign in three districts of Alibori Department (Gogounou, Kandi, and Segbana) and one district in the department of Donga (Copargo). NMCP's leadership included enhanced responsibilities in planning and implementation of IRS campaign. These responsibilities included planning and supervision of operations, IEC and social mobilization, logistics management, environment compliance and M&E activities. The VectorLink team built the capacity of NMCP through the transfer of technical and managerial skills at the national and departmental level to conduct IRS operations with more autonomy and according to the required standards. In addition, the periodic debriefing meetings were chaired by the Donga DDS (or his representative) and the Alibori DDS (or his representative). Table 8 provides a breakdown of the supervision activities performed by GOB staff during the 2019 IRS campaign.

Table 8: Breakdown of Supervision by Beninese Government Agencies

Government Level	Office	Number of People	Supervised Activities
National	NMCP	10	IRS planning, IRS trainings, IEC and mobilization activities, environmental compliance (pre-spray, and post-spray inspection), spray operations supervision, logistical management, M&E and data collection.
	National Directorate of Agriculture (DPV)	1	Control of the quality of the insecticide

Government Level	Office	Number of People	Supervised Activities
Departmental	NMCP-Donga	1	IEC and mobilization, environmental compliance, spray operations, M&E, trainings
	NMCP-Alibori	1	
	DDCVDD (Departmental Directorate of Environment and Climate Change Management) Atacora-Donga)	4	Environmental compliance (pre-spray, mid-spray, and post-spray inspection), spray operations
	DDS	3	Spray operations, IEC mass mobilization, M&E, IRS trainings
	Public Health Service	79	IEC and social mobilization supervision, management of insecticide side effect and poisoning cases
	SHAB (Hygiene and Basic Sanitation Department)	2	Environmental compliance (pre-spray, mid-spray, and post-spray inspection) and IRS trainings
District	Site Coordinator	4	IRS training, mass mobilization, spray operations management and M&E
	District Chief Doctors	8	IRS training, mass mobilization, environmental compliance, spray operations, M&E

3.4 Logistics and Stock Management

3.4.1 Insecticide for the 2019 IRS campaign

A total of 3,678 bottles of pirimiphos-methyl CS were in stock at the end of the 2018 spray campaign. Following the order to the supplier on November 27, 2018 to address the needs for the 2019 spray campaign, a total of 50,856 bottles of pirimiphos-methyl CS arrived at the central warehouse in Benin on April 12, 2019 To comply with the importation requirements, a sample (two bottles) of the Actellic insecticide was sent to the laboratory for quality testing. Table 10 summarizes the insecticide consumption at the operational sites during the 2019 IRS campaign. A total of 54,534 bottles of insecticide were used during the 2019 IRS campaign. 1,028 bottles remained at the end of the 2019 IRS campaign and are set to expire in January 2021.Dispatching of IRS material to Operations Sites

Three weeks before the IRS campaign, VectorLink Benin distributed PPE, insecticide and other IRS equipment to all 19 operational sites. IRS operations were conducted simultaneously in Donga and Alibori departments from May 6 to 29, 2019. Supervision vehicles were at the operational sites one day before the start of the IRS campaign. Table 9 summarizes the distribution of key PPE to each of the operation sites.

Table 9: Distribution of IRS Material and Bottles of Actellic 300CS Used in Each Operational Site

Operational Sites	Overalls	Pairs of Boots	Helmets	Sprayers Goizper	Insecticides bottles used
Donga Department					
Djougou district					
Djougou III	254	124	88	252	2,798
Djougou I	200	96	107	88	2,742
Barei	241	116	106	102	3,554
Barienou	228	112	112	99	3,230
Bougou	109	52	52	49	1,716
Partago	267	129	129	111	3,804
Kolokonde	125	60	60	55	1,656
Total Djougou	**1424**	**689**	**654**	**756**	**19,500**
Copargo District					
Copargo	148	73	73	66	2,182
Anandana	129	62	57	57	
Total Copargo	**277**	**135**	**130**	**123**	**3,876**
Ouaké District					
Semere	183	88	88	79	2,952
Ouake	170	78	78	70	2,181
Total Ouake	**353**	**166**	**166**	**149**	**5,133**
Alibori Department					
Kandi District					
Kassakou	240	123	104	100	2,903
Angaradebou	229	118	100	96	3,304
Sonsoro	345	178	150	142	5,217
Total Kandi	**814**	**419**	**354**	**338**	**11,424**
Gogounou district					
Sori	215	111	95	91	3,567
Gounarou	242	107	92	88	2,947
Bagou	151	78	66	66	2,342
Total Gogounou	**608**	**296**	**253**	**245**	**8,856**
Segbana district					
Piami	255	116	98	94	2,599
Libante	201	86	72	70	2,116
Total Segbana	**456**	**202**	**170**	**164**	**4,715**
Total	**3,932**	**1,907**	**1,727**	**1,775**	**53,504**

3.4.2 Stock Management during the IRS Campaign

The VectorLink Benin team used Inventory Control Cards (ICC) and the stock registers to double track each item in the central warehouse and operation sites. Storekeepers updated the ICC and the register daily on the movement of stock from each store room. They were also required to conduct daily physical stock counts to ensure that the actual stock in the store rooms matched the ICC and the register.

At the beginning of each spray day, insecticide bottles were issued only to team leaders, who documented the number of bottles that they received. Thereafter, the storekeeper immediately entered the amount

provided to the team leaders on the ICC and registered this amount to ensure accurate stock balances. At the end of each IRS campaign day, SOPs turned in their stock of bottles (used and unused) to the team leader, who collated them and submitted them to a storekeeper. The storekeeper recorded the full bottles on the ICC, registered as a positive adjustment, updated the stock balance, and registered the used bottles on a daily utilization record form. The data on this form helped VectorLink Benin calculate trends in insecticide use. To validate the insecticide inventory, storekeepers worked with VectorLink Benin logistics staff to compare the ICC for the unused insecticide bottles with the daily utilization records. This comparison also allowed the VectorLink Benin team to note if SOPs were using too little or too much insecticide during their spraying and if various operation sites needed more insecticide. Each day, the storekeepers sent the amount of insecticide used and remaining insecticide balance to the mHealth platform through SMS.

With respect to PPE, every morning team leaders and storekeepers organized, distributed and signed out all PPE to be used for spray operations. Warehouse managers also organized and distributed all PPE to the washers and other IRS staff as needed. At the end of each day, all PPE was turned over to the washers for cleaning. After the PPE was washed, the washers turned the PPE over to the storekeepers and team leaders who completed another inventory to ensure that all the equipment was returned.

Additionally, the storekeepers prepared a comprehensive weekly stock report and submitted it to the VectorLink Benin logistics manager. The logistics manager then generated aggregated total stock balances for the IRS campaign and noted where PPE and insecticide needed to be sent from the central warehouse to prevent stock outs.

During the IRS campaign, supervisors conducted daily warehouse inspections in each operational site to monitor movement of materials and insecticides and to ensure environmental compliance. Supervisors ensured that storekeepers promptly updated their records and confirmed that records matched physical stock counts in the stores. VectorLink Benin gave special attention to insecticide stocks, including empty bottles that SOPs returned from the field.

3.4.3 Payment of Seasonal Staff

For a prompt and secure payment of seasonal workers during the 2019 IRS campaign, VectorLink contracted with two institutions to pay all seasonal workers: MTN (for Mobile Money's system) and MOOV (for Moov Money's system). The project chose these institutions based on their expansive coverage and wider availability of agents for cash redemption throughout Benin. In particular, e-payment systems with Moov Money and Mobile Money are reliable, have user friendly interfaces for making payments, and have an attentive customer service team. These systems also generate detailed, auditable reports for all payments. The project hired four finance assistants (two in Alibori department and two in Donga department) to help VectorLink finance and administration officers compile payment lists, cross check sign-in sheets and verify phone numbers before payment. Finance assistants responsibilities included:

- Distribution and collection of signed contracts from all seasonal staff lined up for payment (coordinators, supervisors, team leaders, SOPs, Washers, pump technicians, storekeepers, security guards, and mobilizers)
- Collection of all timesheets for seasonal staff before preparing pay statement
- Preparation of payrolls submitted by the site coordinators and approved by the health zone coordinators

For the 2019 spray campaign, the VectorLink project hired 2,708 seasonal agents in the six target districts. They were all paid by the mobile payment system: 2,080 (77%) by Mobile Money and 628 (23%) by Moov Money.

4. ENTOMOLOGY

Entomological surveillance is a key component for IRS programming, providing information on the impact of IRS on vector density and behavior in IRS areas. Entomological activities also assess the quality of IRS operations, the decay rates of insecticide applied, and the vector susceptibility to insecticides used for malaria vector control. Vector Link Benin is supported by the Entomological Research Center of Cotonou (CREC) to generate data on key entomological indicators, including spray quality assessment through the cone bioassay tests. The full report of this evaluation is sent directly to USAID / PMI by CREC. Table 10 below presents the results received on the quality of IRS, one week after the intervention in the sampled villages.

Table 10: Wall Bioassay Results For Pirimiphos-Methyl in Kandi and Gogounou, Alibori / Benin (May, 2019)

	Kandi		Gogounou		Djougou		Copargo	
	Kassakou	Pèdè	Borodadou	Gnidarou	Serou	Soubroukou	Pabegou	Fowa
Cement	100% (n=219)	97,79% (n=181)	100% (n=244)	100% (n=279)	100% (n=127)	99% (n=130)	100% (n=190)	100% (n=140)
Mud	100% (n=226)	100% (n=204)	100% (n=225)	100% (n=98)	100% (n=131)	100% (n=141)	100% (n=87)	100% (n=124)

According to the results above, researchers from CREC found that, seven days after the treatment of houses, the mortality rate of *Anopheles gambiae* (Kisumu susceptible strain) exposed to the treated walls was 100 percent, regardless of the position of the WHO cones on the wall, respectively on cement and mud walls in the selected villages of Gogounou, Djougou and Copargo. This generally testifies to the homogeneity of the insecticide on the wall surfaces and the good quality of the spraying. In Kandi (village of Pèdè), the mortality rate on cement walls was 98% percent, which is not statistically different from the other sites and mud surfaces from same site ($p>0.05$).

5. MONITORING AND EVALUATION

The Monitoring and evaluation (M&E) activities for the 2019 IRS campaign closely followed the processes outlined in the annual VectorLink Benin Work Plan and the VectorLink M&E Plan. The full M&E Plan can be found in Annex B.

5.1 KEY OBJECTIVES AND APPROACH

The overarching M&E approach is to incorporate lessons learned from previous spray campaigns and other VectorLink countries into the Benin M&E system. To uphold high-quality M&E standards, the key objectives of VectorLink Benin M&E system were as follows:

- Emphasize accuracy of both the data collection and the data entry process through comprehensive trainings and supervision at all levels;
- Streamline and standardize data flow to minimize errors and facilitate timely reporting;
- Communicate IRS data and information to stakeholders in a timely and clear manner;
- Ensure IRS data security and storage for future reference through establishment and enforcement of proper protocols; and
- Collect and report IRS program implementation data, as specified in the Monitoring and Evaluation Plan (MEP).

5.2 DATA MANAGEMENT AND PROCESSING

5.2.1 DATA COLLECTION

Before the start of the 2019 IRS campaign, all data collection tools and the database were updated to ensure the collection, management, and reporting of high quality data. Data was collected using standard data collection forms designed to capture data on all core PMI indicators. During the 2019 IRS campaign, IRS data was recorded in the database as quickly and accurately as possible on a daily basis to have real-time insight into the status of the spray campaign. Before the beginning of mobilization and spray operations, those involved in data collection and supervision were trained in the data collection process and in filling out the forms. Data collection forms went through several checks before being entered into the database.

5.2.2 DATA ENTRY

The IRS database was developed by the AIRS Project in Microsoft Access format in 2012, and has been improved over the years to facilitate easy and rapid data verification during the entry process. The VectorLink Benin Database Manager used several logic checks and controls to validate data entries and minimize data entry error. In the 2019 IRS campaign, two data entry and processing centers were used: one in Djougou for data entry for the department of Donga and the other in Kandi for data entry for the department of Alibori. VectorLink Benin employed a total of 43 data entry clerks (DECS), 23 in Djougou and 20 in Kandi, to enter all data generated from the six targeted districts.

DECs performed a final verification of typos and transcription errors or arithmetic calculations for each spray operator form before entering the data into the database. At the end of each day, the M&E Assistants and M&E Managers reviewed the data entered for anomalies and addressed issues with data center staff. For quality control purposes and timely generation of weekly client spray progress reports, the standard was to enter all data within 48 hours of collection. However, in some instances, the data may not be entered within 48 hours when further investigation has to be conducted to verify the accuracy of data collected by spray

operators. For instance, in the event that the team becomes suspicious of any cases of data falsification, the paper forms are taken back to the field where a team undertakes physical checks of houses recorded as being sprayed. This additional field verification is generally done before the data is entered into the database, which may take few days.

5.2.3 DATA QUALITY ASSURANCE

Data quality assurance tools including the Data Collection Verification (DCV), DOS Form and Data Entry Verification Form helped improve supervision and ultimately the quality of data collection and data entry during the 2019 spray campaigns. These tools focused specifically on data quality assurance methods. The five M&E Assistants recruited also contributed to the improvement of data quality supervision. Out of 26,206 forms filled out by SOPs, approximately 504 forms (1.92%) had some missing data, including Insecticide movement, structures codes, head of household names, etc. Some of these forms were corrected directly by the database manager after further verification at the SOP level and also in the field.

Data Collection Verification (DCV) Form

This form is used during randomized household visits to check the accuracy of data collected in the field, to ensure that the data recorded on the Daily SOP forms matches the information households reported and/or the data recorded on the IRS Cards disseminated to households. In the randomization process, the following steps were followed:

- Choosing a central location in the village and the direction to follow (by spinning a pen)
- On the left side of the chosen direction, start random selection with the first household that is found (initial reference household). From the initial household, apply the sampling step to find the first household to investigate. In this household, complete all the information from the DCV form for each structure of this household, considering that a household can have several structures.
- After recording all the information about the structures of the first household investigated, continue in the same direction to identify the next household by applying the sampling step, then record the information of all structures of this second household on the DCV form. continue the same process for about 10 households

Overall, 22 supervisors (VectorLink technical staff, national supervisors, site coordinators) completed 751 DCVs using smartphones in 85 Villages. Additionally, 26 supervisors completed 955 DCVs using paper forms in 86 out of 523 villages. 545 DCV paper forms were completed in Donga department and 410 in Alibori department.

Of the 751 DCV forms completed via smartphone, 169 forms revealed errors made by SOPs, including:

- Poor marking of structures, 11 (6.5%);
- Incorrectly filled out or poor distribution of IRS card, 9 (5.3%);
- Counting error (overestimation or underestimation) of eligible structures, 9 (5.3%),
- Structures marked sprayed but not sprayed, 4 (2.4%).

Corrective actions on specific issues, such as inadequate marking of structures, undercounting of number of structures sprayed, over counting of eligible structures by including granaries, etc., were taken immediately by recording the correct information/data, taking the forms to the field for verification purposes and also by sensitizing spray operators during morning mobilization to prevent the same issues from happening

Table 11: Completed DCV forms using smartphone and paper version

Districts	DCV using smartphone form			DCV using paper form		
	Number of villages visited	Number of DCV forms filled	Number of structures verified	Number of villages visited	Number of DCV forms filled	Number of structures verified
Copargo	12	110	435	0	0	0
Djougou	23	243	756	14	178	178
Gogounou	11	106	378	38	400	400
Kandi	20	123	417	8	10	10
Ouaké	7	77	291	26	367	367
Ségbana	12	92	331	0	0	0
Total	85	751	2608	86	955	955

Directly Observed Spray (DOS) Form

This form was used by team leaders to oversee and improve SOPs' performance and spray quality. Team leaders conducted supervisory visits throughout the spray campaign to observe SOPs' performance and record whether or not the SOPs correctly mixed the insecticide and complied with spray techniques as well as personal, household and environmental safety procedures. Any gaps identified during the observed visit were recorded, creating a red flag in the database, and corrected on the spot. Daily alerts were sent to supervisors with a summary of all red flags from the previous day, which enabled supervisors to monitor closely the quality of SOPs' performance and take corrective action to address any errors and ensure better quality of spray operations. A total of 129 red flags were recorded in Donga out of 11,217 direct observations made: 87 the first week, 33 the second week, 9 the third week, and 0 the last week. In Alibori, 26 red flags were recorded out of 11,046 direct observations: 21 red flags the first week, 3 the second, 2 the third, and 0 the last week.

Out of 155 red flags recorded in Donga and Alibori, 0 (0.0%) were related to leaks in the sprayers, 17 (11%) to household effects not being covered properly, 31 (20%) for not respecting the distance between the wall and the nozzle, 18 (11.6%) to not respecting the overlap of spray swaths, 16 (10.3%) for incorrect speed of spray, 13 (8.4%) to not using CFVs, 19 (12.3%) for poor triple rinsing, 15 (9.7%) to insecticide mixing, 5 (3.2%) to incomplete wearing of PPE, and 21 (13.5%) for household effects not completely moved out.

Data Entry Verification

Spray operators collected spray data using standardized data collection forms designed to capture all core PMI indicators. Data collected were verified by Team Leaders and Supervisors before being transported to the data entry Center. Data clerks performed a final verification of data collection forms (data and arithmetic) before entering the data into the database. At the end of each day, the M&E team (VectorLink M&E and Database Managers and M&E Assistants) used the Data Entry Verification form to verify that the data entered into the database matched the data on the Daily SOP Forms.

Of 22,592 records checked, 110 (0.5%) had errors, including mistyping of household codes and SOPs codes, incorrect spelling of name of head of household or the totals, etc. In addition to the Data Entry Verification Form, the database design enforced several logic rules to ensure the quality of data entries (e.g. the number of pregnant women in the structure cannot exceed the number of women in the structure). VectorLink Benin also provided each data clerk with a data cleaning tool, which enabled DECs to run error reports and correct data entry mistakes each day.

Data was generally entered within 48 hours for timely generation of weekly client spray progress reports. Data entry clerks filed and archived Daily Spray Operator Forms at each of the data centers.

5.2.4 DATA TRACKING, STORAGE, AND SECURITY

Data entry clerks filed and archived completed Daily Spray Operator Forms at each of the data centers. Forms were arranged by date and stored in 3-ring binders. At the end of each day, DECs backed up all databases electronically in three different ways: first, into a backup folder on each local server; second, into a cloud backup and third, onto an external hard disk. All servers, memory cards, and external hard disks are secured in the VectorLink IT office in Cotonou.

5.3 MHEALTH RESULTS

- **SMS Reminders**: A total of 18,807 SMS reminders (an average of three reminders per day) were sent to the 319 seasonal cadres (Team Leaders, Supervisors, Warehouse Manager and Site Coordinators). The SMS reminders focused on environmental compliance (e.g., proper wearing of PPE, household preparation, etc.) and SOPs' performance (i.e. reminders of the number of structures to be sprayed every day to reach the goal).
- **Mobile based supervisory tools:** 751 DCV forms were completed and 375 supervisory forms (83 Homeowner Preparation and Spray Operator Performance forms; 102 Spray Operator Morning Mobilization Inspection forms; 57 Spray Operator Transportation Vehicle Inspection forms; 69 End of Day Cleanup Inspection forms and 64 Storekeeper Performance Inspection forms) successfully completed by national supervisors and site coordinators through CommCare and ODK apps.

Table 12: Submitted Supervisory Forms during the Spray Campaign

Supervisory form	ODK		CommCare	
	Target	Submitted	Target	Submitted
Morning mobilization	52	45	52	102
Transportation Vehicle Inspection	68	55	48	57
Homeowner Preparation and Spray Operator Performance	90	26	60	83
End Of Day Cleanup	72	66	92	69
Storekeeper Performance	60	75	48	64
Data Collection Verification (DCV)	-	-	84	751

- **Mobile Performance Tracker**: Supervisors submitted daily reports on four key target indicators (i.e. number of structures found or sprayed) via SMS. A total of 333,867 sprayed structures were submitted using SMS compared to 335,207 sprayed structures submitted using IRS data collection forms in the two intervention Departments. Data gathered through SMS informed daily decision-making, but the data collected through data collection forms remained the project's official data source, given that these forms collected more comprehensive information and underwent a thorough data entry verification and cleaning process. Table 13 shows the comparison between the two data sources.

Table 13: Comparison of SMS Structures to Confirmed Structures

	Data Collection Form	SMS	Difference
Number of structures found	387,711	392,002	4,291
Number of structures sprayed	335,207	333,867	1,340
Coverage rate	86.5%	95.7%	9.2%

5.4 STRUCTURES FOUND AND POPULATION PROTECTED

5.4.1 STRUCTURES FOUND

The 2019 IRS campaign sprayed 335,207 out of the 387,711 eligible structures found by SOPs in the six targeted districts, for spray coverage of 86.5%. The number of eligible structures found in 2019 has increased by 11.1 percent compared to the number of eligible structures found during the 2018 IRS campaign (N = 348,978). The overall spray coverage rate and spray coverage for each district is described in Table 14.

Table 14: Spray Coverage Based on Structures Found by Spray Operators per District

Department	District	Eligible Structures Found by SOPs	Eligible Structures Sprayed 2019	Coverage Rate 2019
Donga	Copargo	29,936	26,221	87.6%
	Djougou	150,880	128,460	85.1%
	Ouaké	40,699	33,855	83.2%
Alibori	Gogounou	54,179	47,221	87.2%
	Kandi	76,068	67,917	89.3%
	Ségbana	35,949	31,533	87.7%
Total		**387,711**	**335,207**	**86.5%**

All districts exceeded the impact coverage rate of 85 percent except the district of Ouaké which had a coverage rate of 83.2 percent. The main reasons for non-sprayed structures in Ouaké and the other districts included refusal cases and the absence of household owners, especially on market days. Other reasons included farm work and household effects that were difficult to move out of the house. Djougou remained the district with the highest number of non-sprayed structures during the 2019 IRS campaign (22,420, 42.7%) of the total 52,504 non-sprayed structures.

5.4.2 POPULATION PROTECTED

IRS provided protection to a total of 1,077,411 people, including 51,872 (4.8%) pregnant women and 243,648 (22.6%) children under five years of age. See Table 15 for a breakdown of population protected by the 2019 IRS campaign per district.

Table 15: Population Protected during the 2019 IRS Campaign per District

Districts	Total Population			Children <5 years			Pregnant Women
	Men	Women	Total	Male	Female	Total	
Copargo	37,598	34,907	72,505	7,771	8,240	16,011	4,152
Djougou	201,818	185,020	386,838	45,268	45,395	90,663	21,455

Districts	Total Population			Children <5 years			Pregnant Women
	Men	Women	Total	Male	Female	Total	
Ouaké	47,650	44,164	91,814	8,323	8,427	16,750	3,096
Gogounou	89,430	84,041	173,471	20,333	19,937	40,270	8,163
Kandi	127,593	115,473	243,066	26,326	25,091	51,417	11,092
Ségbana	56,936	52,781	109,717	14,075	14,462	28,537	3,914
Total	**561,025**	**516,386**	**1,077,411**	**122,096**	**121,552**	**243,648**	**51,872**

5.5 USE OF LLINS

Among the 1,077,411 people protected by IRS, 749,777 (69.6%) slept under LLINs the night before the spray operator visited during the 2019 spray campaign. Additionally, 190,330 children under five and 40,100 pregnant women were reported as having slept under a mosquito net the previous night. Table 16 provides the breakdown of the LLIN data collected by SOPs.

Table 16: Breakdown of LLIN Data Collected by SOPs as Reported by Heads of Households

Districts	Total number of people (in sprayed structures) who slept under a mosquito net the night before the spray		Total number of children under five years of age (in sprayed structures) who slept under a mosquito net the night before the spray		Total number of pregnant women (in sprayed structures) who slept under a mosquito net the night before the spray	
	Number	(%)*	Number	(%)*	Number	(%)*
Donga Department						
Copargo	51,136	70.5%	12,541	78.3%	3,158	76.1%
Djougou	274,103	70.9%	71,072	78.4%	16,615	77.4%
Ouaké	71,041	77.4%	13,608	81.2%	2,333	75.4%
Subtotal 1	**396,280**	**71.9%**	**97,221**	**78.8%**	**22,106**	**77.0%**
Alibori Department						
Gogounou	124,312	71.7%	31,506	78.2%	6,418	78.6%
Kandi	177,200	72.9%	39,721	77.3%	8,543	77.0%%
Ségbana	78,985	72.0%	21,882	76.7%	3,033	77.5%
Subtotal 2	**380,497**	**72.3%**	**93,109**	**77.4%**	**17,994**	77.7%
Grand total	**776,777**	**72.1%**	**190,330**	**78.1%**	**40,100**	**77.3%**

**Percentages calculated based on the total population protected in each district in 2019.*

6. ENVIRONMENTAL COMPLIANCE

In accordance to USAID Regulation 22 CFR 216 and the Supplemental Environmental Assessment amended and approved in 2019 to include new IRS insecticide that was WHO / PQ-listed (Clothianidin and Clothianidin / Deltamethrin combination), VectorLink Benin used an organophosphate insecticide (Actellic 300CS) to spray all six targeted districts in Northern Benin. The project put a strong monitoring system in place to ensure that the IRS operations adhered to PMI's best management practices (BMP) requirements to protect spray actors, beneficiaries, and the environment. Activities performed to protect these potential components are presented below.

6.1 PRE-SEASON ENVIRONMENTAL COMPLIANCE ASSESSMENT (PSECA)

VectorLink Benin conducted the initial Pre-Spray Environmental Compliance Assessment (PSECA) two months prior to the start of the campaign evaluating compliance with current environmental regulations and established standards. The results of the initial PSECA, completed by a smartphone checklist, generated a work list outlining the actions required for each operations site and served as a baseline for the rehabilitation plan of operation sites.

The VectorLink Benin team along with some government counterparts completed the PSECA using a smartphone application for each operations site. A total of 32 fixed/permanent soak pits were refurbished (19 in Donga department and 13 in Alibori department) and 3 mobile soak pits in Alibori (2 in Segbana district and 1 in Gogounou district) were installed for all 19 operation sites. In addition, as a result of IRS withdrawal from Atacora, eight soak pits were closed in that department.

Figure 6: Prototype of soak pit used during the 2019 IRS campaign in Benin

6.2 MANAGEMENT OF INSECTICIDE SIDE EFFECTS

Since there were no new IRS districts this year, a reminder and documentation on the management of side effects were sent to 86 medical staff (6 clinicians and 80 nurses) who had already benefited from several trainings with regards to the management of possible toxic effects of insecticides in all IRS targeted districts. To prepare for any unforeseen incidents such as insecticide poisoning, an antidote for insecticide poisoning (atropine) was readily available in all district hospitals.

6.3 MEDICAL CLEARANCE

All SOPs hired for the 2019 spray season underwent medical examinations to determine physical fitness during spray operations. Additionally, all female SOPs were given a pregnancy test before the IRS campaign to ensure that no expecting mothers were at risk of exposure to insecticide. The project's policy is to entrust, to the greatest extent possible, to women that tested positive for pregnancy with other tasks that do not expose them directly to the insecticide. The medical tests conducted included: pregnancy test (for women), physical examination, chronic respiratory diseases and blood pressure.

A total of 392 female candidates for IRS operations participated in the initial pregnancy screening. The pregnancy testing took place from April 2-5, 2019 in both departments. The second pregnancy testing took place from April 20, 2019 in both departments. No women tested positive after the pregnancy tests.

6.4 PRE-CONTRACT MOTOR VEHICLE INSPECTIONS

Prior to awarding contracts to the selected car rental companies, all vehicles were subject to an inspection against PMI's BMP, via smartphones to ensure compliance with safety and environmental requirements. A total of 155 vehicles were rented through this process and 155 drivers were trained in Donga and Alibori few days before the commencement of the spray campaign. During the inspection, car rental companies were advised to retrofit the trucks with benches, tents, and railings and to ensure that all the trucks were roadworthy. All selected vehicles were equipped with Spill Management and First Aid kits, Material Safety Data Sheets, and Accident/Emergency response procedures. All drivers attended the training and signed the Driver Policy.

Figure 7: Vector Link Vehicle Inspector

6.5 Mid and Post-Season Environmental Compliance Assessment

The VectorLink staff, along with the NMCP supervisors and departmental supervisors, were involved in routine supervision, and in mid-spray and post-spray environmental inspections in all six districts. The supervision and environmental inspections were conducted using CommCare supervision and ODK tools installed on smartphones. All project staff and supervisors were tasked with identifying weaknesses, providing corrective actions and guiding spray operators on the spot. At the end of each day, the district coordinators and the supervision team held a general meeting to review progress, achievements and shortcomings, and provided recommendations to the operations, logistics and EC teams for further corrective actions.

At the end of the spray campaign, IRS equipment and products were repatriated to central stores. All PPE and IRS equipment, including coveralls, were properly cleaned, and stored in the district stores for use in the next campaign. All unused insecticides were sent to the central warehouse of Natitingou and stored for use in the next campaign. The project team ensured that soak pits were cleaned, covered with a polythene sheet and locked. Storerooms were washed and handed over to the owners.

The VectorLink team, with support from government stakeholders, conducted post-spray site decontamination, decommissioning and environmental compliance inspections in all IRS sites. The purpose of the post-IRS inspections was to ensure the collection and safe disposal of all wastes from each operational site, leaving the sites in an environmentally compliant condition.

6.6 Incidents Encountered during the IRS Operations

A total of five incidents took place in Benin in 2019 (see table 17), which were reported to the PMI team within the 48-hour incident reporting deadline. Anyone involved in cases of pilferage and data falsification was immediately dismissed from any further engagement in the IRS campaign and the matter was reported to the police for investigation.

Table 17: Summary of Incident Cases Recorded during the 2019 IRS campaign

	Incidents	Location	Date
1.	Road accident involving a rental car carrying spray materials on the road from Cotonou to Natitingou, in the surroundings of Birni city, Benin	Kouande District	April 13, 2019
2.	Road accident involving a rental car carrying the project's IT Manager and some project IT material/equipment from Cotonou to Djougou	Tchaourou district in the surroundings of Chachou city	April 25, 2019
3	Data falsification attempt at the Copargo operational site, Donga Department	Copargo District	May 8, 2019
4	Accidental death of a rental car driver due to severe inclement weather at the Gounarou operational site	Gogounou District	May 10, 2019
5	Attempted insecticide theft and fraud at the Barienou operational site, Donga Department	Djougou District	May 28, 2019

6.7 IRS WASTE MANAGEMENT

Under the supervision of the Project Environmental Compliance Officer and the warehouse manager, all solid wastes generated from the 2019 spray campaign were collected and segregated. The logistics team collected all empty insecticide bottles, and reconciled the numbers using ledger books and stock cards. All empty insecticide bottles and used polythene sheets will be recycled by the Social and Environmental Engineering Company / Compagnie d'Ingénierie Sociale et Environnementale (CISE), while insecticide cardboards will be delivered to the Hygiene, Environmental and Safety Company / Générale de l'Hygiène de l'Environnement et de la Sécurité GHES. All contaminated waste paper materials (material safety data sheets, insecticide-impregnated papers) and used nose masks will be incinerated at "Ordre de Malte" Hospital in Djougou. Other waste will be sent to the Cotonou landfill site. The project will keep records of the recycling and disposal certificates issued for all categories of waste. Table 18 shows the different categories of waste generated and their respective management methods.

Table 18: Different Categories of Waste Generated during the 2019 Spray Campaign and Planned Management Methods

Type / Designation	Quantity	Disposing Company	Intended Management Mechanism
Empty Bottles	53,504 units	CISE Recycling Plant	Recycling: production of paving stone
Batteries for flashlights	1,163 Kg	Landfill site of Cotonou City	Landfilling
Used Nose Masks	488 Kg	Ordre de malte Hospital (Djougo)	Incineration
Plastic sheeting / cloth	216 kg	CISE Recycling Plant	Recycling
Defective Flashlights	166Kg	Landfill site of Cotonou City	Landfilling
PVC Gloves	26 Kg	Landfill site of Cotonou City	Landfilling
Empty Actellic Boxes	4458 units	GHES Company	Recycling: production of boards / planks

7. INFORMATION EDUCATION AND COMMUNICATION

Achieving a successful spray campaign generally depends on community acceptance of this intervention. VectorLink Benin has prioritized informing the populations living in intervention areas to ensure full support to IRS activities and to promote acceptance of this intervention by the community. The project carried out several IEC-related activities in anticipation to the 2019 IRS campaign. The project updated existing IEC materials and developed others to suit the 2019 IRS campaign need. IEC materials and tools that the project updated / developed included: training manual and PowerPoint presentations, IRS posters and banners, leaflets, and partner radio contracts. IEC activities focused on positive benefits of IRS in preventing and controlling malaria and on addressing common prevalent myths and misconceptions about IRS.

Project's stakeholders at the community level were involved in IEC activities, namely local leaders, town criers, community health workers, and religious and women association leaders. Many other channels of mass communication were used including local radios, flyers, and targeted communication for communities known to decline acceptance of IRS.
Local radio stations aired various malaria prevention messages. All communication activities and key messages were discussed and planned with the NMCP IEC focal point, and were reviewed and approved by the public health department directorate. Messages from local radio shows and town criers included information about integrated malaria prevention interventions including IRS and the insecticide used in this campaign.

The project held three training sessions before launching the IEC activities, including:

- Training of Trainers held on April 18-20, 2019
- Guidance to local radio managers on April 25, 2019
- Training of mobilizers held on April 29-30, 2019

7.1 ADVOCACY MEETINGS

VectorLink Benin in collaboration with Benin NMCP and partners, conducted two high level advocacy meetings on April 12, 2019: one in Djougou and the other in Kandi. A third special meeting was organized for members of the Djougou District Council, absent at the previous meeting, on May 19, 2019. These meetings involved administrative authorities and community leaders. Following these advocacy meetings, the project's IEC officer helped village leaders conduct public meetings in every village in all IRS districts. The meetings at the village level and the higher level advocacy meetings at the department level and district (Commune) level had the same objective in ensuring that communities were adequately informed about the 2019 IRS campaign and increasing community engagement before the start of IRS operations.

7.2 COMMUNITY MOBILIZATION

As part of mobilization efforts, the project conducted mass campaigns using vehicles (Pick up all-terrain) equipped with microphones / sound baffles in large agglomerations with low coverage based on retrospective data. This activity was carried out by IEC Assistants supported by multilingual mobilizers (speaking local languages) during the period of May 1 - 5, 2019 in Donga and Alibori Departments.

In each district, the IEC assistant, in collaboration with the site coordinator, met with village leaders and town criers one or two days before the arrival of SOPs in their localities. Village leaders who accepted to take part directly in the implementation of IRS activities were hired as mobilizers. In total, the project

trained and engaged approximately 460 mobilizers who resided in the target communities and shared key messages with beneficiaries before the start of the spray campaign. This enabled them to visit every household with IRS messages (i.e. explaining how insecticide application impacts malaria, the fact that spray operators are responsible individuals who will handle people's household belongings with care, demystifying and correcting any misconceptions about IRS and educating households on their roles and responsibilities before, during, and after their house is sprayed). As a change from previous years, IRS cards were distributed by spray teams at the time of spray rather than before the campaign by mobilizers. Town criers reminded beneficiaries of safety precautions and house preparation during IRS operations.

All mobilizers participated in a one-day training in April 2019 that focused on messaging and effective communication techniques, structure marking, and filling in mobilization data collection cards. Household members were provided with leaflets about the IRS campaign. The leaflets informed them of what to do before, during and after the spraying, the need to keep the IRS cards distributed by spray teams to facilitate post-spray monitoring activities.

Town Criers

Each village used one or two town criers depending on its size. When the spray was not conducted in a village in one day for any reason, including weather, the scattering of households in the village, etc., the town crier, in collaboration with the village leader and mobilizer of the village, the IEC assistant and site coordinator, informed household owners of date changes. Town criers and heads of villages reminded the need for the participation of householders in preparing their houses for spraying and complying with instructions, including safety precautions before and after the spray.

Mass Media Communication

Seven community radio stations, four in Donga, and three in Alibori, were contracted to cover the IRS campaign. Activities included the broadcast of messages in French and in local languages covering the following:

- Dissemination of IRS operations schedules in each location
- Talk shows, roundtables and radio plays
- Regular spot on malaria prevention measures
- Best practices during IRS operations, etc.

In addition, sensitization plays on IRS were also displayed in areas where there were many cases of refusal during the previous campaign. VectorLink Benin staff, district and department officials participated in interactive call-in shows and on-air presentations. Local radio stations also covered the campaign launch and closing ceremonies.

The radio station contracts covered the period from April 15 to May 31, 2019. Four weeks after the IRS campaign, radio stations continued to broadcast educational information to communities on malaria prevention aspects, including the continued use of insecticide treated nets (ITNs) every night.

7.3 IEC ACTIVITIES AND OUTCOMES

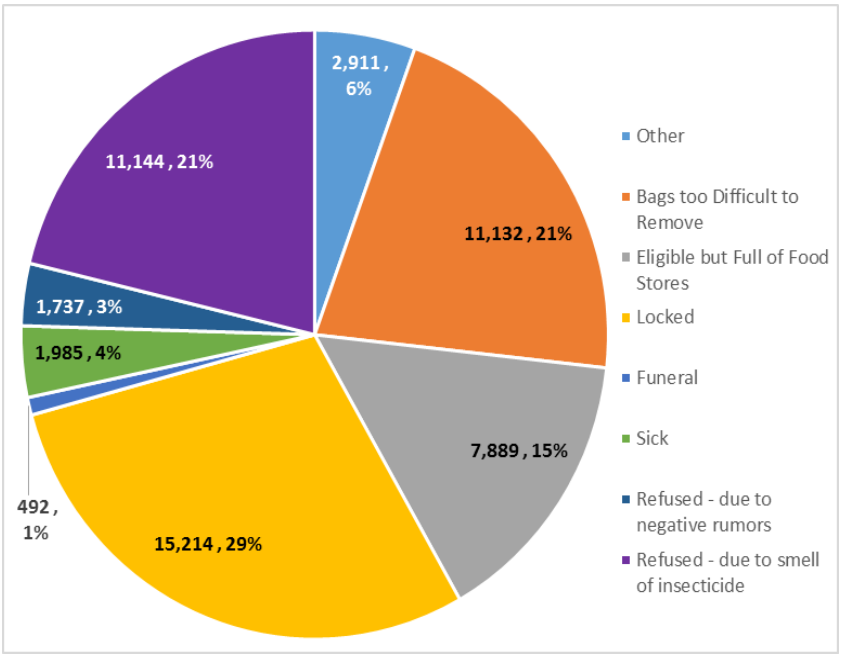
Household owners received educational information from IEC mobilizers and responded with a willingness to accept IRS this year; however, unfortunately during IRS operations, the project experienced low acceptability of IRS at the household level. The average rate of refusals represented 14% of all unsprayed structures. Highest rates of refusals in relation to the structures found in the respective districts were observed in Ouaké (17%) and Djougou (15%). See Table 19 for radio station activities.

Table 19: IEC Activities Conducted by Radio Stations (April 15 to May 30, 2019)

Activities	Number of Broadcasts
Disseminating short radio spots and messages (French and national languages)	2,378
IRS schedule announcements/invitations for local leaders to attend IRS planning meetings (French and national languages)	2,163
Debates and discussion shows (interactive emissions/magazines)	33
Animation radio games	11
Interviews and testimonials of beneficiaries	55
Reports	5

Figure 8 shows the reasons why structures were not sprayed during the 2019 IRS campaign. Bags referred to in the legend as too difficult to move consisted of harvested food items (rice, maize, etc.), weighing up to 700 Kg (1,543 lbs), or any other items stored in bags within the household).

Figure 8: Reasons for non-sprayed structures



7.4 World Malaria Day

The World Malaria Day scheduled to be held in Dassa, Hills department, with the national motto "Zero Malaria, I'm Committing", was canceled at the last minute following the post-election protests of parliamentarians.

8. GENDER

VectorLink Benin considers the values, aspirations and needs of women and men to participate in vector control interventions. The project identifies and addresses inequalities between men and women across spray operations. As in previous IRS campaigns, approaches employed for achieving an impact included:

- Ensuring that recruitment, mobilization, and training include women and respect women's time constraints when feasible.
- Explicit inclusion of gender issues in all training modules, from ToT through cascade training.
- To continue promotion of a respectful working environment through the project's sexual harassment policy for all employees, including seasonal workers, VectorLink has updated the poster on gender awareness guidelines in all operational sites, as well as anti-harassment posters.
- Ensuring that women who are pregnant and recruited during the campaign are assigned to roles without exposure to insecticide.
- Ensuring women have accommodations in operational sites where they feel safe and comfortable, including separate bathrooms and showers equipped with sanitary bins and PPE in appropriate sizes.
- Creating a buddy system so that at least two women are together on each spray team.
- Providing sex-disaggregated data for all indicators, as appropriate.

As result of 2019 IRS campaign, women represented 19.83 percent of the seasonal staff for the six districts versus 20.4 percent in 2018 for eight districts. The project continues to face challenges related to some cultural and religious traditions practiced in the IRS intervention areas that have hindered the achievement of its target of 30 percent female participation in IRS activities. This is mainly due to the difficulty for women to apply for an IRS position, as culturally, they need to obtain authorization from their husband, as well as the perception of IRS traditionally being a typical activity for men. Table 20 provides details on female participation during the 2019 IRS campaign.

Table 20: Female Seasonal Workers during the 2019 IRS Campaign

Category	Female	Male	Total	% female
Mobilizers	64	350	414	15.5
Team Leaders	43	213	256	16.8
District Coordinators	0	6	6	0.0
Supervisors (Mobilizers)	16	30	46	34. 8
Clinicians (Doctor)	0	6	6	0.0
Supervisors (Community)	18	67	85	21.2
Spray Operators	176	1,102	1,278	13.8
Data Clerks	11	32	43	25.6
Site Supervisors	1	13	14	7.1
Spray Pump Technicians	16	48	64	25.0
Washers	128	0	128	100.0
Storekeepers	5	22	27	18.5
Guards	0-	39	39	0.0
Assistants (Finance, Logistics, ECO, M&E, Maintenance, IT and IEC)	5	25	30	16. 7
Total	483	1,953	2,436	19.8

9. IRS COUNTRY CAPACITY BUILDING

One of the project's main tasks is to enhance the local staff and government staff's technical knowledge and management capacity to implement IRS. The project's guiding partnership principles emphasize the importance of building relationships with local partners and strengthening their skills in areas of IRS such as procurement / logistics, environmental compliance, planning, monitoring and evaluation, and IEC/SBCC. As part of a hands-on approach to capacity building, NMCP / vector control officers were fully involved in the supervision of IRS in three districts that they selected directly: Kandi, Gogounou and Segbana. In addition, to strengthen ownership, Environmental Health Officers from the National Directorate of Hygiene (DHAB) accompanied by their respective medical officers at districts (districts) and departmental levels participated in IRS supervision in their respective districts.

10. POST-SPRAY ACTIVITIES

10.1 SUMMARY OF POST-SPRAY ACTIVITIES

For an effective completion of the spray season, the VectorLink Benin team conducted the following activities:

- A meeting with all site coordinators and supervisors for guidance on end-of-campaign activities in Alibori and Donga departments
- All IRS materials and equipment, remaining insecticides, and insecticide-contaminated wastes were returned to central warehouses: Kandi and Natitingou
- Release of all rented vehicles
- Decontamination of secondary warehouses and rinsing areas
- Preparation of the final pay statements of seasonal workers and other vendors for pending invoices
- Repairing and maintaining malfunctioning sprayers and other IRS material including PPE
- Inventory of equipment
- Proper disposal of waste generated during the campaign: recycling, incineration, grinding, etc.
- Post-campaign environmental inspection
- Continued public awareness of prevention methods and the fight against malaria through radio programs to maximize the effectiveness of the IRS campaign

Details on some of these post-campaign activities are provided below and in the appropriate sections.

10.2 DEMOBILIZATION OF COMMODITIES

As in previous spray campaigns, VectorLink cleaned all IRS materials after the end of spray operations. The project then transported materials from IRS sites to the central warehouses (Kandi and Natitingou) for use during the 2020 IRS campaign. The VectorLink team, with support from government stakeholders, conducted post-spray site decontamination and decommissioning. After the VectorLink Benin project restored the sites to a well-maintained state and made them safe for the surrounding communities, the VectorLink team formally handed the sites back to the local authorities for safekeeping until the next IRS campaign.

10.3 INVENTORY ASSESSMENT

Immediately after the end of the spray campaign, all warehouses conducted a post-IRS inventory assessment. The inventory assessment report provides an update on the commodities the project used during the campaign and those remaining for future use. The report further indicates quantities of new, used, or damaged (requiring service or repairs) items. In addition, it provides a list of items scheduled for disposal. Subsequent to this, the VectorLink team conducted comprehensive insecticide reconciliation in all secondary warehouses and all unused insecticides and empty bottles recorded. All empty bottles have been transferred to the site of Pahou for recycling. Annex A shows the most current post-IRS inventory details.

11. CHALLENGES, LESSONS LEARNED AND RECOMMENDATIONS

11.1 CHALLENGES

During the 2019 IRS campaign, VectorLink experienced several challenges, including:

- A total of five incidents took place this year in Benin. The project will take additional control measures in recruiting and training all seasonal staff during the next campaign. To mitigate these incidents, the project will also strengthen its field supervision strategies.
- The team observed weak household preparation and refusals cases to IRS in semi-urban and urban centers. These cases were noted in Djougou and Ouake districts for the following reasons: strong insecticide odor, general inconvenience associated with moving household items to make room for spraying, and the claim of application of alternative vector control interventions such as use of long-lasting insecticide treated nets. This also resulted in low IRS coverage in these areas (see Table 21 and Figure 8).
- Inaccessibility to some remote villages due to poor road conditions.
- Decrease in spray performance by spray operators due to heavy rains.
- Low use of supervision tools by MOH supervisors: mHealth supervisory forms in ODK and CommCare application, and direct observation of spraying.

Table 21: Total Non-Sprayed Structures and Reasons for Not Spraying

Districts	Total # Structures found	Total # Structures not sprayed (%)		Refused*	Locked	Eligible but filled with food bags	Other reasons	Total
Ouake	40,699	6,844	17%	2,849	2,184	1,200	611	6,844
Djougou	150,880	22,420	15%	9,845	5,977	3,712	2,886	22,420
Gogounou	54,179	6,958	13%	3,384	1,901	1,114	559	6,958
Copargo	29,936	3,715	12%	1,820	1,148	404	343	3,715
Segbana	35,949	4,416	12%	1,985	1,574	490	367	4,416
Kandi	76,068	8,151	11%	4,130	2,430	969	622	8,151
Total	**387,711**	**52,504**	**13.50%**	**24,013**	**15,214**	**7,889**	**5,388**	**52,504**

** This category includes the following reasons for unsprayed structures: household effects too difficult to remove, negative rumors, and strong insecticide odor.*

11.2 LESSONS LEARNED

- The project is aware of the need to diversify its mobilization strategies and tools to address the low compliance to this intervention in some targeted communities.
- Engagement of district leaders and political section leaders in urban and semi urban areas as mobilizers to conduct mobilization is critical in the acceptability of IRS in the rural parts of the districts.
- Sustained supervision allows earlier detection or discouragement of bad practices during IRS operations, including insecticide theft attempts and data falsification.
- Daily feedback meetings between project and government supervisors are helpful for the smooth implementation of IRS operations and achievement of high spray coverage.
- Regular feedback of performance of data of spray teams in the field helped to improve spray coverage as mop-up teams could effectively use this data to revisit structures that had been found but not sprayed during the first field visit.
- The participation of government leaders and health managers in all components of IRS operations enhances their interest and ownership of the project activities.
- Religious, cultural and political events made it challenging to implement spray activities in 2019. For instance, during Ramadan, many spray team members were fasting, which could represent a major physical challenge to conducting IRS activities. In addition, several cultural events during a given period of time could lead to homeowners' absence from their houses; hence leading to closed structures during the spray operators' visit. Furthermore, government interventions, such as IRS, were not welcome in certain communities that were not in support of the government.

11.3 RECOMMENDATIONS

- Continue to enhance adherence to recruitment guidelines developed and shared by the VectorLink project
- Emphasize the end of the day clean-up process during the training of team leaders to ensure that the spray operators employed the correct progressive rinsing procedures, and protect themselves using the project provided PPE and the environment as per PMI BMP standards.
- Require all supervisors, particularly government and local supervisors in using supervisory tools imbedded in smartphones.
- Raise the skill level of spray pump technicians in addressing sprayer issues, particularly the proper maintenance and the calibration of sprayers.
- Diversify mobilization strategies to ensure better community acceptance, readiness, and participation in IRS.
- Enhance operational sites capacities and amenities (stores, rinsing area, light sources, etc.) to accommodate the number of SOPs and volume of IRS material.
- Involve district authorities and security representatives in IRS planning and operations to provide oversight supervision of IRS teams at the district level.
- For better implementation of the spray campaign, spray operations should not coincide with certain religious, cultural or political events.
- Discuss with NMCP other potential spray dates, in order to avoid spraying under heavy rains.

Annex A. PROCUREMENT (LOCAL & INTERNATIONAL) AND POST SPRAY STOCK BALANCE

Item	Initial Stock before IRS Campaign [A]	Number of Items Procured [B]	Stock before Campaign [C] (A+B)	Defective Items after IRS Campaign + Consumables (Single use) [D]	Usable Stock Remaining for 2019 [E] (C-D)
Insecticide (Pirimiphos - methyl-CS)	3,678	50,856	54,534	53,504	1,030*
Sprayer X-PERT (Hudson)	681	0	681	0	681
Sprayer IK12 VC (Goizper)	400	0	400	0	400
Sprayer IK Super VC (Goizper)	2,094	40	2,134	2	2,132
Overalls	5,502	0	5,502	04	5,498
Vest	931	0	931	1	930
Helmet	1,935	528	2,463	09	2,454
Gumboots	2,522	0	2,522	17	2,505
Gloves for SOP	3,625	504	4,129	1,695	2,434
Gloves for Washer	209	24	233	120	113
Respirator Mask	42,620	0	42,620	37,112	5,508
Operator Flashlight (head lamp)	0	0	0	0	0
First Aid Kits	219	24	243	164	79
Thermometers	25	0	25	1	24
Fire Extinguishers	34	4	38	03	35
O Ring for Supply Tube Hudson	35	4	39	02	37

Item	Initial Stock before IRS Campaign [A]	Number of Items Procured [B]	Stock before Campaign [C] (A+B)	Defective Items after IRS Campaign + Consumables (Single use) [D]	Usable Stock Remaining for 2019 [E] (C-D)
Filters x PER	700	0	700	0	700
Filter Goizper Pump	312	0	312	0	312
White Washers (spare part for pumps)	209	0	209	88	121
Elbow with Nozzles Goizper	914	0	914	0	914
Nozzle Blues	100	0	100	0	100
Face Shield for Helmets	1950	650	2600	1847	753
Filter Assembly, for Pressure Gauge Hudson	100	0	100	0	100
Cup Retainer Hudson	0	0	0	0	0
Plunger Adaptor	0	0	0	0	0
Complete Chamber Goizper IK SUPER	755	245	1000	188	812
Sieve Pump IK Super	0	0	0	0	0
Two-Component Hose New Pumps/Goizper	0	0	0	0	0
Two-Component Hose Old Pumps/Goizper	0	0	0	0	0
Valve Goizper	0	100	100	10	90
Safety Valves Goizper	56	0	56	10	46
Collar Seal/Goizper	0	0	0	0	0
Lance Filter New Pumps/Goizper	0	0	0	0	0
Lance Filter Old Pumps/Goizper	0	0	0	0	0
Lance Tube Old Pumps/Goizper	0	0	0	0	0
Lance Tube New Pumps/ Goizper	26	0	26	0	26
Pressure Regulator/Goizper	449	551	1000	200	800
Pressure Regulator/Hudson	640	0	640	0	640

Item	Initial Stock before IRS Campaign [A]	Number of Items Procured [B]	Stock before Campaign [C] (A+B)	Defective Items after IRS Campaign + Consumables (Single use) [D]	Usable Stock Remaining for 2019 [E] (C-D)
Spare Parts Kit Pumps Goizper/	20	0	20	0	20
Spare Part Kit Hudson	283	0	283	0	283
Complete Handle/Goizper	0	0	0	0	0
Pressure Gauge Xp Hudson	26	0	26	00	26
Leaflets	0	0	0	0	0
Pregnancy Test Kits	533	0	533	507	26
Generators	03	0	03	00	03
Buckets for SOPs	1737	135	1872	46	1826
Plastic Buckets for Dustbin (100L)	229	00	229	03	226
Barrel (100l)	0	0	0	0	0
Ficam Barrel (200L)	84	0	84	0	84
Rinsing Barrel (150L)	504	140	644	00	644
Fuel Tank (200L)	25	02	27	00	27
Water Tank	23	03	26	01	25
Motorcyles	12	00	12	00	12

** 2 bottles were sent to the laboratory for quality control; which leaves a physical stock of 1,028 bottles of insecticide*

Annex B. Monitoring and Evaluation Plan

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation	Annual Targets and Results									
				Year 1* [1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
Objective 1: Implementation of Malaria Vector Control (VC) Interventions													
1.1	**Successfully execute IRS and other malaria vector control programs**												
1.1.1	Annual country work plan developed and submitted on-time	Data source: Project records Reporting frequency: Annually	By Spray Campaign	1	1	1	1						
1.1.2	Number of eligible structures targeted for spraying	Data source: Previous spray campaign data Reporting frequency: Daily per spray campaign	By Spray Campaign	432,379	442,528	348,978	387,711						

[1] Benin will only be supporting IRS in Year 2. All Vector Control disaggregation only relate to IRS.

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation	Annual Targets and Results									
				Year 1* [1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
1.1.3	Number of eligible structures sprayed with IRS	Data source : Daily SOP Forms Reporting frequency: Daily per spray campaign	By Spray Campaign	367,522	400,997	296,632	335,207						
1.1.4	Percentage of total structures targeted for spraying that were sprayed with a residual insecticide (Spray Coverage)	Data source : Daily SOP Forms Reporting frequency: Daily per spray campaign	By Spray Campaign	85.0%	90.6%	85.0%	86.5%						
1.1.5	Number of people protected by IRS	Data source : Daily SOP Forms Reporting frequency: Daily per spray campaign	By Spray Campaign By Sex By pregnant women By children <5 years old	1,270,500	1,321,758 M:689,431 F: 632,327 Pregnant: 58,086 <5: 269,164	1,112,610	1,077,411 M:561,025 F:516,386 Pregnant: 51,872 <5: 243,648						

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation	Annual Targets and Results									
				Year 1* [1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
1.1.6	EOSR submitted within 45 days after the end of spray (including completing MEP and EMMR)	Data source : Project records Reporting frequency: Semi-annual	By Spray Campaign	1	1	1	1						
1.1.7	Post-spray Data Quality Audit conducted within 90 days of spray completion	Data source : Spray operations reports Reporting frequency: Per spray campaign	By Spray Campaign	1	1	N/A	N/A						
1.1.8	Number of Insecticide Treated Nets (ITNs) distributed, by channel	Project Records Annually	Channel	N/A	N/A	N/A	N/A						
1.1.9	Conducted at least one process assessment of the quality of ITN distribution planning, the quality of household registration, and or ITN distribution implementation during a mass ITN distribution campaign	Project Records Annually	Channel	N/A	N/A	N/A	N/A						
1.1.10	Operational routine monitoring systems for continuous ITN distribution established and disaggregated by channel	Project Records Annually	Channel	N/A	N/A	N/A	N/A						
1.1.11	ITN durability monitoring data collection completed on time as planned in a given project year	Project Records Annually		N/A	N/A	N/A	N/A						

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation	Annual Targets and Results									
				Year 1* [1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
1.2	**Provide technical assistance and planning support for IRS and other integrated malaria vector control activities**												
1.2.1	Number of VC project training workshops targeting NMCP and other host country staff	Project Training Records Annually	Country Technical Area Job Function	N/A	N/A	N/A	N/A						
1.2.2	Number of NMCP and other vector control host country staff accessing DHIS2	DHIS2 Logs Annually	Country Job Function	N/A	N/A	N/A	N/A						
1.3	**Ensure safe and judicious use of insecticides and other malaria vector control products**												
1.3.1	Number of vector control personnel trained in environmental compliance and personal safety standards in vector control implementation	*Data source:* Project records – Training reports Reporting frequency: Each spray season	By Spray Campaign By Sex Job Function	2,537[2]	2,986 M:2450 F:536	3,386[3]	2,491 M: 2,020 F: 471						

[2] This number includes: SOPs, team leaders, government personnel, storekeepers, M&E assistants, service technicians and washers

[3] The target was initially set based on spraying in 8 communes and ultimately the project only sprayed in six communes, hence the discrepancy between the Year 2 target and result.

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation	Annual Targets and Results									
				Year 1* [1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
					22 Site Coordinators; 172 Supervisors; 1,664 SOPs; 327 TLs; 92 IEC Mobilizers; 92 TLs; 24 Government staff; 42 Storekeepers; 6 M&E Assistants; 4 Eco Assistants; 10 IEC Assistants; 5 Technicians Assistants; 175 Pump technicians; 162 Washers; 39 Guards; 242 Drivers		20 Site Coordinators; 89 Supervisors; 1,278 SOPs; 256 TLs; 413 IEC Mobilizers; 14 Government staff; 29 Storekeepers; 5 M&E Assistants; 3 Eco Assistants; 9 IEC Assistants; 3 Logistic Assistant;0 Technicians Assistants; 65 Pump technicians; 132 Washers; 36 Guards; 139 Drivers					
1.3.2	Number of health workers receiving insecticide poisoning case management training	*Data source: Project records – Training reports* Reporting frequency: Each spray season	By spray Campaign By Sex	93	101 M: 64 F: 36	78	86 M: 55 F: 31						

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation	Annual Targets and Results									
				Year 1* [1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
1.3.3	Number of adverse reactions to pesticide exposure documented	Data source: *Incident report forms* Reporting frequency: Each spray campaign	By spray Campaign By Residential/ Occupational Exposure	0	0	0	0	0		0		0	
1.4	**Strengthen capacity of NMCPs, vector control personnel, and other institutions to implement and manage IRS and other vector control activities**												
1.4.1	Total number of people trained to support VC in targeted areas[4]	Data source: *Project records – Training reports* *Reporting frequency*: Semi-annually	*By Spray Campaign* *By Sex* *Percentage of Women* Trained	4,180	2,229 M: 1,931 F: 298 13.4%	1,766	1,623 M: 1,373 F: 250 15.4%						
1.4.2	Number of people trained during IRS Training of Trainers	Data source: *Project records – Training reports* *Reporting frequency:* Semi-annually	*By Spray Campaign* *By Sex* *Percentage of women* trained	166	210 M: 170 F: 40 19.0%	166[5]	110 M: 83 F: 27 24.5%						

[4] The definition of this indicator was changed since the first submission of the MEP to include only SOPs, TLs, and Supervisors, hence the discrepancy between the target and results for Year 1.

[5] The target was initially set based on spraying in 8 communes and ultimately the project only sprayed in six communes, hence the discrepancy between the Year 2 target and result.

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation	Annual Targets and Results									
				Year 1* [1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
1.4.3	Total number of people hired to support VC in target districts	*Data source: Project records – Contracts signed* *Reporting frequency:* *Semi-annually*	By Spray Campaign By Sex Percentage of women hired	3,64	3,764 M: 2,995 F: 769 20.4%	3,104	2,429 M: 1,946 F: 483 19.9%						
1.4.4	Number of government/district officials who acted as supervisors during VC campaigns	Data source : Project Records Reporting frequency: Annually	By Spray Campaign VC Intervention Type	91	34 IRS	77	44 IRS						
1.5	**Promote gender equality in all facets of planning and implementation**												
1.5.1	Number of women hired to support VC campaigns	Data source: Project Records Reporting frequency: Annually	By Spray Campaign Returning female seasonal workers hired in a more senior capacity	1,317; 35%	769; 20.4%	1,242; 40%	483; 19.9%						

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation	Annual Targets and Results									
				Year 1* [1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
1.5.2	Number and percentage of women hired in supervisory roles in target areas for vector control activities[6]	Project Records Reporting frequency: Annually	By Spray Campaign Job Function	253; 50%	132; 21.7% Site Coordinators: 4; Supervisors: 28; TLs: 60 IEC Mobilizer TLs: 34 Environnemental Assistants: 2 IEC Assistant: 3 M&E Assistant:1	213[7]; 50%	83; 17% Site Coordinators: 1; Supervisors: 18; TLs: 43 IEC Mobilizer TLs: 16 Environnement al Assistants: 2 IEC Assistant: 2 M&E Assistant:1						

[6] This number includes site supervisors, team leaders, M&E assistants, and others who supervise seasonal staff

[7] The target was initially set based on spraying in 8 communes and ultimately the project only sprayed in six communes, hence the discrepancy between the Year 2 target and result.

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation	Annual Targets and Results									
				Year 1* [1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
1.5.3	Number and percentage of staff (permanent and seasonal) who have completed gender awareness training	Data source: Project Training Records Reporting frequency: Annually	By Spray Campaign Sex Job Function	4,181; 100%	2,548; 100% M:2173 F: 374 Permanent: 1 Seasonal: 2,547	3,351; 100%	2,141; 83.5% M: 1,728 F: 413 Permanent: 1 Seasonal: 2,140						
1.5.4	Number and percentage of women in senior leadership roles in VectorLink country offices	Data source : Project Records Reporting frequency: Annually	Country Sex (# and %)	2; 50%	2; 50% M: 2; 50% F : 2; 50%	3; 50%	2; 33% M: 4; 67% F: 2; 33%						
1.6	**Implement and support social behavioral change communication and mobilization activities**												
1.6.1	Number of radio spots and talk shows aired	Data source : Project Training Records Reporting frequency: Annually	By Spray Campaign VC Intervention Type	8,217	5,760 IRS	2,880 IRS	2,378 IRS						

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation	Annual Targets and Results									
				Year 1* [1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
1.6.2	Number of print materials disseminated	Data source : Project Training Records Reporting frequency: Annually	By Spray Campaign VC Intervention Type	265,136	255,681 Leaflets: 100,737 ; IRS card: 154,944 IRS	132,634	105,074 Leaflets: N/A; IRS cards: 105,074						
1.6.3	Number of people reached with vector control and/or SBCC messages via door-to-door messaging	*Data source: Mobilization Data Collection Forms* *Reporting frequency: Daily per mobilization conducted*	By Spray Campaign VC Intervention Type Sex	671,631	682,536 IRS M: 326,186 F: 356,350	610,529	N/A[8] IRS						
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	Data source : Project Training Records Reporting frequency: Annually	By Spray Campaign	N/A	N/A	N/A	N/A						

[8] The mobilization strategy was changed after the 2019 targets were set. The new strategy does not include traditional door-to-door mobilization and therefore there was no mobilization data to report for Year 2.

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation	Annual Targets and Results									
				Year 1* [1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
1.6.5	Number and percentage of people with a favorable attitude toward the practice/product (i.e., ITNs, IRS)	Data source : Project Training Records Reporting frequency: Annually	By Spray Campaign VC Intervention Type	N/A	N/A	N/A	N/A						
1.6.6	Number and percentage of people who believe that the majority of their friends and community members practice the behavior	Data source : Project Training Records Reporting frequency: Annually	By Spray Campaign VC Intervention Type	N/A	N/A	N/A	N/A						
1.7	**Environmental compliance**												
1.7.1	Number and percentage of SEAs (with EMMPs) or Letter Reports submitted at least 60 days prior to the commencement of vector control campaigns	Project Records Annually	By Spray Campaign	1; 100%	1; 100%	1; 100%	1; 100%						
1.7.2	Number and percentage of permanent and mobile soak pits inspected and approved prior to IRS campaigns	Project Records Annually	By Spray Campaign Soak Pit Type	39; 100% Permanent:38; mobile:1	38; 100% Permanent: 38 Mobile: 0	46; 100% Permanent:40; mobile: 6	35;100% Permanent: 32 Mobile: 3						

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation	Annual Targets and Results									
				Year 1* [1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
1.7.3	Number and percentage of storehouses inspected and approved prior to IRS campaigns	Project Records Annually	Country Storehouse Type	22; 100%	23; 100% 22 Temporary storehouses and 1 Central warehouse	23; 100%	20; 100% 19 Temporary storehouses and 1 Central warehouse						
1.7.4	Number and percentage of fixed soak pits that are compliant with PMI's Best Management Practices	Project Records Annually	By Spray Campaign	38; 100%	38; 100%	21; 100%	22; 100%						
2. Entomological and Epidemiological Data to Drive Decision-Making													
2.1	**Vector control activities monitored via entomological and epidemiological data**												
2.1.1	Number and percentage of project-supported entomological sentinel sites established to monitor vector bionomics and behavior (vector species, distribution, seasonality, feeding time, and location)	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign VC Intervention Type	N/A	N/A	N/A	N/A						
2.1.2	Number and percentage of entomological monitoring sentinel sites measuring all five basic PMI entomological monitoring indicators (i.e., species composition, abundance, and seasonality of malaria vector; insecticide susceptibility and resistance intensity; mechanism of resistance; quality assurance and residual efficacy monitoring of IRS programs; or vector behavior: feeding time &, location)	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign VC Intervention	N/A	N/A	N/A	N/A						

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation	Annual Targets and Results									
				Year 1* [1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
2.1.3	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)	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign VC Intervention	N/A	N/A	N/A	N/A						
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	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign Insecticide Type	N/A	N/A	N/A	N/A						
2.1.5	Number of wall bioassays conducted within 2 weeks of spraying to evaluate the quality of IRS	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign	N/A	N/A	N/A	N/A						
2.1.6	Number and percentage of cone bioassays conducted within two weeks of spraying with greater than 98% test mortality recorded	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign	N/A	N/A	N/A	N/A						
2.1.7	Number of wall bioassays conducted after the completion of spraying at monthly intervals to evaluate insecticide decay	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign Insecticide Type	N/A	N/A	N/A	N/A						

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation	Annual Targets and Results									
				Year 1* [1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
2.1.8	Number of vector susceptibility tests for different insecticides conducted in selected sentinel sites	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign Insecticide Type	N/A	N/A	N/A	N/A						
2.1.9	Integrated vector control analytics dashboard available for decision making	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign	N/A	N/A	N/A	N/A						
2.1.10	Number of staff (Vectorlink-contracted or non-Vectorlink) trained in entomological monitoring	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign Sex (# and %) Job Function	N/A	N/A	N/A	N/A						
2.2	**NMCPs develop country-level IRS and other malaria vector control strategies**												
2.2.1	Developed an integrated malaria vector control strategy, including a plan for monitoring and managing insecticide resistance supported by the project	Project Records Annually		N/A	N/A	N/A	N/A						
2.2.2	Completed integrated data and visualization landscaping for vector control decision making complete	Project Records Annually		N/A	N/A	N/A	N/A						

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation	Annual Targets and Results									
				Year 1* [1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
2.2.3	Implemented sub-national insecticide rotation as part of an IRM strategy	Project Records Annually		N/A	N/A	N/A	N/A						
2.3	**Build capacity of NMCPs and local institutions to collect, analyze, and use data for strategic malaria control decision-making**												
2.3.1	Number of individuals trained from NMCPs and national institutions to review and interpret data for integrated vector control decision making	Project Training Records Annually	Job Function Organization	N/A	N/A	N/A	N/A						
2.3.2	Proportion of targeted individuals who report using new analytical tools and/or skills in their planning, resourcing, implementation, or measurement activities	Capacity Assessments Thrice Over Project Life	Job Function Organization	N/A	N/A	N/A	N/A						
3. Procure insecticides for IRS and support the delivery and storage of IRS and other malaria vector control products													
3.1	**Cost-effective procurement mechanism established**												
3.1.1	Number and percentage of insecticide procurements that had a pre-shipment QA/QC test at least 60 days prior to spray campaign	Project record-insecticide Procurement Records Annually	By Spray Campaign Insecticide Type	1; 100%	1; 100%	1; 100%	1;100% Actellic 300CS: 1; 100%						
3.1.2	Number and percentage of insecticide procurements received on-time to allow for the initiation of spray operations as scheduled	Data source: Project record-insecticide Procurement Records Reporting frequency: Annually	By Spray Campaign Insecticide Type	1; 100%	1; 100%	1; 100%	1; 100% Actellic 300CS: 1; 100%						

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation	Annual Targets and Results									
				Year 1* [1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
3.1.3	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 Reporting frequency: Annually	By Spray Campaign	1; 100%	0; 0%	1; 100%	1; 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 Reporting frequency: Annually	By Spray Campaign	1; 100%	1; 100%	1; 100%	1; 100%						
3.1.5	PPE procured according to workforce composition	Procurement Records Reporting frequency: Annually	By Spray Campaign	N/A	N/A	N/A	N/A						
3.2	**Robust inventory management and logistics systems established**												
3.2.1	Number and percentage of logistics and warehouse managers trained in vector control supply chain management	Data source : Project Training Records Reporting frequency: Annually	By Spray Campaign Sex	45; 100%	46;100% M:34 F:12	28; 100%	32; 100% M: 25 F: 7						
3.2.2	Number and percentage of operations site warehouses where physical inventories can be verified by daily stock records	Data sources: Inventory and Stock Records Reporting frequency: Annually	By Spray Campaign	22; 100%	22; 100%	21; 100%	20; 100%						
3.2.3	Successfully completed spray operations without an insecticide stock-out	Inventory and Stock Records Reporting frequency: Annually	By Spray Campaign	1	1	1	1						

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation	Annual Targets and Results									
				Year 1* [1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
4. Innovation													
4.1	**Conduct operational research or monitoring to scale up new tools, methods, and approaches**												
4.1.1	Number of operational research studies on promising new tools or new methods/approaches to existing tools that are implemented	Project Records Annually	Type of Innovation	N/A	N/A	N/A	N/A						
4.2	**Create and share knowledge through dissemination of best practices and lessons learned**												
4.2.1	Number of innovations, best practices, and other data or lessons learned shared with other partners or international institutions for global reporting on the Vector Learning Exchange	Project Records Annually	Country Technical Area	1	0	2	0						
4.2.2	Number of individual members who use the Vector Learning Exchange	Project Records Annually		15	1	7	7						
4.2.3	Number of symposia and/or presentations submitted to and accepted at global conferences	Project Records Annually	Country Technical Area	N/A	N/A	N/A	N/A						
4.2.4	Number of success stories written or videos produced and shared on the Vectorlink project website	Project Records Annually	Country	1	0	2	1						
4.2.5	Number of peer-reviewed journal articles submitted and accepted	Project Records Annually	Technical Area	N/A	N/A	N/A	N/A						
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	N/A	N/A						

#	Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregation	Annual Targets and Results									
				Year 1* [1]		Year 2		Year 3		Year 4		Year 5	
				Target	Result	Target	Result	Target	Result	Target	Result	Target	Result
4.3	**Develop and deploy cost-savings approaches**												
4.3.1	Number of innovative or novel approaches implemented to achieve cost savings in IRS and integrated malaria vector control programs	Data source : Project Training Records Reporting frequency: Annually	By Spray Campaign	1	0	1	0						
4.3.2	Number of cost effectiveness assessments of existing approaches in the implementation of IRS and integrated malaria vector control programs	Data source : Project Training Records Reporting frequency: Annually	By Spray Campaign	1	0	1	0						
4.4													
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	Data source : Project Training Records Reporting frequency: Annually	By Spray Campaign Private Sector Organization	0	0	0	0						

Annex C. Number of People Trained

Categories of Individual Trained	Training of Trainers		Spraying Operations		Data Capture		Logistics Training		Technical Maintenance		Mobilization / IEC Training of Trainers		Mobilization/ IEC Training Medical		Treatment of Intoxication		Washer Activities		Fire Security		Transport Security		Master training	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
DDS- (AD / AT)	4	1																						
SHAB Regional																								
NMCP National																								
NMCP Regional	2										2												1	
DDEHU																								
DAGRI																								
CREC																								
Districts Coordinators																							19	1
Health Zone Coordinator																								
District Chief Doctors/ Other Doctors	6																							
Chiefs of Health Post/ Midwife																								
Hygiene Agents/Others Supervisors*	66	23																						
Spray Operators*			1095	183																				
Data Clerks					32	10																		
Storekeepers							22	7											22	5				
Logistics Assistants							3																	
Service Technicians									50	15														
IEC agents													353	60										
Washers																	132							
Drivers																					139			
Guards																			36					
Technician Assistant																								
Team Leader*			212	44																				
IEC Assistant											7	2												
Eco Assistant	1	2																						
Financial Assistant	2																							
M&E Assistant	4	1																						
TOTAL M/F	85	27	1307	227	32	10	25	7	50	15	9	2	353	60				132	58	5	139		20	1
TOTAL/ training	**112**		**1,534**		**42**		**32**		**65**		**11**		**413**		**0**		**132**		**63**		**139**		**21**	

*Counted towards indicator 1.4.1 - Total number of people trained to support VC in targeted areas.

Annex D. Environmental Mitigation and Monitoring Report Form

VectorLink Benin

ENVIRONMENTAL MITIGATION AND MONITORING REPORT (EMMR)

ANNUAL REPORTING FORM

Implementing Organization: Abt Associates, Inc.

Geographic location of USAID-funded activities: **Northern region of Benin**

Period covered by this Reporting Form and Certification: **January-December 2019**

Mitigation Measure	Status of Mitigation Measures	List any outstanding issues relating to required conditions	Remarks
1. Education, Technical Assistance, Training. • Training on all components of IRS implementation	Availability of appropriate teaching modules	N/A	N/A
2. Research and Development: vector control research • Implement laboratory environmental, health, and safety (EHS) manuals with standard operating procedures (SOPs), or use existing SOPs, for laboratory operations in accordance with country-specific compliance mechanisms. • Implement SOPs for the safe storage, transport, and use of equipment, chemical reagents, insecticides, and supplies in accordance with international guidelines (e.g., WHO, FAO) and host country requirements. • Provide training to workers on the approved SOPs or Waste Management Plan (WMP) developed for properly handling and disposing of wastes	Activities entrusted to the CREC-Entomology Research Center of Cotonou (Center complying with international guidelines).	N/A	The center reports directly to USAID/PMI.

Mitigation Measure	Status of Mitigation Measures	List any outstanding issues relating to required conditions	Remarks
4. Small-Scale Construction • Implement rehabilitation activities in conformance with USAID best practices and host country laws and regulations. Refer to the "Small-Scale Construction" chapter of the USAID Sector Environmental Guidelines (www.usaidgems.org/sectorGuidelines.htm • Only non-hazardous materials may be used for rehabilitation of facilities. In particular, asbestos and/or lead-based paint or plumbing will not be used, even if allowed by host country. • If existing hazardous materials are identified during planning or rehabilitation, implementing partners will cease rehabilitation activities until all such materials have been removed by other qualified parties in compliance with host country regulations. • Implementing partners and/or sub-contractors will provide training to workers on applicable best practices. • Implementing partners and sub-contractors will follow best practices, for properly disposing of waste resulting from renovation or rehabilitation activities. Contractors will train workers on the proper use of PPE, and best practices for handling and disposing of waste. • If the presence of asbestos is suspected in a facility to be renovated, the facility must be tested for asbestos before rehabilitation works begins. Should asbestos be present, implementing partners and sub-contractors must cease work until removal is carried out by others in conformity with host country requirements. Work may not re-commence until the facility is retested to demonstrate that asbestos removal has been effective. • All results of the testing for asbestos shall be communicated to the COR.	VectorLink Benin does not undertake any construction but carries out site rehabilitation work before each IRS campaign.	Lack of premises with adequate space to accommodate a large number of operators and bulky spraying equipment.	Implantation of operational sites in the health facilities concessions (hospitals, health centers, etc.) and transformation of containers to serve as stores.

Mitigation Measure	Status of Mitigation Measures	List any outstanding issues relating to required conditions	Remarks
7.Vector Control • Insecticide selection for any USAID-supported malaria program is subjected to the criteria listed in the USAID Programmatic Environmental Assessment, country SEAs, and host country requirements.	VectorLink Benin operates under a Supplemental Environmental Assessment (SEA) approved by USAID in 2016. The SEA covers the nationwide use of all WHO-recommended insecticides for IRS (with the exception of DDT), including pyrethroids, organophosphates, carbamates, and chlorfenapyr (once recommended by World Health Organization Pesticide Evaluation Scheme) for the period 2016-2020. The Environmental Compliance Certificate issued in 2008 by the ABE (Beninese Environment Agency) remains valid.	Low capacity for insecticide analysis in the country	The analysis of the insecticide will be done by a private laboratory via Plant Protection Directorate (DPV)
• Procurement and inventory logs must be maintained.	Procurement and inventory logs are regularly updated		
• Ensure storage facility and personal protective equipment (PPE) are appropriate for the active ingredient used and in accordance with approved SOPs.	17 Storage facilities were refurbished and inspected by the ECO to ensure environmental compliance prior to the start of IRS operations. Appropriate PPE was provided to all staff involved in IRS operations.		
• Distribute insecticides to facilities that can manage such commodities safely in storage, use, and disposal (i.e., in a manner generally equivalent to Implementing partner's own SOWs/WMP).	All sites are inspected to ensure the proper management of insecticide storage, use, and disposal.	Facilities for quality control of insecticides in the country remain low	All EC gaps noticed in storage facilities during the PSECA1 were corrected prior to the start of the IRS campaign.
• Inspect and certify vehicles used for insecticide or team transport prior to contract.	131 vehicles used for the transportation during the campaign were inspected and certified according to best practices.	Two transport vehicles were replaced	All vehicles were equipped with first aid kits.
• Train drivers	155 drivers were trained in safe handling and transport of insecticides; human, personal health, and environmental safety; handling IRS commodities; and spill management.		
• Ensure availability of cell phone, personal protective equipment (PPE) and spill kits during insecticide transportation.	155 drivers had their cell phone and PPE on board; every transport vehicle was provided with a spill kit.		

Mitigation Measure	Status of Mitigation Measures	List any outstanding issues relating to required conditions	Remarks
• Initial and 30-day pregnancy testing for female candidates for jobs with potential insecticide contact.	392 female candidates for IRS operations participated in the initial pregnancy screening. The pregnancy testing took place from April 02-05, 2019 in both Zone. Only 05 women storekeepers performed second pregnancy test no cases of pregnancy were detected. The second pregnancy testing took place from April 20, 2019 in both Zone	The other positions to which they were eligible were already saturated	
• Health test all spray team members for duty fitness.	A medical check-up for 1,864 seasonal staff was conducted a few days before the IRS campaign.		
• Procure, distribute, and train all workers with potential insecticide contact on the use of PPE.	All seasonal workers received full PPE and were trained on PPE usage; and insecticide spill management.		
• Train operators on mixing insecticides and the proper use and maintenance of application equipment.	All spray operators were trained on insecticide mixing hazard management; environmental risk awareness; spray techniques; end-of-day clean-up; and the triple rinsing procedure in addition to proper pump maintenance.		
• Provide adequate facilities and supplies for end-of-day clean up.	All rinsing area and effluent disposal systems were refurbished, inspected, and approved prior to the starting of IRS operations.		
• Enforce application and clean-up procedures.	Supervisors are required to enforce application and clean-up procedures.		The team leaders, site supervisors, and site coordinator received daily automated messages to enforce application and clean-up procedures.
• Implement Information, Education and Communication (IEC) campaigns to inform homeowners of responsibilities and precautions, including washing itchy skin and going to health clinic if symptoms develop and do not subside.	Among IEC activities, homeowner's safety & responsibilities and orientation in case of side effects received special attention. Homeowners were informed of the responsibilities and precautions of IRS.		General public awareness will be strengthened next year in the villages

Mitigation Measure	Status of Mitigation Measures	List any outstanding issues relating to required conditions	Remarks
• Ensure health facility staff is aware of insecticide poisoning management.	Three Medical Officers were trained on the management of insecticide's side effects prior to the campaign. Documentation on technical characteristics, precautionary measures and the action to be taken in case of organophosphorus poisoning was posted at each operations site.		
• Storage facilities and transportation vehicles must be physically secured to prevent theft.	Each store had a double locking system and all vehicles parked in the courtyard of their respective stores where under watch by 24-hour security personnel.		
• Maintain records of all insecticide receipts, issuance, and return of empty containers.	28 storekeepers were trained on the proper warehouse management including the maintenance of all records with a focus on insecticide and PPEs.		
• Conduct analysis comparing number of houses treated vs. number of containers used.	Analysis completed. 335,207 houses were treated with 53,504 bottles of insecticide: one bottle treated on average 6.3 houses.		1028 bottles of insecticides remained and will be used in the next campaign and will expire in January 2021
• Examine houses treated to confirm application	Direct Observation Spraying was conducted by supervisors to assess the quality.		The error eliminator form has been changed this year into spraying directly observed form filled by the team leader.
• Perform physical inventory counts during application season.	Storekeepers and supervisor are trained to perform physical inventory counts during the campaign. The storekeepers regularly performed the physical inventory counts.	Stocks of nose masks sometime were not updated in register.	Appropriate recommendations for the tracking of nose masks were made
• For shipments of insecticide over water, sachets/bottles will be packed in 220 liter open top barrels with a water-tight top and a locking ring, or in a similar durable container. Waterproof labeling must be affixed to the barrel, with the identity of the pesticide, number of bottles inside, the weight, the type of hazard posed by the contents, and the personal protective equipment to be worn when handling the barrel.	PMI VectorLink Benin did not transport insecticide over water during the course of the campaign for IRS.		

Mitigation Measure	Status of Mitigation Measures	List any outstanding issues relating to required conditions	Remarks
• Train applicators on SEA operational requirements, SOPs, PMI BMPs, and approved WMP, developed for the safe and effective storage, distribution, application, and disposal of insecticides	SOPs were trained about BMP guidelines and Benin environmental compliance's laws which included SOPs and the WMP.		
• Ensure application equipment and PPE are appropriate for the active ingredient used and in accordance with approved SOPs, and maintain equipment to avoid leaks.	SOPs and other seasonal workers wore the appropriate PPE suited for use of Organophosphates during spraying and clean-up in accordance with approved standard operating procedures.	Sometimes, because of the hot climate in the intervention area, seasonal workers are less compliant in the wearing of some PPEs, including nose-masks.	Reinforce supervision for a proper and complete wearing of PPEs.
• Maintain application Equipment	All pumps were packed and stored at the end of each day of spraying according to standard operating procedures for pump maintenance.		Advanced training of pump technicians is planned for the management of more complex breakdowns.
• No application of insecticides within 30 yards of beekeeping sites	Beekeeping sites and other protected areas were not sprayed.		The site coordinator maintained a list of restricted areas and villages for IRS.
• Handling, treatment, and disposal of nonhazardous (general waste) and hazardous wastes must be in accordance with the approved WMP/SOPs and the PMI BMPs.	The project has a contract with non-governmental organizations specialized in the management of wastes generated during IRS operations (empty boxes, and empty bottles of insecticides, used masks and gloves, etc.). Research is under way to find other non-governmental organizations for the disposal of other types of wastes, including batteries.	Absence of specialized structures for the management of certain types of wastes (batteries and other metal wastes)	The project continues the prospection of organizations specialized in the proper disposal of all types of wastes generated during IRS campaign
• The WMP, which outlines SOPs for managing waste processes, must be in accordance with PMI best practices and host country requirements	Benin waste management plan has met all requirements of the country and the USAID 22 CFR regulation.		
• Choose sites for disposal of liquid wastes, including fixed and mobile soak pit sites, according to PMI BMPs.	All soak pits were constructed in compliance with standards requirements for proper disposal of liquid waste during the campaign.		
• Construct fixed and mobile soak pits with charcoal according to BMPs to adsorb insecticide from rinse water	All fixed and mobile soak pits contained charcoal according to BMPs to adsorb insecticide from rinse water		
• Maintain soak pits as necessary during season	Soak pits have been maintained as necessary during season. Weeds were removed near the rinsing areas		

Annex E. DCV FORM

Campagne de pulvérisation intra domiciliaire
Fiche de vérification des données sur le terrain

Date de vérification: _____ Nom du superviseur: _____Commune: _____ Arrondissement: _____ Village/ q de ville:_____

N°	N° de Structure (Code Ménage et Numéro de la structure) Ex : D8000001-01	Nom du Chef de Ménage	Statut		Si Non Pulvérisée, Indiquer la raison* (Voir raisons en bas de page)	Date de Pulvérisation/ou de non pulvérisation (Date de passage de l'opérateur)	Code de l'Opérateur (qui a pulvérisé la structure)	Code du Mobilisateur (qui a sensibilisé le ménage)	Total des Habitants	Total des femmes enceintes	Total des enfants <5 ans	Nombre de moustiquaire disponible dans la structure
			Pulvérisée	Non Pulvérisée								
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												

*__Raisons de non pulvérisation__: (1) Malade, (2) fermée, (3) Funérailles, (4) Refus, (5) Rater, (6) Eligible mais transformée en Grenier/cuisine, (7) Autre:_____

Annex F. DATA ENTRY CONTROL FORM

Campagne de pulvérisation intra domiciliaire
Formulaire de vérification des données saisies

NOM DU SUPERVISEUR QUI A PROCEDE A LA VERIFICATION: _____

		DONNEES DE LA FICHE FAISANT OBJET DE VERIFICATION												
Date de verification	Nom de l'agent de saisie	Date de pulvérisation	Zone sanitaire	Commune	Arrondissement	Village	Code OP/Mob	Code CE	Nombre de lignes vérifiées	Nombre de lignes correctes	Lignes vérifiées et paraphées (Oui/Non)	Erreurs constatées & Corrections faites	Ligne "Totaux" vérifiée (Correcte) (Oui/Non)