PRESIDENT'S MALARIA INITIATIVE

PMI | Africa IRS (AIRS) Project

Indoor Residual Spraying (IRS 2) Task Order Four

ANGOLA
END OF SPRAY REPORT 2014

JANUARY 8, 2015

REVISED: FEBRUARY 19, 2015

Recommended Citation: PMI | Africa Indoor Residual Spraying Project (AIRS 2) Task Order Four. January 8, 2015. *Angola 2014 End of Spray Report*

Contract and Task Order Number: GHN-I-00-09-00013-00 / AID- OAA-TO-11-00039

Submitted to: United States Agency for International Development/PMI

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The views expressed in this document do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

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Acronyms & Abbreviations

Abt	Abt Associates
AIRS	Africa Indoor Residual Spraying
CoP	Chief of Party
CDC	Centers for Disease Control
CTC	Center for Technology and Communications
DDT	Dichloro-diphenyl-trichloroethane
DPS/PHD	Direcção Provincial de Saúde/Provincial Health Directorate
DEC	Data Entry Clerk
EES	Enhanced Epidemiological Surveillance
HF	Health Facility
IEC	Information, Education and Communication
IRS	Indoor Residual Spraying
M&E	Monitoring and Evaluation
M&EM	M&E Manager
MoH	Ministry of Health
NMCP	National Malaria Control Program
ODK	Open Data Kit
OM	Operations Manager
PMI	President's Malaria Initiative
PPE	Personal Protective Equipment
PSC	Pyrethrum Spray Collection
RMS/MHD	Repartição Municipal de Saúde/Municipal Health Directorate
SEA	Supplemental Environmental Assessment
SOPs	Spray Operators
TL	Team Leader
ToT	Training of Trainers
USAID	United States Agency for International Development
WHO	World Health Organization

EXECUTIVE SUMMARY

In August 2011, the U.S. Agency for International Development awarded Abt Associates Inc. (Abt) a three-year Africa Indoor Residual Spraying (AIRS) project to support the President's Malaria Initiative (PMI). The project's mandate is to limit exposure to malaria and reduce the incidence and prevalence of malaria in in sub-Saharan Africa. The key objectives of the AIRS project in Angola are to reduce malaria associated morbidity and mortality in select municipalities in Huambo province and establish a model IRS program that will set national performance standards.

AIRS Angola implements the project in close collaboration with the Angolan Ministry of Health through the National Malaria Control Program (NMCP), Provincial Directorates of Health in Huambo, Huila and Cunene provinces, and the Municipal Departments of Health in select municipalities where AIRS Angola supports indoor residual spraying, entomological monitoring, and enhanced epidemiological surveillance as shown in Figure 01 below.

AIRS Angola's main achievements in 2014 are listed in Table 01 below:

TABLE 01: AIRS ANGOLA AT A GLANCE

Number of provinces covered by PMI-supported IRS in 2014	1 (Huambo)
Insecticide	Pyrethroid – K-Othrine (deltamethrin)
Number of structures targeted by PMI-supported IRS in 2014	20,000
Number of structures found by SOPs in 2014	16,506
Number of structures covered by PMI-supported IRS in 2014	14,649
2014 spray coverage	88.7%
Population protected by PMI-supported IRS in 2014	58,370 12,531 children <5 years 1,413 pregnant women
Dates of PMI-supported IRS campaign	October 7 – November 8, 2014
Length of 2014spray campaign[1]	29 operational days
Number of people trained with US government funds to deliver IRS[2]	187

Additionally, AIRS Angola made significant progress in routine entomological monitoring due in large part to the project's insectary. The project provided entomological training in preparation of the national susceptibility study to be carried out by AIRS Angola from January through February 2015 in nine provinces representing the malaria stratification of the country's three endemic areas (i.e., Zaire, Uige, Malanje, Luanda, Benguela, Namibe, Huambo, Huila, and Cunene). The overall objectives of the training included:

- Role of entomology in malaria control;
- Life-cycle stages and different species of malaria vectors;
- Sampling procedures for malaria vectors;
- Vector incrimination and malaria control;
- Malaria vector control measures; and
- Basic principles in monitoring and managing insecticide resistance.

[1] Spraying was completed in 21 operational days; 8 days of extensive mop-up was carried out.
[2] Based on the PMI indicator definition. It includes only spray personnel such as spray operators, team leaders, supervisors, and clinicians. It excludes data clerks, Information, Education and Communication (IEC) mobilizers, drivers, washers, porters, pump technicians, and security guards.

Furthermore, AIRS Angola continues to conduct monthly entomological monitoring activities in six (6) sentinel sites. The project selected these sentinel sties on the basis of former and current IRS target areas in the Huambo and Huila Provinces.

FIGURE 01: MAP OF TARGET PROVINCES

1. Introduction

1.1 Objectives

AIRS Angola's specific objectives for 2014 included the following:

- Cover at least 85 percent of the 20,000[3] targeted and eligible structures found in the select municipality of Huambo (Bailundo Capital, Municipality of Bailundo) and protect up to 60,000 lives from malaria transmission in the target areas.
- Conduct routine entomological monitoring in select sentinel sites within current and former spray areas to collect insecticide resistance data for malaria vector control. Entomological monitoring was conducted in monthly intervals.
- Implement epidemiological surveillance in Cunene, Huambo, and Huila provinces within current and former IRS spray areas to inform PMI and the Government of Angola on the effectiveness of its ongoing IRS activities.

1.2 Spray Sites

In 2014, AIRS Angola carried out indoor residual spraying in only one target area, namely in Bailundo Capital, Bailundo Municipality, Huambo Province.

1.3 Insecticide Selection

In Angola, synthetic pyrethroids have been the insecticide of choice since 2005. Insecticide selection for IRS is a critical issue with the emergence of insecticide resistance throughout Sub-Saharan countries. AIRS Angola conducted susceptibility testing to inform insecticide selection for the 2014 spray campaign in late March 2014 into early April 2014. The project tested one- to five-day old adult female mosquitoes collected from field larvae and pupae using the WHO cone bioassay test. The emergent *Anopheles* mosquitoes were first sorted into species. *An. coustani* and *An. gambiae* s.l. were the two most prevalent *Anopheles* species identified. Only female *Anopheles* mosquitoes identified morphologically as *An. gambiae* s.l. were used for the testing. The test mortality rates of the specimens tested for insecticide resistance to deltamethrin, bendiocarb and fenitrothion were all 100%. Based on the susceptibility data, pyrethroids, carbamates, or organophosphates could potentially been used for IRS, so AIRS Angola used a remaining stock of 22,080 sachets of pyrethroids leftover from the project's 2013 spray campaign during the spray campaign in 2014.

[3] This figure of 20,000 was included in the 2014 work plan, based on geographic data provided by the Bailundo Municipal Department of Statistics.

2. PRE-SPRAY ACTIVITIES

2.1 MICRO-PLANNING

AIRS Angola facilitated the micro-planning meeting in August 2014 in close collaboration with the Provincial Health Directorate (DPS), the Bailundo Municipal Health Directorate (RMS), and PMI. The project team distributed a comprehensive operational plan strategy, which included human resource requirements, logistics and transportation requirements, and selection criteria. During the micro-planning meeting, AIRS Angola reviewed and finalized the 2014 training plan, mobilization and spray calendars, and detailed timeline outlining responsibilities for AIRS Angola and the Provincial and Municipal Health Directorates. Other key stakeholders present at micro-planning were municipal civil society organizations and traditional authorities representing all target villages.

2.2 LOGISTICS AND PROCUREMENT

AIRS Angola conducted the logistics needs assessment in April 2014 to inform the procurement plan for a greatly reduced spray operation in comparison to previous years. No international procurement was required, but only local procurement of supplies and consumables. The Bailundo operational site built in 2013 on the grounds of the Municipal Hospital sufficiently supported the twelve spray teams, including its storage facility, men's and women's segregated showers and latrines, one soak pit, and one wash bay. Additionally, AIRS Angola maintained the central warehouse in Caala Municipality, Huambo Province.

2.3 HUMAN RESOURCES REQUIREMENTS

AIRS Angola hired 180 seasonal workers, 44% of whom were female, for the IRS spray campaigns as shown in Table 02 below.

TABLE 02: SEASONAL PERSONNEL BY NUMBERS AND GENDER

Type of Personnel	No. of Males	No. of Females	Total	% Female
Spray Operators/IEC Mobilizers	63	67	130	52%
Team Leaders for spray operators/IEC mobilizers	13	5	18	28%
Supervisors for spray operators/IEC mobilizers	3	3	6	50%
Warehouse Assistants & Pump Technicians	3	0	3	0%
Logistics Assistant	1	0	1	0%
Washers	0	4	4	100%
Security	3	0	3	0%
Drivers	9	0	9	0%
M&E Assistant	1	0	1	0%
Data Entry Clerks	4	1	5	20%
Total	**100**	**80**	**180**	**44%**

In August 2014 AIRS Angola recruited seasonal personnel at the community level in Bailundo. The AIRS Angola Provincial Coordinator worked closely with the Municipal Health Directorate and community leaders in targeted villages to pre-select candidates, including those who supported the spray campaign in 2013. AIRS Angola used spray personnel criteria developed in coordination with the MHD as guidance for pre-selection. Seasonal vacancies were also posted at the Provincial and Municipal Health Directorates and advertised through the two local radio stations. Candidates

conducted a writing test and submitted medical certificate issued by the Bailundo Municipal Hospital as proof good health and fitness, including a pregnancy test for all female candidates. Pregnant women and/or nursing mothers were trained and integrated in IEC/Mobilization assignment as appropriate.

Angolan women are breaking barriers by leading the fight against malaria through the implementation of IRS, traditionally dominated by men in most countries. The promotion of women's involvement in community health programs by the government of Angola has led to active participation of women in a series of what were perceived as traditionally male-reserved activities. Therefore, more women find it normal and fulfilling to engage actively in IRS and play a major role in the fight against malaria in their communities.

Additionally, on the AIRS Angola project women are increasingly taking on lead roles as trainers, supervisors, and team leaders. They continue to have strong representation as spray operators, mobilizers, warehouse support and washers.

2.4 TRAINING

AIRS Angola conducted a series of trainings between September and October 2014 in preparation for the campaign. The project team was trained in all aspects of IRS through classroom instruction and hands-on practice. Table 03 below shows a description of trainings conducted. In total, 206 persons were trained, as reported in the Training Matrix in Table 04.

TABLE 03: TRAINING BY CATEGORY AND GENDER

Type of Training	People Trained, by Gender			Purpose and General Topics
	M	F	TOTAL	
Supervisors for spray operators/IEC mobilizers	3	3	6	To ensure high standards of ethics and quality of data collection; a refresher training for those with previous IRS experience.
Team Leaders for spray operators/IEC mobilizers	13	5	18	To ensure high standards of ethics and quality of data collection; a refresher training for those with previous IRS experience.
Training of Trainers: spray operators & mobilizers	15	4	19	IRS theory and spray techniques, training, and all data collection tools.
Spray operators/IEC mobilizers	63	67	130	Data collection, IRS as a malaria intervention, community advocacy and IEC messages, environmental compliance.
M&E assistants	1	0	1	AIRS database, data collection, data clerk supervision, verification of mobilization and spray data.
Data Entry Clerks	4	1	5	AIRS database, data entry, data verification, and cleaning.
Warehouse assistants	3	0	3	Stock handling and control, spray pump repair, and environmental compliance.
Pump technicians	3	0	3	Stock handling and control and spray pump repair
Health clinicians	11	3	14	Environmental compliance, insecticide intoxication and treatment.
Washers	0	4	4	Environmental compliance, standards for handling PPE washing, and safety measures.
Security guards	3	0	3	Warehouse and operational site security standards, environmental compliance and day to day requirements during the campaign.
Total People Trained	**119**	**87**	**206**	

TABLE 04: TRAINING MATRIX

Categories of Persons Trained	Training on IRS Delivery										Other Trainings						Total
	Training of Trainers: Spray Ops		Spray Operations/Mobilization		Data Entry & Verification		Warehouse Assistants		Technical Maintenance		Medical Treatment of Intoxication Cases		PPE Washing		Security		
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
Supervisors			3	3													6
SOPs/Mobilizers	15	4	63	67													149
Team Leaders			13	5													18
M&E Assistants					1	0											1
Data Clerks					4	1											5
Warehouse Assistants							3	0									3
Pump Technicians									3	0							3
Health Clinicians											11	3					14
Washers													0	4			4
Security Guards															3	0	3
TOTAL M/F	15	4	79	75	5	1	3	0	3	0	11	3	0	4	3	0	206
TOTAL/ training	19		154		6		3		3		14		4		3		206
Grand TOTAL	206																

3. Environmental and Safety Compliance

3.1 Pre-Season Environmental Assessment

During the month of July 2014, AIRS Angola conducted the Pre-Season Environmental Compliance Assessment (PSECA) of the Bailundo operational site and the central warehouse in Caala. The PSECA was conducted using a pre-programmed smartphone with the spray environmental compliance checklists. A work list was automatically generated and shared with the chief of party (CoP) and operations manager (OM), who also performed in the role of the Environmental Compliance Officer, to guide them on any rehabilitation required prior to the spray campaign. Rehabilitation of the Bailundo operational site included repairs of the electrical systems that had been vandalized during the off-season, replacement of the sawdust and charcoal in the soak pit, and repair of the metal frame that supports the elevated base of the 5,000 liter water tank. Table 05 shows rehabilitation details of the Bailundo operational site.

There is an existing Supplementary Environmental Assessment (SEA) covering Angola's IRS program from 2010 through 2015, with the option to use organophosphates, carbamates, and pyrethroids for IRS. Therefore, no new SEA was required. The short form letter report was submitted to USAID/Washington on August 5, 2014.

TABLE 05 : OPERATIONAL SITES REFURBISHMENT

Area	No. of Operational Sites	Site Refurbished
Bailundo	1	One soak pit refurbished (saw dust and charcoal replaced); old/used charcoal and saw dust were packaged and stored with other IRS solid residual waste designated for incineration. One storage facility refurbished (electrical and water systems repaired)

3.2 Safety and Environmental Compliance during the Spray

Prior to the beginning of training, all seasonal personnel submitted a medical certificate as issued by the Bailundo Municipal Hospital as proof of fitness to participate in the campaign. In Angola, seasonal personnel play dual functions; that is, they serve as both IEC spray mobilizers and spray operators. Therefore, everyone was required to comply with the medical requirements without exceptions. Medical certificates confirmed that individuals had undergone a complete physical exam, including a project-provided pregnancy test for all females administered by the Bailundo Municipal Hospital. Everyone found fit was hired to participate in the campaign. However, despite otherwise clear medical certificates, ten candidates displayed clear signs of poor health and therefore were subjected to a second medical exam which confirmed their ineligibility to carry out IRS. There were 75 female candidates to undergo pregnancy testing; nine of whom tested positive and were therefore assigned to the door-to-door IEC/Mobilization which was carried out two weeks before the spray campaign. Six of these nine women remained with the mobilization teams during the campaign and provide help to homeowners in the preparation of their home for the SOPs.

In accordance with AIRS Angola's environmental compliance standards, everyone working on IRS, including AIRS staff, seasonal personnel, and government stakeholders, was required to adhere to

strict standards of human safety at all times. Mitigation measures were instituted through the provision of required personal protective equipment (PPE) to all spray personnel. PPE included overalls, gloves, boots, helmets, face shields, and dust masks for use throughout the spray period.

Transportation of insecticides from the central warehouse to the Bailundo operational site was done weekly using a mini-bus with spill and first aid kits, Material Safety Data Sheets (MSDS), and accident/emergency procedures sheets. Despite the small spray operation, insecticide was replenished weekly to mitigate temperature conditions at the operational site, which is built of two 40-foot containers retrofitted with windows and floor fans to secure the required temperature of 23-25 Celsius for insecticide storage.

Seasonal personnel were transported from the operational sites to the field using six-ton trucks, which were retrofitted with side and back railings, sitting benches, and tarpaulin covers. Prior to their contracting, vehicles were inspected in accordance to PMI's best management practices for compliance with safety and environmental requirements.

The soak pit and wash area was fenced, gated, and guarded by a security team to prevent non-authorized personnel from accessing the premises. The progressive (triple) rinsing system was followed daily for washing spray pumps. Trained washers washed the PPE over the soak pits daily. All spray personnel took a shower at the end of each day in the segregated shower rooms to decontaminate themselves, for which they were provided soap and a small towel.

The mid-spray environmental compliance inspections were conducted during the spray campaign to ensure all environmental compliance measures put in place ahead of the spray campaign were followed. The inspections were conducted by the operations manager and chief of party in conjunction with the Bailundo Municipal Health Directorate members using both smartphones and paper checklists. The inspection team assessed the proper use of PPE during spraying and washing activities, warehouse stock cards, transportation, display of warning signs, and access to first aid kits. The inspections also verified the segregation of non-contaminated solid waste from insecticide storage; packaging and inventory of contaminate solid waste, and that soak pits were properly used for contaminated liquid waste disposal. Summaries of the mid spray inspections are shown in Table 06 through Table 9 below.

3.3 Management of Insecticide Adverse Effects

During the 2014 spray campaign there were neither vehicle accidents, nor insecticide spillages, nor adverse reactions to pesticide exposure suffered by seasonal personnel. However, there were three mild cases of headaches and dizziness reported, which were immediately attended to by the Bailundo Municipal Hospital. In one case, a 24-year female supervisor was reported to be a hypertension patient. However, she had not taken her medication for the previous days, and as a result, remained at home for five days before being fit to return to the spray campaign. The other two cases were treated and released after a couple of hours.

3.4 Post-Season Environmental Assessment

The post-spray environmental inspection of the Bailundo operational site was conducted using the smartphone tool. All IRS materials and equipment had been inventoried, packed and transported to the central warehouse, including unused insecticide stock, and solid waste. The soak pit and wash areas were thoroughly cleaned, covered, and securely locked. The security service contracted by AIRS was terminated once the site was locked. Therefore, security in the off season is the responsibility of the Bailundo Municipal Hospital security services since the site sits on hospital grounds. A summary of the post-spray inspection is included in Table 10 below.

TABLE 06: SUMMARY OF MID-SPRAY ENVIRONMENTAL INSPECTIONS, BAILUNDO

	Are the storekeepers, spray operators and washers wearing appropriate PPE?	Is the current pesticide Material Safety Data Sheet posted?	Are overalls washed daily, and dried over the soak pit?	Do workers have access to end-of-day washing (including soap and water)?	Are spray operators fed before start of spray (before wearing of PPE)?	Is the store well arranged? (height of arranged items, allowing for free movement; proper stacking of items, allowing for ventilation)	Are warning signs correctly displayed? (danger sign, insecticide safety notice)	Is there a fire extinguisher (not expired) and a spill kit?	Is there a thermometer to measure daily temperature in the store? Are lighting and ventilation adequate (can you see your way through the store during the day)?	Is there a well-stocked first aid kit in the store? (eye wash, vitamin E cream)	Is the soak pit used to dispose of all contaminated water?	Is the roof leak-proof and the floor impermeable?	Does the soak pit adsorb all the effluent waste without creating a puddle and/or run-off?	Are the # 2, 4, and 6 drums filled with water?	Are contents of drums 1, 3, 5, and 7 emptied into spray pumps before spray operators depart for field?	**Total**
Number of noncompliant responses	0	0	0	0	0	0	0	0	0	1 (Eye Wash Expired)	0	0	0	0	0	1
Number of compliant responses	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	14

TABLE 07: SUMMARY OF END OF DAY, BAILUNDO

	Do the SOs continue to wear PPE on the way back to the operations site?	Upon return to the storehouse, are full and empty sachets returned to stores?	Are the empty sachets counted and stored in labeled, sealed containers?	Do the SOs complete their daily report forms?	Are forms checked by spray supervisors?	Have there been any accidents? (Pesticide exposure, vehicle accidents, other injuries or property damage)	Have any SOs complained of irritation (throat, skin, etc.)?	Are the Team Leaders supervising the cleaning and wash-up?	Are there wash facilities with soap and water available for operators?	Do workers at a minimum wash their face and hands with soap and water?	Is there a sloped concrete catchment area or tarpaulin spread out on the ground to catch all effluent?	Are all people (spray operators, washers, maintenance techs) in the wash/soak pit area wearing full PPE?	Is anyone eating or drinking prior to removing PPE and washing?	Is all pesticide remaining in pumps emptied into the #1 drum?	Do the #2, 4 and 6 drums have sufficient water for today's cleanup?	Are spray pumps triple rinsed using the progressive rinse method?	Are the outsides of the pumps rinsed off in the soak pit?	Are the helmets, visors, boots, and gloves rinsed off in the soak pit?
Number of non-compliant responses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of compliant responses	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

TABLE 07: SUMMARY OF END OF DAY, BAILUNDO (CONTINUED)

	Are the overalls washed and then hung for drying?	Is the soak pit used to dispose of all contaminated water?	Does all contaminated water drain properly into the soak pit?	Is the soak pit absorbing all the effluent waste without creating a puddle and/or run off?	Is there adequate gravel to act as a filter?	Are spray pumps hung upside down to dry?	Are washed spray pumps stored in an orderly way for easy preparation the next day?	Are the covers placed on the 7 triple-rinse drums after all pumps are cleaned?	Total
Number of noncompliant responses	0	0	0	0	0	1	0	2	**3**
Number of compliant responses	3	3	3	3	3	2	3	1	**75**

TABLE 08: SUMMARY OF HOME OWNER PREPARATION AND SOP PERFORMANCE, BAILUNDO

	Ask resident if they were informed in advance about the spray activities.	Have all personal belongings, food items, animals/sick persons been removed from the structure?	Have all items that cannot be removed been properly covered with plastic sheet?	Are there any rooms in the house that are used as food stores at the time of spraying?	Were the eaves of the house sprayed?	Have the residents been instructed not to enter for 2 hours, and then open windows and door to air out for 30 minutes before moving back in?	Have residents been informed to wash itchy skin, and to go to a health clinic if they don't feel well after their house has been sprayed?	Are all animals kept outside the structure during spraying and for 2.5 hrs. afterward?	If there are people (sick, elderly, and babies) that cannot be moved, is this household being sprayed?	Have the residents been told to sweep up dead mosquitoes and deposit them in latrine pit and not to allow children or animal inside until this has been completed?	Are there households observed that are refusing IRS?	Are the households satisfied with the IRS?	Are SOs in full PPE?	Is mixing of the insecticide witnessed by the household resident?	Is the pesticide packaged in bottles (Actellic, propoxur)?	If yes, does the operator triple-rinse the bottle while preparing the pesticide in the tank?
Number of noncompliant responses	10	9	3	157	N/A	7	19	12	0	5	507	35	03	200	N/A	N/A
Number of compliant responses	521	522	528	374	N/A	524	512	519	426	526	24	496	528	331	N/A	N/A

TABLE 08: SUMMARY OF HOME OWNER PREPARATION AND SOP PERFORMANCE, BAILUNDO (CONTINUED)

	Is the tank shaken to mix the contents before pressurizing?	Is the Hudson pump pressurized to 55 psi, or the Goizper pump pressurized until the safety valve begins releasing pressure and the red marker is visible before spraying?	Are there any leaks from the pump?	If yes, does the operator service the pump before proceeding?	Are the spray operators spraying with the tip of the nozzle 45 cm away from the wall?	Are the spray operators maintaining the correct speed of application, i.e., covering 2 meters of vertical wall surface in 5 seconds?	Is there a 5 cm overlap with each successive swath?	Are SOs spraying all the recommended surfaces? (walls, eaves, inside of doors, ceiling)	Are the SOs spraying floors, metal roofs, the outside of doors, glass, inside of cupboards, wallpaper, food granaries.	Is the pump re-pressurized if the Hudson tank pressure falls below 35 psi, or the Goizper automatically shuts off?	Are any of the SOs observed smoking, drinking or eating during the day?	If yes, spray operators' names:	Have there been any reported accidents or complaints of pesticide exposure from	If yes, has an Incident Report Form been filed?	If yes, date of incident:	Are the Spray Operators accurately recording data?	If no, In what way is the data inaccurate?	Are Team Leaders using the Error Eliminator to check the accuracy of Spray Operators data?	If yes, are Team Leaders using the Error Eliminator correctly?	Total
Number of noncompliant responses	22	1	28	0	12	25	28	1	9	13	1	0	0	0	0	93	0	12	0	1212
Number of compliant responses	499	530	503	28	519	506	503	530	522	518	530	1	531	0	0	438	0	519	0	12508

TABLE 09: SUMMARY OF MORNING MOBILIZATION INSPECTIONS, BAILUNDO

	Have the spray operators eaten breakfast and had plenty of water to drink prior to donning PPE?	Are SOs in full PPE before boarding truck? Check box if present.)	Are any spray operators eating or drinking after donning PPE?	Do the Team Leaders do a casual physical inspection of SOs, i.e., look out for any obvious breathing problems, fatigue, weakness, alcohol intoxication, etc.?	Do operators fill spray pumps using the contents of drums 1, 3, and 5 and 7 from the previous day's progressive rinse?	Are barrels 1, 3, 5 and 7 empty when Spray Operators depart for the field?	Was this vehicle inspected and approved by ECO or authorized AIRS representative before contract signing?	If yes, Is the AIRS-issued certificate in the vehicle?	If yes, Does the driver and/or vehicle have the needed certification (driver's license, etc.) for transporting hazardous goods or numerous people?	Has the driver attended safety training?	Other than the pesticide sachets or bottles for the day's use, are any pesticides transported in the same vehicle with the operators?	Are food products, animal feed, or consumer goods transported in the same truck as pesticides?	Is there 1. a spill kit (sand, shovel, bucket), and 2. spill/emergency/accident response procedures in the vehicle?
Number of noncompliant responses	0	2	0	0	0	0	0	0	0	0	1	0	0
Number of compliant responses	2	0	2	2	2	2	2	2	2	2	1	2	2

TABLE 09: SUMMARY OF MORNING MOBILIZATION INSPECTIONS, BAILUNDO (CONTINUED)

	Is there a fully-stocked first aid kit (eye wash, Band-Aids, gauze, antibiotic cream, hydrocortisone cream/calamine, and aspirin) in the vehicle?	Do drivers have a cell telephone and appropriate PPE (boots, gloves, and filter mask) in case of a spill or accident?	If this vehicle transports pesticide, can the pesticides be adequately secured and tied down in the vehicle?	Does the vehicle have a fire extinguisher?	If this vehicle transports operators, does the spray operator transport vehicle have seats and railings?	Are the operators properly seated in the transport vehicle with the pump secured between their legs?	Is the vehicle overcrowded?	Is there evidence of pesticide leakage in the trucks?	Have there been any incidents of pesticide exposure?	Have there been any vehicular accidents?	Total
Number of noncompliant responses	0	0	1	0	0	0	0	0	0	0	4
Number of compliant responses	2	2	1	2	2	2	1	2	2	2	41

TABLE 10: SUMMARY OF POST IRS ENVIRONMENTAL COMPLIANCE INSPECTION, BAILUNDO

	Have all the IRS items, signs, insecticides and wastes been removed from this store?	Has the pesticide storage area been washed with soap and water?	Is the soak pit covered and the gates locked?	Are the soak pit and its surroundings left clean?	Was the working relationship between the IRS team and owners of the store good?	Would you recommend re-using this store next year?	**Total**
Number of noncompliant responses	2	0	0	0	0	0	2
Number of compliant responses	0	2	2	2	2	2	10

3.5 SOLID WASTE MANAGEMENT

AIRS Angola placed contaminated solid waste generated by the 2014 spray campaign in the insecticide storage facility in Bailundo and made sure it was segregated from PPE and other supplies. At the end of campaign the project team repackaged and transported the contaminated solid waste to the central warehouse. Recolix Engenharia Ambiental in the Municipality of Viana, Luanda, is the only facility licensed and accredited by the Ministry of Environment in Angola that meets best management practices for solid waste management for IRS. Therefore, this facility handled the incineration of AIRS Angola's contaminated solid waste, carried out on January 15, 2015. Table 11 below shows solid waste management categories, procedures for disposal, and quantities. The certificate of incineration is also shown below.

TABLE 11: SOLID WASTE MANAGEMENT BY CATEGORY AND PROCEDURES

Category	Procedure	Quantity
Empty sachets and plastic bags (sandwich type/size bags which carry SOP specific # of sachets to the field)	Empty sachets are maintained in the same storage room at the operational site with the insecticide throughout the spray campaign. Upon completion of the spray campaign, everythingi was transported to the central warehouse for final counting, and incineration. Procedure for handling used plastic bags (sandwich bag-size) is the same as of handling empty sachets; these too are sent for incineration, as deemed contaminated waste.	6,950 insecticide empty sachets and the plastic sandwich bags used to distribute insecticide to spray operators were counted and packed. Incination was conducted on January 15, 2015
Cardboard Boxes	Angola makes no provision for recycling facilities. In the event empty boxes are not damaged or contaminated, they will be flattened and sent to the local landfill in the Municipality of Huambo. Empty insecticide boxes seldom have any level of contamination once sachets are removed; however, empty boxes are used to store empty sachets and used plastic bags. Should any contamination be detected, the boxes will be sent for incineration with the remainder of the hazards materials from the spray campaign.	All empty, but unsuable cardboard were incinerated at the Central Warehouse. Cardboard filled with insecticide empty sachets and plastic bags were incinerated on January 15, 2015
Gloves	All damaged gloves will be thoroughly washed with water and soap, and sent to a local landfill in the Municipality of Huambo or Bailundo. Angola makes no provision for plastic and/or rubber recycling, though AIRS Angola is assessing this further for potential recycling facilities.	250 pairs of damaged gloves were thoroughly washed, and sent to the Huambo in collaboration with the Municipal Department of Health of Huambo.
Boots	All damaged and unusable boots for future spray campaigns will be thoroughly washed with water and soap. Damaged, but still usable boots will be offered/given to spray operators when possible. SOPs will be warned that these damaged boots cannot be used in chemical environments. Angola makes no provision for rubber recycling, though AIRS Angola is assessing this further for potential recycling facilities. Otherwise, boots which are not given to SOPs will be sent to a local landfill in the Municipality of Huambo or Bailundo.	23 damaged pairs of boots were washed and selected to give to the higher performing spray brigade in Bailundo.
Dust Masks	Dust masks are used once only in accordance with	18,709 dust masks were counted and

Category	Procedure	Quantity
	established standards for IRS. Following the same procedure of the daily handling and management of empty sachets and plastic bags, used masks by SOPs, washers, warehouse personnel and others, are kept in empty insecticide boxes in the insecticide storage room at the operational site, until transported to the central warehouse for final counting, and readiness for incineration at the end of spray campaign.	packed in plastic bags, placed into cardboard considered as contaminated item were incinerated on January 15, 2015
Overalls	Following guidelines by COR team through AIRS ECSM damaged and/or unusable overalls will be washed and set aside for incineration with all other hazardous waste after the spray campaign. Damaged, but still usable overalls will offered/given to spray operators when possible. Otherwise, overalls which are not given to SOPs will be set aside and sent for incineration with other solid waste from the 2014 spray campaign.	92 overalls damaged but still usable, given to the SOPs in Bailundo.
Spray Pumps	To search and identify local metal companies that can fuse stainless, the action will be supported by an assessment before the final decision	118 damaged beyond repair spray pumps are designated forrecycling. A metal recyclying facility recently identified in Benguela, pending inspection, recycling will be carried out in conjuction with all other TO#4 project close-out.
Contaminated saw dust and charcoal (replaced from the soak pit)	Packaged and set-aside with other solid waste designated for incineration	Approximately 350 kg was incinerated on January 15, 2015.

FIGURE 02: CERTIFICATE OF INCINERATION

elisal

RECOLIX
Engenharia Ambiental

Certificado de Destruição de Resíduos
N.º: 104

Declaramos, para os devidos fins, ter destruído o(s) resíduo(s) abaixo descrito(s), pelo processo de Incineração Pirolítica, conforme padrões exigidos pelo Novo Modelo de Gestão de Recolha e Tratamento de Resíduos, seguindo restritivas normas de segurança e respeito ao Meio Ambiente.

EMPRESA: **ABT - ASSOCIATES**

Endereço: Rua n.º 102, Bairro Kapango Urbano – HUAMBO (ANGOLA)

Resíduo (s) Incinerado (s):

Denominação	Quantidade	Unidade
INCINERAÇÃO DE: - Carvão usado contaminado; - Cerradura contaminada; - Saquetas vazias insecticida; - Máscaras usadas	345	Kg
Total:	**345**	**Kg**

Ref. Factura n.º 11/2015

RECOLIX - ENGENHARIA AMBIENTAL
Estrada das Quitandas
Maianga de Cima
Luanda

Data: 20/01/2015

Paula Cristina G. Neto
"Directora Executiva"

4. Communications Activities

4.1 Introduction

Advocacy, communications, and community sensitization are key to successful implementation of an IRS campaign. In addition to the standard practice of door-to-door community mobilization, AIRS Angola carried out community meetings to share IRS key messages in the target municipality. AIRS Angola held advocacy meetings and participated in government health events and those hosted by other partners to promote IRS awareness. AIRS Angola's IEC mobilization methods also included radio and other media outlets to inform communities about IRS and the spray campaign. For example, the project aired 177 radio spots with IRS messages before and during the spray campaign. These spots were aired in both the local dialect (Umbundo) and Portuguese. Table 12 shows all IRS advocacy activities.

Door-to-door community mobilization activities began two weeks prior to the campaign along with three radio spots in two languages and meetings with communities. These meetings took place a week before the spray launch. The purpose of these meetings was to inform communities of the immediate visit by spray operators and educate IRS beneficiaries on proper preparation of their homes, environmental protection, and the importance of IRS in protecting households from malaria.

Additionally, AIRS Angola developed other materials to be disseminated by the mobilization teams prior to and during the spray campaign. Table 13 shows the types and numbers of communication materials produced and distributed. A summary of the mobilization campaign in numbers is shown on Table 14 below.

TABLE 12: IRS CAMPAIGN COMMUNICATIONS AND ADVOCACY ACTIVITIES

Activity	Total
Community Meetings	14
Radio Spots & Advertising	177
Radio (Interviews and Interactive shows)	6
Newspaper articles	3
Mobile unit	1
Spray Launch	1

TABLE 13: IRS COMMUNICATIONS AND ADVOCACY MATERIALS

Item	No. Distributed/Used
Posters	100
Banners	9
IRS Brochure (Portuguese & Umbundo)	14,813
T-Shirts	370
Polo Shirts	122
Caps	399
PMI Stickers	100

TABLE 14: SUMMARY OF AIRS ANGOLA 2014 MOBILIZATION CAMPAIGN

Area	Eligible Structures Found	Structures Sensitized		Adults Reached with IRS Message			IRS Acceptance		IEC Materials Distributed
		Yes	No	Total	Males	Females	Yes	No	
Bailundo	18,019	14,352	3,667	18,668	7,098	11,570	14,352	0[4]	14,813[5]

[4] A total of 3,667 structures were not sensitized as structures were closed; it is unknown whether they would have accepted t IRS or not.

[5] A total of 9,213 IRS brochures were distributed during mobilization, and an additional 5,600 distributed by the advance teams and SOPs during the spray campaign,

5. Spray Activities

5.1 Spray Operations

The 2014 spray campaign began on October 7 and lasted 29 operational days (including 8 days of mop-up) and ended on November 8 as shown in Table 15 below.

TABLE 15: SPRAY CAMPAIGN, BY OPERATIONAL DAYS

Province	Municipality	Spray Campaing Period	Operational Days[6]
Huambo	Bailundo	October 7 – November 8, 2014	29

5.2 Field Supervision

Field supervision was provided by the AIRS Angola team, including the chief of party, operations manager, M&E manager, database manager and provincial coordinator. Members of the Provincial and Municipal Health Directorates also contributed to field supervision with an intermittent presence by traditional authorities within the villages being sprayed. The spray campaign was rigorously supervised at every level to ensure smooth service delivery, ethical behavior, and good performance towards achieving results.

Spray operators were grouped into teams of six. Each team was supervised by a team leader. A supervisor was responsible for supervising three teams. Supervisors reported directly to the senior field leaders, who in turn reported to the provincial coordinator.

- Three teams of six SOPs (18 SOPs total) plus three team leaders constitute a brigade, which is supervised by the Supervisor. Supervisors have oversight over one brigade, and are supervised by the senior field supervisors (Senior Supervisor). Senior field supervisors supervise up to four brigades.

The distribution of spray teams by week is in Table 16. The AIRS Angola Senior Management Team CoP, OM, and M&EM covered the spray campaign on a daily basis to coordinate routine daily supervision by working closely with the provincial coordinator and other field supervisors and government stakeholders.

Regular meetings were held at all levels, in person, or by phone, at the provincial and municipal levels to review progress, make necessary adjustments, and boost field teams' morale.

5.2.1 Supervisory Data

In addition to spray data collection, four brigade supervisors, six RMS/DPS staff, the provincial coordinator, the M&E team, Operations Manager and the CoP, all of whom participated in training prior to campaign, used a mobile phone to complete the Home Owner Preparation and Spray Operator Performance supervisory tool. This provided AIRS senior management with "real-time" reports that outlined common errors committed by spray operators and allowed the team to make immediate corrections. For example, the e-mobile system allowed management to identify spray operators with spraying technique problems and specifically address the issues with them and all spray teams rapidly to improve spray operations and prevent them from happening again.

The CommCare system generated reports from the supervisory checklists submitted that outlined common errors committed by spray operators and allowed the team to make immediate corrections. The M&E manager uploaded the reports to Drop Box every day for supervisors and

[6] Spraying was completed in 21 operational days; 8 days of extensive mop-up was carried out.

AIRS staff to access and view each morning before spray teams left the site. Supervisors discussed concerns with spray teams and provided immediate solutions for improved operations. If any issues were identified in the data, supervisors asked the M&E team to look for the error(s) and correct using the CommCare google excel sheet downloaded at the Huambo office.

The reports generated showed;

- Each team's performance for the past two evaluations and their average performance to date. The teams below the set average of 92% were highlighted in red for more attention and the ones not evaluated were left blank to avoid misinterpretation
- Each SOPs performance for the past two evaluations and their average performance to date. SOPs below the set average of 92% were highlighted in red for more attention and the ones not evaluated were left blank to avoid misinterpretation
- The performance of all SOP/Teams on each question or activity
- On request, another report was generated to identify which SOP or team did badly on a particular question or activity.

This helped clarify with the SOPs and teams how to improve on the questions for which their performance was not very good, and encouraged them to continue the way they were for the questions on which they did well.

Successes:

- Timely access allowed supervisors to identify gaps and make timely adjustments.
- Supervisors had concrete proof of common spray operator errors and used this information every morning during team meetings and one-on-one discussions to review requirements and provide additional support.
- Spray operator repeated errors were minimized once addressed.
- Brigade supervisors and team leaders identified low performing spray operators, and made rapid efforts to improve team performance.
- Increased engagement and commitment by the RMS/DPS staff in the field for supervision efforts.
- Spray operators knew they were being supervised with real time data; therefore, they stepped up their efforts and increased their performance.
- Real-time data on household preparation, so mobilization efforts could be scaled-up and adjusted to ensure beneficiaries were ready for spray.

Lesson Learned:

- The Home Owner Preparation and SOP Performance tools greatly improved operations, as supervision was more direct on a one-to-one basis and results were recorded

TABLE 16: SPRAY TEAMS DISTRIBUTION BY WEEK

Week	SOPs in field per Week	No. of Teams per Week	No. of Eligible Structures Found	No. of Structures Sprayed	No. of Insecticide Sachets Used	No. of Structures Sprayed per Insecticide Sachet	No. of Structures Sprayed per Day per SOP
1	352	59	3,557	3,228	1,339	2.4	9.2
2	418	70	4,539	3,997	1,823	2.2	9.6
3	417	70	4,147	3,725	1,787	2.1	8.9
4	395	66	2,743	2,340	1,213	1.9	5.9
5	379	63	1,520	1,359	791	1.7	3.6
Average	392	65	3,301	2,930	1,391	2.1	7.4[7]

[7] The average 7.4 daily average per spray operator reflects a decline in daily performance during the mop-up period.

5.3 Logistics and Stock Management

The central-level warehouse facility located in the Caala Municipality, Huambo Province served as the distribution center for insecticide, personal protective equipment (PPE), and other IRS materials and supplies. The Bailundo Operational site was managed by a warehouse manager supported by warehouse assistants/pump technicians. These individuals ensured distribution of supplies to the operational site storage facilities and handled spray pump repair and maintenance.

The warehouse manager also tracked empty insecticide sachets daily at the operational sites. They were accounted for by recording the number of insecticide sachets each team leader received daily and how many were used.

5.4 Spray Campaign Transportation

Transportation of the multi-functioning seasonal personnel was handled with 3- to 6-ton trucks retrofitted with side railings, seating benches in the middle or on the side, and tarp coverage. A total of nine vehicles were contracted to support both the mobilization and spray campaigns in Bailundo as shown in Table 17 below.

TABLE 17: DISTRIBUTION OF VEHICLES BY TYPE

Area	Community Mobilization & Spray Campaign Transportation	Supervision Transportation	Total
Bailundo, Huambo	7 trucks	2 Land Cruisers	9

6. Post-Spray Activities

6.1 Close Out Operations

6.1.1 Post-spray inspection

The spray campaign officially ended on November 8, 2014. Soon thereafter AIRS Angola conducted its post-spray inspection in the Bailundo operational site in coordination with the Municipal Department of Health. The inspection verified the complete closure of latrines, rinsing area, and soak pit, including the fence and gate of the site in general. The inspection also ensured all environmental standards were followed during the movement of insecticide and empty sachets. The Open Data Kit (ODK) system forms on the smartphone were used in this post-spray inspection.

6.1.2 Evaluation Meeting

The post-spray evaluation meeting was held on November 28, 2014 with the participation of representatives from the Provincial and Municipal Health Directorates (i.e. supervisors, medical officers, community leaders and civil societies). The objective of the post-spray evaluation meeting was to report results, document challenges encountered during the spray operations, and discuss lessons learned.

6.2 Logistics And Inventory

Following completion of the spray campaign, the Bailundo operational site was closed-out and all the commodities were transported to the central warehouse. At the central warehouse level stock records were updated to show the remaining stock and audited by the logistics coordinator, operations manager, and the finance and administration manager. Table 18 below shows the remaining inventory currently maintained in AIRS Angola's central warehouse.

TABLE 18: POST-SPRAY CAMPAIGN PROGRAM INVENTORY

Description	Pre-Spray Campaign Inventory	Used or Damaged Inventory	Lost or Stolen Inventory	Post-Spray Campaign Inventory
Insecticides	22,080	6,953	0	15,127
Overalls	1,071	92	0	979
Boots	588	11	0	577
Helmets	926	2	0	924
Visor (New)	123	0	0	123
Visor (Good)	474	140	0	334
Bracket (good)	559	16	0	543
Bracket (New)	123	0	0	123
Spray Pumps 8L	642	118	0	524
Spray Pumps 10L	113	1	1	111
Spray Pump Repair Kit	36	0	0	36
Nozzle Assembly Complete	423	0	0	423
Polyethylene Nozzle Gasket	900	0	0	900
Provets	10	0	0	10

Description	Pre-Spray Campaign Inventory	Used or Damaged Inventory	Lost or Stolen Inventory	Post-Spray Campaign Inventory
Pumps strainer	1,620	100	0	1,520
Strainer	52	0	0	52
Water Container (500L)	1	1	0	0
Water Container (2000L)	2	1	0	1
Water Container (2500L)	1	0	0	1
Water Container (5000L)	6	0	0	6
200L Metalic Drums	3	0	0	3
200L Plastic Drums	26	0	0	26
100L Plastic Drums	36	2	0	34
50L Plastic Drums	19	0	0	19
Bucket 10L	119	0	0	119
Basin	59	4	0	55
Jar	27	5	0	22
Brush for washing PPE	22	0	0	22
Gloves	2,080	640	0	1,440
Backpack	260	117	0	143
Reflective Vests	130	53	0	77
Flash lights	15	0	0	15
Megaphones	42	1	0	41
First Aid Kit Box	32	6	0	26
Thermometer	1	0	0	1
Plastics Sheets/Tarp	245	3	0	242
Plastics Roll/Tars	1	0	0	1
Plastic Container	16	2	0	14
Clipboards	394	149	0	245
Clipboard (New)	90	0	0	90
Marker	1,472	664	0	808
Calculator	33	0	0	33
Stapler	10	0	0	10
2-hole Punch	4	0	0	4
Desk Tray	2	0	0	2
Ink pad	67	0	0	67
Flipchart	5	0	0	5
Trough / Vat	9	0	0	9
Pump Hangers	3	0	0	3
Plyers	3	0	0	3
Screwdriver	4	0	0	4
Hammer	2	0	0	2
Fuel Jugs	3	0	0	3
Broom	20	0	0	20
Broom without handle	9	0	0	9
Talc powder	12	0	0	12
Soap bar	141	110	0	31
Soap Powder Sachets	750	746	0	4

Description	Pre-Spray Campaign Inventory	Used or Damaged Inventory	Lost or Stolen Inventory	Post-Spray Campaign Inventory
Pregnancy Test	221	135	0	86
Toothbrush	50	28	0	22
Socks	704	220	0	484
Towels	250	219	0	31
Trash Basket	4	0	0	4
Plastic shovel	7	0	0	7
Metal shovel	2	0	0	2
Wheelbarrow	2	0	0	2
Hose for pumping water	1	0	0	1
Water Hose 1/2" (Mtr)	4	0	0	4
Iron Pipes	3	0	0	3
Pallets	116	0	0	116
Wooden Benches	13	0	0	13
Ladder	1	0	0	1
White board (Various Sizes)	15	2	0	13
Coffee pot	4	0	0	4
Fire extinguisher	15	11	0	4
Warehouse Metal Shelf	1	0	0	1
Warehouse wooden Shelf	4	0	0	4
Plastic chairs	55	3	0	52
Generator	6	2	0	4
Floor Fans	10	3	0	7
Scale	1	0	0	1
Load balance	1	0	0	1
Water pump	5	4	0	1
T-shirt (IEC MOB)	620	473	0	147
Polo Shirts	145	122	0	23
Cap (Hat)	500	399	0	101
IRS Household Cards	12,500	10,338	0	2,162
Brochure Umbundo	12,500	6,550	0	5,950
Brochure Portuguese	12,500	6,550	0	5,950
PMI stickers (A4)	343	0	0	343
PMI stickers (10/30 cm)	1,350	100	0	1,250
Pen	500	500	0	0
Battery for flash light	166	166	0	0

7. ENTOMOLOGY

7.1 VECTOR SUSCEPTIBILITY STUDY

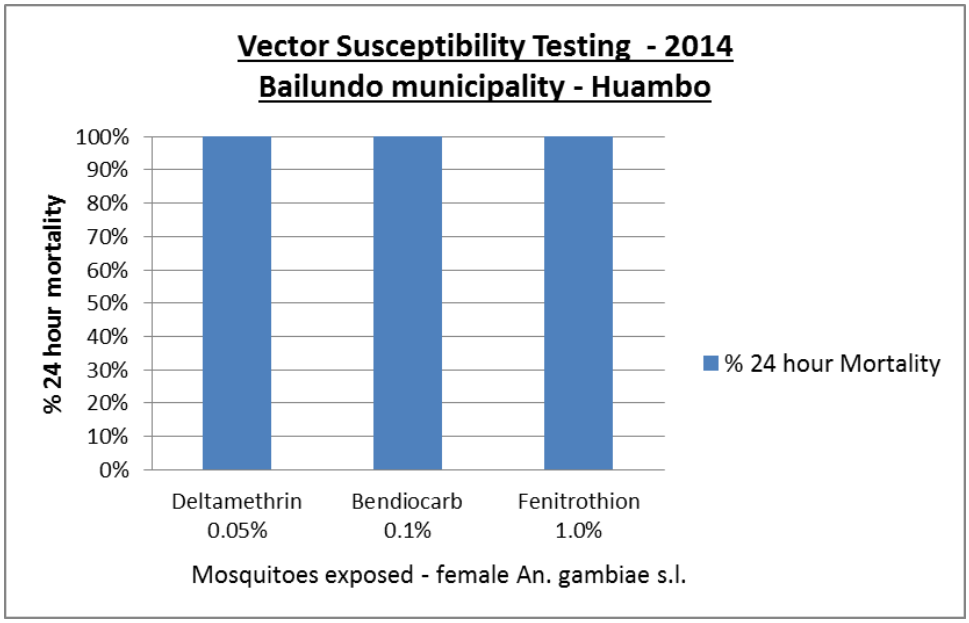
AIRS Angola's entomological team conducted an insecticide resistance study in April 2014 to select the appropriate insecticide for the 2014 spray season. One to five day old adult female mosquitoes that emerged from field-collected larvae and pupae were tested using the WHO tube bioassay test. The emergent *Anopheles* mosquitoes were first sorted into species. *An. coustani* and *An. gambiae* s.l. were the two most prevalent *Anopheles* species identified. Only female *Anopheles* mosquitoes identified morphologically as *An. gambiae* s.l. were used for the testing.

The insecticides tested were:

- Deltamethrin 0.05% from the pyrethroids class;
- Bendiocarb 0.1% from the carbamate class; and
- Fenitrothion 1.0% from the organophosphate class.

The corrected 24-hour test mortality rates of *An. gambiae* s.l. exposed to 0.05% Deltamethrin, 0.10% Bendiocarb, and 1.00% Fenitrothion were 100%. According to the 2013 WHO resistance classification criteria, the results indicate full susceptibility of the vector to the above three insecticides tested as outlined in Figure 03 below.

FIGURE 03: 2014 INSECTICIDE SUSCEPTIBILITY STUDY



7.2 ENTOMOLOGICAL MONITORING

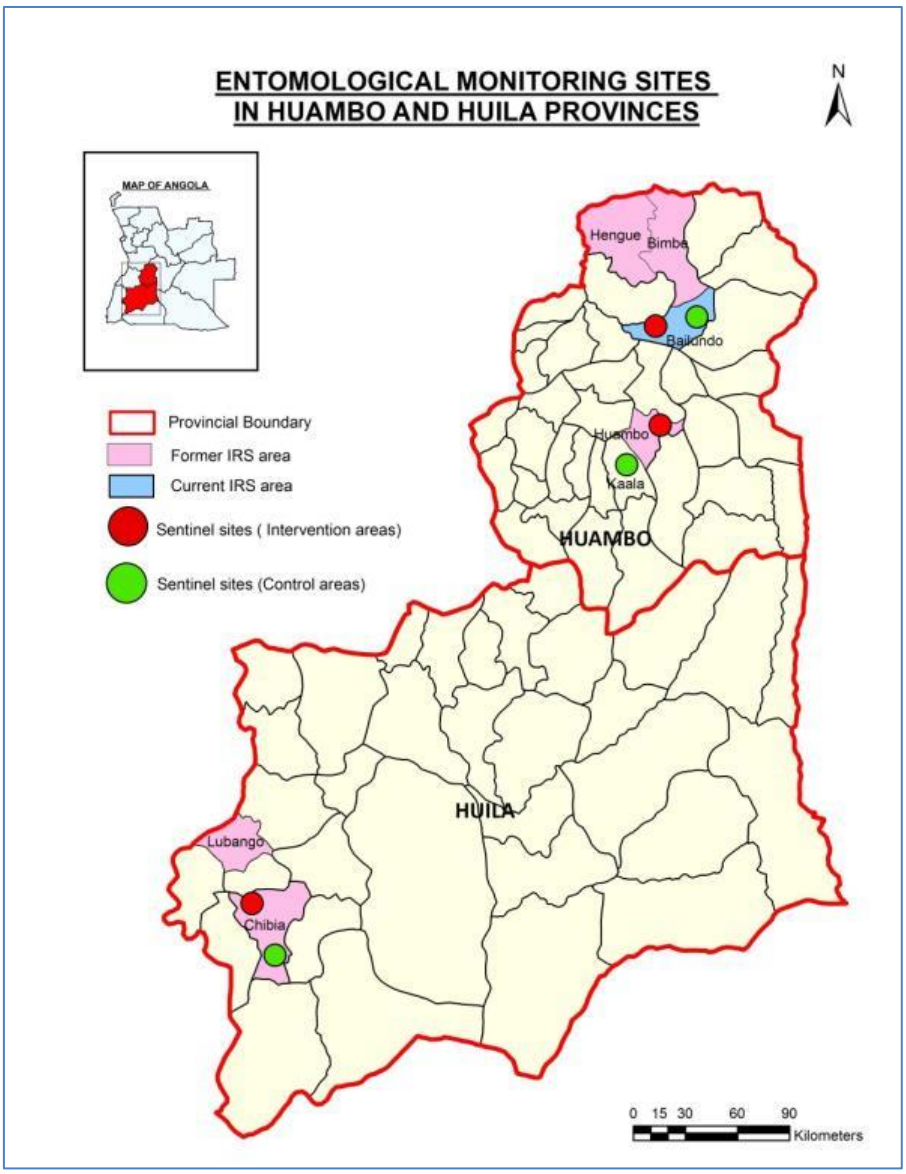
AIRS Angola established and continues to carry out monthly entomological monitoring in six sentinel sites as outlined in the 2014/15 work plan. These sentinel sites were selected on the basis of former and current IRS target areas as shown in Table 19 and Figure 04 below.

TABLE 19: SENTINEL SITES

Province	Municipality	Village	Intervention Status
Huambo	Huambo	Chiva	Former IRS area
Huambo	Caala	Chandenda	Control Area
Huambo	Bailundo	Chandandi	Current IRS Area
Huambo	Bailundo	Mana Kulele	Control Area *
Huila	Chibia	Bairro Cinzento	Former IRS Area
Huila	Chibia	Hango	Control Area

*This area served as a control until September; however it was sprayed during the 2014 spray round.

FIGURE 04: ENTOMOLOGICAL MONITORING SITES IN HUAMBO AND HUILA PROVINCES



Monthly entomological monitoring activities have been carried from April 2014 to date. The following entomological techniques are used:

1. CDC light trap collections – 10 traps in each village

2. Pyrethrum spay collections (PSCs) – 10 houses in each village
3. Indoor adult collections using Prokopack aspirator – 10 houses in each village
4. Pit Trap for adult collections – 1 per village

Mosquito density was relatively higher in the month of May when the mosquito survey started, compared to subsequent months. Angola has a long rainy season, from November to April followed by a dry season. The observed trend in vector density can be explained by this rainfall pattern. The decline in vector density over time was observed in all the intervention and control villages. The highest number of host-seeking and resting *An gambiae* s.l. was collected from the Bailundo intervention area in May using CDC light traps and pyrethrum spray collections, which were 11.4 mosquitoes per trap per night and 6.1 mosquitoes per house per day, respectively (Table-20, Table-21). The entomological monitoring activities began seven months after the last spray campaign when the intervention was believed to have little impact on mosquito population. Overall, mosquito densities were very low from June through October with less than two *An. gambiae* s.l. collected per house per day using either CDC light traps or PSCs. This is likely because all of these collections took place during the dry season. In January 2015 a slight increase was observed in Huila province, which may be due the increase number of breeding sites resulting from December rainfall.

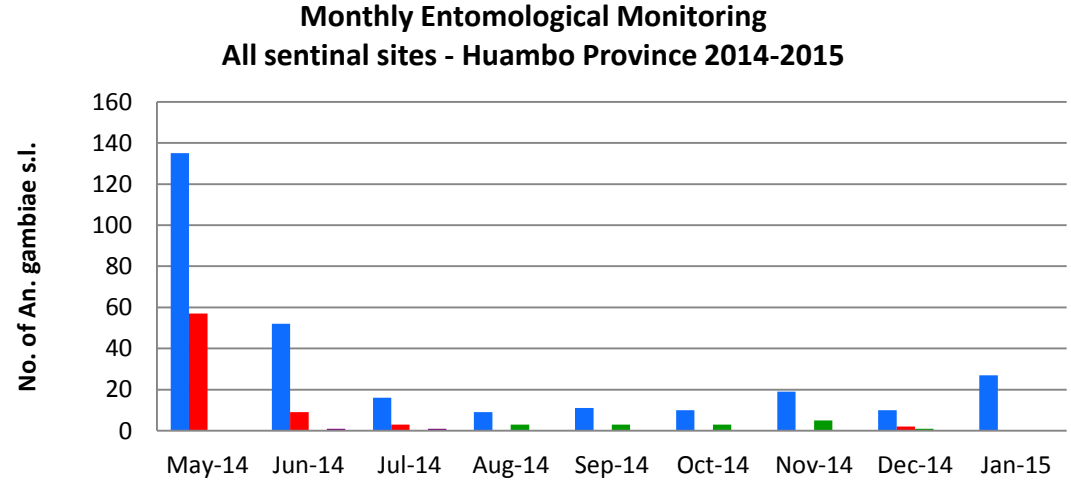
TABLE 20: MONTHLY *An.gambiae s.l.* DENSITY (PER HOUSE/DAY) USING CDC LIGHT TRAPS

Province	**Huambo**				**Huila**	
Municipality	**Bailundo**		**Huambo**		**Huila**	
Sentinel site	**Candandi (I)**	**Mana Kulele (C)**	**Chiva (I)**	**Chandenda (C)**	**Bairro Cinzento (I)**	**Hango (C)**
May 14	11.4	1.2	0.9	0.0	0.4	0.4
June 14	2.4	2.2	0.6	0.0	0.0	0.1
July 14	1.2	0.3	0.0	0.1	0.0	0.1
August 14	0.0	0.0	0.2	0.7	0.0	0.0
September 14	1.4	0.0	0.0	0.0	0.0	0.1
October 14	0.5	0.5	0.0	0.0	0.0	1.4
November 14	1.3		0.1	0	0	0
December 14	0.1		0		0.5	0.4
January 15	0.5		2.1	0.1	0.1	0

TABLE 21: MONTHLY *An.gambiae s.l.* DENSITY (PER HOUSE/DAY) USING PYRETHRUM SPRAY CATCHES

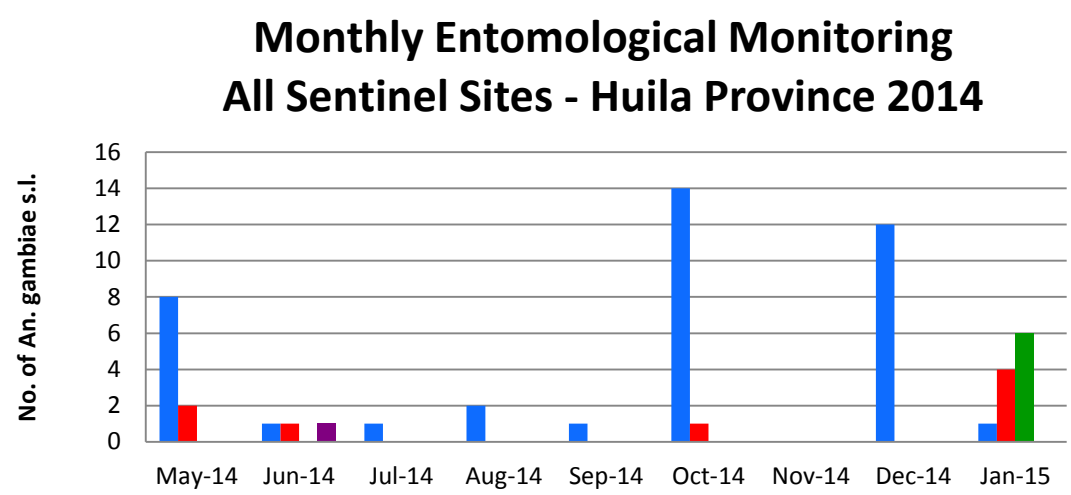
Province	Huambo				Huila	
Municipality	Bailundo		Huambo		Huila	
Sentinel site	Candandi (I)	Mana Kulele (C)	Chiva (I)	Chandenda (C)	B. Cinzento (I)	Hango (C)
May 14	6.1	1.0	0.0	0.0	0.1	0.1
June 14	0.4	0.6	0.0	0.0	0.1	0.0
July 14	0.4	0.0	0.0	0.0	0.0	0.0
August 14	0.0	0.0	1.8	1.4	0.0	0.0
September 14	0.0	0.0	0.0	0.0	0.1	0.0
October 14	0.0	0.0	0.0	0.0	0.0	0.1
November 14	0		0	0		
December 14	2		0	0	0	0
January 15	0		0	0		0.1

FIGURE 05: TOTAL NO. OF *An. gambiae s.l.* MOSQUITOES COLLECTED IN HUAMBO USING DIFFERENT TECHNIQUES



	May-14	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15
CDC LT	135	52	16	9	11	10	19	10	27
PSC	57	9	3	0	0	0	0	2	0
Prokopack				3	3	3	5	1	0
Pit Trap	0	1	1	0	0	0	0	0	

FIGURE 06: TOTAL NO. OF *An. gambiae s.l.* MOSQUITOES COLLECTED IN HUILA USING DIFFERENT TECHNIQUES



	May-14	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15
CDC	8	1	1	2	1	14	0	12	1
PSC	2	1	0	0	0	1	0	0	4
Prokopak				0	0	0	0	0	6
Pit Trap	0	1	0	0	0	0	0	0	0

7.3 IRS QUALITY ASSURANCE TESTING

WHO cone bioassay testing was done in five sentinel villages in Bailundo Municipality to evaluate the quality of spraying. The quality assurance was done within the first two weeks of spraying where ten houses were tested in each sentinel village using field-collected larvae and pupae reared to adults in the insectary. Testing results demonstrated some low mortality in houses tested in Sachole and Velha Chica villages, while other sentinel site mortality was high. Therefore, AIRS conducted a spray technique refresher training immediately over two consecutive days to all spray operators, team leaders and supervisors to ensure delivery of quality spraying and better supervision. While AIRS planned to re-test these two villages soon thereafter, the larvae scarcity precluded the retesting from taking place.

Bioassays were also repeated in monthly intervals at the same sentinel sites to monitor residual efficacy/decay rates of the insecticides. It was observed that 24-hour mortality rates were markedly lower during December 2014 and January 2015 in all sites. In these bioassay tests wild caught *Anopheles* species were used, assuming that they were *An. gambiae* s.l. However, for all tests it was noted that most of the mosquitoes were not *An. gambiae* s.l, but An. *rufipes, An. coustani, An. maculipalplis, An. longipalpis, An. squamosus, An. marshalli, An. theileri* and very few *An. funestus.* Most of them were An. *rufipes and An. coustani.* and these were also confirmed from the specimens sent to the Centers for Disease Control, Atlanta and Wits Research Institute for Malaria in South Africa (WITs) University. Hence, it was also decided to conduct some refresher training for entomological staff on morphological identification.

FIGURE 07: MONTHLY 24 HOUR MORTALITY RATES

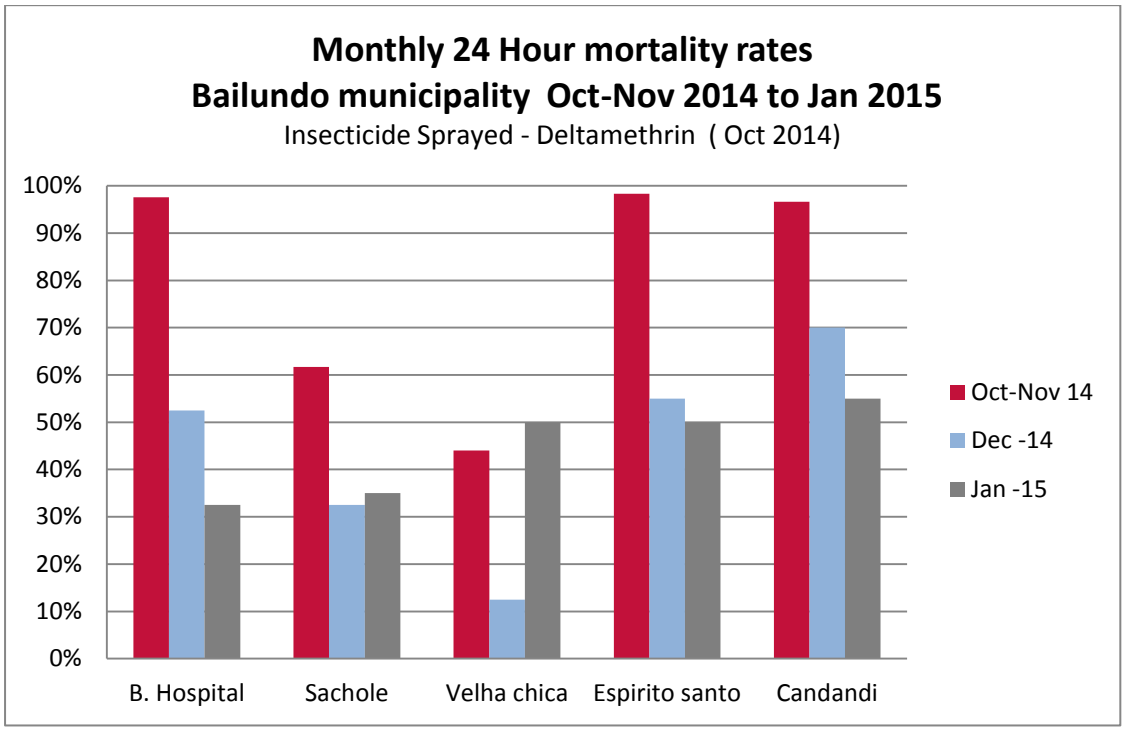


FIGURE 08: MONTHLY KD 30 RATES

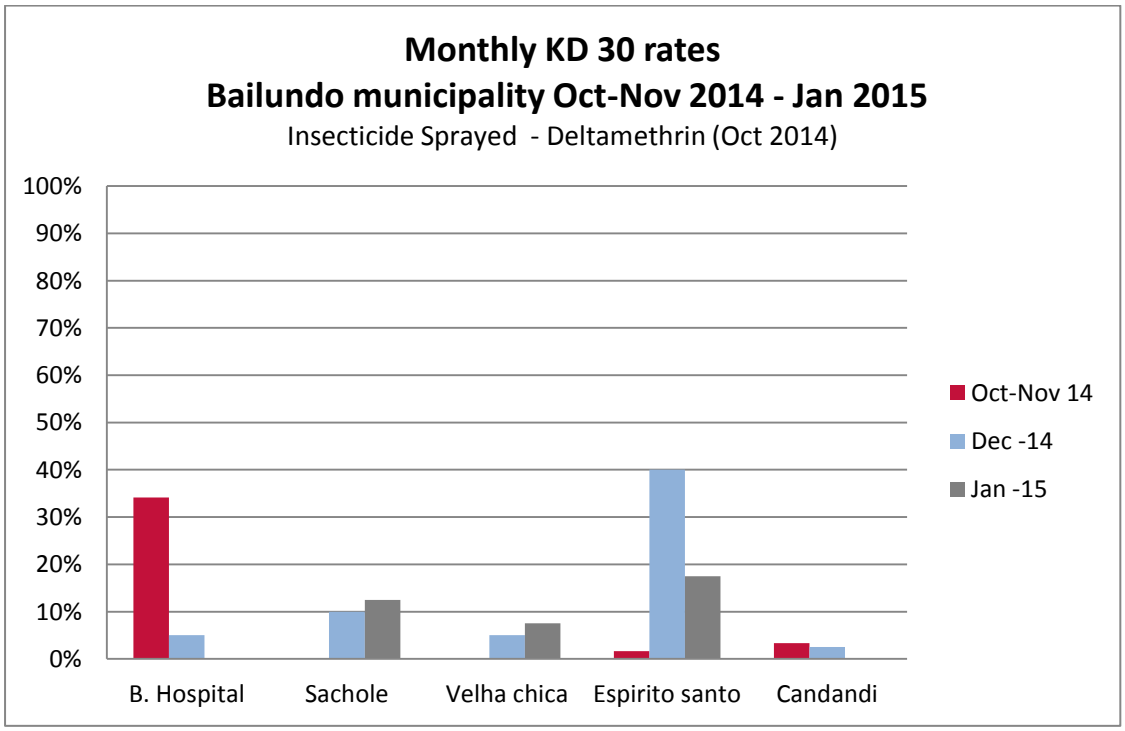
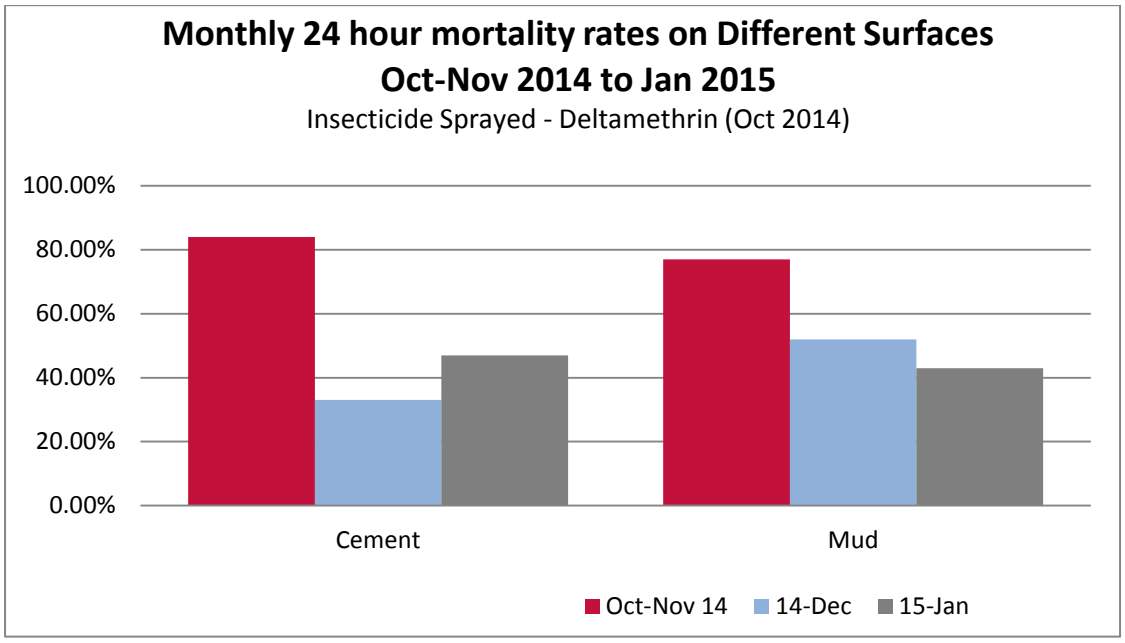


FIGURE 09: MONTHLY 24 HOUR MORTALITY RATES ON DIFFERENT SURFACES



When compared, the results from monthly reports from Oct 14 – Jan 15 clearly show that the residual efficacy of the insecticide sprayed (deltamethrin) in this area has markedly gone down during the 3-month period.

In this study low 30 minutes knockdown rates were shown from the beginning and after 3 months it has reached below 5% in all sentinel villages.

Residual efficacy of insecticide on both mud and cement surfaces also shows the same decaying pattern with some higher efficacy on cement, except in Dec 2014.

This decrease in residual efficacy may be due to the quality of spraying, climatological factors, surface properties and the susceptibility status of mosquitoes tested. It should also be noted that most wild caught *Anopheles* mosquitoes were not morphologically confirmed to be *An. gambiae* s.l., and their susceptibility status was not known. This also shows the importance of having a susceptible vector mosquito colony in the insectary.

7.4 INSECTARY

At present the insectary is mainly used to rear wild caught *Anopheles* larvae from the field and also to preserve and store adults from various field collections and tests. These field collected, insectary reared adults were mainly using for susceptibility and quality assurance tests. Non availability of a susceptible vector mosquito colony in the insectary is still a big drawback for quality assurance and insecticide decay monitoring tests.

7.5 TRAINING

AIRS conducted entomological training in preparation of the national susceptibility study being carried out during the months of December 2014 through February 2015 in nine provinces representing the malaria stratification of the three endemic areas of the country, including Zaire,

Uige, Malanje, Luanda, Benguela, Namibe, Huambo, Huila and Cunene. Basic entomological knowledge was given to participants, starting with a) Malaria Introduction, b) Malaria Vector Control, c) Larvae and Pupae Collection, d) Mosquitoes In General, d) Mosquitoes Sampling Techniques, e) Insecticide Resistance, f) Wall Cone Bioassay, g) WHO Susceptibility Testing and h) Mosquitoes Morphology.

Training was led by AIRS Angola Senior Entomologist Ranjith de Alwis, with the support of Dr. Cani Pedro Jorge, Senior Entomologist from NMCP, and the AIRS Angola entomology team comprised by Inácio Pedro Chilala, Vicente Eduardo Chipepa, Martinho Adriano Bango, Technicians, and Luis Manuel Gonçalves, Coordinator. The AIRS Angola CoP played the role of facilitator/moderator during the 6-day training of 38 participants, including four women as shown in Table 22 below. Participants, who had a diverse background in malaria and public health, included Provincial Malaria Supervisors for all the provinces participating, and municipal malaria focal points of the same provinces.

TABLE 22: LIST OF THE PARTICIPANTS PER SITE

Province	Males	Female
Cunene	3	0
Huambo	12	1
Huila	3	0
Luanda	3	1
Malange	3	0
Namibe	3	0
NMCP	3	0
Uige	2	1
Zaire	2	1
Total	34	4

8. Monitoring & Evaluation

8.1 Key Objectives and Approach

The AIRS Angola monitoring and evaluation system drew strengths from the lessons learned and best practices from previous spray campaigns in Angola and in other AIRS countries. As outlined in the 2014 work plan, the M&E approach is as follows:

- Emphasize accuracy of both the data collection and the data entry processes through comprehensive training and supervision at all levels.
- Streamline and standardize data flow to minimize errors and facilitate timely reporting.
- Ensure IRS data security and storage for future reference, through the establishment and enforcement of proper protocols.
- Document lessons learned and best practices observed during implementation and apply to future IRS campaigns.

8.2 Data Collection and Management

AIRS Angola incorporated all M&E protocol updates, including improvements to the data collection tools, AIRS Access, before the start of mobilization and spray campaigns to facilitate high-quality IRS campaign results. The M&E team used a Microsoft Access macro application "Collector" to compile data from the AIRS database with the e-mobile system to track campaign progress and generate "real-time" reports. These M&E enhancements allowed AIRS to provide immediate feedback to field staff to resolve issues and inform spray operations.

All data collection was preceded by training of AIRS Angola staff, government supervisors, mobilizers, spray operators, data clerks, and an M&E assistant. Thirty spray operators recorded household data on the standard paper-based data collection tools and 42 used smartphones, and team leaders verified the electronic spray data on tablets. Brigade supervisors, government officials and AIRS core staff used the remaining smartphones to perform the Home Owner Preparation and SOP Performance supervisory tool. Data clerks performed a final check on the spray forms before entering data into the database. Spray data were delivered and entered into the database within 48 hours post-spray for quality control purposes and timely generation of weekly progress reports. Data center staff filed and archived the data collection forms by date and team number for easy retrieval. The M&E team performed daily electronic back-up of the data to the server.

8.3 Data Center Operations and Data Entry

AIRS hired three data clerks to enter mobilization and spray data for the campaign. Following the AIRS protocol, data clerks entered data at two stages: (1) by totals for quick reporting and feedback, and then (2) by details for quality control purposes. AIRS set up one data center for paper-based spray data collected by 30 spray operators. Each of the three data clerks had a laptop and entered data directly into a SQL server that was linked to their computer systems. All computers were installed with the most recent version of the AIRS Access database and the new IRS Cleaner/Reporter.

8.4 Data Quality Assurance and Quality Control

During the 2014 campaign, AIRS used the M&E supervisory and data verification tools implemented in 2013 to uphold data quality assurance activity. AIRS piloted mobile phone-based supervision by

digitizing the Home Owner Preparation and SOP Performance supervisory checklist. We describe each tool's purpose and the staff responsible for completing the tools here.

- **Error Eliminator (EE) for Mobilization and Spray Data**: Team leaders, supervisors, provincial coordinators and AIRS supervisory staff (M&E assistant, M&E manager, database manager, COP, operations manager) used the EE, while in the field, to verify that data collection form were completed fully and correctly. The EE highlights common errors found in previous IRS campaigns to make it easier for supervisory staff to identify and reconcile issues, where necessary. Any discrepancies were immediately addressed and reconciled.

- **Data Collection Verification (DCV) Form**: Supervisors, field officers, provincial coordinators and AIRS supervisory staff used the DCV form to check the accuracy of the spray data collected by spray operators. To do this, staff visited households to record the spray status on the DCV form and crosschecked that information with the Daily Spray Operator Forms. Any discrepancies were immediately addressed and reconciled.

- **Home Owner Preparation and SOP Performance Checklist**: Four Brigade supervisors, the M&E assistant, AIRS Angola senior staff, and six government staff used this electronic tool to evaluate spray techniques, data collection accuracy, SOP performance, and household preparedness (See Spray Operations Section 5.2.1).

8.5 Database Quality Control and Data Cleaning

As in previous campaigns, Abt Associates' Client Technology Center (CTC) programmed the Access database with audit checks and data locks to reduce the number of data entry errors. In 2013, CTC introduced SQL Servers to sync data clerk computers to one database, avoid duplicate structure entries and increase speed of processing large amounts of data. Data clerks continued to use the IRS Reporter/Cleaner to identify discrepancies between totals and details, duplicate data, missing records, and data entry errors. As a result, data clerks needed only eight days to reconcile mobilization and spray data after the 2014 spray campaign. Data clerks and M&E staff also used the IRS Reporter/Cleaner to generate local spray reports, as needed. Data entered by spray operators via smartphones was cleaned by the M&E team after downloading the data from the mobile website. A Microsoft Access program, developed by CTC, compiled the Access data with mobile phone data for a comprehensive campaign dataset.

8.6 2014 CAMPAIGN RESULTS

During the 2014 IRS campaign, AIRS Angola sprayed 14,649 of the 16,506 structures found by spray operators, resulting in 88.7% spray coverage. AIRS Angola protected a total of 58,370 people, including 1,413 pregnant women and 12,531 children under five years old. Table 23 provides a summary of the 2014 Angola spray campaign in Bailundo Capital, highlighting core PMI indicators. Figure 10 shows the daily spray progress over the course of the campaign. Table 24 provides a summary of structures not sprayed and reasons for not spraying.

TABLE 23: SUMMARY OF SPRAY RESULTS

Structures Found	Structures Sprayed	Spray Coverage	Population Protected	Population Protected					
				Males Protected	Females Protected	Pregnant Women	Children <5 Years	Population Not Protected	% Population Protected
16,506	14,649	88.7%	58,370	28,510	29,860	1,413	12,531	3,409	94.5%

FIGURE 10: DAILY PERFORMANCE TRACKER

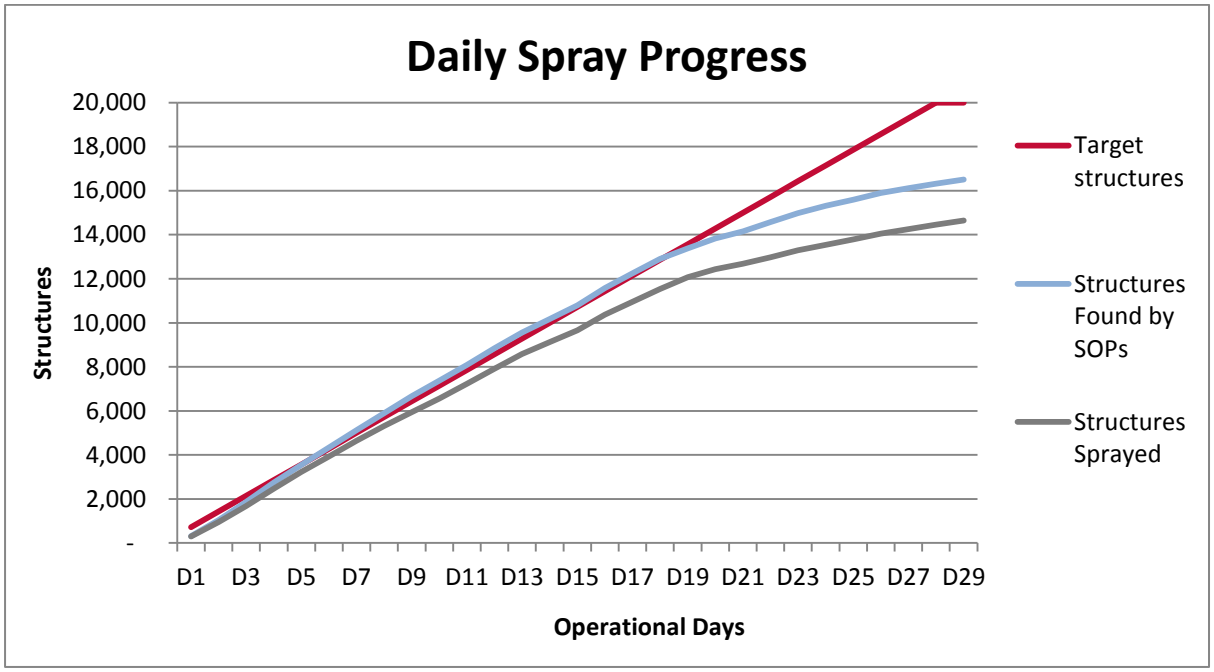


TABLE 24: STRUCTURES NOT SPRAYED

Reason	No. of Structures
Funeral	13
Not Eligible	18
Sick	99
Refused	455
Closed	1,182
Others (Unspecified)	80
Total	**1,847**

8.7 Insecticide Use and Spray Operator Performance

AIRS Angola used 6,953 insecticide sachets to spray 14,649 structures. There were no lost or damaged sachets. On average, one sachet of insecticide covered 2.1 structures. Spray operators used an average of 3.6 sachets per day to spray an average of 7.6 structures. Data on insecticide stocks and use, and SOP performance, are presented in Tables 25 and 26 below.

TABLE 25: INSECTICIDE SACHET STOCK

Item	Unit of measure	Intial inventory	Used	Wastage/Loss (Full Sachets)	Stock Balance
Insecticide	Sachets	22,080	6,953	0	15,127

TABLE 26: SPRAY OPERATOR PERFORMANCE AND INSECTICIDE USE

Area	Days SOPs worked	Structures sprayed	Sachets used	Structures sprayed/sachet	Structures sprayed/SOP work days
Bailundo	1,916	14,649	6,953	2.1	7.6

8.8 E-mobile Spray and Supervisory Data Collection Systems

8.8.1 Smartphone Set-up and Inventory Management

Smartphones and tablets purchased in 2013 were used in 2014. Due to difficulties in 2013, CTC installed and used Dimagi's CommCare platform after the positive experience during a pilot in another AIRS country during the summer 2014. This allowed spray operators to scroll back and forth through the forms, and edit data before submitting. This system also cooperated with a CTC-generated data aggregator system to combine Microsoft Access data with mobile phone data and reduce the need for manual cleaning. Per last year's success, the M&E team used ID numbers on each phone and tablet and assigned one to each staffer to avoid loss and

8.8.2 Spray Data

During the 2014 spray campaign, AIRS continued to use e-mobile data collection and verification for spray data, which was originally piloted in 2013. We made improvements to the e-mobile system, which included improving the question order and wording and utilizing Dimagi's CommCare platform that worked well for a mobile phone pilot in another AIRS country during summer 2014. Three weeks before spray, the M&E team trained 154 staff on paper-based data collection and selected 88 highly-skilled staff to attend two–days training on the e-mobile system. We performed a refresher training four days before spraying began for e-mobile data collection. The 88 people trained consisted of 72 spray operators, 12 team leaders and four supervisors for four days on the general use of phones and tablets, and how to record, verify and submit data. The AIRS home office developed the training materials and sent to the M&E team for translation into Portuguese. After observing practical sessions, AIRS selected 42 spray operators, seven team leaders and the four brigade supervisors most capable of using the e-mobile system. Due to equipment amount limitations, 35 other staff (i.e., spray operators and team leaders) used the paper-based forms to collect and verify data.

Spray operators were instructed to complete one Start and End of Day Form for each day (unless they worked in more than one village in a day), and one Structure Form for each structure found (either sprayed or unsprayed). The phones were set up for automatic submission once the form was completed so the team leader could verify on the tablet immediately and/or before spray teams left the field. Team leaders flagged errors for the M&E team to reconcile in the downloaded dataset.

8.8.3 Data Cleaning and Reporting

The M&E team downloaded the mobile data from the CommCare website and reconciled any errors based on team leader flags. Since the M&E team had immediate access to the data, they were able to identify high refusal rates and closed/locked structures quickly in 14 villages. AIRS deployed a mobilization unit to circulate in specific villages with a loudspeaker playing IEC messages. Consequently, IRS acceptance rates improved in these specific villages, but we did find several closed structures owned by households that remained in the field until after spraying ended.
For the weekly spray progress and end of spray reports, the M&E team used the data aggregator to export the mobile dataset and arrange them in the same reporting format as the Access data for seamless integration of both datasets.

8.8.4 Lessons Learned and Recommendations

Overall, the e-mobile spray data collection and supervisory systems was successful and provided AIRS staff with "real-time" data to guide and improve spray operator performance and spray operations. The successes, lessons learned, and recommendations based on our experience in Angola this year are as follows:

Successes

Spray Data:

- Built technical capacity of 88 seasonal personnel, about 30% of which were return workers from 2013.
- Provided real-time spray data for reporting both internally and externally to stakeholders, allowing for quick and timely adjustments as identified..
- Upheld AIRS robust M&E supervisory and data verification system.
- Enhanced the e-mobile system to potentially adapt to other uses in FY2015 (i.e. epidemiological surveillance, etc.)
- Managed a successful inventory system; no stolen or lost equipment.

Lessons Learned

- On the CommCare e-mobile data collection, the tests with the IT support team building the system should be carried out with the local mobile carriers to avoid the IT support team using a more advanced carrier than the implementing teams.

Recommendation

- Continue to implement a technology capacity assessment as part of the testing and recruitment.
- Apply mobile data collection to already existing epidemiological data reporting.

8.9 Malaria Epidemiological Surveillance Reporting System

In August 2013, AIRS Angola started to assist and supervise malaria data collection in five municipalities (19 health facilities - HFs) in Huambo, Huila and Cunene Provinces, areas that were receiving or had in the past received IRS. AIRS visited and conducted an assessment of data

collection and malaria case reporting in April 2014 in all the health facilities.[8] The goal of this work is to be able to monitor the effects of IRS or IRS withdrawal.

8.9.1 Key Observations

- There was slow uptake on the use of new malaria data collection forms for a variety of reasons and in some cases non-compliance:
  - There was already a heavy workload for medical personnel to register patient registry books, conduct Rapid Diagnostic Tests (RDTs), and disburse prescriptions.
  - Health facility (HF) administrator technicians who received training were not passing that information on to others and they themselves were unable to master the form
  - Lack of ownership or interest by HFs in the overall systems' improvement
- Incomplete data in registry books: Most of the records in the existing registry books were not complete as technicians were not completing all fields, registry books were missing, and most of the patients sent to laboratories for testing did not return with results.
- Incomplete malaria data collection forms: In some HFs, the forms were not completely and accurately completed by technicians. For example, when some HFs had stock outs of RDTs and reagents, malaria cases were not recorded.
- Testing of suspect cases: In all HFs, when RDTs are used, sometimes medical personnel do not review results due to heavy workloads or the idea that they will always come back negative. As a result, the medical personnel were only doing it since it is a requirement, but not following the instructions to ensure good results.
- Treatment of cases: Some medical personnel were found to be treating negative cases. They justified this by stating that the malaria parasite could be in a period of incubation, and therefore, they needed treat it before it became detectable. Additionally, some cases that had not been tested for malaria were treated. Both of these practices can lead to treatment resistance. Thus, the indicator on cases treated in the registry books, pharmacy records, laboratory records and HF monthly reports are not necessarily accurate.
- Poor communication between consultants, lab technicians and pharmacy staff: Often times, medical personnel send patients to laboratories when the lab is closed or when there are no reagents or RDTs available. Lab technicians were also informing patients of their results at the laboratories, and therefore, patients with negative results were not returning to the consultant. Thus, medical personnel could not complete records in the registry book.
- Poor monthly reporting rates by a few HFs.
- Lack of RMS/DPS follow-ups: Most of the RMS/DPS staff had not made follow-up visits in the absence of AIRS Angola staff to oversee HF engagement in the ES activities. Even when findings have been reported that need their intervention.
- RDTs and drugs found expired in a few HFs without the technicians noticing.

8.9.2 Key Recommendations

- After observing errors found in the registry books and data collection forms, AIRS staff should continue to conduct monthly refresher trainings and supervisory visits to HFs to ensure accurate and complete data recording of clinical, laboratory and pharmacy data.

[8] AIRS Angola will submit a *Semi-Annual Epidemiological Surveillance (ES) Report* March 1, 2015 to PMI that details the ES results since the onset of this activity.

- To improve data quality and speed of malaria case results, we recommend "digitizing" the ES data collection tool using the smartphones purchased for spray data collection in the 19 sampled HFs. We plan to include this activity in the FY2015 work plan.
- During supervisory visits, AIRS should encourage HF staff to ensure that all drugs, RDTs and reagents expiring in less than three months are transferred to HFs with stock outs or in great need. Technical assistance should be provided to the RMS/DPS and HFs in order to overcome the supply chain management issues.
- Recommend that the Ministry of Health revise patient registry standards and reinforce training on proper malaria case documentation. For example, if a patient is diagnosed and treated in a health facility in Huambo Municipal Hospital, but is a resident of Mungo Municipality, this patient should be registered as a Mungo Malaria case, and not as a Huambo malaria case.

9. Capacity building

After ten years of IRS implementation in the country, building the capacity of local entities to carry out IRS activities continues to be a slow process in Angola. Results of the initial capacity building assessment carried out by AIRS Angola in May 2013 reflected limited existing capability within the MoH at the national, provincial, and municipal levels across all technical areas. AIRS Home Office and AIRS Angola's CoP agreed in coordination with PMI Angola and the project's overseeing COR team to table the IRS capacity assessment in Angola. In the meantime, AIRS continued to work closely with the NMCP, and together led entomological training for 38 eight participants from across the country, and have continued to work in close collaboration in preparation of the national susceptibility study to be carried out from January through February 2015.

10. CHALLENGES

10.1 CHALLENGES

Some of the key challenges faced during the 2014 campaign included:

- **Collection of accurate spray data**: As was reported in previous years, some spray operators were found to be forging the spray data resulting in their immediate dismissal. However, reinforced supervision by the AIRS Angola team and the municipal government greatly reduced this number in 2014.
- **Inaccurate counting of total population living in sprayed and unsprayed structures**: Post-spray data verification reflected that *Total Populations* data was not counted correctly for a few structures; the most common mistake being the non-inclusion of children.
- **Team leaders not using the error eliminator form correctly**: Some team leaders ticked "yes" on the error eliminator form without verifying.
- **Low spray coverage**: Absence of household heads throughout the spray campaign due to farming responsibilities.
- **Refusal Rate**: The dual intervention approach (i.e., long-lasting insecticide treated nets (LLIN) distribution simultaneously with the spray campaign) caused a high refusal rate in the acceptance of IRS. AIRS Angola took measures throughout the campaign to successfully anticipate and reduce the household refusals (e.g., enhancing community understanding, radio spots and radio shows attended by the DPS, RMS, King of Bailundo, PMI Angola, and AIRS Angola CoP). However, these efforts did not reduce the household refusal rate to the reasonably minimal level desired.

Annex A: Monitoring and Evaluation Plan Indicator Matrix

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Dis-aggregated	PMI/AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Result	Target	Result	Target	Result
Component 1: Establish cost-effective supply chain mechanisms including procurement, distribution and storage of IRS-related commodities and execute all aspects of logistical plans for IRS-related activities.											
1.1 Procurement											
1.1.1 Number and percentage of international insecticide procurement orders delivered in country, at port of entry, at least 30 days prior to the start of spray operations	[*Numerator:* Number of international insecticide procurement orders delivered in country, at port of entry, at least 30 days prior to the start of spray operations]	Y1, Y2, Y3	*Data source*: Logistics and Procurement Inventory Reports *Reporting frequency*: Each spray season	By spray campaign	AIRS	1; 80%	1; 100%	1; 100%	0; 0%[9]	0: 0%	0: 0%

[9] Insecticide arrived at the port of entry before the spray campaign began (24 days prior) but not at least 30 days before spray campaign began.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Dis-aggregated	PMI/AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Result	Target	Result	Target	Result
	[*Denominator:* Total number of international insecticide procurement orders] *Calculation:* [Numerator ÷ Denominator] x 100										
1.1.2 Number and percentage of international procurement orders for equipment, including PPE, received at port of entry, 30 days prior to start of spray operations.	[*Numerator:* Number of international procurement orders for equipment, including PPE, received at port of entry, 30 days prior to start of spray operations] [*Denominator*: Total number of international procurement orders for equipment, including PPE] *Calculation:* [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	*Data source:* Logistics Inventory Report *Reporting frequency*: Each spray season	By spray campaign	AIRS	1; 85%	8; 100%	4; 100%	4; 100%	0	0

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Dis-aggregated	PMI/AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Result	Target	Result	Target	Result
1.1.3 Number and percentage of local PPE procurement orders that are delivered to the main warehouse, 14 days before the start of spray operations	*[Numerator:* Number of local PPE procurement orders delivered to the main warehouse 14 days before the start of spray operations] [*Denominator*: Total number of local PPE procurement orders.] *Calculation:* [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	*Data source:* Logistics and Procurement Inventory Reports *Reporting frequency*: Each spray season	By spray campaign	AIRS	1; 80%	2; 0%	2; 100%	2; 100%	1: 100%	1: 100%
1.1.4 Successfully Complete spray operations without an insecticide stock-out	Milestone: (Complete/Not Complete)	Y1, Y2, Y3	*Data source:* Logistics Inventory Report *Reporting frequency*: Each spray season	By spray campaign	AIRS	Acheived	Acheived	Achieved	Achieved	Achieved	Achieved

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Dis-aggregated	PMI/AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Result	Target	Result	Target	Result
1.2 In-country Logistics, Warehousing, and Training											
1.2.1 Number and percentage of logistics and warehouse managers trained in IRS supply chain management	*[Numerator:* Total number of logistics and warehouse managers trained in IRS supply chain management using AIRS Project resources] *[Denominator:* Total number of AIRS logistics and warehouse managers] *Calculation*: [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	*Data source*: Routine training records *Reporting frequency*: Each spray season	By spray campaign By gender	AIRS	9; 80%	10; 100% 8 males, 2 females	20; 100% 16 males, 2 females	11; 55% 9 males, 2 females	4; 100% 3 male 1 Female	3: 75% 3 Males 0 Female

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Dis-aggregated	PMI/AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Result	Target	Result	Target	Result
1.2.2 Number and percentage of base stores where physical inventories are verified with up-to-date stock records	*[Numerator:* Number of base stores where physical inventories are verified by up-to-date stock records] [*Denominator*: Total number of base stores audited] *Calculation:* [Numerator ÷ Denominator] x 100	Y2, Y3	*Data source:* Logistics and Environmental compliance reports *Reporting frequency*: Each spray season	By spray campaign	AIRS	80%	3; 100%	6; 100%	5; 83.3%	2: 100%	2: 100%
1.2.3 Submit up-to-date inventory records to AIRS Home Office 30 days after the end of each spray campaign	Milestone: (Complete/Not Complete)	Y2, Y3	*Data source:* Post-Spray Logistics Inventory Report *Reporting frequency*: Each spray season	By spray campaign	AIRS	N.A.	Not Complete[10]	Complete	Not Complete [11]	Complete	Completed

[10] Inventory records *were* submitted with the EOSR.
[11] Inventory records *were* submitted with the EOSR.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Dis-aggregated	PMI/AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Result	Target	Result	Target	Result
Component 2: Implement safe and high-quality IRS programs and provide operational management support.											
2.1 Planning and Design of IRS Programs											
2.1.1 Annual IRS country work plan developed and submitted on time	Milestone: (Complete/Not Complete)	Y1, Y2, Y3	*Data source:* Project records *Reporting frequency*: Annually		AIRS	Complete	Complete	Complete	Complete	Complete	Complete
2.2 Support of Safety and Health Best Practices and Compliance with USAID and Host Country Environmental Regulations											
2.2.1 SEA/letter report submitted on time[12]	Milestone: (Complete/Not Complete)	Y1, Y2, Y3	*Data source*: Project records – submitted SEAs/ letter reports *Reporting frequency:* Each spray campaign	By spray campaign	AIRS	Complete	Complete	Complete	Complete	Complete	Complete
2.2.2 Number and percentage of soak pits and storehouses inspected and approved prior to spraying	*[*Numerator*:* Number and percentage of soak pits and warehouses/ storerooms inspected and certified by an environmental officer/AIRS	Y1, Y2, Y3	*Data source:* Pre, Mid- and Post-Inspection Reports submitted by environmental officers	By spray campaign	AIRS	6; 100% 3 soak pits 3 ware-houses	8; 100% 5 soak pits 3 ware-houses	16; 100% 8 soak pits 8 ware-houses	10; 62.5% 5 soak pits 5 ware-houses	3: 100% 1 soak pit 2 ware-houses	3: 100% 1 soak pit 2 ware-houses

[12] In Year 1 and Year 2, SEAs were due 30 days prior to the start of spraying and letter reports were to be submitted 14 days prior to the start of spraying. In Year 3, due dates will be agreed upon with PMI-Washington and will be noted in each country-specific MEP to assess indicator 2.2.1.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Dis-aggregated	PMI/AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Result	Target	Result	Target	Result
	environmental compliance officer prior to each spray campaign supported by the AIRS Project] [Denominator: Total number of project soak pits and/or storehouses] Calculation: *[Numerator ÷ Denominator] x 100*		*Reporting frequency:* Each spray season								
2.2.3 Number of government environmental and health officers trained in IRS environmental compliance	Total number of government environmental and health officers trained in IRS environmental compliance using AIRS Project resources	Y1, Y2, Y3	*Data source:* Training reports from environmental compliance officer *Reporting frequency:* Semi-annually	By spray campaign By gender	AIRS	48	42; 10 males, 32 females	45; 9 males, 36 females	24; 15 males, 9 females	10; 8 males, 2 females	7; 7 males
2.2.4 Number of spray personnel trained in environmental compliance and personal safety standards in IRS implementation	Total number of spray personnel who attend a training in environmental compliance and personal safety standards in IRS	Y1, Y2, Y3	*Data source:* Project records – Training reports *Reporting frequency:* Each spray season	By spray campaign By gender	AIRS	1,287	762; 480 males, 282 females	575; 350 males, 225 females	716; 441 males, 275 females	110; 66 males 44 females	187 105 males 82 females 44% of women

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Dis-aggregated	PMI/AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Result	Target	Result	Target	Result
	implementation using AIRS Project resources, includes all staff who received environmental compliance training – spray operators, team leaders, washpersons, storekeepers, etc.										trained
2.2.5 Number of health workers receiving insecticide poisoning case management training	Total number of clinical personnel trained in insecticide poisoning case management using AIRS Project resources	Y2, Y3	*Data source:* Project records – Training reports *Reporting frequency:* Each spray season	By spray campaign By gender	AIRS	45	42; 10 males, 32 females	45; 9 males, 36 females	24; 15 males, 9 females	15; 10 males, 5 females	14; 11 males 3 females
2.2.6 Number of adverse reactions to pesticide exposure documented	Total number of incidents of pesticide exposure reported that resulted in a referral for medical care	Y1, Y2, Y3	*Data source:* Incident report forms that are required for each incidence of pesticide exposure *Reporting frequency:* Each spray season	By spray campaign By residential/ occupational exposure	AIRS	0	0	0	0	0	0
2.2.7. Number of vehicular accidents reported	Total number of vehicular accidents reported	Y1, Y2, Y3	*Data source*: Vehicular incident report forms that are required for	By spray campaign	AIRS	0	0	0	0	0	0

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Dis-aggregated	PMI/AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Result	Target	Result	Target	Result
			each accident *Reporting frequency:* Each spray season								
2.3 Support Entomological Monitoring Activities and Insecticide Resistance Strategies											
2.3.1 Number of sentinel sites supported by the AIRS project	Total number of entomological sentinel sites supported by the AIRS project	Y1, Y2, Y3	*Data source:* Entomological reports *Reporting frequency:* Annually	By spray campaign	AIRS	18	22	23	7	7	6
2.3.2 Number and percentage of entomological monitoring sentinel sites measuring all five primary PMI entomological indicators	*[Numerator:* Number of entomological monitoring sites measuring all five primary PMI entomological indicators] *[Denominator:* Number of entomological monitoring sentinel sites] *Calculation:* [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	*Data source:* Entomological reports *Reporting frequency:* Annually	By spray campaign	AIRS	N.A.	1; 100%	3; 100%	5; 100%	5; 100%	1; 20%

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Dis-aggregated	PMI/AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Result	Target	Result	Target	Result
2.3.3 Number and percentage of entomological monitoring sites measuring at least one secondary PMI indicator	*[Numerator:* Number of entomological monitoring sites measuring at least one secondary PMI indicator] *[Denominator:* Number of entomological monitoring sites] *Calculation:* [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	*Data source:* Entomological reports *Reporting frequency:* Annually	By spray campaign	AIRS	N.A.	N.A.	0; 0%	0; 0%	1; 100%	1; 100%

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Dis-aggregated	PMI/AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Result	Target	Result	Target	Result
2.3.4 Number and percentage of insecticide resistance testing sites that tested at least one insecticide from each of the four classes of insecticides recommended for malaria vector control	*[Numerator:* Number of insecticide resistance testing sites that tested at least one insecticide from each of the four classes of insecticides recommended for malaria vector control] *[Denominator:* Number of insecticide resistance testing sites] *Calculation:* [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	*Data source:* Entomological reports *Reporting frequency:* Annually	By spray campaign By type of insecticide	AIRS	1; 85%	3; 100%	2;[13] 100%	2; 100%	1; 100%	1; 100%
2.3.5 Number of wall bioassays conducted within 2 weeks of spraying to evaluate the quality of IRS	Total number of wall bioassay studies conducted in established sentinel sites to evaluate quality of IRS spraying activities	Y1, Y2, Y3	*Data source:* Entomological reports *Reporting frequency:* Per spray campaign	By spray campaign	PMI	14	13	19	5[14]	5	5
2.3.6 Number of wall bioassays conducted	Total number of wall bioassay studies	Y1, Y2, Y3	*Data source:* Entomological	By spray campaign	PMI	5	14	19	4	5	3

[13] Conducting in Huila and Huambo only in Year 2.
[14] Lack of human resources in entomology, made it impossible to meet the target.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Dis-aggregated	PMI/AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Result	Target	Result	Target	Result
after the completion of spraying at monthly intervals to evaluate insecticide decay	conducted at monthly intervals in established sentinel sites to evaluate the rate of insecticide decay on sprayed surfaces		reports *Reporting frequency:* Per spray campaign								
2.3.7 Number of vector susceptibility tests for different insecticides conducted in selected sentinel sites	Total number of vector susceptibility tests conducted to gauge the effectiveness of individual insecticides proposed for use in spray operations	Y1, Y2, Y3	*Data source:* Entomological reports *Reporting frequency:* Per spray campaign	By spray campaign By type of insecticide	PMI	14	3	2	2	1	1
2.4 Conduct Communications Activities and Community Mobilization											
2.4.1 Number of radio spots and talk shows aired	Total number of radio spots and talk shows aired in target spray districts to stress the safety and benefits of IRS, ensure successful spray coverage, timely vacating of premises and adherence to IRS safety precautions by community members	Y1, Y2, Y3	*Data source:* Project records *Reporting frequency:* Semi-annually	By spray campaign	AIRS	200	185	150	80 55 radio spots; 25 radio shows	20 15 radio spots, 5 radio shows	183 177 radio spots 6 radio shows

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Dis-aggregated	PMI/AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Result	Target	Result	Target	Result
2.4.2 Number of IRS print materials disseminated	Total number of IRS educational materials developed, printed and distributed to community members in target spray districts using AIRS Project resources	Y1, Y2, Y3	*Data source:* Project records *Reporting frequency:* Semi-annually	By spray campaign By Type of printed material and message(s)	AIRS	200,000	188,035	150,000	41,804 400 posters, 6 banners, 38,738 IRS brochures 1,300 T-shirts, 1,000 caps, 360 PMI stickers	23,102 50 Posters 2 Banners 22,000 IRS Brochures 500 T-shirts 500 Caps 50 PMI stickers	15,913 100 Posters 9 Banners 14,813 brochures 370 T-Shirts 122 Polos 100 PMI Stickers 399 caps
2.4.3 Number of people reached with IRS messages via door-to-door mobilization	Total number of adults reached with IRS message during pre-spray community, door-to-door mobilizaiton	Y1, Y2, Y3	Data source: Moblilization Data Collection Forms Reporting frequency: Daily per moblization conducted	By spray campaign By gender	AIRS	148,725	304,651	300,000	221,688 97,954 males, 123,734 females	18,000 7325 males, 10,675 females	18,668 7,089 males 11,570 females

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Dis-aggregated	PMI/AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Result	Target	Result	Target	Result
2.5 Spray Targeted Structures According to Technical Specifications											
2.5.1 Number of structures targeted for spraying	Total number of structures found in targeted spray districts by spray operators	Y1, Y2, Y3	*Data source*: Daily Spray Operator Forms *Reporting frequency:* Daily per spray campaign	By spray campaign	PMI	136,000	145,107	101,000	106,515	20,000	16,506
2.5.2 Number of structures sprayed with IRS	Total number of sprayed structures in targeted districts where spraying was conducted	Y1, Y2, Y3	*Data source:* Daily Spray Operator Forms *Reporting frequency:* Daily per spray campaign	By spray campaign	PMI	115,600	141,782	85,850	98,136	17,000	14,649
2.5.3 Percentage of total structures targeted for spraying that were sprayed with a residual insecticide (Spray Coverage)	[Numerator: Total number of structures sprayed in targeted districts] [Denominator: Total number of structures in targeted areas found by spray operators] Calculation: [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	*Data source*: Daily Spray Operator Forms *Reporting frequency:* Daily per spray campaign	By spray campaign	PMI	85%	97.7%	85%	92.1%	85%	88.7%

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Dis-aggregated	PMI/AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Result	Target	Result	Target	Result
2.5.4 Number of people residing in structures sprayed (Number of people protected by IRS)	Total number of people residing in structures sprayed (Actual numbers are collected during spray operations; population estimates are not used.)	Y1, Y2, Y3	*Data source*: Daily Spray Operator Forms *Reporting frequency:* Daily per spray campaign	By spray campaign By Pregnant women By Children <5 years	PMI	650,000	676,090; 37,049 pregnant women, 115,678 children <5	500,000; 27,399 pregnant women, 85,549 children <5	419,353; 23,459 pregnant women, 74,542 children <5	64,000; 1550 pregnant women, 12,860 children <5	58,370 1,413 pregnant women, 12,531 children <5
Component 3: Provide ongoing monitoring and evaluation and quality control measures											
3.1 Submit Monitoring and Evaluation Plan (MEP) to PMI-Angola	*Milestone:* (Complete/Not Complete)	Y1, Y2, Y3	*Data source*: Project records *Reporting frequency*: Semi-annual		AIRS	Complete	Complete	Complete	Complete	Complete	Complete
3.2 Submit a post-spray data quality audit report to the M&E Specialist in the AIRS Home Office within 60 –180 days of completion of spray operations	*Milestone*: (Complete/Not Complete)	Y1, Y2, Y3	*Data source:* Spray Data Quality Report *Reporting frequency*: Per spray campaign	By spray campaign	AIRS	N.A.	N.A	Complete	Complete d	N.A.	N.A.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Dis-aggregated	PMI/AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Result	Target	Result	Target	Result
3.3 Submit a country-specific Eligible Structure Definition Document to local PMI advisors and NMCP	*Milestone:* (Complete/Not Complete)	Y1	*Data source:* Project records *Reporting frequency:* Semi-annually		AIRS	Complete	Complete	N.A.	N.A.	N.A.	N.A.
3.4 Supply chain review conducted by Imperial Health Sciences (HIS)	Milestone: (Complete/Not Complete)	Y1, Y2	*Data source:* RTT supply chain review reports *Reporting frequency:* Semi-annually	By spray campaign	AIRS	N.A	1	N.A.	N.A.	N.A	N.A
Component 4: **Contribute to global IRS policy-setting and country-level policy development of evidence-based IRS; disseminate experiences and best practices.**											
4.1 Number of guidelines/checklists/tools related to IRS operations developed or refined with project support	Total number of implementation guidelines, process checklists and program tools related to IRS operations developed or refined using the technical and/or financial resources of the AIRS Project	Y1, Y2, Y3	*Data source:* Project records – Activity reports *Reporting frequency:* Semi-annually	By guideline/checklist/tool	AIRS	N.A	21	16[15]	18[16]	19	20

[15] Tools include checklists for environmental compliance (3), mobilization (5), spray operations (3), and logistics (3), and 2 M&E's SOPs.
[16] Tools include checklists for environmental compliance (6), mobilization (3), spray operations (5), logistics (2), and (2) M&E's SOPs.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Dis-aggregated	PMI/AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Result	Target	Result	Target	Result
4.2 Number of articles/best practices documents published	Total number of articles or other best-practice documents that have been published in relevant journals or through PMI/USAID communications vehicles	Y2, Y3	*Data source:* EOSR *Reporting frequency*: Semi-annually	By spray campaign By IRS Technical Area	AIRS	N.A.	0	1	0	2	0
4.3 Number of best practice presentations given at national/ regional/international workshops and conferences	Total number of project-related oral and poster presentations delivered in national, regional and/or international meetings related to IRS.	Y2, Y3	*Data source:* Project records – Activity reports *Reporting frequency:* Semi-annually	By IRS Technical Area	AIRS	N.A.	10[17]	6	9	5	7

[17] Presentations covered topics in entomology (3), environmental compliance (3), and IRS in general (4).

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Dis-aggregated	PMI/AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Result	Target	Result	Target	Result
Component 5 (Cross-cutting): Capacity building, knowledge transfer, gender inclusion.											
5.1 Capacity building (Gender Inclusion)											
5.1.1 Number of people trained in IRS implementation	Total number of personnel trained in IRS implementation using AIRS Project resources. This figure only includes spray personnel such as spray operators, team leaders, supervisors, clinicians.	Y1, Y2, Y3	*Data source:* Project records – Training reports *Reporting frequency*: Semi-annually	By spray campaign By gender Percentage of women trained	PMI	800	691; 435 males, 256 females 37% of women trained	470; 291 males, 179 females 38% of women trained	671; 413 males, 258 females 38.5% of women trained	230; 184 males, 46 females 20% of women trained	187 105 males 82 females 44% of women trained
5.1.2 Number of people trained to deliver or support IRS in target districts	Total number of people trained using AIRS Project resources to implement/support elements of IRS in target districts. This figure includes all cadres that serve a role in IRS.	Y1, Y2, Y3	*Data source*: Project records – Training reports *Reporting frequency*: Semi-annually	By spray campaign By gender By role (e.g., spray operator, storekeeper) Percentage of women trained	AIRS	1,287	1,203; 734 males, 469 females 39% of women trained	810; 486 males 324 females 40% of women trained	870; 537 males, 333 females 38.3% of women trained	316; 253 males, 63 females 20 % of women trained	206 113 Males, 93 Females 45% of women trained

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Dis-aggregated	PMI/AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Result	Target	Result	Target	Result
5.1.3 Number of personnel trained as IRS implementation trainers	Total number of personnel trained in Training of Trainers (ToT) for IRS delivery	Y1, Y2, Y3	*Data source:* Project records – Training reports *Reporting frequency:* Semi-annually	By spray campaign By gender Percentage of women trained	AIRS	225[18]	40; 25 males, 15 females 38% of women trained	25; 15 males, 10 females 39% of women trained	29; 21 males, 8 females 27.6% of women trained	11 8 males 3 females	19; 15 males 4 females 21% women trained
5.1.4 Number of government environmental and/or health officials trained in IRS oversight	Total number of national and sub-national/district government environmental and/or health officials who are trained in oversight of IRS implementation using AIRS Project resources	Y1, Y2, Y3	*Data source:* Project records – Training reports *Reporting frequency*: Semi-annually	By spray campaign By gender Percentage of women trained Type of government official	AIRS	10	42; 10 males, 32 females 76% of women trained Type: Health clinicians	45; 9 males, 36 females 80% of women trained Type: Health clinicians	24; 15 males, 9 females 37.5% of women trained Type: Health clinicians	15; 10 males, 5 females 33% of women trained Type: Health Clinicians	14; 11 Males 3 Females 21% of women trained
5.1.5 AIRS conducted a capacity assessment	AIRS Angola program conducted an assessment of IRS capacity among national and sub-national/district government health officials	Y1, Y2	*Data source:* Project records – Capacity assessment reports *Reporting frequency*: Semi-annually		AIRS	Complete	In process	Complete	Inconclusive	N.A.	N.A.

[18] Year 1 target was misunderstood and not established based on PMI's definition.

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Dis-aggregated	PMI/AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Result	Target	Result	Target	Result
5.1.6 Number of capacity building MOUs signed by AIRS, NMCP and partners/ institutions	Total number of Memoranda of Understanding (MOU) on provision of local capacity building finalized and signed between AIRS, the Malaria and Other Parasitic Diseases Division (MOPPD), and other local partners and institutions	Y1, Y2, Y3	*Data source*: Project records – MOUs *Reporting frequency*: Semi-annually	By spray campaign	AIRS	1	1	1	1	1[19]	1

[19] 2012 MOU applies.