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Indoor Residual Spraying (IRS 2) Task Order Six

GHANA
END OF SPRAY REPORT
2017

SPRAY CAMPAIGN: APRIL 25 – MAY 30, 2017

Recommended Citation: PMI Africa IRS (AIRS) Project, Indoor Residual Spraying (IRS) 2 Task Order Six. July, 2017. *Ghana End of Spray Report 2017.* Bethesda, MD, Abt Associates Inc.

Contract: GHN-I-00-09-00013-00
Task Order: AID-OAA-TO-14-00035

Submitted: July 12, 2107

Approved: August 2, 2017

Submitted to: United States Agency for International Development/PMI

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GHANA
END OF SPRAY REPORT 2017

SPRAY CAMPAIGN: APRIL 25 – MAY 30, 2017

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ACRONYMS

AIRS	Africa Indoor Residual Spraying
BCC	Behavior Change Communication
BMP	Best Management Practices Manual
BYD	Bunkpurugu-Yunyoo District
CBS	Community-based Surveillance
COP	Chief of Party
DCV	Data Collection Verification form
DEHO	District Environmental Health Officer
DHMT	District Health Management Team
DCO	Disease Control Officer
DOC	District Operations Coordinator
DOS	Directly Observed Spraying
DVLA	Driver and Vehicle Licensing Authority
EC	Environmental Compliance
ECO	Environmental Compliance Officer
EE	Error Eliminator form
EMD	East Mamprusi District
EPA	Environmental Protection Agency
FS	Field Supervisor
GHS	Ghana Health Service
GUD	Gushegu District
IEC	Information, Education and Communication
IRS	Indoor Residual Spraying
KAD	Karaga District
KUD	Kumbungu District
M&E	Monitoring and Evaluation
MaVCOC	Malaria Vector Control Oversight Committee
MMD	Mamprugu Moaduri District
MSP	Mobile Soak Pit
NMCP	National Malaria Control Program
NMIMR	Noguchi Memorial Institute for Medical Research
ODK	Open Data Kit
PMI	President's Malaria Initiative
PMT	Performance Monitoring Tool
PPE	Personal Protective Equipment
PSECA	Pre-Season Environmental Compliance Assessment
SEA	Supplemental Environmental Assessment
SOP	Spray Operator
TL	Team Leader
TOT	Training of Trainers
USAID	United States Agency for International Development
WMD	West Mamprusi District

EXECUTIVE SUMMARY

The President's Malaria Initiative (PMI) has been funding indoor residual spraying (IRS) in Ghana since 2008 with the aim of reducing the malaria burden, especially among children under five years and pregnant women.

In August 2011, PMI awarded Abt Associates a three-year Africa IRS (AIRS) project. It was funded through the United States Agency for International Development. In September 2014, PMI awarded Abt Associates a three-year follow-on project, called The PMI AIRS project, to support the implementation of IRS in up to 20 African countries, including Ghana.

Implementation of Ghana's PMI IRS program is built on lessons learned in the country's nine years of spraying. In 2017, AIRS Ghana implemented IRS in seven districts, which include two new districts, as compared with 2016 spray areas. The districts are: Bunkpurugu-Yunyoo (BYD), East Mamprusi (EMD), Kumbungu, KUD), Mamprugu Moaduri (MMD), and West Mamprusi (WMD), as well as Karaga (KAD) and Gushegu (GUD). The addition of Karaga was partly supported through savings realized by the NgenIRS project's subsidy of the purchase of Actellic 300CS. Gushegu was added because of additional resources made available to the project by PMI. The new districts were selected after a detailed analysis of the malaria case burden (based on data from the regional health directorate), their proximity to the other project districts and ease of access, and their IRS acceptance history. The 2017 IRS campaign lasted for 31 working days between April 25 and May 30.

PMI AIRS recruited and trained temporary staff for the spray operations before the start of the campaign. The AIRS Ghana team carried out logistics and environmental compliance assessments to ensure that the standard operating procedures were in compliance with PMI's Best Management Practices Manual. Prior to the campaign's start, the team submitted a letter report that documented notable changes from previous years as well as key environmental compliance aspects of the spray campaign. The project held stakeholder, partner, and community sensitization meetings in order to create the necessary awareness and effective involvement of all participants for successful spray operations.

By the end of IRS operations, AIRS Ghana had found 324,115 structures and sprayed 304,648 of them, for spray coverage of 94 percent (Table ES-1). In so doing, the project protected a total of 840,438 people including 18,431 pregnant women and 152,681 children under the age of five years.

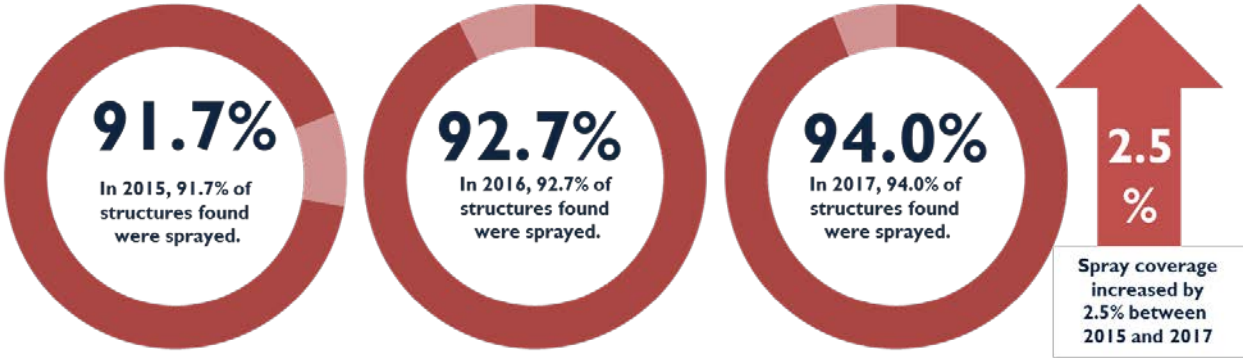
TABLE ES-1. AIRS GHANA AT A GLANCE

Number of districts covered by PMI-supported IRS in 2017	7 districts: Bunkpurugu-Yunyoo, East Mamprusi, Kumbungu, Mamprugu Moaduri, West Mamprusi, Karaga, Gushegu
Insecticide	Organophosphate (Actellic 300 CS)
Number of structures sprayed by PMI-supported IRS in 2017	304,648
Number of structures targeted for 2017 spray (2016 found)	316,587
Number of structures found by spray operators during 2017 PMI-supported IRS spray season	324,115
2017 spray coverage	94.0%
Population protected by PMI-supported IRS in 2017	840,438 (including 18,431 pregnant women and 152,681 children under 5 years old)
Dates of PMI-supported IRS campaign	April 25 to May 30, 2017
Length of campaign	31 days
Number of people trained with U.S. Government funds to deliver IRS*	954

* Based on the PMI indicator definition. This includes only spray personnel such as spray operators, team leaders, supervisors, and clinicians. It excludes data clerks, Information, Education and Communication mobilizers, drivers, washers, porters, pump technicians, and security guards.

The 94 percent coverage represents an increase over the two previous years (Figure ES-1). This was despite two main challenges. One challenge was residents' refusals of IRS in some, mostly suburban, areas. AIRS Ghana worked closely with community leaders (local chiefs, opinion leaders, and assembly men and women) to tackle resistance in low-coverage communities. The project also enhanced collaboration with the regional and district health directorates to address this issue. The second challenge was the rains, which started early; there were three rainy days when the spray teams could not be deployed fully or even partially to the field, which resulted in extending the spray campaign in some areas by one day.

FIGURE ES-1. SPRAY COVERAGE RESULTS, 2015–2017



1. INTRODUCTION

Indoor residual spraying (IRS) is a major component of Ghana's current National Malaria Control Strategy. Ghana's current National Strategic Plan for Malaria Control (2014–2020) aims to protect at least 80 percent of the population at risk by 2020 through a combination of universal coverage of insecticide-treated nets, IRS in areas with high parasite prevalence, larviciding, seasonal malaria chemoprevention, and prevention of malaria in pregnancy. The President's Malaria Initiative (PMI) has been supporting the National Malaria Control Program (NMCP) to achieve the goal of reducing the malaria burden, with IRS as one of the interventions since 2008. Table 1 lists the number of districts PMI supported with IRS and population protected each year for the past ten years.

TABLE 1. NUMBER OF DISTRICTS AND POPULATION PROTECTED 2008–2017

Year	Number of Districts	Population Protected
2008	5	601,000
2009	6	708,103
2010	8	849,620
2011	9	926,699
2012	9	941,240
2013	4	534,060
2014	4	570,572
2015	5	553,954
2016	5	570,871
2017	7	840,438

In 2017, the PMI Africa Indoor Residual Spraying project (AIRS) Ghana team worked in partnership with the Ghana Health Service (GHS) and NMCP to plan and implement IRS operations in the seven targeted districts (Bunkpurugu-Yunyoo, East Mamprusi, Gushegu, Karaga, Kumbungu, Mamprugu Moaduri, and West Mamprusi), all in the Northern Region. A total of 316,587 structures were targeted for spraying, which began on April 25 and ended on May 30 in all seven districts.

By the end of IRS operations, AIRS Ghana had found 324,115 structures and sprayed a total of 304,648 structures for a spray coverage of 94.0 percent. In addition, the project achieved the following specific results during 2017 IRS operations:

- All districts achieved the **85 percent** or more PMI spray coverage target. Also, six out of the seven districts achieved the **90 percent** or more NMCP/ GHS spray coverage target.
- A total population of **840,438** (including 18,431, pregnant women and 152,681 children under five years old) were protected.
- The spray quality was good with **100 percent** mosquito mortality across all seven sites, except one test performed on a wooden door, 1–3 days after spray. Mortality was 100 percent in all sites one month after spray.

- PMI AIRS Ghana through the Noguchi Memorial Institute for Medical Research (NMIMR) provided financial support to the NMCP for entomological monitoring activities with a focus on insecticide resistance mapping and monitoring.
- AIRS Ghana provided the National Malaria Vector Control Oversight Committee (MaVCOC) technical support by sharing entomological data on insecticide resistance and mosquito behavior. AIRS Ghana also funded quarterly meetings of the committee. MAVCOC provides guidance on malaria vector control issues in Ghana. MaVCOC is chaired by and under the purview of the NMCP. Its members represent the GHS, NMCP, NMIMR, and partners (including PMI, AIRS, and Anglo Gold Ashanti Malaria Control Ltd) working on malaria vector control in the country.

2. Pre-Spray Activities

2.1 Insecticide Selection

As in 2016, the members of MaVCOC used findings on susceptibility of the local vectors and residual efficacy to decide on the class of insecticide to use for the IRS campaign. All MaVCOC members agreed that the long-lasting organophosphate Actellic 300 CS is still effective and would be most appropriate for the 2017 campaign.

2.2 Micro-planning

To effectively plan for a successful IRS campaign – as well as strengthen local ownership – the AIRS Ghana team conducted micro-planning meetings just before the spray season started with government stakeholders at the district and community levels, particularly with district health directorates and district assemblies. The purpose of the meetings was to review the operational plan and target for the 2017 operations and to renew stakeholder roles and commitments. The agenda included discussion of following topics:

- Spray campaign length
- Information, Education and Communication (IEC) and behavior change communication (BCC) plans and strategies
- Insecticide selection (particularly with the NMCP)
- International and local procurement
- Performance and target setting
- Monitoring and supervision plan including attachment of GHS staff to 2017 IRS operations
- Recruitment of spray operators (SOPs)
- Official launch of the 2017 spray campaign and commencement date for spray operations
- Partner roles and commitments
- Spray coverage targets and data quality
- Dissemination of weekly reports to stakeholders
- Provision/ maintaining offices and storage facilities for AIRS Ghana district team (especially in Karaga and Gushegu Districts).

2.3 Logistical Needs Assessment

The purpose of the logistical needs assessment was to inventory supplies and materials required for the implementation of a cost-effective and efficient IRS campaign in 2017. The process involved visits to all district operational sites as well as the central warehouse. The project carried out the following activities:

- District-level assessments: AIRS Ghana held meetings with the district health management teams (DHMTs) and officials from the district assemblies to discuss readiness for the campaign and their role in providing facilities that will be used as site offices. Out of the 21 operational sites, 18 are provided by either the DHMT or the District Assembly. These include the five new sites provided by the district assemblies in Karaga and Gushegu. The DHMT in Kumbungu also provided space for

the data center free of charge in 2015 and it is still in use by the AIRS Ghana project. The remaining three operational sites (two in Kumbungu and one in Bunkpurugu-Yunyoo) are being rented by the AIRS Ghana project from private individuals.

- Quantification of IRS commodities: This was based on the number of structures found in 2016 and those targeted for spraying in 2017. The number of structures also included estimated number of structures for Karaga and Gushegu based on 2012 spray data. Quantification of materials was also based on the number of days of spray operations, number of SOPs, and number of other supporting staff to be hired.

The project used results from the assessments and quantification to develop a logistics distribution plan and make decisions about international and local procurements and human resources needs and hiring.

2.4 PROCUREMENT

AIRS Ghana separated the procurement of commodities into international and local procurements to ensure cost effectiveness and timely delivery of commodities. The AIRS Ghana team procured local supplies that included washers' aprons, stationery, and detergents, and produced informational posters. The team completed all local procurements by the end of February 2017. This gave the team about two months of buffer period before the start of spray.

A major component of international procurement was the purchase of Actellic 300 CS. A total of 2,782 bottles of Actellic 300 CS were left over from 2016. Using 316,587 structures as the 2017 spray target, AIRS Ghana calculated that a total of 70,353 bottles of Actellic 300 CS would be required for the 2017 spray campaign. With 2,782 bottles available from 2016, the project needed to procure 67,571 bottles. Because of product packaging of 12 bottles per box, the project procured 5,632 boxes (67,584 bottles). Therefore, the beginning balances of Actellic 300CS for the 2017 campaign was 70,366 bottles.

Other international consignments included Goizper pumps with accessories, nose masks, hard hats, coveralls, boots, and hand gloves. As with the locally procured items, AIRS Ghana took receipt in advance of the campaign, and it distributed both local and international items to various operational sites before 2017 spray operations started. Annex A lists all materials procured and quantities remaining after the spray campaign.

2.5 HUMAN RESOURCE REQUIREMENTS

The district human resource requirements consisted of two groups: 1) full-time staff (AIRS District Operations Coordinators (DOCs), and 2) temporary staff: Monitoring and Evaluation (M&E) Assistants, IEC Assistants, Data Entry Assistants, Logistics Assistants, Site Managers, Field Supervisors (FSs), Team Leaders (TLs), SOPs, Store Assistants, Washers, Water Fetchers, and Security Guards. In addition, AIRS Ghana engaged some GHS officers, community-based surveillance (CBS) volunteers, and individuals who could read and write to carry out house-to-house mobilization activities. The project also engaged Mosquito Collectors and Supervisors to carry out entomological activities for the quality check.

2.6 GENDER INTEGRATION

AIRS Ghana used two main approaches in the recruitment of females to take up various roles on the project: 1) encouraging more women to apply, and 2) hiring high-performing females from previous campaigns who were being mentored for supervisory roles.

The first approach encouraged more women to apply for various positions. This was done through advertisements in local papers, at all operational sites, district health directorates, district assemblies, and in other public places such as churches and mosques. The second approach used high-performing

females who previously worked for the project to make recommendations. These recommended females were then considered for hiring by the project. The project made communities and their leaders aware of the importance of balancing the gender of the spray teams and to encourage women to apply.

With this effort, AIRS Ghana increased female-related indicators in 2017 as shown in Table 2. However, AIRS Ghana has observed a drop in the overall proportion of females in IRS and this may have resulted from a combination of factors. Some females engaged in 2016 did not return in 2017. Some were not available because they used their earnings from the 2016 campaign to further their education. Some got married and were nursing mothers at the time of the spray campaign. Strategies for female inclusion were introduced in the new districts, Gushegu and Karaga. Considering the cultural norms, especially in communities that are largely Muslim, it will take time for these strategies to yield sustainable and significant results.

Since 2015, the project has worked to improve the work environment for females on spray teams. Facilities were refurbished to accommodate the needs of female workers and to ensure their privacy. The project changed coveralls for women from a one-piece to a two-piece one to make it easier to use the bathrooms. Women were also given a bigger pack of sanitary pads, sufficient for two menstrual cycles. These changes improved working conditions and made it easier for females to adhere to compliance procedures.

AIRS Ghana revised the PMI AIRS Anti-Sexual Harassment Guidelines to include graphics and to make the messaging easy to read and to recall. Also, to create a safe work environment free from any form of harassment, the AIRS Ghana project management team frequently sent out gender-related SMS messages to spray team members during the 2017 spray campaign to reinforce the PMI AIRS Anti-sexual Harassment Guidelines posted at each operational site.

The revised PMI AIRS Anti-Sexual Harassment Guideline (center, between two TIP-related posters

TABLE 2. SUMMARY OF FEMALE-RELATED INDICATORS, 2015–2017

Female-related indicators						
	#	%	#	%	#	%
Females trained to deliver IRS*	194	27.8%	210	30.3%	223	23.4%
Females trained to support IRS**	292	18.9%	308	18.5%	358	15.5%
Females hired to support IRS***	306	20.8%	319	21.4%	383	16.8%
Females hired in supervisory roles †	27	15.5%	33	18.9%	39	16.3%
Female SOPs hired	135	30.3%	147	33.3%	142	23.2%
Female TLs hired	20	22.7%	24	27.3%	26	21.5%

*183 SOPs, 26 TLs, 7 FSs, 7 Medical Assistants

** All cadre of temporary female workers trained, including those trained to deliver IRS (Table 4)

***Includes washers who were not trained

† 26 TLs, 7 FSs, 4 IEC Assistants, 0 M&E Assistant, 0 Site Managers, and 2 Logistics Assistants

2.7 TRAINING AND RECRUITING

IRS is a highly technical process and demands rigorous and thorough training of all personnel in order to achieve the intended impact. AIRS Ghana trains district staff annually before spray operations begin. In all, AIRS Ghana organized 10 types of training in preparation for the 2017 spray campaign (Table 3).

2.7.1 REAL-LIFE TRAINING

In 2017, AIRS Ghana introduced a practical "real-life" simulation of spraying into both the TOT and SOP training. The purpose for this was to overcome the challenges of the traditional way of training SOPs. The traditional SOP training is at an outdoor location, usually with a close to perfect flat surface wall without obstacles and that allows smooth body movement with clean swathes.

However, a major limitation of this is that it does not allow SOPs to practice their spraying skills in a setting that closely resembles a real house that they will be spraying. The "real-life" training was introduced to address this challenge. During live-fire field demonstrations, SOPs were taken to a real compound for demonstration of the entire spraying process. Focus was on helping SOPs gain practical understanding of all the theoretical information that they had received. The live-fire training allowed them to practice the following skills: determining the eligibility of the structure, preparing a structure before spraying, and spraying around obstacles, circular wall surfaces, and roofs, among others.

SOPs and TLs seem to like this part of the training as was observed during the question and answer session. AIRS Ghana will continue to implement this as part of SOPs and TLs trainings in the future and allocate more time for this exercise as suggested by SOPs and TLs.

TABLE 3. SUMMARY OF 2017 AIRS GHANA TRAINING

Type of Training	Dates	Length (days)	Location	Brief Description
IEC Training of Trainers (TOT)	25-27/01/17	3	Tamale	IEC and mobilization strategies, including sensitization techniques, structure identification, and household mobilization data collection. Participants were trained to train mobilizers at the district level.
Mobilizer Training	27/02 – 02/03/17	1	All 21 operational sites	AIRS IEC strategy. Participants were to go back to their communities to sensitize and mobilize households prior to the spray campaign.
Logistics and Store Management	15-17/03/17	3	Tamale	Record and stock keeping of all inventories.
Spray Operations TOT	01-05/04/17	5	Walawale	Spraying techniques, compliance, and data capture. Gender training was also part of the TOT for seasonal workers that inclued site managers and FS.
Training for SOPs	09-13/04/17	5	All 7 districts	Spraying techniques, compliance, and data capture.
IRS Database Training	13-15/03/17	3	Tamale	Introduction to and use of the 2017 AIRS database for mobilization and spray data entry. Participants were also trained on the data cleaning system, data storage, and security systems.
Health Worker/ Poison Management	08/03/17	1	Tamale	Managing insecticide poisoning at the health facility.
Fire/ Security Training	05-09/04/16	0.5 day (once every year)	All 5 districts	Handling fire at the operational site and best basic security management practices at the operational site.
Driver Training	22 – 23/04/17	2	Tamale	Defensive driving techniques, safety requirements while driving a vehicle with insecticides.
Entomology Training	18/02/2017	1	Tamale	Methods of mosquito collection, packaging, and shipment.

A Supervisor explains what an eave is and how to spray it

Question-and-answer time during live-fire session in a compound

SOPs practice how to prepare a structure before spraying, deciding which Items to remove from walls, and which items to cover

SOPs practice how to cover and spray around obstacles

Overall, the project trained 2,310 people (1,952 males, 358 females). The yellow-highlighted cells in Table 4 indicate trainees who qualify under the PMI indicator definition "number of people trained with USG [U.S. Government] funds to deliver IRS."[1] In 2017, AIRS Ghana trained 954 people (731 men and 223 women) to deliver IRS under this definition.

[1] These figures include only spray personnel such as SOPs, TLs, Supervisors, and Clinicians. They exclude data clerks, IEC mobilizers, drivers, washers, porters, pump technicians, and security guards.

TABLE 4. NUMBER OF PEOPLE TRAINED

Categories of Persons Trained	Training on IRS Delivery										Other Trainings												Total		
	Training of Trainers: Spray Ops		Spray Operations		Data Entry		Logistics & Store management		IEC Training of Trainers (TOT)		IEC Mobilisers Training		Medical Treatment Intoxication Training		Fire/ Security Training		Driver's Training		Finance Training		Entomology				
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	TOTAL
DOC	3	0																					3	0	3
Disease Control Officers	7	0																					7	0	7
District Environmental health officers	6	0																					6	0	6
Environmental Protection Agency rep.													1	0									1	0	1
Spray operators			502	183																			502	183	685
Team Leaders			97	26																			97	26	123
Data Assistants					15	8																	15	8	23
District M&E Assistants					8	1																	8	1	9
Logistics Assistants							5	2															5	2	7
Store Assistants							7	16															7	16	23
Medical Assistants/ Prescribers													35	7									35	7	42
IEC Assistants									17	4													17	4	21
IEC Implementers, Mobilizers											1010	99											1010	99	1109
Field Supervisors (Spray Ops)	58	7																					58	7	65
Site Managers	22	0																					22	0	22
Drivers																	48	0					48	0	48
Administrative Assistant																							0	0	0
Practical Entomological training																					61	3	61	3	64
Finance Assistants																			5	2			5	2	7
Guards															45	0							45	0	45
TOTAL M/F	**96**	**7**	**599**	**209**	**23**	**9**	**12**	**18**	**17**	**4**	**1010**	**99**	**36**	**7**	**45**	**0**	**48**	**0**	**5**	**2**	**61**	**3**	**1952**	**358**	**2310**
TOTAL/ training	**103**		**808**		**32**		**30**		**21**		**1109**		**43**		**45**		**48**		**7**		**64**		**2,310**		

2.7.2 NUMBER OF PEOPLE HIRED

AIRS Ghana hired a total of 2,277 temporary staff to deliver services during the 2017 IRS campaign. Of these, 383 were females and 1,894 were males, with the percentage of hired females at 16.8 percent.

Temporary staff hired in 2017 included 611 SOPs. The percentage of females hired for the position of SOP decreased by 10 percentage points from 33.3 percent in 2016 to 23.2 percent in 2017. This is the first decrease in this percentage since the implementation of gender efforts in 2015. Despite AIRS Ghana encouraging more females to re-join the project, a good number did not for the variety of reasons described earlier; they include going on for further studies, being pregnant, and nursing babies. AIRS Ghana will continue to follow up with these females and monitor their availability for future campaigns.

In addition to the positions listed in Table 5, AIRS Ghana engaged some CBS volunteers from the various communities for one or two days (depending on the length of spraying in the volunteer's community) to help with announcements in the evening before and on the day of spray. CBS volunteers also took part in stakeholder meetings at the sub-district level, where they learned about IRS and about their mobilization roles.[2]

[2] CBS volunteers did not receive formal IEC training nor were they hired by the project; therefore, they are not captured in Tables 4 and 5.

TABLE 5. NUMBER AND TYPE OF TEMPORARILY HIRED PEOPLE

Category	Bunkpurugu Yunyoo		East Mamprusi		Gushegu		Karaga		Kumbungu		Mamprugu Moaduri		West Mamprusi		Tamale/ Regional		All			
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	Total	% Female
Data Assistants	1	2	0	4	1	2	0	3	3	0	0	2	2	2	0	0	7	15	22	31.8%
Finance Assistants	0	1	1	0	0	1	0	1	0	1	0	1	1	0	0	0	2	5	7	28.6%
IEC Assistants	0	5	2	2	1	2	1	1	0	2	0	2	0	3	0	0	4	17	21	19.0%
Logistics Assistants	0	1	0	1	1	0	0	1	0	1	1	0	0	1	0	0	2	5	7	28.6%
Store Assistants	4	1	1	3	2	1	2	0	2	0	1	1	2	1	1	0	15	7	22	68.2%
Mobilizers	13	221	25	172	16	180	8	144	9	137	2	45	26	111	0	0	99	1,010	1,109	8.9%
Security officers	0	10	0	11	0	6	0	4	0	4	0	4	0	6	0	0	0	45	45	0.0%
Site Managers	0	5	0	4	0	3	0	2	0	2	0	2	0	3	0	0	0	21	21	0.0%
Spray Operators	29	72	50	75	8	78	4	72	15	58	12	25	24	89	0	0	142	469	611	23.2%
Supervisors	0	10	3	10	1	8	0	8	0	7	0	4	3	8	0	0	7	55	62	11.3%
Team Leaders	4	17	6	19	1	16	3	12	3	11	3	4	6	16	0	0	26	95	121	21.5%
Washers	12	0	12	0	7	1	5	0	4	0	4	0	9	1	0	0	53	2	55	96.4%
Water Fetchers	0	1	6	2	0	3	0	3	1	1	0	4	4	1	0	0	11	15	26	42.3%
M&E Coordinators	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	0	0	7	7	0.0%
Packers	6	26	3	13	3	9	0	0	0	0	0	0	0	22	0	0	12	70	82	14.6%
Entomology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	56	3	56	59	5.1%
Total	**69**	**373**	**109**	**317**	**41**	**311**	**23**	**252**	**37**	**225**	**23**	**95**	**77**	**265**	**4**	**56**	**383**	**1,894**	**2,277**	**16.8%**

3. INFORMATION, EDUCATION, AND

The IEC campaign to support the 2017 IRS operations started on February 1, 2017. Communication activities were simultaneously carried out across all 21 operational sites of the project to prepare the communities for spraying. This was done through educating, sensitizing, resolving related issues, and addressing misconceptions that existed in some targeted communities.

In 2017, project behavior change efforts identified and targeted the households with lower spray coverage from the 2016 spray campaign. The households that had some of their structures locked or refused IRS in 2016 spray data were visited and sensitized by IEC Assistants to improve acceptance and spray coverage.

The project employed a variety of community-based strategies using interpersonal and mass media approaches to contribute to a successful spray campaign. The objectives of these community-based strategies were to involve locals in the implementation of IRS and improve their active contribution toward the success of the spraying in their communities.

The mass media approaches included use of video shows on IRS and malaria; radio discussions with call-in segments, and work with district information services departments to conduct mass educational campaigns. Annex B provides a timeline for the IEC activities implemented this year.

3.1 INCREASING COMMUNITY PARTICIPATION

AIRS Ghana intensified the use of strategies aimed at increasing community-level participation in the implementation of IRS. These strategies included: 1) involving communities in deciding how to effectively spray their communities to improve the acceptance of IRS. 2) providing data needed for them to assess the trend of coverage in their communities so that they can identify and reinforce factors responsible for upward trends and find solutions to factors responsible for downward trends, and 3) engaging community members in educating their fellow community members on IRS using their own community-based platforms.

The project targeted and worked with community-level influencers such as chiefs, queen mothers, imams, pastors, community health workers, and other respected individuals from the community. It engaged them in a number of communication activities such as facilitating community meetings, educating their communities, disseminating information on IRS, and participating in media campaigns and video shows. The platforms used included mosques and churches, community radios, child weighing, immunization and antenatal clinics, regular meetings of community groups, and door-to-door campaigns to improve acceptance in difficult households.

During the spraying of some communities, community-level influencers worked as Program Advocates and participated in the mobilization of their communities for spraying. They helped with pre-informing their communities about spray dates, carried out door-to-door visit of households in their communities to ensure that households were sprayed, and helped persuade difficult households to accept spraying. Representatives of chiefs were again integrated with spray teams during the spraying of their communities; they were tasked with observing and monitoring the spraying of their communities and reporting back to their chiefs on the progress of spraying in their communities.

GHS Mobilizers worked alongside spray teams to ensure that all households in their communities were well-prepared for spraying. They reminded households of what to do before, during, and after their rooms had been sprayed and assisted in persuading reluctant households to spray. When spray teams revisited the communities, they helped to identify households that had not been available at the time of spray or that had some sleeping rooms yet to be sprayed.

3.2 Avoiding Locked Structures and Refusals

The number of unsprayed structures declined from a little over 8 percent in 2015 to 6 percent in 2017. Prior to the start of the 2017 spray campaign, AIRS Ghana developed an Open Data Kit (ODK) platform mobile data collection application to help IEC Assistants follow up on households with structures that went unsprayed in 2016, either because the structures were found to be locked or because owners refused IRS. The application was pre-loaded with a list of selected households.[3] IEC Assistants directly followed up with these households to resolve issues that prevented their acceptance of IRS.

The mobile data collection application also contained sensitization messages, tailored to different refusal situations, that IEC Assistants were prompted to use. For locked structures, the IEC Assistants were required to ask how long the structure had been locked, why it was locked, where the owner was, as well as the owner's name and phone number (if the respondent or household was willing to give the number). This was to enable the project to contact the owners to ask for access to the structures. Where owners refused to accept IRS, IEC Assistants were instructed to ask for the reasons for refusal and to deliver messaging to resolve or escalate the issue.

IEC Assistants identified and visited 391 such households. Data from the same households in 2017 and 2016 were compared, and the following observations made:

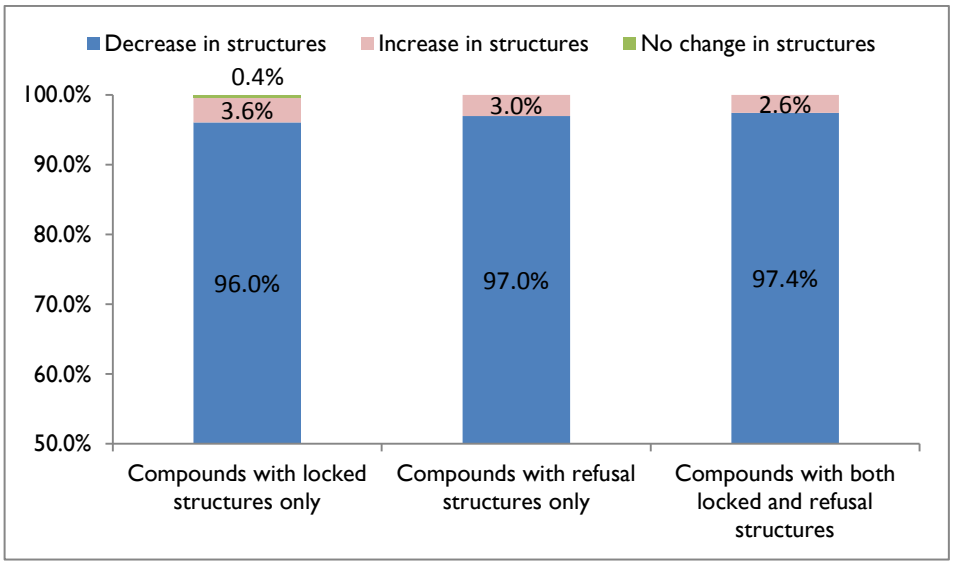
- Of the 391[4] households visited, 99 (25%) were compounds with only refusal cases, and 253 (65%) were compounds with only locked structures. The remaining 39 (10%) were compounds with both locked structures and refusal cases. After the 2017 spray campaign, 377 out of the 391 compounds reported a decrease in the number of unsprayed structures from 2016. Thirteen compounds reported increases in the number of unsprayed structures and one compound reported no change.
- In the eight months after the 2016 spray campaign, 218 (75%) of the 292 compounds with locked structures reported that the locked structures were not locked at the time of follow-up. The remaining 74 (25%) compounds indicated that their structures continued to be locked. Of these 74, 53 (72%) indicated their occupants had traveled, some for farming or for other economic reasons. The remaining 21 compounds indicated that structures were still locked for some other reason, such as it being a food store or there were no persons sleeping in them (ineligible).
- In the 99 refusal-only compounds as well as in the 39 compounds with both locked structures and refusals, IEC Assistants worked to resolve issues causing the refusal of IRS.

Figure 1 illustrates these outcomes. Regardless of outcome, AIRS Ghana will continue to monitor these households to ensure that the positive changes in behavior are reinforced and sustained especially in refusal cases. Monitoring of locked structures and refusal cases newly found (in 2017), especially in the new districts, also will be done to continue the project's success in decreasing the number of unsprayed structures.

[3] AIRS Ghana focused on households with three or more unsprayed structures (locked or refusal). The project did not want to devote a lot of its limited resources following up on all compounds with unsprayed structures, especially since they were dispersed throughout 700 communities.

[4] Considering that the compounds visited had a minimum of three structures that were either locked or refusal cases; this translates into a minimum of 1,173 structures.

FIGURE 1. OUTCOME OF COMPOUNDS MONITORED, 2016 TO 2017



3.3 PRE-SPRAY STAKEHOLDER MEETINGS

The project held pre-spray stakeholder meetings in all sub-districts on March 20–24, 2017, across all seven targeted districts, which included the two newly added districts of Karaga and Gushegu. The purpose of the meetings was to assess the trend of spray coverage, set benchmarks, and devise strategies for improving spray coverage in the sub-districts during the 2017 spray campaign.

AIRS Ghana also held initial re-entry stakeholders meetings in Gushegu and Karaga to formally announce the re-introduction of IRS. Participants identified ways of assisting the project to successfully implement IRS again. Health and traditional leadership and the district assemblies pledged their support for the program. The districts assemblies also provided offices to be used as IRS operational sites.

Participants included community and religious leaders, district directors of health and their team from the DHMT, and district coordinating directors and their team from the district assemblies. Other participants were respected individual community members; mobilizers; and heads of groups such as village savings and loan associations, farmers, traders, beauticians and hairdressers, youth, Ataya (tea-drinking), and the physically challenged.

3.4 2017 SPRAY CAMPAIGN LAUNCH

The project launched the 2017 spray campaign in Karaga district on April 20, 2017. Karaga was chosen for the launch due to the high level of cooperation with the project and its high spray coverage in previous years. An indication of the level of cooperation was evident when the Karaga Chief, despite ill health, attended the launch together with his sub-chiefs. The launch helped to solicit the support of the community leaders, health officials, and local government officials present in ensuring a successful campaign. Other participants included representatives from PMI Ghana (Guest of Honor), USAID Ghana, NMCP, GHS, district assemblies (all targeted districts), DHMTs (all targeted districts), traditional and religious leaders, Ghana Education Service, Ghana Security Services, NGOs, and AIRS Ghana staff, as well as selected community members.

Mr. Zigirumugabe addresses guests at the 2017 IRS launch

A community cultural troupe adds color to the launch

After the ceremony, all dignitaries went to a nearby house to observe the symbolic spraying of the first room, which signified the launch of the 2017 spray campaign. The IEC Assistant for Karaga took the household through the homeowner preparations, and the need to adhere to the safety and compliance messaging. A female SOP educated guests on how to mix the insecticide. She then sprayed the room, and reinforced clean-up messages the household had been given earlier by the IEC Assistant.

3.5 COMMUNITY MEETINGS

Community leaders discuss how to spray their difficult community

Community members in Sakogu meet with the IEC Assistant, Sumera Imran

Community meetings started on February 1, 2017, and continued throughout the spray campaign across all 21 sub-districts. They provided a platform for face-to-face interaction with community members – the community members raised their concerns, and in response AIRS Ghana addressed those concerns, correct misconceptions about the insecticide, and explained the importance and effectiveness of IRS as a malaria control strategy. In Karaga and Gushegu, where IRS had not taken place since 2012, the meetings re-introduced IRS; explained health, safety, and compliance procedures; identified and resolved concerns; and addressed any misconceptions from the 2012 campaign.

Table 6 lists the meetings held in all communities in the 21 sub-districts from February 1–June 17, 2017.

TABLE 6. NUMBER OF COMMUNITY MEETINGS HELD AND NUMBER OF ATTENDEES, FEBRUARY 1-JUNE 17, 2017

District	Bunkpurugu-Yunyoo	East Mamprusi	Kumbungu	Mamprugu Moaduri	West Mamprusi	Karaga	Gushegu	Total
No. of Meetings	152	94	85	45	49	125	266	**816**
Total No. of Attendees	2,274	2,196	1,085	884	454	1,684	2,164	**10,741**

3.6 COMMUNITY EDUCATION

IEC Assistants recruited for each of the 21 operational sites carried out community education events in their designated areas. Some events were carried out in collaboration with the District Information Services Departments. In addition, the GHS allowed the IEC Assistants to present at its community outreach programs and to educate mothers at antenatal clinics and Community Health Improvement Services compounds. These outreach activities enabled communities to understand IRS, how it works as a preventive intervention, the malaria cycle, and how malaria affects susceptible groups.

Community Health Nurses helped to educate community members on the risks posed by malaria, and the current malaria situation in the community or as recorded at their health facilities. There were dramatizations by the community members on the effects of malaria and the need for all community members to work together to ensure the total protection of their communities. These dramatizations were aimed at making the educational sessions interesting, and enabling community members to easily understand and recall the IRS/malaria messages. IEC Assistants facilitated discussions on IRS, its benefits, and evidence of IRS' effectiveness as a malaria intervention.

The targets for the community education sessions were children/students and their teachers in schools; mothers attending GHS antenatal clinics or child weighing/immunization outreach sessions; adult populations usually found in mosque and churches; and heads of households/ adult decision makers at home during door-to-door visits. Table 7 shows the number of community education events carried out in each district.

TABLE 7. NUMBER OF COMMUNITY EDUCATION EVENTS

Activity	BYD	EMD	WMD	KUD	MMD	KAD	GUD	Total
Door-to-door outreach for households with high number of locked structures	189	50	107	108	62	88	175	779
Information van (communities visited)	25	91	0	130	7	42	99	394
Educational outreach (primary schools, junior/ senior high schools, voc/ tech. schools visited)	91	51	23	32	19	30	88	334
Mosque and church outreach	154	113	66	92	73	85	84	667
Health outreach (antenatal clinics, Community Health Planning and Service compounds visited, etc.)	61	65	10	58	10	26	51	281

3.7 RADIO PROGRAMS AND VIDEO SHOWS

AIRS Ghana in 2017 continued to use its multimedia approach, via radio, video, print and other means. Table 8 shows the number of each.

Three kinds of radio programming were used: spots/jingles, discussions with call-in segments, and announcements. All were conducted in the local language. There were two kinds of radio spots. One carried messages about the benefits of IRS and outlined homeowner preparations in clear steps for households to follow. The other radio spot addressed the concerns, myths, and misconceptions frequently raised by community members.

AIRS Ghana staff, district assembly representatives, DHMT representatives, pastors, imams, leaders of youth groups, and chiefs led the interactive radio discussions. The discussions alerted communities to the upcoming spray exercise, and addressed common community concerns and misconceptions. The speakers encouraged the households to leave heavy items in the middle of their rooms and not to pack out everything. Listeners were also educated about malaria, its effects, and how IRS works, its benefits and its effectiveness as a malaria control intervention. There were discussions on achieving the PMI spray coverage target of 85 percent and the NMCP/GHS target of 90 percent, and how each household was responsible for contributing to achieving these targets.

Radio announcements for the communities scheduled to be sprayed were made in the evening prior to spray and early in the morning of the spray day throughout the spray campaign period. The project worked with four different radio stations to cover the spray campaign in all districts.

For the 2017 spray campaign, the project printed 1,000 posters and 7,200 brochures for Karaga and Gushegu districts. The other districts, where spraying had taken place in 2016, had 3,500 posters in stock. The print materials had messaging on the benefits of IRS and homeowner preparations. Mobilizers displayed the posters in public places, and distributed the brochures to the households in Karaga and Gushegu districts.

TABLE 8. IRS RADIO PROGRAMS, VIDEO SHOWS, AND IEC MATERIALS DISTRIBUTED

Activity	Total Number
Radio spots; jingles (before, during, and after spray)	846
Radio programs (interactive shows)	30
Radio annoucements	372
Video shows	33
IRS materials distributed (to public places)*	4,500
Gong gong beating	1,175

* This is the number of IEC materials pasted in public places. It does not include those given to households in the house-to-house mobilization.

The traditional community communication tool, the "gong gong," usually owned by the chief, was used as a local mass communication tool to inform community members about spray dates to communities. It is considered as an important tool as it is often used by the chief to summon the community to undertake an activity or disseminate information.

3.8 HOUSE-TO-HOUSE MOBILIZATION

Before the 2017 spray campaign, AIRS Ghana carried out house-to-house mobilization over 12 days, March 3–14. To ensure effective supervision of this activity, each community was scheduled to begin and end its mobilization in no more than six days within the 12-day period. AIRS Ghana trained and engaged 1,109 Mobilizers from the GHS to conduct the house-to-house mobilization.

Most mobilizers resided in or near the communities they mobilized. Prior to spraying, they were to enumerate households for spraying and deliver IRS messages. Their face-to-face interaction consisted of the following: 1) correcting any misconceptions the households had about IRS, educating the households on their roles and responsibilities before, during, and after the house was sprayed, and asking households that complained about having to remove their belongings from the house during spraying to compare that temporary inconvenience with the longer-term benefits of good health; 2) asking households if they would accept IRS and reporting to the project where refusal was an issue; and 3) informing households that the Mobilizers were the first point of contact should the household have any later issues with the spraying of their rooms.

In addition, Mobilizers collected data on the number of people reached with IRS messages and provided missing households' IRS cards and stickers.

During the spray campaign, Mobilizers ensured that residents were informed in advance about the exact spray dates for their community. On the day of spray, they helped to ensure that each household was ready for spraying; in some cases, they helped households pack out their belongings. Table 9 shows results of house-to-house mobilization.

TABLE 9. HOUSE-TO-HOUSE MOBILIZATION RESULTS

District	No. Households Visited	No. Households Sensitized	No. Adults Reached with IRS Messages			No. IEC/BCC Materials Distributed to Households
			Males	Female	Total	
Bunkpurugu-Yunyoo	15,061	15,061	18,497	22,902	41,399	1,036
East Mamprusi	16,358	16,352	22,465	28,452	50,917	980
Kumbungu	8,310	8,301	16,243	20,337	36,580	515
Mamprugu Moaduri	4,321	4,321	7,182	8,359	15,541	256
West Mamprusi	12,510	12,498	20,340	24,847	45,187	713
Karaga	8,438	8,438	12,541	16,266	28,807	500
Gushegu	11,418	11,418	18,405	22,198	40,603	500
Total	**76,416**	**76,389**	**115,673**	**143,361**	**259,034**	**4,500**

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

3.9 COLLABORATION WITH SEND GHANA

The USAID-funded advocacy organization Social Enterprise Development Foundation of West Africa-Ghana (SEND Ghana) works in East Mamprusi and Gushegu districts. It collaborated with AIRS Ghana to educate district citizens' monitoring committees in these districts. The 15-member committees are composed of representatives of various community groups such as traditional leaders, the DHMT, the

district assembly, the Water, Sanitation and Hygiene Committee, and heads of youth, women's, and other groups.

AIRS Ghana introduced the committees to IRS, how it works, and its benefits through training on homeowner preparation, and health, safety, and compliance procedures. The committees in turn trained the groups they represent.

3.10 Monitoring of IEC Activities

AIRS Ghana continued to use its two mobile phone-based supervisory tools developed in 2016 to monitor IEC activities: the Monitoring and Reporting Form, and the Mobilization Supervision Form. The purpose of using mobile tools was to quickly get reports from the field and, when needed, to immediately feedback corrective actions. A paper-based form for monitoring the activities of Mobilizers during the spraying of their communities was also used.

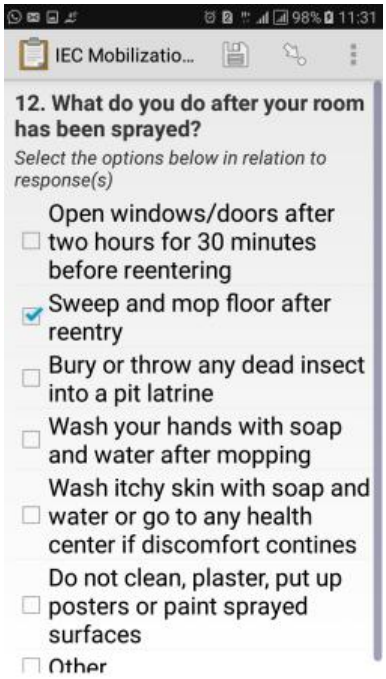
3.10.1 Mobilization Supervision Form

IEC Assistants used the Mobilization Supervision ODK form to supervise Mobilizers during the house-to-house mobilization. The form ensures that Mobilizers were correctly sensitizing households and collecting accurate data. The project revised the form in 2017 to include the verification of data the Mobilizers recorded on the house-to-house mobilization (MO1) forms. This is done by matching records on the MO1 form against the information in the IRS card and sticker. IEC Assistants, DOCs, and regional AIRS staff supervising the house-to-house mobilization used the mobilization supervision form. In the two-week house-to-house mobilization period, supervisors observed mobilization in a total of 2,161 compounds.

During the house-to-house visits, Mobilizers confirmed that 99.9 percent of the households had an IRS card and IRS sticker. In 99.4 percent of compounds, the card and sticker had the same serial number. Where the serial numbers were different, both the card and sticker were replaced with matching ones. In 98.8 percent of compounds, household details were correctly and accurately captured.

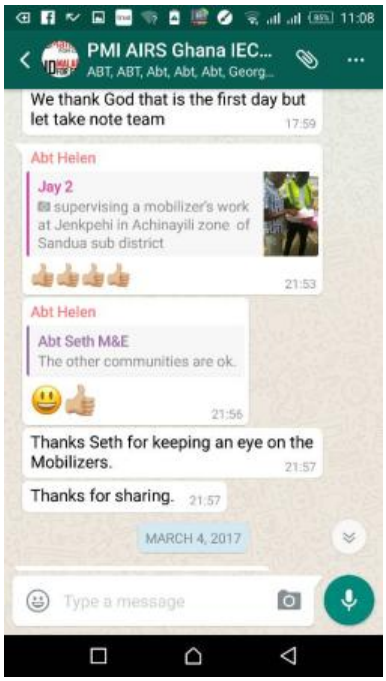
All households were able to mention at least one benefit of IRS; 92.0 percent was able to mention three or more benefits; 98.5 percent knew how to prepare their homes for spraying and what to do after spraying; 93.7 percent understood that the Mobilizer was the first point of contact for household who wanted to get in touch with the project. This is a marked improvement from 2016's 80 percent of households. Finally, 85 percent of households knew that the intervention was sponsored by the American people. (The funding source for the project was mentioned frequently in all radio spots and discussions, and during community education events.)

All supervisors communicated in real time through a WhatsApp digital application to share images of challenges encountered during the supervision. This helped other supervisors to look out for and ensure that such issues were not happening or were being corrected in the communities they supervised.



The IEC Mobilization Supervision Form used in the supervision

Regional staff involved in the supervision of house-to-house mobilization



Sharing ideas / challenges to ensure Mobilizers report accurate data to the project

One challenge identified by supervisors was the low household knowledge/ understanding of how to preserve their sprayed walls after spraying is done. This finding led to the reinforcement of IRS messaging on maintaining the sprayed wall. IEC Assistants and Mobilizers educated and encouraged community members to do their part to ensure the effectiveness of the spray by not hanging clothes, painting, and putting up posters and curtains on sprayed walls. Post-spray wall maintenance messages were reinforced using the radio, information vans, community meetings, and community education events.

3.10.2 Monitoring Mobilization during Spraying

During spraying, district officials and community leaders participated with the project staff in monitoring mobilization. District-level Disease Control Officers (DCOs) and District Environmental Health Officers (DEHOs) supervised the mobilization efforts and ensured the communities had been informed about household preparations, and safety and compliance activities to be performed before, during, and after spray.

Also during spraying, IEC Assistants, TLs, and FSs used an attendance sheet to monitor the mobilization activities of Mobilizers. Community members also served as back-up checks to verify that Mobilizers had sensitized and mobilized their communities.

3.10.3 Monitoring and Reporting Forms for IEC Activities

IEC Assistants conducted various communication activities during the pre-spray period. These activities were monitored using the Monitoring and Reporting Form. IEC Assistants had to fill the form on a mobile phone and take the GPS coordinates at the locations where they conducted each activity. This enabled the project to know what and where activities were being conducted at any time. It also helped to provide immediate feedback on challenges reported or draw the attention of IEC Assistants to messaging they were giving less attention.

IEC Assistants reported a total of 253 activities. Table 10 shows the number of pre-spray activities reported together with the objectives for which those activities were carried out. The work done on creating awareness of the malaria risk is evident from the number of activities addressing particular objectives. More has to be done in homeowner preparation in the future. This mobile application, after its successful pilot, will replace a paper-based form IEC Assistants have been using.

TABLE 10. OBJECTIVES TARGETED AND ACTIVITIES* REPORTED

Objective	Number of Activities Reported Targeting the Objective
Create awareness on the risk posed by malaria	190
Create awareness of benefits of IRS	187
Engage community leadership	166
Educate on communal responsibility for IRS effectiveness	170
Resolve IRS-related issues	166
Homeowner preparations, health, safety and compliance	159

*Total of 253 activities where one activity can have multiple objectives and one activity is repeated in different places and at different times. Activities include educational meetings at schools, churches, mosques, health centers, and communities.

Generally, the use of smartphones for monitoring the implementation of IEC strategies made it easier to know which strategies and messages were being used more often than others and to address many issues that arose.

4. IMPLEMENTATION OF IRS ACTIVITIES

4.1 SPRAY CAMPAIGN

Following the IRS launch in Karaga District, spray operations began on April 25 simultaneously in all 21 operational sites in all seven target districts, and concluded on May 30 (31 operational days). Spraying was done from Monday to Saturday based on spray calendars that AIRS Ghana DOCs developed for each community in consultation with district-level stakeholders. The project shared finalized spray calendars with community Mobilizers to use in community preparations prior to spray team visits.

Each spray day started at the operational site at about 6AM. Spray teams gathered at the operational site and had their breakfast before donning their personal protective equipment (PPE). The Site Manager assigned spray teams to the various communities that would be sprayed and also assigned vehicles for transportation. TLs filled out health check forms for each SOP on their team to make sure she/he was healthy and fit for the day's work. SOPs would fetch leftover insecticides from barrels 1, 3, and 5 out of 7 as required by the BMPs, then proceed to the field.

In the field, TLs and FSs supervised the distribution of SOPs to various compounds for spraying to be done. In doing so, TLs conducted Directly Observed Spraying (DOS) and FSs reviewed homeowner preparation and SOP performance to ensure that all best practices for spray quality and environmental compliance were followed. SOPs collected spray data using the SOP Daily Data Collection form.

At the close of the day, TLs and FSs verified data collected by SOPs for errors and made any needed corrections TLs summarized all SOP data and submitted them to the Site Managers. Site Managers used the summarized data to complete the Performance Tracking Sheet displayed on a wall in each site. They also ensured that all spray cards for their site reached the data center on the same day as spraying for data entry to begin.

Intermittent rain interrupted spraying for at least two days across all 21 operational sites. Nineteen operational sites made up for the lost time by working on a Sunday within the spray campaign period; they concluded their spraying on May 29. However, two sites: Kumbungu site (Kumbungu district) and Zanteli site (Gushegu district) extended the spray campaign by one day, to May 30, to make up for the lost days.

By the end of the spray campaign, SOPs found 324,115 structures[5] and sprayed 304,648 of them for an overall spray coverage of 94.0 percent. Detailed spray data are provided in Section 8.6.

4.2 SUPERVISION OF IRS

IRS is a highly technical process that demands thorough supervision and monitoring in order to achieve the intended impact. AIRS Ghana ensured that there was adequate supervision and monitoring at all levels throughout the spray campaign. The Chief of Party (COP), Operations Manager, M&E Manager, Database Manager, IEC Coordinator, and Environmental Compliance Officer (ECO) formed one supervision team guiding districts/sites on all technical aspects of IRS. The district-level supervision teams comprised the

[5] This figure includes estimates for the number of structures found/not sprayed in compounds not accessed. Every compound in a community that is not accessed is assigned a number of structures equivalent to the average number of structures per compound in that community based on the 2014 (2012 for Karaga and Gushegu district) spray data.

DOC, the District M&E Assistant, and the District Logistics Assistant. At the operational site level, the supervisory team comprised the Site Manager, FSs, and TLs.

AIRS Ghana developed a monitoring and supervision schedule for all supervisors for the 2017 spray campaign. All supervisors used standard AIRS supervision and monitoring tools to assess the spray quality, environmental compliance, and spray data collection. The tools are described in Table 11.

TABLE 11. SPRAY CAMPAIGN SUPERVISORY TOOLS

Supervisory Tool	Purpose and Person Responsible
Spray Operator Morning Mobilization and Vehicles Inspections	*Purpose*: To ensure spray teams leave for the day with the correctly accounted for PPE, equipment, insecticide, and supplies, and are safely transported to the spray site. *Person responsible for completing this checklist*: Site Manager, FS, ECO, DOC
End-of-Day Cleanup	*Purpose*: To ensure spray teams correctly follow environmental compliance procedures for cleaning equipment, account for insecticide stocks, and store equipment for the next day. *Person responsible for completing this checklist*: Site Manager, ECO, visiting HQ staff, and DOCs (when visiting an operational site)
Homeowner Preparations and Spray Operator Performance	*Purpose*: To ensure that SOPs spray houses (structures) that have been correctly prepared for spraying (inside and out) and use correct spray and insecticide handling techniques. *Person responsible for completing this checklist*: FSs, IEC/ Coordinator, ECO, Operations Manager, and DOCs (when visiting the field for supervision)
Storekeeper Performance	*Purpose*: To ensure that Site Storekeepers are following best warehousing practices and accounting for stocks and equipment. *Person responsible for completing this checklist*: Site Manager, DOC, District Logistics Assistant, Logistics Coordinator, Operations Manager, COP, visiting HQ staff
Directly Observed Spraying	*Purpose*: To ensure proper application of insecticides by correctly aplying the spray techniques. *Person responsible for completing this checklist*: TLs

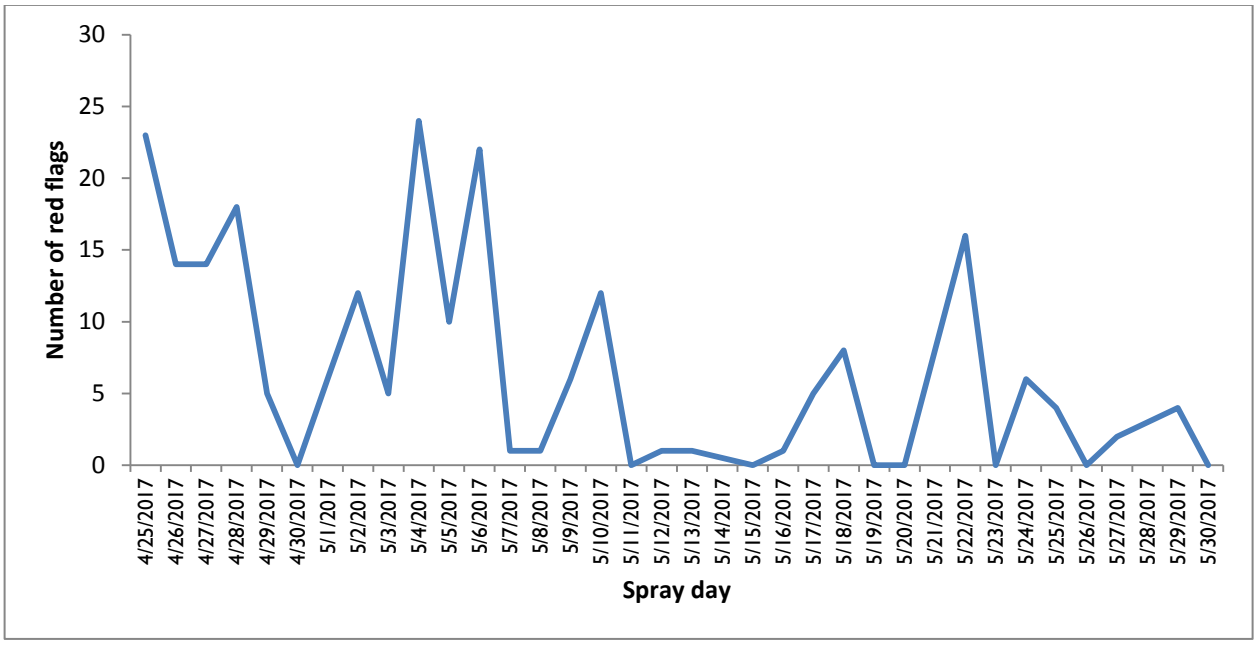
4.2.1 DIRECTLY OBSERVED SPRAYING

TL conducts directly observed spray (DOS) supervision

In 2017, AIRS Ghana continued the use the DOS form introduced in 2016. Its use was extended to include FS. TLs had a target to perform five DOS and FS had a target of two DOS per day in addition to filling out other supervisory tools. All TLs and FSs received training on how to use the DOS form during the TL and SOP training and at the TOT (for FS). Data Entry Assistants entered data captured on the DOS form into the DOS database that AIRS Ghana designed in 2016.

In total, TLs and FSs conducted a total of 16,826 DOS inspections over the 31-day spray campaign period. Of these, 16,672 (99.0 percent) inspections did not raise any red flags. The remaining 154 (1 percent) inspections raised 221 red flags. The TLs and FSs addressed these red flags on the spot. Figure 2 shows the day-to-day occurrence of red flag incidents during the spray campaign. Although there were few spikes at any time, the number of red flags in the second half of the campaign was lower than in the first half. Issues observed during DOS inspections were discussed every day at morning assemblies.

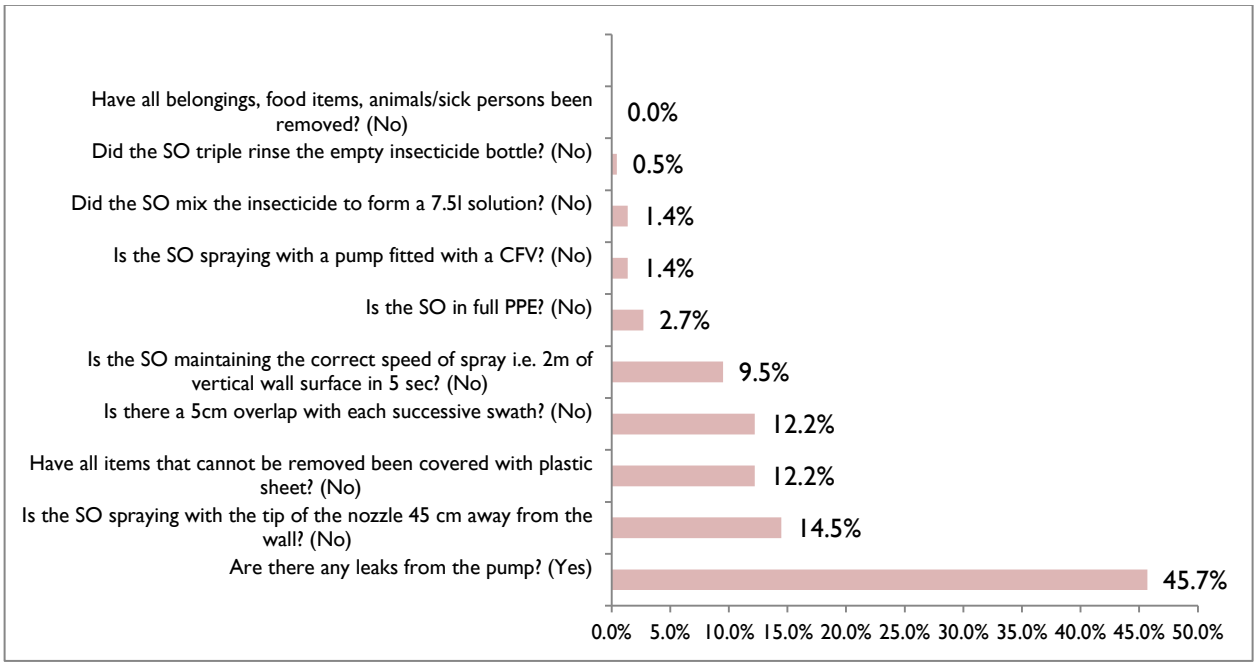
FIGURE 2. NUMBER OF RED FLAGS OBSERVED EACH SPRAY DAY



Further analysis showed that a little over 45 percent of the 221 red flag incidents were due to some form of air leakages from the spray pumps. The leakages were not the type that lead to spillage of insecticides but rather were leakages of air through some part of the spray pumps, especially from around where the nose connector is attached to the spray pump for Hudson pumps. Some Goizper pumps also leaked air from around the neck of the plunger. The air leak meant only that the pumps lost pressure faster than usual and SOPs had to pressurize them frequently. Nevertheless, the pumps were repaired or replaced as soon as the problem was brought to the attention of a supervisor. Error in data recording by the TLs is also possible as the response to the leakage question is different from the nine other questions in the list. In a few instances (2.7%), SOPs were not in full PPE during mixing of insecticide. Figure 3 shows the distribution of red flags about other issues.

One of the major challenges the project faced during the implementation of DOS is that some TLs were observed not to be recording their DOS findings immediately after the observation was made. Instead, they waited until the end of the day to record the findings. The reason TLs provided was that they do that when there was no error/red flag to record. This issue was discussed and proper procedures – that the SOP must fill out the DOS form as soon as the incident is observed, and not at the end of the day – clarified daily at morning assemblies. Also, AIRS Ghana used the SMS platform to send out reminders to all TLs.

FIGURE 3. DISTRIBUTION OF RED FLAGS BY QUESTIONS ASKED



4.3 Data Reporting

SOPs collected data using the daily SOP data collection form. TLs checked and verified the data cards. FSs, District M&E Assistants, and Data Entry Assistants completed further checks before the data were entered daily into the AIRS spray database. AIRS Ghana shared weekly IRS progress reports with the project home office and PMI, and also with the GHS (regional and district officials), district assemblies, and NMCP.

4.4 Logistics and Stock Management

In line with operational standards, AIRS Ghana trained and hired seven District Logistics Assistants and 22 Store Assistants to manage central, district, and operational site warehouses. They maintained and updated records including stock cards and ledger books for each item with details of transactions, quantities involved, dates, and destination. Supervisors (COP, Operations Manager, Logistics Coordinator, ECO, DOCs, and Site Managers) regularly checked records and conducted physical stock counts, mainly insecticides, to ensure that the actual stock corresponded with records on stock cards and in ledger book.

District Logistics Assistants completed weekly inventory updates for each operational site in their districts. The project used these updates as a basis to approve requests for IRS materials and to reconcile central warehouse stock in Tamale. To ensure that goods were tracked, signed copies of requests and delivery notes accompanied each logistical transaction.

Operational site Store Assistants used insecticide tracking sheets to record the quantities of Actellic 300CS bottles each TL received every day. At the close of each spray day, the Store Assistants recorded the number of full and empty bottles returned from the field on the same tracking sheet, and transferred the data unto the stock cards for reconciliation. The Logistics team also worked closely with the M&E

team to ensure that quantities of used insecticides on stock cards corresponded with what was reported in the AIRS database.

Of the 70,366 bottles of Actellic 300 CS available for the 2017 spray campaign, 70,199 bottles were distributed to the districts and 65,895 bottles were used; 167 bottles stayed at the central store.

4.5 Mobile Data Collection, Messaging, and Reporting

The use of mobile phones for data collection and reporting has become an integral part of many current development projects. In 2017, AIRS Ghana used mobile phone data collection technologies, messaging, and reporting applications based on Textit, CommCare, and ODK platforms.

4.5.1 mHealth: Job Aid Messaging

AIRS Ghana continued to use the SMS-based job aid system that was introduced in 2015. The job aid was primarily used to remind spray teams and supervisors of standard operating protocols and key environmental compliance issues. It was also used to reinforce the need to create a work environment that is void of discrimination against individuals based on their gender, religion, or ethnicity. In 2017, messages on human trafficking were added to the set of messages sent to spray teams. Through the SMS job aid system, AIRS Ghana sent out customized notices and information to different categories of spray team members grouped by their role on IRS and other criteria (e.g., TLs, SOPs, males, females, etc.). Table 12 provides examples of the job aid messages, including gender awareness and human trafficking messages that were sent to spray teams during the campaign. Spray team members received the messages on their personal phones. Over the course of the campaign, AIRS Ghana modified the messages based on the issues reported through the digitized supervisory forms and observations from the field. An example of such modified message was a reminder that AIRS Ghana sent to TLs to fill out the DOS form as soon as the observation is done, and not at the end of the day.

TABLE 12. SAMPLE OF 2017 SPRAY CAMPAIGN JOB AID MESSAGES

Message	Group Sent To	Time Sent
When you enter a structure to spray, ALWAYS close the door and spray behind the door.	SOPs	before 7 a.m.
Please remember to use your FULL PPE when mixing insecticide, during spraying and during end of day clean-up.	SOPs, TLs	before 7 a.m.
Team Leaders, please fill the DOS form in the compound where the observation is done, not at the site office or at the end of the day.	TLs	before 7:30 a.m.
Please remember to supervise end of day clean-up in the soakpit today.	Supervisors	After noon
No one should be harassed for their ethnic or tribal status, religion, age, national origin, disability, race, sex, marital status, or sexual or gender orientation	SOPs, TLs, Supervisors	before 7 a.m
People tafficked are not allowed to socialize, contact their family or friends. Do you know anyone like that? Report it to your DOC!	SOPs, TLs, Supervisors	before 7 a.m.

AIRS Ghana monitored the receipts of job aid messages through interactions with spray team members during field supervision. On average, of the 1,464 messages sent daily, about 1,412 (96.4 percent) arrived at the expected time. The remaining 52 were either not delivered at all or did not arrive at the expected

time because of an error in the telephone numbers, numbers provided were no longer in use, and poor network connectivity.

AIRS Ghana did discontinue one mHealth initiative: data from the PMT were no longer sent via SMS for daily reporting for the following reasons. As observed in 2016, Data Entry Assistants were able to enter spray data from the field into the AIRS database (by both "Totals" and "Details") within 24 hours. This enabled AIRS Ghana to generate the same report that the PMT SMS generated. In addition, the AIRS database provided more accurate data on spray coverage and progress than the SMS, because the database caters to revisits and the SMS does not. Also, database data are thoroughly cleaned, unlike PMT SMS data. The PMT SMS data were more likely to overestimate the number of structures found and underestimate spray coverage due to numerous revisits as the spray campaign progressed. Therefore, to avoid duplication of effort and use more accurate data, AIRS Ghana decided to use the AIRS database data for reporting of daily progress. It did continue to use the paper-based Performance Tracking Sheet at operational sites for monitoring performance and displaying results at the site level.

As in 2015 and 2016, AIRS Ghana also continued the use of the *WhatsApp* application to communicate with DOCs and Site Managers, especially when immediate action was required.

4.5.2 Field Supervision Reporting Using Phone-based Supervisory Checklists

AIRS Ghana continued the use of the smartphone version of the AIRS country-wide standardized supervisory checklists. Environmental compliance checklists (the Pre-season Storeroom and Soak Pit Assessment tool, Pre-contract Transport Inspection tool, and Post-IRS Environmental Compliance Inspection tool, used mainly by the AIRS Ghana ECO) were maintained on the ODK platform. The other supervisory checklists (see Table 11 in Section 4.2) and Data Collection Verification (DCV) forms were maintained on Dimagi's CommCare platform.

The use of the smartphone version of these supervisory tools enabled quick feedback when compliance reports coming from the field needed immediate corrective actions. All supervisory tools were programmed on Android-based smartphones and used before, during, and after the spray campaign. FSs used them to conduct SOP performance and homeowner preparation checks. Site Managers used them to supervise daily morning mobilization, storekeepers' performance, and end-of-day clean-up inspection. The ECO used the system for the pre-season environmental compliance assessment (PSECA), vehicle inspection, and post-spray site inspection and certification. The AIRS technical team used the CommCare-based system to supervise all aspects of the spray operation. As soon as data were submitted to a cloud server, an email was generated and sent to a set of recipients, including the COP, Operations Manager, ECO, and home office team. Immediate follow-up was done on any issues that were reported through the emails.

IT and M&E teams quickly resolved technology issues identified. The Dimagi representative responsible to the AIRS Ghana team also followed up with the team frequently throughout the campaign. A common complaint was the conflict of user passwords due to sharing of phones among some FSs; the issue was resolved expeditiously. However, the use the smartphone for the supervision checklist was not easy for some supervisors; misunderstanding and recording errors were observed. In doing verification, some red flags reported by the system were found to be errors in recording.

4.6 Nozzle Tip Test

One of the factors that can affect correct dosing is the amount of discharge from the nozzle tip. For correct dosing, the nozzle tips of pumps fitted with control flow valve have to discharge 570ml per minute at a standard tank pressure of 45 psi (or 315 kPa). To ensure that all spray pumps were discharging at the

right rate, AIRS Ghana introduced weekly nozzle tip testing during the 2016 spray campaign. These tests were repeated in 2017. On Sundays, Site Managers and FSs calibrated all nozzle tips to ensure that the nozzle tips were discharging the correct amount of insecticides. The tests consisted discharging the content (water) of a spray pump into a measuring cylinder for one minute. The normal discharge range of a nozzle tip with control flow valve was 570ml +/- 10% (Range: 513ml – 627ml). If the total volume of discharge after one minute was less, the nozzle tip was cleaned and retested. If the results still indicated that the discharge per minute was low, then the nozzle tip was replaced but kept in water and detergent for further cleaning and possible future use. If the discharge was above the upper limit, the nozzle tip was discarded and replaced.

The project deployed about 700 nozzle tips to the various operational sites for use in the 2017 spray campaign. Ninety-six nozzle tips were replaced after undergoing the nozzle tip test, 72 of them for over-discharging and the remaining 24 for under-discharging. (As just described, the 24 were kept for cleaning.) AIRS Ghana will continue to conduct the nozzle tip test in the future to ensure that all spray pumps and nozzle tips are discharging the right amount of insecticides for an effective IRS.

5. POST-SPRAY ACTIVITIES

5.1 POST-SPRAY MEETINGS

AIRS Ghana held the post-spray stakeholders meetings in all seven target districts on June 19–24, 2017, after the spray campaign ended. The purpose of the meetings was to discuss spray coverage for the sub-districts for the year, examine the trend of coverage over the years, review decisions and strategies decided on during the pre-spray meetings to improve spray coverage, and then to find out what worked and what did not. The participants also discussed challenges encountered during the spray campaign, lessons learned, and best practices to adopt in preparation for the next spray campaign. The meeting was also an opportunity for the project to show appreciation to all stakeholders for their support and single out exemplary communities for other communities to emulate. In all of these meetings, it was very clear that stakeholders appreciated PMI's assistance for the various malaria control interventions and for continuous implementation of the project.

The level of participation and commitment by influential persons in the spray campaign was commended.

The project will hold a national post-spray evaluation meeting in Tamale at a date to be determined with the NMCP. Participants will include the NMCP, the Overlord of the Mamprugu Traditional Area, the Paramount Chief of the Kumbungu Traditional Area, AngloGold Ashanti, regional health directorate, regional coordinating council, district health directorates and district assemblies in target districts, and the representatives from Ghana's Environmental Protection Agency (EPA). The objectives of this national meeting will be to:

- Present the performance of 2017 spray operations to stakeholders and review the trend of spray coverage;
- Share best practices and challenges from the 2017 IRS campaign; and
- Secure the commitment of community leaders for the next round of spray.

5.2 DEMOBILIZATION

After the 2017 spray campaign, AIRS Ghana moved all logistical items from the various operational sites to either the district stores or the central warehouse in Tamale within two weeks of the end of operations.

The team cleaned all rinsing barrels at all operational sites. The project organized transportation of all waste items (used nose masks, hand gloves, and empty Actellic 300 CS bottles) to the main district stores to await proper and final waste disposal. Of the 70,366 bottles of Actellic 300 CS available for the 2017 spray campaign, 70,199 bottles were distributed to the districts and 65,895 bottles were used. The final inventory including 167 bottles that stayed at the central warehouse showed that 4,471 bottles of Actellic were left over at the end of the 2017 campaign. All the remaining stock has a manufacturing date of January 2017; with two years of shelf life, the stock expires in January 2019.

Other post-spray activities are captured in chapters 6, Entomology, and 7, Environmental Compliance.

6. ENTOMOLOGY

The project conducted a spray quality assessment to test the quality of work by different spray teams from randomly selected operational sites in each targeted district, within the first week of the IRS campaign. Follow-up cone bioassays were conducted on each main type of sprayed surfaces, mud and cement walls and wood from the doors and windows, one month post-spraying. Table 13 shows a summary of the results for these bioassays conducted April 26–June 9, 2017.

TABLE 13. SUMMARY OF WALL BIOASSAY RESULTS FOR QUALITY CHECK 1–3 DAYS AND ONE MONTH POST-SPRAY

Community	Colony	24-hour Mortality Rate %(n)					
		Cement surfaces		Mud surfaces		Wooden Doors/Windows	
		To	T1	To	T1	To	T1
Bunbuna (BYD)	Kisumu	100% (60)	100% (60)	100% (60)	100% (60)	100% (40)	100% (40)
	Wild	100% (60)	100% (60)	100% (60)	100% (60)	100% (40)	100% (40)
Kpemale (BYD)	Kisumu	100% (60)	100% (60)	100% (60)	100% (60)	100% (40)	100% (40)
	Wild	100% (60)	100% (60)	100% (60)	100% (60)	100% (40)	100% (40)
Dabari (EMD)	Kisumu	100% (60)	100% (60)	100% (60)	100% (60)	100% (40)	100% (40)
	Wild	100% (60)	100% (60)	100% (60)	100% (60)	100% (40)	100% (40)
Timtishe (GUD)	Kisumu	100% (60)	100% (60)	100% (60)	100% (60)	100% (40)	100% (40)
	Wild	100% (55) †	100% (60)	100% (60)	100% (60)	100% (40)	100% (40)
Bilsinaa yili (KAD)	Kisumu	100% (60)	100% (60)	100% (60)	100% (60)	100% (40)	100% (40)
	Wild	100% (60)	100% (60)	100% (60)	100% (60)	100% (40)	100% (38)†
Cheyohi (KD)	Kisumu	100% (60)	100% (60)	100% (60)	100% (60)	100% (40)	100% (40)
	Wild	100% (60)	100% (59) †	100% (60)	100% (60)	100% (40)	100% (40)
Gbullung(KD)	Kisumu	100% (60)	100% (60)	100% (60)	100% (60)	100% (40)	100% (40)
	Wild	100% (60)	100% (60)	100% (60)	100% (60)	100% (40)	100% (40)
Gupanarigu(KD)	Kisumu	100% (60)	100% (60)	100% (60)	100% (60)	100% (40)	100% (40)
	Wild	100% (60)	100% (60)	100% (60)	100% (60)	100% (40)	100% (40)
Kuba (MMD)	Kisumu	100% (60)	100% (60)	100% (60)	100% (60)	100% (40)	100% (40)
	Wild	100% (60)	100% (60)	100% (60)	100% (60)	100% (40)	100% (40)
Kariminga (WMD)	Kisumu	100% (60)	100% (60)	100% (60)	100% (60)	93% (40)	100% (40)

† Some mosquitoes were crushed or escaped during transfer into holding cups.

7. Environmental Compliance

7.1 Pre-Season Assessment

Effective implementation of IRS requires the establishment of strong environmental compliance protocols. This is needed to ensure safety of humans and proper handling and management of waste. The 2017 IRS campaign was carried out under the Supplemental Environmental Assessment (SEA) (2015–2020) that was approved by PMI for Ghana in 2015. Based on this approval, only a letter report was required prior to the start of the 2017 spray campaign. As a result, AIRS Ghana submitted a letter report to PMI on February 27, 2017.

In addition to the submission of the letter report, the following activities were conducted as part of preparations to make the 2017 IRS campaign fully compliant with standard environmental compliance protocols and procedures.

7.1.1 Pre-Season Environmental Compliance Assessment, Renovations, and Letter Report

The AIRS Ghana ECO, with support from Ghana's EPA representative and all DEHOs from the IRS districts, made preliminary visits to all 21 operations sites in the seven districts including Karaga and Gushegu to conduct the initial PSECAs.

The initial PSECA visits took place December 12–18, 2016. The purpose of the PSECA was to assess the existing stores and soak pits and identify where maintenance and renovations work was required. After the PSCECA, a worklist was generated and used to guide all repairs and maintenance work at the operations sites. Findings that needed attention at the 16 existing operations sites were cracks in the wash areas and minor repair work in some stores. More extensive work was required for the stores, soak pits, and wash areas at the five additional operations sites in the new districts of Gushegu and Karaga.

In Gushegu, AIRS Ghana had to entirely renovate two sites that were last used for IRS operations in 2012. The third site was new, provided by the District Assembly but in need of extensive work to get it up to PMI Best Management Practices (BMP) standards.

In Karaga, AIRS Ghana had access to one operations site used in 2012. The second site was provided by the District Assembly. Both sites needed a great deal of renovation to meet PMI BMP standards.

Site renovations started simultaneously across all 21 operations sites in the first week of February 2017. These included repair of cracks in the floor of wash areas, de-silting and re-filling of some soak pits, repair of locks for insecticide storage rooms, and some painting. At the Gambaga site in East Mamprusi district, the old soak pit was desilted and refilled to correct the poor filtration observed during the 2016 spray campaign. In addition, an extra soak pit and wash area were added at the same site to ensure that each soak pit will be used by at most 50 spray operators. A similar additional soak pit and wash area was added at the Wungu site in West Mamprusi district for the same reason. In all, a total of eight new soak pits were constructed in Bunkpurugu Yunyoo (1), East Mamprusi (1), West Mamprusi (1), Karaga (2), and Gushegu (3). All of the newly constructed soak pits were the improved versions of soak pits. Unlike the older soak pits being used in Ghana, with the bio-bed in the middle of the wash area, the wash area is separated from the new soak pit and the two are connected via a polyvinyl chloride pipe.

Also, to avoid the perennial problem of cracks in cement wash area floors, the floors of the renovated wash areas were lined with thick tarpaulin, to ensure that all water will flow into the bio-bed without passing through the cracks in the floor. This will reduce the recurring expenditure of mending the cracks. This 2017 pilot will be extended to other wash areas in the future.

Wungu site, West Mamprusi: Old type of soak pit with wash area covered with tarpaulin to ensure that all wash water gets into the bio-bed

Wungu site: Improved soak pit showing the bio-bed located outside the wash area

In implementing some of the recommendations made by the USAID Regional Environmental Compliance Advisor, Henry Nii Arday Aryeetey, on his visit to Ghana in 2016, the project designed a new safety poster expressly for the insecticide stores in 2017. The poster emphasized safety rules for IRS storekeepers and was targeted at Logistics and Stores Assistants. It was introduced in their trainings and posted in all 21 operational sites. The poster served as a reminder and highlighted the responsibilities of store keepers when handling insecticides:

- **Always wear full PPEs. Never wear slippery foot wear or loose clothes.**
- **Remember you are responsible for your own safety and for the safety of others.**
- **Always practice good storekeeping.**
- **All accidents are preventable.**
- **Use the right tools and equipment and use them in the right way.**
- **Always follow the rules; do not take short cuts.**
- **If you are not trained, DON'T DO IT.**
- **NEVER eat or drink while working with pesticide.**

Safety poster at the entrance of Pishigu (Karaga district) insecticide store

Burglar-proof security feature at Pishigu operational site

After all PSECA recommended actions were carried out, the project team submitted a letter report to PMI that summarized key environmental compliance indicators. The letter report was submitted for informational purposes prior to the start of the 2017 campaign.

A team that comprised the AIRS Ghana COP and ECO, EPA officials, and DEHOs carried out final inspection and certification of the storage facilities and soak pits on April 8–12. The team confirmed that all repairs recommended from the initial PSECA had been completed and that each site was ready for 2017 spray operations; in light of this, the Home Office Environmental Compliance Manager gave a green light to start the 2017 IRS campaign.

7.1.2 Use of Mobile Soak Pits

AIRS Ghana ECO (in life jacket), crossing the White Volta to Mount MSPs at Singa

End-of-day clean-up with MSP at Wulugu in West Mamprusi District

After successfully piloting mobile soak pits (MSPs) in 2016, AIRS Ghana increased the number of MSPs from 11 in 2016 to 25 in 2017 and from three locations in 2016 to eight in 2017. Five of the target districts (except Bunkpurugu Yunyoo and Gushegu districts) used MSPs in at least one location. A Kumbungu district spray team used MSPs during their six-day camping in a remote community. A team in Karaga district also used MSPs during their nine-day camping in remote communities and in communities that would not be accessible once rains start. In East Mamprusi (Nagbo community) and West Mamprusi (Wulugu community), MSPs were used throughout the spray campaign.

The Site Managers, FSs, and TLs installed the MSPs with supervision by the ECO and DOCs. Prior to the installations, the ECO inspected all the possible locations for the MSPs and storage facilities where the IRS materials were to be stored. GPS coordinates for these locations were taken and shared with the Home Office. The installation and use of MSPs were successful without any challenges.

During the 2017 spray campaign, AIRS Ghana identified more potential locations for MSPs in Gushegu and Bunkpurugu-Yunyoo districts. As a result, more MSPs may be used in future IRS campaigns.

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

7.2 Mid-Season Environmental Compliance Assessments

The AIRS Ghana ECO, together with other supervisors including the COP and Operations Manager, visited all 21 operational sites during the spray campaign to assist and support the district teams to ensure full environmental compliance. The project team used each visit to conduct mid-season environmental compliance assessments for all the sites, using the appropriate supervisory checklists (see Table 11, Section 4.2). Emphasis was on the safety of the IRS workers and community members, proper storage of insecticides, stock control and inventory management procedures, effluent waste disposal, proper spill response procedures, and pump maintenance. The project team paid special attention to the use of PPE, handling of insecticides, and mixing procedures including the triple-rinse process for empty Actellic 300 CS bottles. During the assessments, the team observed that all the sites met the PMI BMP standards for IRS operations.

Non-compliance issues observed on the field by supervisors were corrected on the spot and subsequently discussed with spray teams at the morning assembly. Also, as mentioned earlier in the report (Section 4.5.1), AIRS Ghana sent SMS messages as reminders to spray team members at the operations sites throughout the spray campaign to ensure that environmental compliance requirements were followed at all times.

In addition, the ECO followed up on non-compliance issues whenever an email alert was received, especially indicating a possible accident/incident reported. This was to verify and/ or confirm any red flags reported through the use of the supervisory checklists. Some red flags reported turned out to be input errors made by supervisors during data capture. In situations like that, refresher trainings were organized for those supervisors to minimize such false red flags.

Some of the common errors will be used to enhance future trainings especially on the use of smartphones for data collection. Users of the supervisory checklist have also observed that some of the questions in the checklist are not straightforward. AIRS Ghana and the Home Office team will review the questions to improve use of the checklist in the future.

In 2017, AIRS Ghana piloted the randomization of one supervisory checklist (end-of-day clean-up) questions. For this pilot, a supervisor was presented with a set of random questions, based on which s/he would observe the performance and provide feedback. As a result, two supervisors that were observing the same activity would be presented with different questions from a pool of questions concerning that activity. This was an attempt to ensure that supervisors are properly observing activities and consciously providing accurate feedback in a shorter period of time. In this regard, AIRS Ghana recommends that randomization be extended to the Homeowner Preparation and Spray Operator Performance checklist. This checklist is long and takes quite a bit of time to administer properly and accurately, causing some supervisors to provide quick responses without paying attention, as was observed in some cases of false red flags.

As part of USAID's independent assessment of environmental compliance standards, independent consultant Dr. John Azu of the Global Environmental Management Support project assessed the environmental compliance standards of the AIRS Ghana project. The assessment was conducted May 1–9, 2017. Dr. Azu visited 17 of the 21 operations sites. During the visits, he met stakeholders and heads of institutions including the NMCP, EPA, Northern Regional Health Directorate, DHMTs, and IRS district assemblies. He also interviewed some full-time AIRS Ghana project staff as well as some temporary project staff, including IEC Assistants, Mobilizers, SOPs, FSs, Site Managers, and Store Assistants. He also interacted with homeowners, drivers, and security guards.

Dr. Azu's debriefing session was done in the presence of the AIRS Ghana COP, Operations Manager, and ECO, and the USAID Tamale office representative. He commended AIRS Ghana for maintaining very high standards in environmental compliance.

A Tamale-based representative from USAID Ghana, Mr. Dominic Derry (PMS-Health), also took part in the mid-spray supervisions. His monitoring and supervision took him to Karaga, West Mamprusi, East Mamprusi, Bunkpurugu/Yunyoo, and Mamprugu Moaduri districts. He also took part in the debriefing session with Dr. Azu.

Dr. Azu (far left, in coverall) tests resident's knowledge of post-spraying protocols

Dr. Azu (far left) interacts with some AIRS Ghana Field Supervisors

7.3 Daily SOP Health Checks

The AIRS Ghana project introduced the daily health check in 2016 to ensure worker safety and compliance. The main purpose of the health check was to ensure SOPs' fitness and health prior to going to the field. In 2016, TLs performed the health checks every morning throughout the spray campaign using the Daily Health Team Leader Checklist. This continued during the 2017 spray campaign. The checklist has five questions that ask if the SOPs had had breakfast, had symptoms of fatigue, or had other health complaints. Also checked is whether low SOP performance on the previous day (when observed) was due to health-related issues. The TL is supposed to report any identified issues to his/her supervisors or Site Manager each morning after the health check. The FSs and Site Managers subsequently inform the DOCs for the needed action to be taken. However, no SOP reported symptoms preventing him/her from going to the field during the 2017 spray campaign. All completed checklists are currently kept at the district level for future reference.

7.4 Incidents

Over the years, AIRS Ghana has emphasized the need for safe operation of cars and motorbikes. In 2017, AIRS Ghana committed to ensuring safe driving by contracting the Ghana Driver and Vehicle Licensing Authority (DVLA) to train and license all FSs who were to use project motorbikes during the 2017 spray campaign. AIRS Ghana pre-financed the training and licensing process and, on agreement of the FSs, the amounts were deducted from their salaries. Also, at the TOT, safe driving and the consequences of careless driving were fully discussed.

On April 23, 2017, before the spray campaign began, AIRS Ghana recorded a motorbike accident in Gushegu. The individual involved in this accident was not a DVLA-trained rider and acted against the project advice of not to ride a motorbike without a DVLA license. On April 24, also pre-spray, there was an accident involving a pick-up truck that AIRS Ghana had rented for supervision activities.

On April 29, during the spray campaign, a motorbike accident involving a supervisor and an SOP was reported in West Mamprusi district.

In all cases, the person involved sustained minor injuries for which they received medical attention. In the last case, the workers were given a day off.

In each of these cases, an incident report was submitted within the stipulated timeline. AIRS Ghana will continue to emphasize safe driving measures and to ensure that all motorbike riders are fully trained and licensed by the DVLA before hiring.

7.5 Post-Season Environmental Compliance Assessment

All storage facilities and soak pits at the 21 operational sites have been cleaned and all solid waste (nose mask, gloves, etc.) transported to the district main stores waiting for final transportation to the regional stores. All empty and full bottles have been transported to the central store. The post-spray environmental compliance inspections took place June 26–July 1, 2017. All sites have been well cleaned and closed according to PMI BMP standards. All storage facilities will remain locked and guarded by security guards until the next spray campaign. The DOCs will follow up to make sure district storage facilities and all soak pits remain secured and cleared of vegetation.

7.6 Waste Disposal

The main forms of solid waste generated during the 2017 IRS campaigns are the following:

- Empty triple-rinsed bottles of Actellic CS;
- Used nose masks, torn hand gloves, and damaged rubber boots;
- Excavated charcoal and sawdust from repaired soak pits;
- Used granulated activated charcoal from MSPs; and
- Damaged cover sheets and face shields,

AIRS Ghana will continue to partner with Cyclus and Zoil Service Ltd to dispose all the IRS solid waste in accordance with the PMI BMP standards. All non-plastic IRS solid waste (used nose masks, excavated charcoal and sawdust) have been packaged into bags, awaiting final incineration at Zoil Service Limited in Takoradi in August 2017.

A total of 65,896 triple-rinsed Actellic 300 CS empty bottles generated from the 2017 spray campaign will be sent in July/ August to Cyclus Elmina Plastic Recycling Limited or Zoil Services Limited for recycling. The recycling will be witnessed by the Ghana AIRS ECO and a representative from the Ghana EPA. AIRS Ghana will obtain a certificate of destruction and production from these companies for recordkeeping purposes.

AIRS Ghana has not been able to identify a company to recycle the torn hand gloves, but we continue to search for alternative waste management companies that can do this. The AIRS team is working with the EPA to find the best means to dispose of these items. In the interim, the torn gloves will be chopped into pieces and disposed of in a licensed landfill in Takoradi, according to the PMI BMP recommendations.

The well-washed used coveralls and damaged rubber boots will be given to deserving SOPs.

The detailed environmental monitoring and mitigation report is attached as Annex C.

8. Monitoring and Evaluation

8.1 Key Objectives and Approach

The AIRS Ghana M&E systems drew strength from previous years' experiences, lessons learned, and best practices that were shared across AIRS countries.

As outlined in the 2017 work plan, the M&E approach was to use lessons learned to:

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

8.2 Data Collection and Data Management

Data were collected using standardized data collection forms designed to capture all core PMI indicators. All data collection was preceded by training data collectors (mobilizers, SOPs, District M&E Coordinators, etc.) on data capture. Mobilization data were collected by Mobilizers (IEC implementers and CBS volunteers) during house-to-house mobilization. During spray operations, all spray data were collected by SOPs and verified through data quality assessment processes. To ensure data integrity, AIRS Ghana also used a number of quality assurance and control tools. Table 14 describes the 2017 data collection and quality assurance tools, their purposes, and intended users. An expanded list of quality assurance methods and tools that AIRS Ghana used across all components of IRS operations is provided in Annex D.

TABLE 14. GHANA IRS 2017 DATA COLLECTION AND QUALITY ASSURANCE TOOLS

Data Collection Tool	Used by Whom and When
Training Participants Registration Form	Used by lead trainer at training workshop to capture category and number of people trained; disaggregated by gender.
IEC/BCC Mobilization Form	Used by IEC (CBS) mobilizers during pre-spray house-to-house mobilization/sensitization activities to collect data on number of households and people reached with IRS messages and the number of IEC/BCC materials distributed directly to households.
Daily SOP Form	Used by SOPs during spray operations to capture structures found, structures sprayed and not sprayed, population protected and unprotected, and information surrounding mosquito net availability.
Error Eliminator (EE) form	Purpose: • To check the completeness and correctness of data collected in the field by SOPs. • To highlight common data collection errors so they can be quickly identified, corrections made, and on-the-spot re-training provided. Used by: • TLs, on a daily basis, to check completeness and accuracy of the forms filled by the SOPs under their supervision. Supervisors, DOC, District M&E Coordinators, Operations Manager, Database Manager, and M&E Manager also used the EE when visiting the field.
Data Collection Verification form (Mobile data collection application form)	Purpose: • Used during randomized household visits to check the accuracy of data collected in the field by SOPs, i.e., to ensure that the data written on the Daily SOP Forms match the information reported by households and/or the data recorded on the IRS cards disseminated to households. Used by: • District M&E Coordinators, predominantly. Database Manager and the M&E Manager.

The DCV form was converted from a paper form into a mobile data collection application in 2016 and was used as such in 2017. Tables 15 and 16 show the numbers of households interviewed using the DCV form and issues observed and resolved, respectively.

TABLE 15. NUMBER OF HOUSEHOLDS/COMPOUNDS VISITED USING THE DCV FORM

District	No. of Households/Compounds Visited
Bunkpurugu-Yunyoo	80
East Mamprusi	116
Kumbungu	143
West Mamprusi	73
Mamprugu Moaduri	180
Karaga	129
Gushegu	191
Total households visited	**912**

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

Errors/Issues Observed	Corrective Actions Taken
Understatement of total number of eligible structures found by SOPs. Some SOPs did not count locked eligible structures in compounds as part of the total number of strutures found.	The M&E team emphasized to SOPs, TLs, and FSs that all eligible structures, locked or unlocked, were to be counted. When the spray teams found a locked structure, they were to probe further about its eligibility for spraying and when the occupant would be returning so it could be unlocked and sprayed.
Overstatement of total number of eligible structures found. Some new SOPs considered eligible rooms as separate structures and counted them as such. Some SOPs included food stores and traditional shrines (especially when these structures were locked at the time of visit) in the count. In a few instances, households persuaded SOPs to count structures under construction as eligible assuming they would be occupied in few days time. Many of these structures were not completed at the time of the verification.	The M&E team advised SOPs, TLs, and FSs to be careful in determining the eligibility of structures before recording them. Spray teams were reminded of the eligible structure definition and of how to identify an eligible struture. The M&E team reiterated that the eligibility of a structure is based on evidence at the time of the visit, not on its expected future eligiblility.
Overstatement of total number of eligible structures sprayed. Structures with more than one room were counted as sprayed when not all the rooms were sprayed.	SOPs were cautioned about this even before IRS operations started. TLs and FSs intensified field spot checks to avoid the error. All affected compound data were corrected.
Undercounting of number of structures sprayed. This undercounting was specific to very large compounds where SOPs had to make their way through different courtyards to access all structures.	The M&E team asked SOPs, TLs, and FSs to carefully count both eligible and sprayed structures especially in large compounds with multiple courtyards. They also were advised to mark with chalk the structures when counting sprayed and not sprayed structures in such compounds.

8.3 DATA ENTRY

AIRS Ghana employed 22 Data Entry Assistants (three in Bunkpurugu-Yunyoo, four in East Mamprusi, three in Kumbungu, two in Mamprugu Moaduri, four in West Mamprusi, three in Karaga, and three in Gushegu) to enter all house-to-house mobilization, spray, and DOS data generated from the seven districts. The database set-up entailed using a server and workstations in each data entry center. The project team installed the 2017 AIRS Ghana database and the DOS database on all 22 laptop computers. Each district entered data simultaneously.

AIRS data entry protocols dictate that data entry is twofold. First, "Totals" data entry captures the total lines from each spray operator form. It is completed within 24 hours of the SOP form reaching the data center. It is used for quick reporting of ongoing spray progress. The second is "Details" data entry, where detailed data for each compound is entered into the database. It is completed within 48 hours of the SOP form reaching the data center.

In 2017, AIRS Ghana followed the same data entry protocols. However, both "Totals" and "Details" data were all entered into the AIRS database within 24 hours. The quick data entry time afforded the project the opportunity to use the more accurate "Details" data to make quick decisions. "Total" data as used in

previous years did not adjust for revisit data and would underestimate spray coverage and overestimate the number of structures found. The "Details" data adjusted for these errors and therefore was used for daily reporting.

8.4 Data Cleaning

Data Entry Assistants at the district level cleaned the data. This involved the following:

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

Data cleaning was done using a Microsoft Access-based IRS Cleaning/Reporting tool. The Data Entry Assistants cleaned both mobilization and spray data daily throughout the spray campaign with final data cleaning completed within eight days of the end of the spray campaign.

8.5 Daily and Weekly Progress Reports

During the 31-day spraying period, three set of reports were sent on a weekly and daily basis to the client and/ or Home Office team:

- Weekly Progress Report: submitted once a week to PMI/ USAID. The report provides a high-level summary of weekly spray progress toward operations targets.
- Daily District Summary Report: sent to DOCs to help them plan and allocate resources at their disposal. The report provides information on structures found and sprayed, spray progress and coverage, insecticide use, number of SOPs who worked, and average number of structures sprayed per SOP for each operational site.
- Daily Community Coverage report: submitted daily especially after week one when revisits intensified. The report is used by DOCs to track communities that have spray coverage below 85 percent. The report contains information for each community and a list of compounds in the community where spray coverage is less than the 85 percent target. The report is used to draw revisit plans to ensure that targeted communities and compounds are effectively reached. IEC Assistants also use this report to do targeted IEC follow-up messaging in specific communities and compounds.

8.6 Results

A list of all program indicators for the 2017 spray campaign is presented in the M&E Plan matrix in Annex E. The following sections summarize the results for the core PMI indicators and other spray indicators.

8.6.1 Spray Coverage and Population Protected

SOPs found a total of 324,115 structures during the 2017 spray campaign. Across the seven districts, 306,648 structures were sprayed by SOPs, for total spray coverage of 94.0 percent. Spray coverage increased from 91.7 percent in 2015, to 92.7 percent in 2016, and to 94.0 percent in 2017, in other words, a 3.1 percent increase from 2015 and a 1.4% increase from 2016. Details on the number of structures found, sprayed, and district spray coverage are presented in Table 17.

There were 874,608 people counted as living in the structures found by SOPs. Of this number, 96.1 percent (840,438 people) were protected through IRS. They included 18,431 pregnant women and 152,681 children under the age of five years.

TABLE 17. SUMMARY OF 2017 SPRAY RESULTS

District	Structures			Population			Pregnant Women Protected		Children Under 5 Years Protected	
	Found by SOPs	Sprayed	% Sprayed	Protected	Not Protected	% Protected	#		#	
Bunkpurugu Yunyoo	55,000	53,760	97.7%	133,586	2,236	98.4%	2,375		19,141	
East Mamprusi	69,562	66,295	95.3%	179,386	5,939	96.8%	4,013		31,840	
Gushegu	48,843	43,874	89.8%	134,043	8,145	94.3%	3,397		29,333	
Karaga	36,976	34,149	92.4%	103,160	4,519	95.8%	2,569		21,247	
Kumbungu	35,934	35,021	97.5%	90,662	1,775	98.1%	1,975		15,822	
Mamprugu Moaduri	22,371	20,869	93.3%	56,698	3,137	94.8%	1,301		10,355	
West Mamprusi	55,429	50,680	91.4%	142,903	8,419	94.4%	2,801		24,943	
Total	**324,115**	**304,648**	**94.0%**	**840,438**	**34,170**	**96.1%**	**18,431**		**152,681**	

8.6.2 REASONS FOR UNSPRAYED STRUCTURES

Overall, 6 percent of structures found by SOPs (19,467) were not sprayed in 2017. No reason was reported for not spraying 100 of these structures, but the remaining 19,367 unsprayed structures had assigned reasons why they were not sprayed. The two main reasons were: 1) SOPs found structures locked (75%) and 2) the household refused spraying (16%).

A common reason for locked structures was that their owners were away for short or protracted periods, in some cases over a year. Some initially locked structures were sprayed during spray campaign revisits. Nevertheless, some structures remained locked through the end of the campaign and could not be sprayed. In 2017, unsprayed locked structures accounted for a little less than 5 percent of total structures found by SOPs.

A common reason for refusal was that household members did not like the odor of the insecticide. Unsprayed structures due to refusals accounted for less than 1 percent of the total structures found by SOPs.

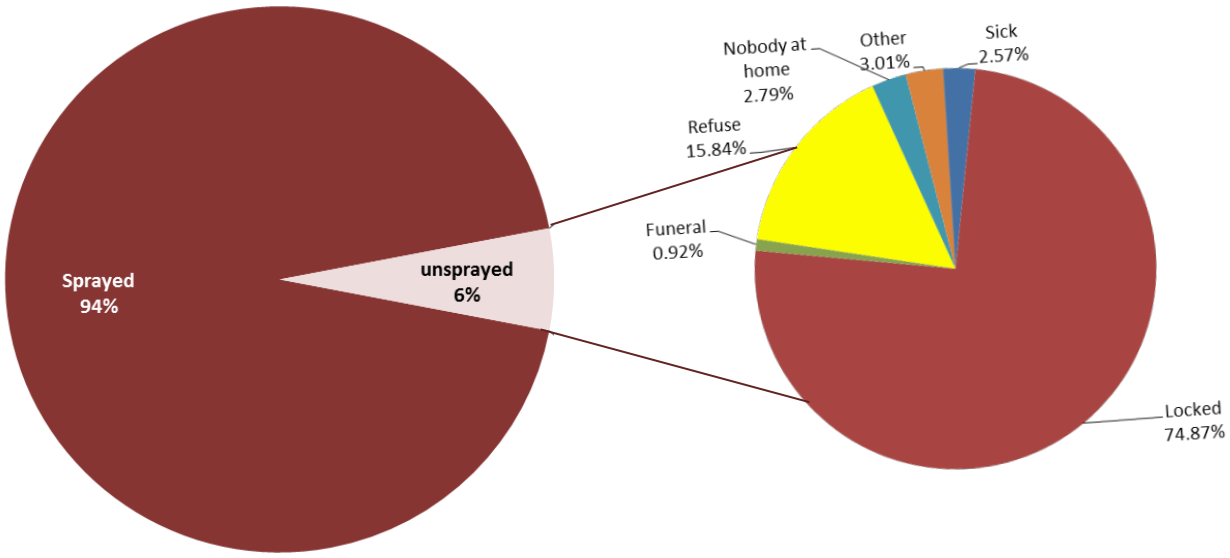
Some 497 structures (2.6% of unsprayed structures) were not sprayed because they had sick people in them. Additionally, 540 structures (2.8%) were not sprayed because there was "nobody at home" at the time of the SOP visit, and 179 structures (less than 1%) were not sprayed because the household was holding a funeral in the home at the time of the SOP visit. Details on the reasons why structures were not sprayed are summarized in Table 18 and illustrated in Figure 4.

TABLE 18. REASONS FOR NOT SPRAYING STRUCTURES, BY DISTRICT

District	Sick		Locked		Funeral		Refusal		Nobody Home		Other		Total Not-sprayed Structures
	#	%	#	%	#	%	#	%	#	%	#	%	
BYD	69	5.6%	697	56.4%	10	0.8%	371	30.0%	4	0.3%	85	6.9%	1,236
EMD	75	2.3%	2,549	78.1%	20	0.6%	569	17.4%	11	0.3%	40	1.2%	3,264
KUD	25	2.8%	680	75.3%	2	0.2%	161	17.8%	24	2.7%	11	1.2%	903
WMD	88	1.9%	3,546	75.3%	28	0.6%	819	17.4%	62	1.3%	168	3.6%	4,711
MMD	15	1.0%	1,154	76.8%	1	0.1%	295	19.6%	2	0.1%	35	2.3%	1,502
KAD	67	2.4%	2,237	79.3%	62	2.2%	291	10.3%	97	3.4%	66	2.3%	2,820
GUD	158	3.2%	3,638	73.8%	56	1.1%	562	11.4%	340	6.9%	177	3.6%	4,931
Total	**497**	**2.6%**	**14,501**	**74.9%**	**179**	**0.9%**	**3,068**	**15.8%**	**540**	**2.8%**	**582**	**3.0%**	**19,367**

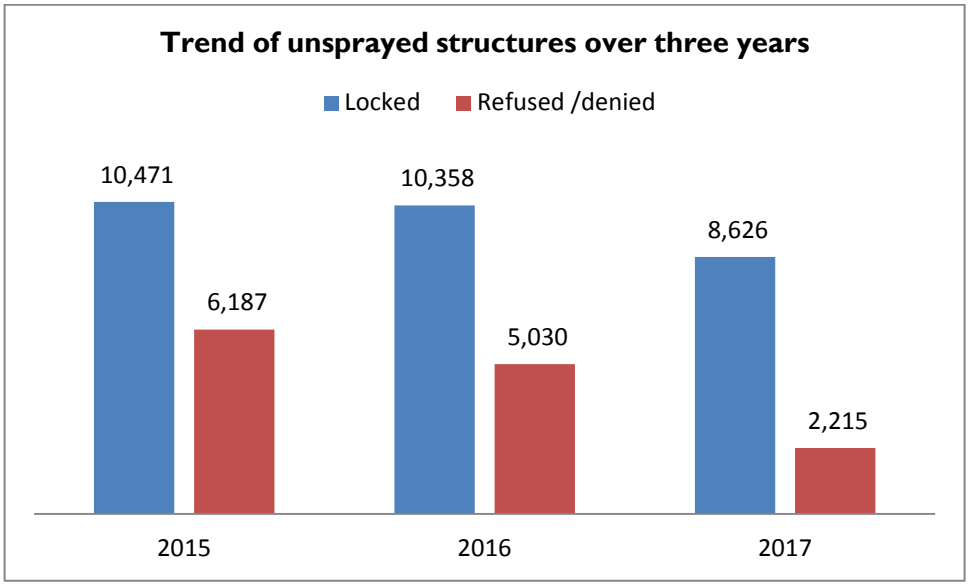
Note: 100 unsprayed structures were not assigned a reason, and they are not included in the table.

FIGURE 4. REASONS FOR NOT SPRAYING STRUCTURES



AIRS Ghana continues to strive to reduce unsprayed structures in its operational areas over three years of spraying, 2015–2017. Its efforts have contributed to a steady decline in unsprayed structures, especially because of locked structures and refusals. This decline is especially evident in the five older districts (BYD, EMD, KUD, MMD, WMD), where the number of locked structures found by SOPs fell significantly, from 10,471(56.2%) in 2015 to 8,626 (74.3%) after the 2017 spray campaign. Also, the number of unsprayed structures due to refusals fell significantly, from 6,187 (33.2%) in 2015 to 2,215 (19.1%) in 2017 (Figure 5).

FIGURE 5. TREND OF UNSPRAYED STRUCTURES (LOCKED AND REFUSED) IN THE FIVE OLDER DISTRICTS



Gushegu district had the highest number of unsprayed structures with locked structures and refusal cases at 3,638 and 562, respectively. Karaga district reported 2,237 locked structures and 291 refusals. This brought the total number of locked structures to 14,501 and refusal cases to 3,068.

AIRS Ghana will continue to target and develop strategies to overcome issues that are barriers to IRS in particularly difficult households/compounds and communities.

8.6.3 AVAILABILITY AND USE OF MOSQUITO NETS

Across the seven districts, 348,602 mosquito nets were available at the time of the SOP visits; 15,456 pregnant women and 132,234 children under five years of age slept under a mosquito net the night before the SOP visit. Table 19 presents mosquito net indicators, by district. Percentages are calculated using the total population of pregnant women and children under five protected.

TABLE 19. NUMBER AND USAGE OF MOSQUITO NETS

District	Total Mosquito Nets Found	Preg. Women Sleeping under Mosquito Nets the Previous Night		Children Under 5 Sleeping under Mosquito Net Previous Night	
		#	%	#	%
Bunkpurugu-Yunyoo	57,491	2,055	86.5%	17,660	92.3%
East Mamprusi	73,643	3,455	86.1%	27,865	87.5%
Gushegu	51,919	2,527	74.4%	23,280	79.4%
Karaga	41,083	2,113	82.2%	17,837	84.0%
Kumbungu	38,420	1,796	90.9%	14,750	93.2%
Mamprugu Moaduri	24,236	1,092	83.9%	8,808	85.1%
West Mamprusi	61,810	2,418	86.3%	22,034	88.3%
Total	**348,602**	**15,456**	**83.9%**	**132,234**	**86.6%**

8.6.4 OTHER SPRAY INDICATORS

AIRS Ghana distributed 70,200 bottles of Actellic 300 CS from the central stores to the seven districts for the 2017 spray campaign. SOPs used a total of 65,898 bottles to spray the 304,648 structures. No insecticide was reported missing or damaged. The districts returned a total of 4,302 bottles to the central stores at the end of the spray campaign. Each bottle of Actellic 300 CS sprayed an average of 4.6 structures. On average, 540 SOPs (out of 611 hired) worked each day across the seven districts. Each SOP sprayed an average of 18.2 structures a day with an average of 3.9 bottles of Actellic 300 CS used per day as presented in Table 20.

TABLE 20. INSECTICIDE TRACKING AND SOP PERFORMANCE

Indicator	District							
	Bunkpurugu Yunyoo	East Mamprusi	Gushegu	Karaga	Kumbungu	Mamprugu Moaduri	West Mamprusi	Overall
Total bottles received from regional stores	12,840	15,600	9,840	7,752	7,884	4,584	11,700	**70,200**
Total bottles used	11,689	14,715	8,776	7,319	7,676	4,342	11,378	**65,895**
Total bottles damaged or lost	0	0	0	0	0	0	0	**0**
Total bottles left over (returned to central stores)	1,148	885	1,064	433	208	242	322	**4,302**
Average number structures sprayed per bottle	4.6	4.5	5.0	4.7	4.6	4.8	4.5	**4.6**
Average number of bottles per SOP per day	4.4	4.1	3.7	3.6	3.9	4.2	3.6	**3.9**
Average number of SOP working per day	86	115	76	66	63	33	101	**77**
Average number of structures sprayed by SOP per day	20.2	18.6	18.6	16.7	17.9	20.4	16.2	**18.2**

9. Capacity Building of the Ministry of Health

Capacity building is an ongoing process through which individuals, groups, and organizations enhance their ability to identify and meet development challenges. AIRS Ghana's role is to build the knowledge and skills of the Ministry of Health in the implementation of IRS.

AIRS Ghana's guiding partnership principles emphasize the importance of building relationships with local partners and strengthening their skills in areas such as strategic planning, leadership, operating systems, advocacy, organizational management, and program development and management.

Based on the agreement between the PMI Ghana team, the NMCP, and AIRS Ghana, DCOs and DEHOs in the targeted districts were assigned to the 2017 spray campaign for 20 days. Disease Control Officers worked closely with the AIRS DOCs in the planning and supervision of spray operations at the district level. DEHOs also worked closely with the AIRS DOCs and the AIRS ECO to ensure environmental compliance during the 2017 spray campaign.

Also, both DCOs and DEHOs were helpful in community sensitization and mobilization, especially in relatively resistant communities.

In future campaigns, AIRS Ghana will continue such mentorship opportunities to ensure that practical skills in the planning, implementation, and supervision of IRS are properly transferred to NMCP and GHS staff.

In December 2016, AIRS Ghana did a follow-up capacity assessment of the Government of Ghana and its ability to conduct IRS. This assessment was last conducted in 2013. To ensure that results from the two assessments were comparable, the project used the same methodology and framework in both years.

The assessment found no changes in some IRS technical component areas. The procurement technical area scored 35 percent in both 2013 and 2016, and the IEC technical area maintained a score of 63 percent. AIRS Ghana did training in IRS planning and implementation in 2014; however, since the Government of Ghana does not have an IRS program of its own, that skill has not been used much by those who were trained and so no additional training will be provided. The NMCP is strong in doing IEC activities, some of them on malaria though hardly any on IRS. Because its overall effort is strong, AIRS Ghana will do training on IEC in IRS for the NMCP and some GHS staff later in 2017.

Also, PMI, through AIRS Ghana has been supporting the National Insecticide Resistance Monitoring Partnership, which includes members of the MaVCOC and has a secretariat with a coordinator situated at the NMIMR. The partnership brings together researchers and vector control implementers within Ghana to generate and monitor insecticide resistance data in the country. A key area of the partnership has been to provide the framework for sharing data on insecticide resistance in a collaborative way so as to support disease control strategies, especially those that require the use of insecticides.

10. Challenges and Recommendations

The following challenges, lessons learned, and recommendations were identified during the 2017 spray campaign.

10.1 Challenges

1. Rains were a major problem during the 2017 spray campaign. At least three spray days were lost due to rains. The rain also made it difficult to reschedule communities since household members wanted to take advantage of the rains to prepare their fields for planting. The project tried to negotiate Sunday spraying with the affected communities; this worked in some places but not in others.
2. New dwelling construction is encroaching on the soak pits and stores at some operational sites. Some sites could not store insecticides because they no longer meet BMP standards for distance from human residence or body of water. Langbinsi site in East Mamprusi is an example; an alternative insecticide storage facility had to be found away from the operations site. Also, a storage site in Mamprugu Moaduri district might not be compliant in the future. Project costs could increase if other, privately owned facilities have to be rented.
3. Locked structures are still a challenge. Many residents of compounds with locked structures continued to report that the owners have migrated to other areas, especially southern Ghana, to work and took their keys with them. This is despite efforts to minimize the number of locked structures through targeted IEC messages.
4. Household preparation in Gushegu township was a challenge because many people were reluctant to move outside the many items they had in their rooms.
5. The "live fire" aspect of the SOP training was well received by SOPs and TLs and is believed to have improved SOP performance. However, given the number of topics the five-day SOP training already has to cover (technique, data capture, communication, environmental compliance and safety, etc.), it will be difficult to fit this practical training into the current curriculum.

10.2 Lessons Learned and Recommendations

1. To avoid the rains, AIRS Ghana will explore moving the start of the spray campaign forward by two to three weeks, i.e., to the first week of April. Considering the data for mosquito peak, malaria transmission, and decay rate of the insecticide, early April is feasible. This would allow the spray campaign to be completed before the rains start.
2. AIRS Ghana has started scouting for new storage facilities or operational sites. This will continue till appropriate facilities that meet BMP standards are identified for future spray campaigns.
3. The introduction of the Locked Structures and Refusal Cases Tracker has helped the project to monitor and work on targeted messages for these categories of unsprayed structures. Data used for targeting and tracking the compounds/ households will be expanded to include Karaga and Gushegu

districts. The project will also explore the possibility of increasing the number of households by reviewing the criterion for the household selection from 'households with 3 or more locked or refused/denied structures' to 'households with 2 or more locked or refused/denied structures.'

4. A spray team will be stationed in Gushegu town, to make a team available for spraying throughout the campaign. This approach worked in Gamabaga town (East Mamprusi), where there was similar resident reluctance to move items at a given time. Testimonies from households will encourage others to accept the spraying. The strategy also will be used in Wale Wale Township in future.
5. AIRS Ghana recommends continuing the "live fire" aspect in the SOPs training curriculum. To accommodate the practical training, the project suggests extending the five-day training by one or two days.

ANNEX A. INVENTORY OF STOCK AND QUANTITIES POST-SPRAY

TABLE A-1. IRS 2017 INTERNATIONAL PROCUREMENT ITEMS

	Item Description	UOM	Bal B/f	Quantity Procured	Total	Quantity Used	Quantity Damaged/ Bad	Quantity After Campaign	Remark
INSECTICIDE									
	ACTELLIC 300 CS	Bottle	2,782	67,584	70,366	65,895	0	4471	
PPE									
	Coverall	Pcs	1,110	685	1,795	1,795	309	1,486	
	Face Shield	Pcs	440	2,050	2,490	1,359	1,359	1,131	
	Hand Gloves	Pair	396	2436	2832	1504	1099	1,733	
	Hard Hat	Pcs	542	320	862	841	165	697	
	Head Gear	Pcs	791	217	1,008	887	45	963	
	Heavy Duty Gloves	Pair	42	144	186	116	86	100	
	Nose Mask	Pcs	3,280	27,000	30,280	28,020	28,020	2,260	
HUDSON PUMP & ACCESSORIES									
	Hudson (8 Liters)	Pcs	434	0	434	296	296	138	
	Hudson (10 Liters)	Pcs	192	0	192	50	0	192	
	Hudson (12 Liters)	Pcs	40	0	40	0	0	40	
	Control Flow Valve	Pcs	40	50	90	26	26	64	
	Lance Tube	Pcs	7	0	7	3	0	4	
	Nozzle Body	Pcs	100	0	100	0	0	100	
	Nozzle Cap	Pcs	100	0	100	0	0	100	
	Pressure Gauge	Pcs	0	0	0	0	0	0	
	Repair Kit	Set	62	0	62	20	0	42	

	Shutoff Valve Body Cap	Pcs	200	0	200	0	0	200	
	Strainer	Pcs	0	0	0	0	0	0	
	Valve Cap	Pcs	25	0	25	0	0	25	
GOIZPER PUMP & ACCESSORIES									
	Goizper (8 Liters)	Pcs	89	0	89	0	0	89	
	Goizper IK Super (10 Liters)	Pcs	10	505	515	515	95	420	
	Nozzle Tip (8002E)	Pcs	420	1000	1420	104	0	1316	
	Handle (Trigger)	Pcs	182	20	202	3	0	199	
	Hose	Pcs	290	20	310	3	0	307	
	IK-12 VC Service Kit	Set	15	40	55	25	0	30	
	Lance Tube	Pcs	0	20	20	1	0	19	
	Metallic Hose Adopter	Pcs	17	0	17	0	0	17	
	Plunger	Pcs	0	20	20	3	0	17	
	Pressure Regulator (control flow valve)	Pcs	85	19	104	3	0	101	
	Tube with Nuts 0.6M (Strainer)	Pcs	34	0	34	34	0	0	
MOBILE SOAK PIT ITEMS									
	Activated Carbon (Charcoal 10 Kg)	Bag	16	0	16	11	0	5	
BIO-MONITORING TEST KIT									
	Test Mate Analyzer	Pcs	15	0	15	0	0	15	

TABLE A-2. IRS 2017 LOCAL PROCUREMENT ITEMS

Item Description	UOM	Bal B/f	Quantity Procured	Total	Quantity Used	Quantity Damaged/ Bad	Quantity After Campaign	Remark
PPE's								
Apron	Pcs	75	42	117	101	14	103	
Boot	Pair	678	315	993	976	66	927	
Cotton Socks	Pair	118	1533	1651	1629	1378	273	
Life Jacket	Pcs	53	0	53	34	0	53	
Neck Cover	Pcs	999	644	1643	1572	212	1431	
IRS Reusable								
Bathing Bucket	Pcs	51	37	88	76	12	76	
Calculator	Pcs	111	47	158	157	30	128	
Calibrated Cup	Pcs	16	6	22	21	0	22	
Danger Sign	Pcs	91	42	133	124	0	133	
Fire Extinguisher	Pcs	45	12	57	57	3	54	
Flash Light	Pcs	332	443	775	774	433	342	
Hand Wash Bowl	Pcs	38	49	87	87	38	49	
Heavy Duty Brush	Pcs	20	36	56	40	13	43	
Jerry Can	Pcs	62	79	141	141	0	141	
Megaphone	Pcs	0	21	21	21	0	21	
Mobilizers Vest	Pcs	72	600	672	672	72	411*	
Public Address System	Set	5	9	14	14	0	14	
Pliers	Pcs	12	12	24	21	3	21	
Rain Coat	Pcs	2	21	23	23	7	16	
Rinsing Barrels	Pcs	138	27	165	165	0	165	

	Rope (Drying Line)	Pcs	18	15	33	33	0	33	
	Sand Bucket	Pcs	20	8	28	28	0	28	
	Screw Driver	Pcs	20	1	21	21	5	16	
	Shifting Spanner	Pcs	17	7	24	21	3	21	
	Shovel	Pcs	19	7	26	21	0	26	
	Spray Bag	Pcs	727	73	800	733	131	669	
	Spread Sheet	Pcs	585	791	1376	290	1258	118	
	Stop Watch	Pcs	0	21	21	21	9	12	
	Tarpaulin For Fixed Soak Pit	Pcs	0	4	4	4	0	4	
	Thermometer	Pcs	13	11	24	21	2	22	
	Wash Basin	Pcs	81	11	92	88	9	83	
	Water Cup	Pcs	219	435	654	654	188	466	
	Water Filter	Pcs	428	198	626	369	76	550	
	Water Jug	Pcs	58	59	117	105	19	98	
	Whistle	Pcs	58	52	110	83	46	64	
	IRS Consumables								
	ANTICEPTIC (Carmel 250ml)	Bottle	21	490	511	410	0	101	
	Atropine Injection (1 Amp)	Pcs	50	430	480	480	0	0	
	Bar Soap (Key Soap)	Pcs	40	704	744	700	0	44	
	Bathing Soap (Geisha)	Pcs	486	1860	2346	2179	0	167	
	Batteries (Dry Cell)	Pair	1020	1684	2704	2151	0	553	
	Chalk	Pack	5037	0	5037	916	0	4121	
	Empty Sack	Pcs	52	240	292	89	0	203	
	First Aid Kit	Set	10	99	109	71	0	38	

	Liquid Soap	Pcs	41	74	115	42	0	73	
	Nozzle Brush	Pcs	4	706	710	658	0	52	
	Powdered Soap	Sachet	22	860	882	707	0	175	
	Sanitary Pad	Set	104	350	454	250	0	93	
	Towel	Pcs	4	859	863	863	0	0	
	Vitamin E Cream	Pcs	25	700	725	725	0	0	
Print Materials									
	Daily Spray Operator Card	Pcs	0	26000	26000	20893	0	5107	
	Data Collection Verification Form	Pcs	0	150	150	0	0	150	
	Delivery Book	Booklet	28	21	49	25	0	24	
	Error Eliminator	Pcs	4600	6130	10730	9812	0	918	
	Goods Receipt Note	Booklet	16	0	16	6	0	10	
	IEC IRS Brochure	Pcs	0	10000	10000	10000	0	0	
	IEC IRS Steps Poster	Pcs	3500	500	4000	4000	0	0	
	IEC Malaria Free Poster	Pcs	3500	500	4000	4000	0	0	
	IRS Card and Stickers	Pair	0	88000	88000	88000	0	0	
	Ledger Book	Pcs	21	9	30	30	0	0	
	MO1 Card	Pcs	1552	6000	7552	5852	0	1700	
	Material Safety Data Sheet	Set	30	14	44	6	0	38	
	Performance Tracker	Pcs	0	21	21	21	0	0	
	PMI/AIRS Anti Sexual Harassment	Pcs	13	22	35	35	0	0	
	Request Book	Booklet	13	25	38	28	0	10	
	Spray Operator's Guide	Booklet	41	585	626	486	0	140	
	Spray Notice Form	Card	0	88000	88000	88000	0	0	

	Store Keeper's Guide	Booklet	25	0	25	1	0	24	
	Spill Response Procedure	Set	31	17	48	21	1	49	
	Stock Card	Pcs	720	2980	3700	2904	0	796	
	Team Leader Guide	Booklet	3	353	356	98	0	258	
	Team Leader Summary/ Dos	card	0	6288	6288	5820	0	468	
	USAID/ PMI Sticker	Pcs	310	0	310	310	0	0	
	Vehicle Log Book	Booklet	28	32	60	33	0	27	
	Storekeeper Poster	Pcs	0	22	22	22	0	0	
Mobile Soak Pit Items									
	Brush	Pcs	11	25	36	36	14	22	
	Hoe	Pcs	11	4	15	15	6	9	
	Mobile Soak Pit Carrier	Pcs	12	25	37	37	8	29	
	Mobile Soak Pit Bucket (25ltrs)	Pcs	11	25	36	36	5	31	
	Napkin (Was Cloth)	Pcs	24	100	124	124	47	77	
	Shovel	Pcs	11	4	15	15	5	10	
	Tarpaulin (4mx4m)	Pcs	11	15	26	26	1	25	
	Wash Basin (Boot Wash)	Pcs	11	20	31	31	0	31	
	Water Barrel (60 Liters)	Pcs	25	43	68	68	1	67	
	Water Cup	Pcs	11	25	36	36	4	32	
	Waste Barrel (100 Liters)		11	1	12	12	0	12	
Mobile Phone For IRS Field Reporting									
	Samsung CH@T 222	Pcs	14	0	14	12	9	5	
	Samsung Galaxy Pocket	Pcs	30	0	30	30	0	30	

	Huawei Y3	Pcs	31	0	31	31	0	10	
	Huawei Y5	Pcs	0	52	52	52	0	52	

*189 still being used by mosquito collectors

ANNEX B. TIMELINE FOR 2017 IEC ACTIVITIES, BY WEEK

Activities	February				March				April				May				June		
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
IEC/BCC in difficult HHs		■	■	■															
Information van awareness creation		■	■	■															
Pre-spray house-to-house mobilization					■	■	■	■											
Pre-spray stakeholders meetings							■												
Community meetings	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Health facility/ outreach events								■	■	■	■								
In-school programs/ outreach								■	■	■	■								
Church and mosque education								■	■	■	■	■	■	■	■	■	■	■	
Video shows								■	■	■	■	■	■	■	■	■			
Spray door-to-door mobilization												■	■	■	■	■			
Media campaign to support spray											■	■	■	■	■	■	■		
Post-spray stakeholders meetings																			■

ANNEX C. GHANA IRS ENVIRONMENTAL MITIGATION AND MONITORING REPORT

Mitigation Measure	Status of Mitigation Measures	Outstanding Issues Relating to Required Conditions	Remarks
1a. Pre-contract inspection and certification of vehicles used for pesticide or spray team transport.	Pre-contract inspections and certification of vehicles was conducted April 21-23, 2017. The 48 vehicles contracted met all certification criteria. Drivers' documents were also inspected to ensure that they met all requirements. All vehicles and drivers were certified.	No outstanding issues	Vehicles are pick-ups and Benz buses.
1b. Driver training	The project trained all 48 contracted drivers of the rented vehicles in Tamale on April 23, 2017. Topics included safety measures for transporting insecticides and safe driving techniques. The practical session involved spill response procedures and proper use of vehicle log sheet.	No outstanding issues	AIRS Ghana contracted all drivers for the entire spray campaign period.
1c. Cell phone, personal protective equipment (PPE) and spill kits on board during pesticide transportation.	All drivers were required to have a cell phones as a pre-requisite to hiring. They were given a set of PPE for use when transporting insecticides. Each vehicle was equipped with a spill response kit. In 525 morning mobilization and vehicle inspections conducted during the	No outstanding issues	Spill response kits, PPE, incident report forms, and Material Safety Data Sheet were provided to drivers after their training. When some items went missing, the project arranged for their quick replacement.

	2017 spray campaign, 65 instances of non-compliance were observed. Corrective actions were taken before the vehicles left for the field.		
1d. Initial and 30-day pregnancy testing for female candidates for jobs with potential pesticide contact.	On April 6-7, 2017, prior to hiring SOPs, the project conducted initial pregnancy tests with 200 female candidates for the positions of SOP, Washer, TL, and Store Assistant. The project conducted the second test on May 18-22 for females who were hired.	No outstanding issues	Females found to be pregnant during the second test were re-assigned to duties unrelated to pesticide use. For example, Store Assistants (mostly females) who tested positive were limited to managing the non-pesticides store. Store Managers (mostly males) were put in charge of the pesticides store. All test records are available on file.
1e. Health fitness testing for all operators	All 849 spray personnel candidates were given the required pre-spray general physical/ medical examination on April16-7, prior to training.	No outstanding issue	The medical exam was conducted by trained Medical Assistants from government health facilities. The exam included checking blood pressure, respiratory system, pulse, vision, ear nose and throat, chest condition, and locometer system. Of the 849 candidates examined, 5 did not pass the exam and were not cleared for training or hiring. All physical exam records are available on file.
1f. Procurement of, distribution to, and training on the use of PPE for all workers with potential pesticide contact.	Both international and local PPE procurements were done on time. PPE were received and distributed to all operational sites on April 11-24, 2017, prior to the start of spray. Also, all candidates who might have contact with pesticides completed training on correct use of PPE and were subsequently given a complete set of PPE for use throughout the spray camapaign.	No outstanding issues	The project hired and trained on the use of PPE in handling pesticide: 22 Store Keepers, 7 Logistics Assistants, 48 contract drivers, 121 TLs, 62 FSs, 21 Site Managers, 611 SOPs, and 55 Washers.

1g. Training on mixing pesticides and the proper use and maintenance of spray pumps.	All Supervisors, Site Managers, TLs, SOPs, DOCs, and government officials including DCOsisease Control Officers and DEHOs in the targeted districts were trained on appropriate mixing of insecticide including triple rinse of the Actellic 300 CS bottles. The facilitors also demonstrated the proper use and maintenance of spray pumps.	No outstanding issue	AIRS Ghana trained 103 Supervisors, Site Managers, DOCS, DCOs, and DEHOs at the TOT, and 808 SOPs and TLs at their repsective trainings.
1h. Provision of adequate facilities and supplies for end-of-day cleanup,	All 21 operational site had adequate storage facilities that were either provided by District Assembly or rented from an individual. 464 end-of-day inspections were conducted and observed 12 instances of non-complance regarding provision of adequate facilities and supplies.	No outstanding issue	All the facilities were inspected and and met BMP standards prior to the start of the spray campaign.
1i. Enforce spray and clean-up procedures.	All supervisors inspected clean-up procedures as scheduled. Site Managers and FSs supervised pump clean-up throughout the spray campaign. Site supervisors and TLs observed washing and bathing at each site. The 464 end-of-day inspections identified only 2 instance of clean-up procedures not being enforced (a TL did not supervise washing of pumps). This was corrected by informing the TL to attend to his supervisory duty.	No outstanding issues	The COP, Operations Manager, ECO, DOCs as well as site managers supervised clean-up procedures daily through out the campaign.
2a. IEC campaigns to inform homeowners of responsibilities and precautions.	IEC Assistants and community mobilizers informed homeowners about their roles, responsibilities, and precautions via house-to-house mobilization. Community meetings, radio discussions, and jingles highlighted the roles, responsibilities, and precautions for homeowners before, during, and after their homes	No outstanding issues	5,633 homeowner preparation and SOP performance checks were carried out. In 2 instances, mobilizers did not inform homeowners adequately. Few households did not know some of the post-spray requirments. Supervisors corrected the omission during inspections.

	were sprayed. SOPs were trained to inform the households about what they should do before, during, and after the spraying.		
2b. Prohibition of spraying houses that are not properly prepared.	Much importance was placed on adequate preparation of structures prior to spraying. 2017 trainings on the spray techniques included a live-fire session, a practical demonstration of how structures should be prepared for spraying. Ensuring proper preparation was mainly done through supervision and physical spot checks by AIRS regional-level supervisors, TLs, and FSs. With the introduction of DOS, TLs greatly increased inspections. Corrective measures were taken where needed.	No outstanding issues	In the 5,633 inspections of homeowner preparation and SOP performance conducted, inspectors observed only 199 instances of improper preparation (food items were not removed or not covered). These were corrected before spraying was done.
2c. Two-hour exclusion from house after spraying	SOPs reminded households to wait two hours after spraying before opening the rooms, and to allow circulation of air for 30 minutes before cleaning. Households were advised to mop their rooms, and wash their hands with soap and water after cleaning and bury dead insects and water used to mop the floor.	No outstanding issues	This message was repeatedly stressed in the radio discussions and jingles played throughout the campaign.
2d. Instruct homeowners to wash itchy skin and go to health clinic if symptoms do not subside.	All household members were instructed to wash with plenty of water and soap if they experienced itching skin, and report to the nearest clinic if itching persisted.	No outstanding issues	Forty-three Medical Assistants including EPA staff were trained on insecticide poison management on March 8. In addition, AIRS stocked all health facilities around its operational sites with Atropine.
3a. Indoor spraying only.	SOPs sprayed only the sprayable surfaces of the interior of sleeping rooms. These include behind the doors, inner walls, ceiling, and eaves (where applicable.	No outstanding issues	Spraying only of recommended indoor surfaces was emphasized throughout all trainings. AIRS also sent out job aids, at least, three times a week to all SOPs and Supervisors

			on spraying of reccommended surfaces.
3b. Training on proper spray technique	During the TOT and SOP trainings, the project introduced "live fire," a practical session during which SOPs practiced spray techniques in a "real" structure, i.e., identical in all respects to the structures the SHOPs would spray during the campaign. Obstacles were created for SOPs to maneuver their way in spraying the room and still maintain perfection. Emphasis was on preparing the structure, standing 1 meter from the surface being sprayed; keeping the nozzle tip 45cm from the surface; and spraying at the correct speed of 5 seconds per swath for a 2-meter wall.	No outstanding issues	
3c. Maintenance of pumps	At the TOT and SOPs training, Supervisors and teams were trained on pump maintenance. Spray pumps were checked daily before use. Pump parts were found to be faulty were replaced. Pumps were calibrated weekly throughout the spray campaign.	No outstanding issues	Site managers and supervisors serviced (including oiling) and calibrated all spray pumps on weekends.
4a. Choose sites for disposal of liquid wastes, including mobile soak pit sites, according to PMI BMPs.	All 21 operational sites were visited and inspected to ensure they met PMI BMP standards before they were certified for use. The AIRS Ghana ECO inspected all 25 MSP sites prior to their installations.	No outstanding issues	
4b. Construct fixed and mobile soak pits with charcoal to adsorb pesticide from rinse water.	25 MSPs were constructed for the 2017 spray campaign. All the MSPs were stacked with GAC to absorb pesticide from the end-of-day clean-up. All fixed soak pits were built with five layers: sawdust, charcoal, bigger stones, smaller stones, and gravel.	No outstanding issues	All MSPs were properly uninstalled and decommissioned at the end of the spray campaign.

4c. Maintain soak pits as necessary during season.	All soak pits were rehabilitated and properly maintained before and throughout the spray campaign. There were no puddles or stagnant water noticed in any of the soak pits. For the older soak pits, where the bio-bed is located in the middle of the wash area, tarpaulins were spread on the entire wash area to ensure that all liquid waste flowed into the bio-bed.	Expansion of Zantili and Karaga soak pits is recommended so they accommodate 45 and 50 SOPs respectively.	Expansion of the soak pits at Zantili and Karaga will reduce the waiting time during end-of-day clean-up.
4d. Inspection and certification of solid waste disposal sites before spray campaign.	Site inspections at waste management companies will be done in July 2017 to ascertain the status of the facilities before solid wastes are dispatched there.	No outstanding issues	The companies are Cyclus Elmina Plastic Recycling Limited and Zoil Services Limited. AIRS Ghana will ensue they still have the capacty to recycle and incinerate all 2017 solid waste.
4e. Monitoring waste storage and management during campaign.	The project stored and managed all solid waste generated during the spray campaign. All Store Assistants clearly labeled sacks/boxes for used nose masks, hand gloves, and other waste. Contaminated materials were bagged in separate sacks from uncontaminated items according to PMI BMP standards.	All solid waste including triple-rinsed empty Actellic 300 CS bottles are being stored in district warehouses awaiting transport to the central warehouse in Tamale. In August 2017, the project will move the waste to Cyclus Elmina Plastic Recycling Limited and/or Zoil Services Limited for final disposal.	
4f. Monitoring disposal procedures post-campaign.	The ECO and EPA representative will monitor the post-spray campaign solid waste procedure.	This is anticipated to be done in August 2017.	Waste disposal will be done at Cyclus and/or Zoil Services Limited.

5b. Reconciliation of number of houses sprayed vs. number of sachets/bottles used.	The average number of structures sprayed per bottle is 4.6 This was re-calculated every day throughout the spray campaign to ensure that insecticide usage was consistent with the number of structures sprayed. No deviations were detected.	No outstanding issues	The numbers of structures sprayed and bottles used were tracked daily using the insecticide tracker in the stores and in the database, as well as the performance tracking sheet
	The regional team, district M&E team, TLs, and FSs performed regular spot checks in sprayed houses to verify and confirm insecticides application. This was mainly done through visual examination of sprayed walls, eaves, and ceilings.	No outstanding issues	All supervisors and TLs checked spray quality by direct observation of the SOPs.
5d. Perform physical inventory counts during the spray season.	The regional team did physical counts of randomly selected inventory items on a regular basis. The ECO and other supervisors used the storekeeper performance checklist to verify the stocks. A total of 77 of store inspections were carried out throughout the campaign. Only 5 problems were detected with the inventory numbers.	No outstanding issues	All stored items had stock cards. The ECO and Logistics and Procurement Coordinators checked and verified the stock cards and used their data for final inventory reconciliation.

ANNEX D. DATA QUALITY ASSURANCE AND CONTROL METHODS

Issue	Method/Tools for Quality Assurance
Mobilization data integrity	• Use of standardized data collection forms. • Comprehensive training for mobilization data capture. • Multiple levels of supervision. • Household visits for spot checks. • Database designed with locks and validation checks. • Use of EE to ensure complete and accurate data collection.
Spray data integrity	• Use of standardized data collection forms. • Comprehensive training for spray data capture. • Multiple levels of supervision. • SOPs supervised directly by their TLs. • Supervisors monitored the TLs and verified SOP forms. • M&E Manager, Database Manager, and District M&E Coordinators monitor and verified data captured by SOPs, TLs, and Supervisors. • Structure spot checks to cross-check daily spray data captured by SOPs. • Database designed with locks and validation checks. • Use of EE and DCV forms to ensure complete and accurate data collection. • Compared number of compounds sprayed with number of compounds mobilized, to address any issues with missed compounds.

Spray data entry and management	• Data entry training for all Data Entry Assistants.
	• Prompt (daily) field data entry and transfer.
	• Data entry via double-data-entry method:
	  ▪ Initial data entry of totals per data collection form within 12 hours after spray
	  ▪ Follow-up entry of details data, i.e., data per individual household/compound, within 24 hours after spray
	• Data scan for irregularities by Database Manager and IRS supervisory staff.
	• Use of Microsoft Access-based IRS Cleaning/Reporting tool to clean data daily.

Data security	• Data collection forms printed on durable sheets. • Paper data collection forms filed systematically in arc files. • Database designed with passwords to restrict unauthorized entry. • Databases backed up daily on the server laptop, Dropbox, and external drives.

ANNEX E. GHANA MONITORING AND EVALUATION PLAN INDICATOR MATRIX

PMI AIRS Project

Ghana Monitoring and Evaluation Plan Indicator Matrix

UPDATED: June 19, 2017

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
Component 1: Establish cost-effective supply chain mechanisms and execute logistical plans								
1.1 Procurement								
1.1.1 Number and percentage of insecticide procurements that had a pre-shipment quality assurance/ quality control test at least 60 days prior to spray campaign	*Data source*: Project records – insecticide procurements *Reporting frequency*: Each spray campaign	By Spray Campaign	1; 100%	1; 100%	1; 100%	1; 100%	1; 100%	1;100%
1.1.2 Number and percentage of international insecticide procurements delivered in country, at port of entry, at least 30 days prior to the start of spray operations	*Data source*: Project records – international procurements *Reporting frequency*: Each spray campaign	By Spray Campaign	1; 100%	1; 100%	1; 100%	1; 100%	1; 100%	1;100%
1.1.3 Number and percentage of international equipment procurements, including PPE, delivered in country, at port of entry, at least 30 days prior to start of spray operations	*Data source:* Project records *Reporting frequency*: Each spray campaign	By Spray Campaign	1; 100%	0; 0% (was not delivered 30 days prior to spray)	2[6]; 100%	1[7]; 50%	3[8]; 100%	3;100%[9]

[6] One shipment with parts Goizper pump and one with Hudson equipment and other PPEs
[7] Hudson repair kit and other PPE did not arrive 30 days prior to the start of the IRS (target), but they did arrive in time for distribution before the campaign started.
[8] One shipment with Goizper equipment, one with Hudson equipment and one with PPEs
[9] All 3 shipment arrived 30 days prior to start of campaign (Goizper pump PPEs and CFV seal for Hudson pumps.)

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
1.1.4 Number and percentage of local procurements of PPE delivered 14 days before the start of spray operations	*Data source:* Project records *Reporting frequency*: Each spray campaign	By Spray Campaign	1; 100%	1; 100%	2[10]; 100%	2; 100%	2[11] 100%	2;100%
1.1.5 Successfully completed spray operations without an insecticide stock-out	*Data source:* Project records *Reporting frequency*: Each spray campaign	By Spray Campaign	Completed	Completed	Completed	Completed	Completed	Completed
1.2 In-Country Exemption and Custom Clearance Process								
1.2.1 Complete exemption and clearance process within the minimum 2 weeks	*Data source:* Project records *Reporting frequency:* Each spray campaign	By Spray Campaign	Completed	Completed	Completed	Completed	Completed	Completed
1.3 In-Country Logistics, Warehousing, and Training								
1.3.1 Number and percentage of logistics and warehouse managers trained in IRS supply chain management	*Data source*: Training records *Reporting frequency*: Each spray campaign	By Spray Campaign By Gender	21; 100%	22; 100%	22; 100%	22; 100% (9 Males, 13 Females)	30; 100%	30;100% (12 Male, 18 Female, 60% Female)
1.3.2 Number and percentage of base stores where physical inventories are verified by up-to-date stock records	*Data source:* Project records *Reporting frequency*: Each spray campaign	By Spray Campaign	16; 100%	16; 100%	16[12];100%	16; 100%	21; 100%	21;100%
1.3.3 Submit up-to-date inventory records 30 days after the end of each spray campaign	*Data source:* Project records *Reporting frequency*: Each spray campaign	By Spray Campaign	Completed	Completed	Completed	Completed	Completed	Completed

[10] One target for cotton socks and one for coveralls
[11] One target for cotton socks and one for gum boots
[12] One at each of the 16 sites

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
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 PMI AIRS country work plan developed and submitted on time	*Data source:* Project records *Reporting frequency*: Annually	By Spray Campaign	Completed	Completed	Completed	Completed	Completed	Completed
2.1.2 Percentage reduction in project operational expenses per structure from the previous year,excluding insecticide costs	*Data source:* Project financial records *Reporting frequency*: Annually	By Spray Campaign	5%	31[13]%	5%	21[14]%	5%	-32[15].%
2.2 Support of Safety and Health Best Practices and Compliance with USAID and Host Country Environmental Regulations								
2.2.1 SEA/letter reports submitted on time based on schedule agreed upon with the-PMI COR team	*Data source*: Project records – submitted SEAs/ letter reports Reporting frequency: Each spray campaign	By Spray Campaign	Completed	Completed	Completed	Completed	Completed	Completed
2.2.2 Number of spray personnel trained in environmental compliance and personal safety standards in IRS implementation[16]	Data source: Project records – Training reports Reporting frequency: Each spray season	By Spray Campaign By Gender	648	651[17] (459 male, 192 females; 29.5% female)	664[18]	662[19] (455 males, 207 female, 31.1% female)	898[20]	911[21] (695 males, 216 females; 23.7% female)

[13] Cost comparison 2014 vs 2015: the project-wide approach to calculating this indicator compares the ratio between Oracle charges for the operations code in the two years and the number of structure sprayed in the two years. In Ghana, the total of the two ratios is considered the percent saved because the country charged less but sprayed more structures in 2015 than in 2014. Insecticide and capital cost are excluded.

[14] As above, applied for 2015 vs 2016 calculations. Increase in structures sprayed between 2016 and 2015 is 5,348.

[15] Operations cost was higher in 2017 because of startup costs (soak pit, store, office etc.) in 5 sites of 2 new districts; new pumps, hike in the market of car rentals; extensive rehabilitation and additional soak pits in old districts etc.

[16] This includes Site Managers (16), Field Supervisors (46), Team Leaders (92), and Spray Operators (497).

[17] This includes Site Managers 16 (16M, 0F), Field Supervisors 46 (42 M, 4 F), Team Leaders 92 (72M, 20F), and Spray Operators 497 (329M, 168F).

[18] All participants at TOT and SOP training.

[19] This includes Site Managers (16), Field Supervisors (48), Team Leaders (92), Spray Operators (490), Government Officials (11), and DOCs (5) for Year 2

[20] This includes DOCs (2), Government officials (16), Site Managers (24), Field Supervisors (64), Team Leaders (132), and Spray Operators (660).

[21] This includes DOCs (3), Government officials (13), Site Managers (22), Field Supervisors (65), Team Leaders (123), and Spray Operators (685).

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
2.2.3 Number of health workers receiving insecticide poisoning case management training	Data source: Project records – Training reports Reporting frequency: Each spray season	By Spray Campaign By Gender	44	31 (29 male, 2 female; 6.5% female)	37	33 (30 Male, 3 Female; 9.1% female)	49	43 (36 male, 7 female; 16.1% female)
2.2.4 Number of adverse reactions to pesticide exposure documented	Data source: Incident report forms Reporting frequency: Each spray campaign	By Spray Campaign By Residential/ Occupational Exposure	0	0	0	0	0	0
2.2.5 Number and percentage of soak pits and storehouses inspected and approved prior to spraying	Data source: Project records – Reports submitted by district environmental officers Reporting frequency: Each spray season	By Spray Campaign By Soak Pit By Storehouse	16; 100%	16; 100%	16; 100% (Soak Pits) 16; 100% (Store houses)	16[22]; 100% 16; 100%	21; 100% (Soak Pits) 21; 100% (Store houses)	21[23];100% (Soak Pits in all the 21 sites) 25 Mobile Soak Pits 21;100% (Stores houses in all the 21 sites)
2.3 Conduct Communications Activities and Community Mobilization								
2.3.1 Number of radio spots and talk shows aired	*Data source*: Project records Reporting frequency: Per spray campaign	By Spray Campaign	472 jingles 28 talk shows[24]	513 jingles 11 talk shows 298 radio announcements	392[25] jingles 12 talk shows	826 (532 radio spots and jingles, 16 radio programs: interactive	1,012 (652 radio spots and jingles, 22 radio programs:	1,248 (846 radio spots and jingles, 30 radio programs: interactive shows, 372 radio announcements

[22] 16 soak pits were inspected and approved prior to spray operation. Also 11 mobile soak pits (MSPs) were used on rotational basis in four districts (KUD, MMD, WMD, and EMD). The proposed sites for the installation of MSPs were inspected and approved before installation was done.

[23] 21 soak pits were inspected and approved prior to spray operation. Also 25 MSPs were used within the districts as follows KAD15, EMD 4, WMD 4, and MMD 2. Out of the 25 MSPs, 6 were used at Singa community (KUD) in the first week of the spray campaign before distributed among MMD and WMD. The proposed sites for the installation of MSPs were inspected and approved before installation was done.

[24] There were 444 jingles and 28 radio talk shows in year 1.

[25] This includes: Jingles =35 days*3 times a day*2 radio stations and announcements =35days*2 times a day*2 radio stations during spray campaign. Pre-spray jingle play= 7days*3 times*2 radio stations

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
						shows, 278 radio announcement)	interactive shows, 338 radio announcement)	
2.3.2 Number of IRS print materials disseminated	Data source: Project records Reporting frequency: Semi-annually	By Spray Campaign By Type of printed material and message(s)	26,333	26,333(22,433 posters and 3,900 brochures)	27,993[26] poster	27,993[27] posters	14,500 (4,500 posters and 10,000 fliers for Karaga and Gushegu)	11,700 (4,500 posters for all the district and 7,200 fliers for Karaga and Gushegu)

[26] No brochure were printed or distributed in 2016; AIRS Ghana only printed and distributed posters.
[27] 20,993 distributed by mobilizers and 7,000 distributed through other means.

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
2.3.3. Number of people reached with IRS messages via door-to-door mobilization	Data source: Mobilization Data Collection Forms Reporting frequency: Daily per mobilization conducted	By Spray Campaign By Gender	289,353[28]	214,864	292,849[29]	198,170 (89,372 Male, 108,798 Female)	418,311[30]	259,034 (115,673 Male, 143,361 Female)
2.4 Spray Targeted Structures According to Technical Specifications								
2.4.1 Number of structures targeted for spraying	Data source: Previous spray campaign data, enumeration data (targets); Daily Spray Operator Forms (results) Reporting frequency: Daily per spray campaign	By Spray Campaign	231,345	224,592	224,592	227,857	316,587[31]	324,115
2.4.2 Number of structures sprayed with IRS	Data source: Daily Spray Operator Forms Reporting frequency: Daily per spray campaign	By Spray Campaign	196,643[32]	205,935	190,903	211,283	269,099	304,648
2.4.3 Percentage of total structures targeted for spraying that were sprayed with a residual insecticide (Spray Coverage)	Data source: Daily Spray Operator Forms Reporting frequency: Daily per spray campaign	By Spray Campaign	85%	91.7%	85%	92.7%	85%	94.0%
2.4.4 Number of people residing in structures sprayed (Number of people protected by IRS)	Data source: Daily Spray Operator Forms Reporting frequency: Daily per spray campaign	By Spray Campaign By Gender By pregnant women	596,706	553,954 (11,676 pregnant women, 98,525 children under 5)	585,698	570,871 (10,881 Pregnant Women, 96,150 Children under 5	851,419[33]	840,438 (18,431 Pregnant Women, 152,681 children under 5 years old)

[28] 50% of targeted population for 2015 campaign, 596,706
[29] 50% of targeted population for 2016 campaign, 585,698
[30] 50% of targeted population for 2017 campaign 836,621
[31] This figure is made up of 227,857 structures found from the 2016 spray campaign and an estimated 39,794 structures for Karaga and 48,936 structures for Gushegu.
[32] 85% of number of structures targeted for spraying
[33] This figure is made of 599,482 people residing in sprayed and unsprayed structures for 2016 campaign and estimated 108,228 for Karaga and 143,709 for Gushegu.

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
		By children <5 years						
Component 3: Ongoing Monitoring and Evaluation and Quality Control Measures								
3.1 Submit PMI-approved M&E plan to PMI-Ghana for approval	Data source: Project records Reporting frequency: Semi-annual	By Spray Campaign	Completed	Completed	Completed	Completed	Completed	Completed
3.2 Conduct a post-spray data quality audit within 60 days of completion of spray operations	Data source: Spray operations reports Reporting frequency: Per spray campaign	By Spray Campaign	N/A	N/A	N/A	N/A	Completed	Ongoing
Component 4: Contribute to Global and Country-Level IRS Policy Setting and Develop and Disseminate Experiences and Best Practices								
4.1 Number of guidelines/checklists/tools related to IRS operations developed or refined with project support	Data source: Project records – Activity reports Reporting frequency: Semi-annually	By Spray Campaign By Guideline /checklist/tool	N/A	N/A	2	9	2[34]	2
4.2 Number of articles/best practices documents published	Data source: Project records – Activity reports Reporting frequency: Semi-annually	By Spray Campaign By IRS Technical Area	N/A	N/A	2	0	1	1[35]
4.3 Number of best practice presentations given at national/ regional/international workshops and conferences	Data source: Project records – Activity reports	By Spray Campaign	1	1[36]	1	2[37]	1	1[38]

[34] End of day clean-up check list modified to give 10 random questions and team developed ODK based monitoring tool for locked structures and refusals
[35] Manuscript on entomological work submitted to Malaria Journal
[36] The Second Pan African Mosquito Control Association Annual Control Conference, October 6-8, 2015. Tanzania
[37] Presentation on recycling of Actellic bottles and bio-monitoring during the PMI AIRS project regional meeting in Cape Town, South Africa
[38] Best practice presented at the RBM SBCC meeting in Tanzania

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
	Reporting frequency: Semi-annually	By IRS Technical Area						
4.4 Number of enterprises engaged through public-private partnerships	Data source: Project records – Activity reports Reporting frequency: Semi-annually	By Spray Campaign	N/A	N/A	N/A	N/A	1	1[39]
Component 5: Contribute to the Collection and Analysis of Routine Entomological and Epidemiological Data								
5.1 Support Entomological Monitoring Activities and Insecticide Resistance Strategies								
5.1.1 Number of entomological sentinel sites supported by the PMI AIRS Project established to monitor vector bionomics and behavior (vector species, distribution, seasonality, feeding time, and location)	Data source: Entomological reports (End of Spray report) Reporting frequency: Annually	By Spray Campaign	14	14	14	14	16	16
5.1.2 Number and percentage of entomological monitoring sentinel sites measuring all the five primary PMI entomological monitoring indicators	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign	14, 100%	14, 100%	14, 100%	14, 100%	16;100%	16;100%
5.1.3 Number and percentage of entomological monitoring sites measuring at least one secondary PMI indicator	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign	14, 100%	14, 100%	14, 100%	14, 100%	16;100%	16;100%
5.1.4 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	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign	10, 100%	8: 80%	10, 100%	9; 90%	9;100%	On going (Susceptibility test to be done this rainy season- May-October)

[39]AIRS-AngloGold joint entomology monitoring site and experience sharing forum established

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
5.1.5 Number of wall bioassays conducted within 2 weeks of spraying to evaluate the quality of IRS	Data source: Entomological reports Reporting frequency: Per spray campaign	By Spray Campaign	24	44	40[40]	52[41]	42	40
5.1.6 Number of wall bioassays conducted after the completion of spraying at monthly intervals to evaluate insecticide decay	Data source: Entomological reports Reporting frequency: Per spray campaign	By Spray Campaign	128	396 Completed	128	126 Completed	128	54 (Ongoing as of July 4, 2017)
5.1.7 Number of vector susceptibility tests for different insecticides conducted in selected sentinel sites	Data source: Entomological reports Reporting frequency: Per spray campaign	By Spray Campaign By Type of Insecticide	40	39[42] Completed	40	38	42	16 so far completed (Pirimiphos methyl (7) Alphacypermethrin (5) Bendiocarb (3) DDT (1),ongoing)

[40] Target: 10 communities, 4 tests per community, 40 tests in total

[41] Actual: 13 communities, 4 tests per community, 52 tests in total. The 52 tests consist of 16 tests for wild mosquitoes and 36 tests for Kisumu mosquitoes.

[42] Pirimiphos-methyl 0.25% (11); Fenitrothion 1% (1); Alpha-cypermethrin 0.5% (8); Deltamethrin 0.05% (5); Propoxur 0.1% (2); Bendiocarb 0.1% (7); DDT 4% (5)

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
5.2 Support Epidemiological Malaria Data Collection and Analysis								
5.2.1 Collect routine epidemiological data	Data source: Project Reports Reporting Frequency: Annually	By Spray Campaign	N/A	N/A	N/A	N/A	N/A	N/A
5.2.2 Number of targeted health facilities with routine epidemiological malaria data collection supported by the PMI AIRS Project	Data source: Epidemiological reports Reporting frequency: Annually	By Spray Campaign	N/A	N/A	N/A	N/A	N/A	N/A
Component 6 (Cross-cutting): Capacity Building, Knowledge Transfer, Gender Inclusion								
6.1 Increasing the Role of Women and Addressing Gender Barriers								
6.1.1 Number of people trained to deliver IRS in target districts	Data source: Project records – Training reports Reporting frequency: Semi-annually	By Spray Campaign By Spray Campaign By Gender Percentage of Women Trained	707	698 (504 male, 194 females; 27.8% females)	708	694 (484 Male, 210 Female; 30.3% females)	947	954 (731 Male, 223 Female; 23.4% female)
6.1.2 Total number of people trained to support IRS in target districts	Data source: Project records – Training reports Reporting frequency: Semi-annually	By Spray Campaign By Spray Campaign By Gender Percentage of women trained	1,629	1,544(1,252 males, 292 females; 18.9% females)	1,664	1,667 (1,359 Male, 308 Female; 18.5% females)	2,485	2,310 (1952 Male, 358 Female; 15.5% female)
6.1.3 Number of women recruited for	Data source: Project records –	By Country	258[43]	306 (20.8%)	573[44]	319; (21.4%)	397[45]	383 (16.8%)

[43] Based on 40% female target for all positions: Total number of people to be recruited is approximately 646 (excluding 32 security personnel); 40% gives 258.

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
IRS employment	Recruitment reports reports Reporting frequency: Semi-annually	By Percentage of women recruited						
6.1.4 Number of people trained as IRS Training of Trainers	Data source: Project records – Training reports Reporting frequency: Semi-annually	By Spray Campaign By Gender Percentage of women trained	82	78 (74 males, 4 females; 5.1% females)	83	79 (74 Male, 5 Female; 6.3% female)	106	103 (96 Male, 7 Female;6.8% female)
6.1.5 Total number of people hired to support IRS in target districts	Data source: Project records – Contracts signed Reporting frequency: Semi-annually	By Spray Campaign Gender Percentage of women hired	678	1,471 (1,165 males, 306; 20.8% females)	1,465	1,491 (1,172 Male, 319 Female; 21.4% Female)	2,350[46]	2,277 (1,896 Male, 383 Female; 16.8% female)
6.1.6 Number of women hired in supervisory roles in target districts (includes site supervisors, team leaders, M&E assistants and others who supervise seasonal staff)[47]	Data source: Project records – Contracts signed Reporting frequency:Semi-annually	By Spray Campaign Percentage of women hired	17[48]	27[49]	35[50]	33[51]	48[52]	39[53] 16.3% women

[44] Based on 40% female target for all positions: The total number of people expected to be recruited for all temporal positions in 2016 (excluding 32 security personnel) is approximately 1,433.

[45] Based on 40% female targets for all positions: The total number of people to be recruited for all temporal position in 2017 (excluding 36 security personnel) is approximately 993; 40% is 397.

[46] Actual number of people to hire (without buffer and government officials)

[47] People counted include: Site Managers, Field Supervisors, IEC Assistants, M&E Assistants, Logistics Assistants, and Team Leaders

[48] Approximately 174 people will fill these supervisory positions: Site Managers (16), Field Supervisors (44), IEC Assistants (16), M&E Assistants (5), Logistics Assistants (5), and Team Leaders (88)] for year 1; we are targeting 10% of them to be females.

[49] Site Managers (0), Field Supervisors (3), IEC Assistants (2), M&E Assistants (1), Logistics Assistants (1) and Team Leaders (20)

[50] Approximately 20% of the total number of people expected to fill this position (174 people will fill these supervisory positions: Site Managers (16), Field Supervisors (44), IEC Assistants (16), M&E Assistants (5), Logistics Assistants (5) and Team Leaders (88)).

[51] This includes M&E Assistant (1), Field Supervisors (5), Team Leaders (24), IEC Assistants (2), Logistic Assistant (1), and Site Managers (0)

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
6.1.7 Number of staff (permanent and seasonal) who have completed gender awareness training	Data source: Project records – Training reports Reporting frequency: Semi-annually	By Spray Campaign Gender Percentage of women hired	22[54]	20[55]	64[56]	64	817[57]	833[58] (623 male, 210 female, 25.2% female)
6.2 Capacity Building								
6.2.1 Number of government officials trained in IRS oversight	Data source: Project records – Training reports Reporting frequency: Semi-annually	By Spray Campaign By Gender Percentage of Women Trained	10	11 (11 males, 0 females; 0% female)	11	10 (10 Males, 0 Females)	16	13 (13 male, 0 female)
6.2. Implement all activities outlined in their yearly Capacity Building Action Plan	Data source: Project records – Capacity assessment reports Reporting frequency: Semi-annually	By Spray Campaign	Completed	Completed partially (2 out of 3 activities completed).	Completed	Completed	Completed	Partially complete (DCOs and DEMO trained) (Outstanding is training for NMCP/ GHS IEC unit staff due to conflict of schedules)
6.2.3 Ghana government implements at least one aspect of the IRS program	Data source: Project records – memoranda of understanding	By Spray Campaign	N/A	N/A	N/A	N/A	N/A	N/A

[52] Approximately 20% of the total number of people expected to fill this position (240 people will fill this position: Site Managers (22), Field Supervisors (62), IEC Assistants (228), M&E Assistants (7), Logistic Assistants (7) and Team Leaders (120).
[53] This figure is made up of IEC Assistants (4), Logistics Assistants (2), Team Leaders (26), and Field Supervisors (7).
[54] 22 permanent staff will be trained in year 1
[55] The permanent staff are 22; two entomology staff missed it because they were in the field. There are plans for them to do the training soon.
[56] The number includes only TOT participants for year 2 who did not take part in the training in year 1. Even though the government officials will be at the TOT, they will not be counted because they are neither permanent nor seasonal project staff.
[57] SOPs and TLs are the only group to be trained in year 3. Others (permanent and supervisors) were trained in years 1 and 2, respectively. New Supervisors and Site Managers especial in the new districts, Karaga and Gushegu, will be included. The figure (817) includes SOPs = 660, TL = 132, Supervisors (Karaga and Gushegu) = 17, Site Managers (Karaga and Gushegu) = 6, DOCs = 2
[58] This figure is made of DOCs (new)=3, Supervisors (Gushegu and Karaga)=17, Team Leaders=123, SOPs=685 Site Managers (Karaga and Gushegu)=5

Performance Indicator	Data Source(s) and Reporting Frequency	Disaggregate	Annual Targets and Results					
			Year 1		Year 2		Year 3	
			Target	Results	Target	Results	Target	Results
independently.	Reporting frequency: Semi-annually							