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Indoor Residual Spraying (IRS 2) Task Order Four

2013 MALI END OF SPRAY REPORT

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2013 MALI END OF SPRAY REPORT

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ACRONYMS

AIRS	Africa Indoor Residual Spraying Project
ASACO	Community Health Associations (Association de Santé Communautaire)
BMP	Best Management Practices
COP	Chief of Party
DNACPN	National Directorate for Sanitation and Pollution Control (Direction National de l'Assainissement, Contrôle de Pollution et de Nuisances)
DTC	Health Center Technical Director (Directeur Technique de Centre)
ECM	Environmental Compliance Manager
ECO	Environmental Compliance Officer
F&A	Finance and Administration
ICC	Inventory Control Cards
IEC	Information, Education, and Communication
IRS	Indoor Residual Spraying
M&E	Monitoring and Evaluation
MRTC	Malaria Research and Training Center
NMCP	National Malaria Control Program (Programme National de Lutte contre le Paludisme)
PID	Pulvérisation Intra Domiciliaire
PSC	Pyrethrum Spray Catch
PMI	President's Malaria Initiative
PPE	Personal Protective Equipment
RTI	Research Triangle Institute International
RTT	RTT Group, Ltd
SEA	Supplemental Environmental Assessment
STTA	Short-Term Technical Assistance
TOT	Training of Trainers
USAID	United States Agency for International Development
WHO	World Health Organization

EXECUTIVE SUMMARY

Under its Indoor Residual Spraying 2 Task Order Four contract with the United States Agency for International Development (USAID), Abt Associates has assumed the role of lead implementing agent for the Indoor Residual Spraying (IRS) project supported by the President's Malaria Initiative (PMI) in Mali, and in 13 other sub-Saharan African countries. In November 2011, Abt Associates established its project office in Bamako and began the implementation of IRS programming under the project name, the Africa Indoor Residual Spraying Project (AIRS) Mali. The key objective of AIRS Mali in 2013 was to reduce malaria-associated morbidity and mortality in Baroueli, Bla, and Koulikoro districts by completing IRS for an estimated 240,493 eligible structures found during enumeration, and thereby protecting as many people as possible.

After the March 2012 coup d'etat, per USAID's instructions, AIRS Mali could not work with the Government of Mali or any organization funded by it. In 2013, USAID authorized AIRS Mali to resume work with the Government of Mali at all levels.

AIRS MALI AT A GLANCE

Number of districts covered by PMI-supported IRS in 2013	3 districts: Bla, Barouéli and Koulikoro
Insecticide	Carbamate (bendiocarb)
Number of structures found by spray operators	233,789
Number of structures sprayed by spray operators	228,985
2013 spray coverage	97.9%
Population protected by PMI-supported IRS in 2013	850,104 (22,405 pregnant women and 153,962 children under five years old)
Dates of PMI-supported IRS campaign	August 1 – September 19, 2013
Length of campaign	46 days
Number of people trained with USG funds to deliver IRS[1]	853

As in 2012, AIRS Mali completed entomological monitoring for the 2013 IRS campaign in place of the Malaria Research and Training Center (MRTC). (The MRTC is affiliated with the University of Mali and is funded by the Malian government.)

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

Key lessons learned from the 2013 IRS campaign include:

- Communities found that when the IRS campaign begins, mosquitoes are numerous and have already started to bite. During the post-campaign workshop, the community leaders proposed that the beginning of the IRS be moved back to June.
- Due to the rainfall, some areas are hard to access and other means of transportation may be easier, such as motorcycles, bikes and canoes.
- The IRS campaigns should continue to encourage more women to participate in the IRS campaign.
- The project should start incineration before the end of the campaign, to prevent a backlog of waste to be incinerated, and ensure that the incinerator does not break down or wear out.

Résumé (en français)

Sous son contrat ''Task Order Four contract'' avec l'Agence Internationale de Développement des Etats Unis, (USAID), Abt Associates a assumé le rôle de principal agent d'exécution pour l'Initiative contre le paludisme (PMI) a appuyé le Projet de pulvérisation Intradomiciliaire au Mali, et dans 13 autres pays d'Afrique subsaharienne. En Novembre 2011, Abt a installé son nouveau projet à Bamako et a débuté la planification de la mise en œuvre de la pulvérisation Intra domiciliaire sous le nom de projet, ''African Indoor Residual Spraying (AIRS)'' ou Programme Africain de Pulvérisation Intra Domiciliaire au Mali. L'objectif clé de la PID en 2012 au Mali est de réduire la morbidité et la mortalité dues au paludisme dans les trois districts: Koulikoro, Bla et Baroueli par la PID couvrant ainsi environ 211 000 structures éligibles et protéger ainsi autant de personnes que possible dans ces trois districts.

En 2012, en raison de la situation politique préoccupante au Mali, la politique de l'USAID a instruit AIRS Mali de ne pas travailler avec le gouvernement malien, ou les organismes financés par le gouvernement malien au cours de la mise en œuvre de la campagne PID 2012. AIRS-Mali a rapidement engagé les Associations de Santé Communautaires (ASACO) dans les districts couverts, et a commencé à travailler avec les Directeurs Techniques des Centres de Santé financés par la Communauté. Grâce à cette participation directe des communautés, AIRS-Mali a eu une adhésion de bénéficiaires à la campagne IRS, ce qui a conduit à une réparation rapide des sites et une mise en place de la logistique pour la campagne. AIRS a également misé avec succès sur son personnel technique au Mali et sur son siège pour développer des solutions rentables pour planifier et mettre en œuvre la surveillance entomologique pour la campagne PID, y compris la construction d'un insectarium au niveau du bureau.

Mais en 2013, l'interdiction de travailler avec le Gouvernement du Mali a été levée. Toutes les activités avant, pendant et après la campagne ont été menées avec l'implication effective de nos partenaires nationaux et ceci à tous les niveaux.

AIRS MALI EN BREF

Nombre des districts couverts par PMI en 2013	3 districts: (Bla, Barouéli et Koulikoro)
Insecticide utilisé pour la PID	Carbamate (bendiocarb)
Nombre de structures couvertes par PMI-en 2013	228,985
Nombre de structures trouvées par les opérateurs et ciblées par PMI en 2013	233,789
Taux de couverture de la PID 2013	97.9%
Population protegée par PMI-en 2013	850,104 (22,405 femmes enceintes et 153,962 enfants de moins de 5 ans).
Dates de la campagne financée par PMI	Août 1 – Septembre 19, 2013
Durée de la campagne	46 jours

Nombre de personnes formées avec les fonds du Gouvernement Américain[2] pour faire la PID	853

Comme en 2012, AIRS-Mali s'est engagé dans la surveillance entomologique pour la campagne PID 2013 à la place de (MRTC) (MRTC est affilié à l'Université du Mali et est financé par le gouvernement du Mali).

Les leçons tirées de la campagne PID 2013:

- Les communautés ont constaté que lorsque la PID commence, les moustiques sont nombreux et ont déjà commencé à piquer. Ils ont proposé que le début de la campagne PID commence avec 1 mois d'avance.
- Pendant les zones de pulvérisation difficiles d'accès: apporter un soutien d'autres moyens de transport, tels que moto, vélo et surtout le canoë.
- Ajustez le nombre d'opérateurs par région,
- L'implication des femmes dans la campagne IRS a fait la différence.
- Commencez incinération avant la fin de la campagne ne peut pas fatiguer trop l'incinérateur et de détruire les déchets solides dans le temps.

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

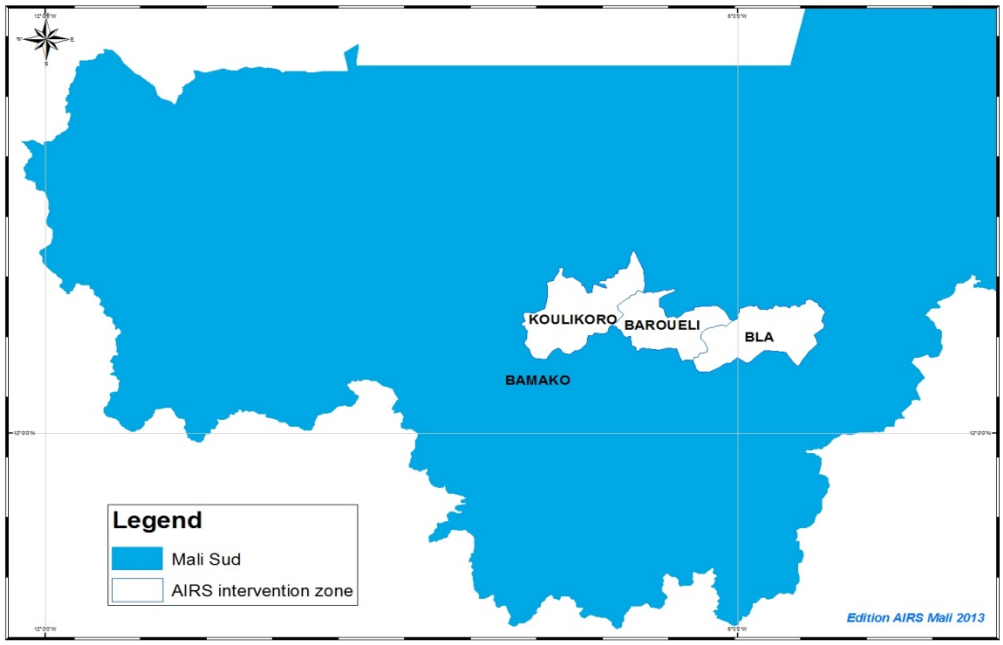
I. INTRODUCTION

Under its Indoor Residual Spraying 2 Task Order Four contract with the United States Agency for International Development (USAID), Abt Associates has assumed the role of lead implementing agent for the Indoor Residual Spraying (IRS) project supported by the President's Malaria Initiative (PMI) in Mali, and in 13 other sub-Saharan countries. In November 2011, Abt Associates established its project office in Bamako and began the implementation of IRS programming under the project name, the Africa Indoor Residual Spraying Project (AIRS) Mali. The key objective of AIRS Mali in 2013 is to reduce malaria-associated morbidity and mortality in Baroueli, Bla, and Koulikoro districts by completing IRS for an estimated 240,493 eligible structures found during enumeration, and thereby protecting as many people as possible.

2. Country Background

PMI has supported IRS in Mali since 2008, initially through IRS programs in Bla and Koulikoro districts. In 2011, PMI added support to IRS programming in Baroueli district, thus making the IRS supported area geographically continuous. Because of the short residual life of the carbamate class insecticide (bendiocarb) used during the 2012 IRS campaign in some areas (particularly southern Baroueli district), PMI and the National Malaria Control Program (NMCP) agreed to delay the start of the IRS campaign to August 1, 2013 and end on September 19, 2013, to ensure that the sprayed walls would retain their efficacy through the peak malaria transmission season during September and October. AIRS Mali did note to PMI and the NMCP that the start of the 2013 IRS campaign would coincide with the start of the rainy season, and in some areas transport and spraying would experience delays due to difficult roads. However, the timeline for completing the IRS campaign was feasible.

FIGURE 1: LOCATION OF BAROUELI, BLA, AND KOULIKORO DISTRICTS FOR THE IRS CAMPAIGN



2.1 Political Situation in Mali

In 2012 the government of Mali experienced instability, but with a newly elected president in 2013 and relative stability in the northern part of the country, USAID authorized the project to work with the government during the 2013 IRS campaign. AIRS Mali worked with community and government partners at the local, regional, and district level.

2.2 Objectives for 2013 IRS Campaign

As stated in the 2013 AIRS Mali Work Plan, the four objectives for AIRS Mali in 2013 were:

1. Cover at least 85 percent of targeted and eligible structures found in all three districts (Baroueli, Bla, and Koulikoro).
2. Promote a participatory implementation (at all levels) of the IRS operations in the three health districts of Baroueli, Bla, and Koulikoro.
3. Continue efforts to develop national and local capacity in organizing, planning, implementing, and evaluating IRS campaigns, with the goal of identifying a plan for sustainability.
4. Participate in the development of a national IRS strategy document, and provide further support towards:
    - A national-level IRS training manual, and
    - Supporting workshops and various training activities to disseminate the national IRS strategy.
5. Complete quality entomological monitoring for the 2013 IRS campaign. This will include gaining accurate information regarding vector susceptibility and residual life of carbamates, to ensure the NMCP and PMI have enough information for deciding on an insecticide for the 2014 IRS campaign.

Overall, AIRS Mali aimed to cover an estimated 240,493 structures in Baroueli, Bla, and Koulikoro during the 2013 IRS campaign, and protect as many as possible of the estimated 854,631 that live within the three districts.

2.2.1 Adjustments to Achieve 2013 Work Plan Objectives

In 2013, all activities before, during and after the IRS campaign were implemented with the full involvement of government partners. The AIRS Mali project has continued to manage the entomological monitoring with the participation of the NMCP's entomologist.

3. PREPARATION FOR IRS CAMPAIGN

3.1 IRS CAMPAIGN PLANNING

Listed below are the activities that were undertaken to plan and organize the 2013 IRS campaign:

- Development and Completion of 2013 AIRS Mali Work Plan (November 2012 – March 2013). The work plan was completed by the AIRS Mali staff and the AIRS core team. Guidance on the work plan was provided by PMI Mali and PMI Washington, leading to the final approved work plan in March, 2013.
- Internal IRS Campaign Planning (January – July): Beginning in January, the AIRS Mali team began the detailed planning for all activities to be completed within the IRS campaign. AIRS Mali staff met regularly between January and July, to review the organization and planning for the IRS campaign. These meetings included revising training programs and materials, and setting standard for the IRS campaign. The internal IRS campaign planning included taking inventory of IRS equipment and commodities left over from 2012, and making the appropriate procurements in-country and internationally to gain the right inventory.
- Meeting with IRS Steering Committee (March 2013): All activities were planned and implemented in collaboration with government technical partners (NMCP, National Directorate for Sanitation and Pollution Control (DNACPN), Ministry of Agriculture, and other government and non-government organization stakeholders) at the national , regional, district, and community levels.
- Meeting with Community Leaders in Koulikoro, Bla and Baroueli (March): The meetings with community leaders included discussion of the dates for the IRS campaign (given that the NMCP and PMI wanted to start spraying in August, instead of July).
- Meetings with Community Health Association (ASACO), Health Center Technical Director (DTC) and district level (June and July): Rapid meetings were undertaken with ASACO members and DTCs throughout the spray districts in June and July to assure communities that the IRS campaign would happen in 2013. The meetings also established the roles and commitments of the ASACO and DTC in implementing the IRS campaign.

3.2 PRE-SPRAY ENVIRONMENTAL ASSESSMENT

3.2.1 GEOGRAPHIC RECONNAISSANCE

A very brief geographic reconnaissance was completed by AIRS Mali's Environmental Compliance Officer (ECO) in March followed immediately by the pre-spray environmental assessment.

The activity identified areas with difficult geography (see Annex 1) given the start of the rainy season in August, and would need additional planning for the transport of IRS commodities, spray operators, seasonal staff, and the transport of spray campaign data to data entry sites. Overall, the geographical reconnaissance better informed the AIRS Mali in scheduling the 2013 IRS campaign, and helped gain local knowledge of the terrain covered by the IRS campaign.

3.2.2 Pre-Spray Environmental Inspection

A pre-campaign environmental inspection took place early in March and April carried out by the Mali AIRS ECO with the participation of the focal points at the DNACPN and NMCP. The inspection covered all 68 operation sites.

The key objectives of the pre-spray environmental inspection were:

- To examine the location and physical state of storerooms for storing insecticides and other materials used during the IRS operations
- Observe the operational condition of the soak pits and progressive rinsing areas
- Identify areas of environmental non-compliance, and propose a plan for rectifying these issues
- Collect data for the completion of the Letter Report. The Letter Report was sent to PMI on April 30, 2013.

The inspections resulted in refurbishing of storerooms, rinsing areas, soak pits, and showers/toilets at the operations sites, completed by July 25, 2013. Refurbishments were also completed at the three districts' warehouses in Baroueli, Bla, and Koulikoro.

During the pre-spray environmental inspection in 2013, several wash areas were found to be too small to adequately contain all seven barrels needed for progressing rinsing. AIRS Mali decided to expand all washing areas in Bla, Barouéli and Koulikoro using the standard model created by AIRS; to rehabilitate soak pits; to build fences and drying racks at all sites; and to repair warehouses (usually roof, floor and exterior walls) where needed.

The AIRS EC Manager took a Short-Term Technical Assistance (STTA) trip to provide support during the pre-spray inspection, and advised the use of barrels with a smaller capacity, for progressive rinsing, instead of the systematic construction of new wash areas. Washing areas were thus newly constructed only in a small number of sites with more than 10 spray operators.

FIGURE 2: REFURBISHMENT OF OPERATION SITE IN KOULIKORO DISTRICT

Annex 2 notes the location of each operation site (where the soak pits, wash areas, and storeroom were located) for the 2013 IRS campaign, and if the operation site received refurbishments to its storeroom, soak pit, or fencing.

3.2.3 Testing of Mobile Incinerator

The ECO and the Logistics and Procurement Manager visited the mobile incinerator in Noumoubougou (Koulikoro district) in late March and carried out tests to ensure it had the ability to reach a high enough temperature to properly incinerate and dispose of solid wastes from the IRS campaign.

AIRS Mali was authorized to use this incinerator as it was purchased and procured by PMI, and although it currently sits in a government facility, it has not been formally handed over to the government of Mali. The incinerator test was performed with the assistance of a mechanical engineer.

A follow-up test of the incinerator was completed on August 27, with the mechanical engineer and AIRS Mali staff noting that the incinerator was able to reach the optimal temperature for solid waste incineration. The incineration of solid waste began September 16, 2013 and ended on October 12, 2013.

FIGURE 3: TESTING OF THE MOBILE INCINERATOR

3.3 INSECTICIDE SELECTION AND PROCUREMENT

Carbamate was selected as the insecticide class for the 2013 IRS campaign, based on entomological testing and insecticide resistance monitoring performed by the entomology component of the Mali AIRS in 2012.

Just after the 2012 IRS campaign, AIRS Mali calculated that 92,930 sachets of carbamate were needed to cover an estimated 210,217 structures in the three spray districts. This order was made and 92,930 sachets arrived in Mali in April 2013. An enumeration completed in July 2013 by AIRS Mali readjusted the target number of structures to 240,493. The need for insecticides increased to 107,462 sachets. To avoid any disruption and maintain a good buffer, AIRS Mali added 14,498 sachets to their stock. Part of this (3,712 sachets) came from the Benin AIRS Project, and the other part (10,786 sachets) was ordered from Bayer in South Africa.

The carbamate was tested for quality control by the South Africa Bureau of Standards. All batches sent to Mali were found to be of good quality.

3.4 Logistics Planning and Procurement

3.4.1 Personal Protection Equipment Inventory and Procurement

AIRS Mali completed a full inventory count in all three district warehouses. The AIRS Mali team found that most of the inventory, especially the Personal Protection Equipment (PPE), was in good shape and of sufficient quantity to use during the 2013 IRS campaign. Most notably, helmets, coveralls, face shields, and face shield brackets did not need to be procured internationally. However, stocks of face masks were low, therefore more were procured for the 2013 IRS campaign, and though the price was low, the quality of the masks found locally were of poor quality, so AIRS Mali decided to order the masks internationally. Additionally, a large amount of consumables (soap, spray operator cards, Information, Education, Communication (IEC) materials, etc.) was procured locally for the IRS campaign. Overall, procurements were made locally and internationally using an open tender process in which the project collected bids/quotes on commodities to be purchased.

3.4.2 Establishing Logistical Needs for 2013 IRS Campaign

During its internal planning meetings, the AIRS Mali team planned the logistics and transportation for the 2013 IRS campaign. In June, following the geographic reconnaissance and the visits to the operation sites by the operations manager, logistics and procurement coordinator, technical manager, and ECO, the AIRS Mali team finalized its plans for moving IRS commodities to each operation site. On July 27, all IRS commodities were moved from the three district warehouses to the operation sites.

Table 1 below denotes the distribution of selected IRS commodities to each operation site per district.

TABLE 1: DISTRIBUTION OF SELECTED IRS COMMODITIES TO OPERATION SITES

Operation Sites	Number of Teams	Overall	Boots/ Pair	Helmet /Complete	Spray Pump	Gloves	Mask Respirator
Koulikoro	39	492	260	242	174	723	8,970
Bla	66	857	441	348	304	1,256	15,230
Baroueli	54	634	365	280	215	834	12,790
Total	**159**	**1,983**	**1,066**	**870**	**693**	**2,813**	**36,990**

3.5 Human Resources

AIRS Mali hired 2,354 seasonal staff to implement the 2013 IRS campaign. This included 1,953 men and 401 women (17%). Table 2 below provides a full breakdown of the number of men and women hired for each seasonal staff position.

TABLE 2: 2013 IRS CAMPAIGN SEASONAL STAFF

Position	Men	Women	Total
District coordinators	3	0	3
District logisticians	3	0	3
District supervisors	3	2	5
Data clerks	10	11	21
Pump mechanics	6	0	6
District warehouse managers	3	0	3
Finance assistants	2	1	3
Transporters for IRS data	9	0	9
Spray operators	539	11	550
Community supervisors	66	2	68
Team leaders	148	12	160
Storekeepers	58	10	68
IEC mobilizers	937	235	1172
Washers	0	114	114
Entomological technicians	5	3	8
Security guards	68	0	68
Drivers	93	0	93
Total	**1,953**	**401**	**2,354**

However, although the priority was given to hiring seasonal staff from previous IRS campaigns that had performed well, AIRS Mali placed job advertisements for some of the seasonal staff in Malian newspapers in June.

Overall, spray operators, team leaders, pump mechanics, and washers were recruited in each spray area by the head of the ASACO and the DTC, based on criteria developed by the AIRS Mali technical staff. These criteria included: all spray operators were required to be able to read and write, carry spray pumps for several hours per day, as well as to have a certified note from a doctor stating that they are in good health (and for women noting that they are not pregnant).

3.6 TRAININGS

The objective of the 14 training sessions was to ensure that all seasonal staff were aware of their roles and understood how the IRS campaign would function. Additionally, the training sessions covered the precautions that should be undertaken and what to do in emergency situations (such as poisoning from insecticide), and also reinforced to all seasonal staff the value of their work in preventing malaria transmission.

In 2013, all the training sessions were implemented with the support and the involvement of the technical partners of the government. All trainings took place between May 28 and July 30. In total, AIRS Mali trained 2,426 people, of whom 409 or 16.9% were women.

TABLE 3: TOTAL PEOPLE TRAINED (BY POSITION)

Categories of Persons Trained	M	F	Total Total
Technical directors of community health center	66	9	75
District coordinators	3	0	3
Spray operators	539	11	550
Data clerks	10	11	21
Community supervisors	66	2	68
Districts supervisors	3	2	5
Team leaders	148	12	160
Washers	0	114	114
District logisticians	3	0	3
Storekeepers	58	10	68
Warehouse keepers	3	0	3
Mobilizer agents	937	235	1,172
Entomologist technicians	5	3	8
Security guards	68	0	68
Drivers	93	0	93
Radio hosts	15	0	15
TOTAL M/F	**2,017**	**409**	**2,426**
TOTAL			**2,426**

Listed below are descriptions of the trainings that took place in 2013:

Training of Trainers in IEC: Three trainings took place (one per spray district), between May 28 and July 7. The trainings covered key messages for the IEC mobilizers to communicate before, during and after the IRS campaign to prepare households for the IRS campaign, provide information on malaria prevention, and answer questions. The DTCs participated in many of these trainings, and were available to speak about the malaria outreach programming that the health centers provide.

Training of IEC Mobilizers: A two-day training session was organized in the 68 health areas by the DTCs for all IEC mobilizers. The training sessions were in each site held on July 4 to 16. In total, 1,172 mobilizers and 68 IEC supervisors were trained on the following:

- General information about malaria transmission, treatment and prevention
- Schedule and details of IRS campaign activities
- Best practices and strategies for informing household members about the IRS campaign

Training of Trainers for IRS Spray Campaign Operations: Since the AIRS Mali program hired most of the same district coordinators and DTCs from the 2012 IRS campaign, this training was more of a refresher course, to make sure the district coordinators remained cognizant of the key issues to discuss during the spray operator training. The training was held in Segou, July 8 - June 11, 2013.

Training of Spray Operators: Spray operator training was completed July 17 – 24, at six different training sites in each district. The training covered spray techniques and rinsing of spray pumps, scheduling and the methods for completing the 2013 IRS campaign with Malian government staff, and the correct ways for working with households, before, during, and after spraying. 778 people participated in the training; many of them had worked on past IRS campaigns. A post-test was provided at the end of the training, with the people that scored highest on the test becoming IRS campaign supervisors, and team leaders. All participants received spray operations training, but only 550 participants became spray operators; the other 228 participants were selected for other positions within the spray campaign.

FIGURE 4: TRAINING OF TRAINERS IN SEGOU

Orientation of the Supervisors and Team Leaders: An orientation session was organized in each district for the supervisors, team leaders, and storekeepers selected after the spray operator training. The session was led by the AIRS Mali team focused on supervision tasks, strategies, and the responsibilities and tasks of the storekeepers.

Logistics Training: 68 secondary warehouse managers were trained on how to manage the stocks of materials and equipment at their disposal.

Coverall Washing Training: 114 woman washers were trained on coverall-washers, and discuss best practices of washing and rinsing.

Store Security Training: 68 guards were trained on their roles and responsibilities in monitoring stores.

Radio Host Training: 15 hosts of community radio stations were trained on the IEC messages to disseminate and on how to fill out the monitoring cards of broadcast messages.

District Training Teams: Teams composed of 3 local coordinators, 2 district supervisors, 3 logistics managers and 3 central warehouses managers were oriented on their mission, tasks and responsibilities.

Data Capture Training: Data clerks gained familiarity with the IRS campaign data entry forms and the database used for uploading all IRS campaign data. Data clerks also practiced entering data. Overall, 21 data clerks were trained and assigned to two database entry centers (one in Bamako and one in Segou).

Transport Security Training: 93 drivers were hired to transport IRS commodities and spray teams learned correct methods to secure and safely handle insecticides. Participants learned how to manage an insecticide spill and safely clean vehicles after each day of the IRS campaign.

Training in Management of Insecticide Intoxication Cases: An orientation session was organized in each district for the DTCs. The training went over the correct protocol and methods to be followed to treat spray operators should any be injured or fall sick from the IRS campaign. In turn, the DTCs were asked to present this information to the district health staff.

Training of Eight Entomological Technicians: Since AIRS Mali completed entomological monitoring for the 2013 IRS campaign, the entomological technicians (who supported the AIRS Mali entomologist) were trained in mosquito field collection practices, insectary maintenance, identifying mosquito breeding sites, larval and pupae collection, identification of Anopheles larvae from Culiciene, and managing human landing catches. Annex 3 provides a breakdown of the number of people trained before the 2013 IRS campaign.

4. ENUMERATION

Due to the political situation in 2012, AIRS Mali could not complete correctly enumeration before the start of the spray campaign in Year 1. Therefore, AIRS Mali carried out a very thorough enumeration before this year's spray campaign, from June 1- June 7, 2013. This timing ensured that AIRS Mali had the correct number of targeted structures well before the start of the spray campaign.

Enumeration surveyors collected data on the number of household compounds (concessions) and eligible structures using a specific enumeration data collection card. This data was then entered into an Access database by data entry clerks. The AIRS Mali database manager cleaned this data once all enumeration forms had been entered.

The enumeration data were important for the following reasons:

- AIRS Mali gained details about the location of each eligible structure.
- AIRS Mali would know the appropriate number of sachets needed for each district before the start of the spray campaign.
- The enumeration data provided a "check" or point of comparison for the number of structures found by spray operators during the spray campaign. Thus, if spray operators were over-reporting the number of structures sprayed, the AIRS team would have data as a point of comparison, which would show the discrepancy.

Overall, 240,493 eligible structures were identified during enumeration. Table 4 provides the details of the number of structures enumerated per district in 2012 and 2013.

TABLE 4. 2013 ENUMERATION DATA VS. 2012 SPRAY DATA

Districts	2013 Eligible compounds	2013 Eligible structures	2012 Eligible compounds	2012 Eligible structures
Koulikoro	18,314	65,711	14,113	53,404
Baroueli	18,048	72,329	13,923	69,668
Bla	28,725	102,453	20,604	87,145
Total	**65,087**	**240,493**	**48,640**	**210,217**

5. COMMUNICATIONS

The AIRS Mali staff developed the communication activities for 2013 based on the cumulative lessons learned and experiences gained by the IRS team from the 2011 – 2012 spray rounds. Two months before the start of IRS, AIRS Mali began working with staff at the national and district level, ASACO members and the DTC to make initial contacts with community leaders (traditional village chiefs, religious leaders, and other community organizations and associations, especially women's associations) to brief people that the 2013 IRS campaign would start in August. Community meetings were arranged between AIRS Mali staff and community leaders to begin the IRS campaign sensitization process, and to ask community leaders to begin discussing with community members how to prepare their structures for the IRS campaign.

AIRS Mali had completed numerous communication activities before the IRS campaign. These included enumeration, to gain a better understanding of the exact location of eligible spray structures in the spray districts, and organizing groups and puppet shows concerning malaria messaging.

Communication activities that were completed in 2013 include:

Newspaper Articles: Two articles were published in L'ESSOR newspapers during the first week of the IRS campaign, providing the schedule for the IRS program, and the benefits of the IRS program. Follow-up articles were published that listed the results of the IRS campaign, and interviewed beneficiaries about what their structures were like after being sprayed. All messages noted the appreciation for USAID and PMI for funding the IRS program.

Door-to-Door Mobilization: After being trained in early July, the IEC mobilizers visited communities throughout the spray districts. They spoke with residents, and discussed:

- The benefits of IRS for malaria prevention
- How to prepare a structure for the spray campaign
- To wait two hours after spraying to re-enter the structure
- To not allow animals near the structure during and after spraying
- To sweep up and dispose of any insects that were killed by spraying
- The importance of continuing to use mosquito nets
- When to expect the spray operator in their area

Additionally, IEC mobilizers informed all beneficiaries to wait until January 2014 before applying any paint, plaster, etc. to the walls that were sprayed in their structure.

One day before the start of spraying in a village, IEC mobilizers revisited the communities, and notified people of the spray campaign schedule, and reminded them to properly prepare their structures for the sprayers over the next few weeks.

Table 5 shows the results of the door-to-door mobilization efforts.

TABLE 5: RESULTS OF DOOR-TO-DOOR MOBILIZATION

District	# Visited concessions		# of Adults Sensitized by door-to-door mobilization			Most common reason concessions not mobilized
	# Mobilized concessions	# Not mobilized concessions	Male	Female	Total	
Baroueli	**11,848**	46	41,596	49,999	91,595	Absence, people at work in the fields (29/46; 63%)
Bla	**19,520**	19	70,763	75,201	145,964	Absence, people at work in the fields (10/19; 53%)
Koulikoro	**12,971**	212	59,194	55,077	114,271	Refusal (142/212; 67%)
Total	**44,339**	**277**	**171,553**	**180,277**	**351,830**	

Overall, door-to-door mobilization sensitized 351,830 adults in the three spray districts. AIRS Mali noted that this was a lower number of people reached by door-to-door mobilization than in previous years, and cited the following reasons:

- In June when the rains begin, many adults work in their fields most of the day, and were absent from their communities to receive the door-to-door mobilization.
    - In some cases with the heads of households out in the fields, family members refused IEC mobilizers. In these communities it is traditionally unacceptable to let a stranger into a household, unless the head of the household is present, or the stranger is accompanied by the village chief.
- Additionally, since the door-to-door mobilization coincided with the rainy season, in some areas roads became difficult or impassable and often delayed the ability of IEC mobilizers to reach all communities.

Due to the low coverage rate, IEC door-to-door mobilization was extended in some areas for the first few weeks of the IRS campaign to ensure more people received IRS messaging.

Radio Broadcasts: Since radios are widely used and listened to throughout the spray districts, AIRS Mali made sure to use radio broadcasts to ensure wider dissemination of IRS spray campaign information, particularly the schedules of which communities would be covered by the IRS campaign. Therefore AIRS Mali signed several agreements with local radio stations to broadcast a variety of programs in French and Bambara to further promote IRS campaign messaging.

The radio programs that were produced for the IRS campaign included:

- Radio announcers visiting communities covered by the IRS campaign and recording interviews with spray operators, washers, team leaders, and district coordinators about how their work was progressing. Interviews were also completed with DTCs,

ASACO members, AIRS Mali staff, and village chiefs to discuss what they had observed during the IRS campaign.

- Radio stations also produced small concerts in various communities, where griots and other musicians played songs about malaria and IRS. The concerts were played live over the air. Additionally, the radio station staff worked with AIRS Mali to include messaging about the 2013 IRS campaign. The audiences at the concerts were quizzed about the IRS campaign, with people answering questions correctly receiving an IRS campaign t-shirt or cap.

In total, all community radios broadcasted 5,035 radio programs and organized 22 interactive shows.

6. IMPLEMENTATION OF IRS ACTIVITIES

AIRS Mali had all contracted radio stations in the three spray districts make a general announcement that the IRS spray campaign would start on August 1, 2013.

6.1 SPRAYING OPERATIONS

The 2013 IRS campaign lasted for almost seven weeks, ending on September 19, 2013. 160 spray teams were deployed for the 2013 IRS spray campaign. The distribution of spray teams was determined by the number of eligible structures per district, and the geography/terrain that the spray teams would cover.

Table 6 below notes the distribution of spray teams per district.

TABLE 6: DISTRIBUTION OF SPRAY TEAMS BY DISTRICT

District	No. of Spray Teams	No. of Enumerated Eligible Structures per District
Bla	66	102,453
Baroueli	55	72,329
Koulikoro	39	65,711
TOTAL	**160**	**240,493**

Considering the importance of supervision in IRS, spray teams were kept as small as possible. Spray operators were assigned to spray teams consisting of four or five spray operators and one team leader. Additionally, field supervisors were deployed to monitor four spray teams each. The supervisors in turn were supervised by the district coordinator and informally by the DTC. The DTC's role was to provide supervision to the campaign in their health area each day by attending the departure of SOPs in the morning, returning in the afternoon, following spraying in some villages, and making sure that the forms were properly filled out.

In 2013, new forms of supervision were introduced to monitor the quality of data collection. Table 7 provides a summary of supervision completed during the IRS campaign.

TABLE 7: SUPERVISION DURING THE 2013 IRS CAMPAIGN

IRS Campaign Staff Member	Supervision Activities
AIRS Mali Chief of Party	Directed all aspects of the 2013 IRS campaign, and ensured IRS campaign met its goals and objectives. Directly supervised AIRS Mali technical, operations, and finance and administration (F&A) managers.
AIRS Mali Technical Manager	**Supervised:** Entomologist, ECO, M&E manager, and in charge of Koulikoro district during the IRS campaign **Tasks:** The technical manager coordinated the entomological and

IRS Campaign Staff Member	Supervision Activities
	environmental compliance monitoring of the IRS campaign; and supervised the Monitoring and Evaluation (M&E) activities and data entry and reporting. The technical manager worked closely with the operations manager to monitor the quality of the IRS activities.
AIRS Mali Operations Manager	**Supervised:** Logistics and procurement coordinator, and in charge of Bla district during IRS campaign **Tasks:** The operations manager coordinated all IRS implementation activities, ranging from supplying storerooms with IRS commodities to ensuring transport for the spray operators. The operations manager ensured that all activities were carried out in accordance with the IRS campaign's schedule.
AIRS Mali ECO	**Supervised:** Supervised the Baroueli district coordinator, and in charge of Baroueli district during the IRS campaign **Tasks**: The ECO ensured environmental compliance for all IRS activities. The ECO led the pre-, mid-, and post-spray environmental inspections, and made sure soak pits and rinsing areas were functional.
AIRS Mali M&E Manager	**Supervised:** Database manager and data clerks **Tasks**: Assured the daily entry of spray operations data into the database. Provided quality controls, including random spot checks in the field to ensure that the data collected and entered into the database is accurate.
AIRS Mali Entomologist	**Supervised:** Entomological technicians **Tasks**: Completed all entomological monitoring activities, including the testing for spray quality during the first week of the IRS campaign. Helped establish the AIRS Mali insectary.
AIRS Mali Logistics and Procurement Coordinator	**Supervised:** District warehouse managers and district logisticians **Tasks:** Kept track of all inventory for the 2013 IRS campaign, and organized logistics for moving inventory to operation sites, to prevent stock-outs.

During the spray campaign all operations sites were staffed by storeroom keepers, guards, washers, and supervisors for monitoring the work of the spray teams, and the transport of vehicles for moving spray operators to and from spray sites.

Spray operations began at 6:00 am with the spray personnel meeting at their designated operation site to pick up PPE, pumps and insecticide for the day. Once spray equipment and materials were distributed, the supervisor met with the spray team leaders, shared the schedule regarding which communities would be sprayed, and the route to take to reach each community.

The spray teams departed for the communities to carry out spraying and returned to the operation site around noon or 1 pm. Once returned to soak pit, spray operators lined up for progressive rinsing of their spray pumps, and then removed coveralls and PPE for washing by the washers. Spray operators returned all insecticide sachets (either empty or unused) to the secondary storekeeper. The storekeeper placed empty sachets in a tightly closed drum within the storeroom to await transport for solid waste

disposal after the IRS campaign, and also to provide a collection point to count/verify empty sachets against the number of sachets used. The unused sachets were returned to the available stock-on-hand and were distributed the following spray campaign days.

IRS district teams, in close collaboration with the DTC, provided oversight to achieve AIRS Mali's goal of providing day-to-day operational management and support for IRS implementation, including all aspects of monitoring and quality assurance for spray operations.

Overall, the 2013 IRS campaign did not experience any insecticide poisonings or spills, and no injuries were reported, and AIRS Mali found that communities were very receptive to having their structures sprayed. There was one minor vehicle accident, please see Annex 10 for more detail.

6.2 Stock Management during the IRS Campaign

AIRS Mali recruited three district logisticians for the IRS campaign to serve as a link between the operation site storekeepers and the district warehouse managers. The district logistician worked to coordinate supply chains for moving needed IRS materials to the appropriate operation sites, and ensuring the correct use and accuracy of stock cards for inventory record-keeping. The district logisticians regularly checked with storekeepers regarding their stock levels and where needed arranged for the transport of IRS commodities from the district warehouses to the operation sites.

AIRS Mali used inventory control cards (ICC) for recording each item in the three district warehouses (Baroueli, Bla, and Koulikoro) and operation sites. Storekeepers updated the ICC daily regarding the movement of stock in or out of the storeroom. Storekeepers were also required to conduct routine physical stock counts daily to ensure that the actual stock in storerooms matched the ICC record.

Every morning during the spray campaign, the team leaders, with the storekeepers, would organize, distribute, and sign out all PPE to be used for the spray operations. The storekeepers also organized and distributed all PPE to the washers and other IRS staff as needed. At the end of each day, all PPE was turned over to the washers for cleaning. After the PPE was washed, the washers turned the PPE over to the storekeepers and team leaders, who completed another inventory count to ensure that all inventory was returned.

At each operations site, storekeepers handed over to the team leaders the number of sachets of carbamates that each spray operator would use for spraying that day. The team leaders signed a special card to acknowledge receipt of the sachets of carbamate. The special cards also noted the codes of the sachets received, for further tracking if needed. The team leader also noted on another card the number of sachets provided to each spray operator, and the codes for the sachets issued to each spray operator.

At the end of each spray day, spray operators turned in their used and unused sachets to the team leader, who collated these and submitted them to a store keeper.

The storekeeper recorded the returned full sachets on the stock card as a positive adjustment, and updated the stock balance. The used sachets were registered on a daily utilization record form that helped AIRS Mali calculate trends in use of insecticide.

Additionally, the storekeepers prepared a comprehensive weekly stock report and submitted it to the district logisticians, and the AIRS Mali logistics and procurement coordinator, who then generated aggregated total stock balances for the IRS campaign and noted where PPE and insecticide needed to be sent from the district warehouses, to prevent stock-outs.

A mid-campaign inventory was completed by the district logistician for each operation site in their district, and the balance of the inventory counted was reconciled with the inventory balances at each district warehouse. Additionally, the AIRS Mali logistics and procurement coordinator reviewed the inventory balances, and used the mid-campaign inventory as the basis for sending needed IRS commodities to each operation site, during the second half of the IRS campaign.

Overall, as found in Table 8, AIRS Mali noted the following inventory and use of carbamate during the IRS campaign.

TABLE 8: USE OF INSECTICIDE DURING THE 2013 IRS CAMPAIGN

Transaction	Balance
Remaining 2012 carbamate stock	7,974
Carbamate procured and shipped to Mali before enumeration	92,989
Total Insecticide before enumeration	100,963
Carbamates sachets used during the 2013 IRS campaign	93,435
Remain carbamate	7,528
After enumeration: carbamate from Benin	3,712
After enumeration: carbamate from Bayer SA	10,786
Current carbamate stock balance in Mali	**22,026**

6.3 MID-SPRAY ENVIRONMENTAL INSPECTION

The mid-spray environmental inspection was conducted by the inspection team (ECO, DNACP/DRACPN representatives and NMCP representative) in the three spray districts from September 2 to September 12. The ECO used a Smartphone checklist form for the inspection that was based on PMI's Best Management Practices (BMP) manual. The inspection team reported the following issues during the mid-spray inspection:

Areas of Strength:

- Proper drainage of wastewater into a soak pit.
- No cracks in the washing area.
- Coverage of soak pit with concrete slabs.
- Washing areas and their surroundings well fenced.
- In general stores are in a good condition.
- Availability of spills management kits, first aid kits and fire extinguishers in the stores visited.
- Storekeepers knew how to manage insecticide spills and how to use fire extinguishers.

- Insecticides were placed on pallets.
- Availability of PPE in sufficient numbers and the appropriate use by actors.
- Spray operators implement the spraying according to the standard techniques.
- The technique of waste management after spraying was well controlled by the beneficiaries.
- Beneficiaries received information for structures preparation at least a day before spraying.

Areas in Need of Improvement:

- The practice of preliminary boot cleaning before entering the washing area was not always respected.
- Some stores were not large enough.
- Fire extinguishers were not generally stored in the appropriate place in the storeroom.
- Lack of pallets for other materials in secondary stores (except insecticides).
- Frequent bad condition of flashlights for spray operators.
- Boots sizes were a problem (not enough large sizes).
- Information for keeping away poultry and animals is not usually given or not followed by beneficiaries.

6.4 Results of Logistics and Supply Chain Analysis by RTT

In 2013, the team AIRS Mali created an electronic inventory and management tool for the district warehouses. This system was tested in Koulikoro, which had electricity and an internet connection. This innovative application enabled the AIRS project to monitor the component supply in real time during spraying operations in 2013, namely the stock-keeping, inventory management, automatic inventory of items, and activities of the district warehouse.

The three main warehouse managers received training on the use of the tool in their respective districts. A laptop with a database of warehouse management information has been installed at their disposal. Monitoring and remote assistance were established to strengthen the capacity of warehouse managers in the implementation of the project.

The 68 secondary storekeepers received an orientation on using SMS to send information to the district warehouses in order to input data for the management tool.

7. MONITORING AND EVALUATION OF 2013 IRS CAMPAIGN

Monitoring and evaluation for the 2013 IRS campaign closely followed the processes outlined in the 2013 AIRS Mali Work Plan and the M&E Concept Paper developed by the AIRS core team. M&E activities, under the supervision of the Chief of Party, were led by the AIRS Mali M&E manager and the database manager. A secure and reliable Access database that was used in previous spray campaigns was updated by the database manager to reflect minor changes to the 2013 AIRS M&E system, and deployed to the data entry centers in Bamako and Segou. Nine data clerks worked in the Bamako data center and entered data from Koulikoro district; 12 data clerks worked in the data center in Segou, which received data from Baroueli and Bla districts.

7.1 KEY OBJECTIVES

The key objectives of AIRS Mali M&E activities are:

- To emphasize accuracy of both the data collection and data entry processes through comprehensive training and supervision at all levels
- To streamline and standardize data flow, minimize error, and facilitate timely reporting
- To ensure IRS data security and storage for future reference through the establishment and enforcement of proper protocols
- To document lessons learned and good practices observed in the implementation of the project activities and apply these to future project years

7.2 DATA MANAGEMENT

The AIRS Mali team made revisions to the data collection tools to accommodate the few updates to the AIRS M&E system for the 2013 spray campaigns. As noted above, all updates were incorporated into the Access database to ensure accuracy and consistency of data entry and reporting.

Data clerks entered spray data into the database and transmitted results to the AIRS Mali office in Bamako within 24 to 48 hours of spray for quality control purposes and the timely generation of weekly client reports that tracked the progress of the 2013 IRS campaign. Once entered, paper forms were filed and temporarily archived at the data centers. Eventually, all data collections forms were transferred to the AIRS Mali office in Bamako for long-term storage. A daily electronic back-up of data was saved to the AIRS Mali server and to an external hard drive for data safety.

FIGURE 5: DATA CLERKS ENTERING SPRAY CAMPAIGN DATA AT THE SEGOU DATA CENTER

7.3 DATA QUALITY ASSURANCE AND QUALITY CONTROL

Data quality assurance was carried out daily during the IRS campaign by a variety of AIRS staff (i.e. spray operators, team leaders, district coordinators, M&E manager, database manager, etc.) Specific activities conducted to ensure data quality included:

Physical Data Verification:

- Spray Operator Level: 100% of spray data collected on spray operator forms were reviewed, arithmetically verified, and signed off by the team leader and the supervisor.
- District Level: District coordinators received the paper forms from the supervisors and checked the accuracy of the spray data. Afterward, the spray operator forms were transmitted to the data centers by motorbike messengers (one from each district) each evening.
- Data Entry Level: Data clerks reviewed each form for typos and transcription errors and verified the arithmetic calculations on the spray forms were correct before entering the data into the database.

USAID/Mali health office's Monitoring and Evaluation officer also conducted DQA on IRS to ensure quality data are collected and reported.

M&E Data Quality Assurance Tools

TABLE 9: DATA QUALITY ASSURANCE TOOLS

Data Quality Assurance Tool	Purpose, Used by who and when
Error Eliminator (EE)	Purpose: • To check the completeness and correctness of data collected in the field.

Data Quality Assurance Tool	Purpose, Used by who and when
	• To highlight common data collection errors so they can be quickly identified with corrections being made and re-training provided by the supervisor. Used by: • Team leaders and community supervisor on daily basis – two spray forms per team each day • district supervisors, district spray operations coordinator, technical manager, and M&E Manager also used the error eliminator during field supervision.
Data Collection Verification (DCV) form	Purpose: • To check the accuracy of data collected in the field– i.e. ensure that the data written on the daily spray operator forms matches the information reported by households and/or the data recorded on the IRS cards disseminated to households. Used by: • District supervisors of district • M&E manager
Data Entry Verification (DEV) form	Purpose: • To verify data entry accuracy, i.e. ensure the data in the database matches the data as noted on the data collection form. Used by: • Database supervisors • The database manager and the M&E manager during their visits to the data entry centers.

Table 10 shows the percentage of structures verified by AIRS Mali using each of the data quality assurance tools.

TABLE 10. NUMBER OF SUPERVISORY TOOLS USED

M&E supervisory tools	Structures Verified	Percent Verified	Target Percentage
Error Eliminator (Support 17)	1,349	**.58%**	**42.8%**
Data Collection Verification (Support 15)	1,286	**.55%**	**.16%**
Data Entry Verification (Support 16)	1,497 lines (1,265 Details lines and 232 Totals lines)	**.9%**	**100%**

AIRS Mali had already developed a large number of supervisory tools which have been in place in previous campaigns. Initial use of the data quality assurance tools was lower than expected because of the numerous tools supervisors were responsible for and the lack of field testing of the Data Quality Assurance tools before the start of the campaign. Based on the 2013 experience, AIRS Mali will streamline their entire set of supervisory tools and change the language of the Data Quality Assurance forms into Bambara to increase use.

7.4 SPRAY COVERAGE RESULTS

The 2013 AIRS Mali campaign sprayed 228,985 structures of the 233,789 structures found, for spray coverage of 97.9%.

TABLE 11: SPRAY COVERAGE AND POPULATION PROTECTED

District	Eligible Structures Found	Structures Sprayed	Spray Coverage	Population Protected (total)	Children <5 Years Protected	Pregnant Women Protected
Koulikoro	61,879	60,150	97.21%	227,309	37,511	6,672
Baroueli	73,162	71,661	97.95%	276,120	48,692	6,644
Bla	98,748	97,174	98.41%	346,675	67,759	9,089
Total	**233,789**	**228,985**	**97.95%**	**850,104**	**153,962**	**22,405**

7.5 POPULATION PROTECTED

In total, 850,104 people were protected by AIRS Mali during the 2013 spray campaign, including 22,405 pregnant women and 153,962 children under five-years old.

TABLE 12: POPULATION PROTECTED, DISAGGREGATED BY SEX, AND DISTRICT

	Total Population Protected		
District	**Male**	**Female**	**Total**
Koulikoro	116,971	110,338	227,309
Baroueli	138,919	137,201	276,120
Bla	168,928	177,747	346,675
Total	**424,818**	**425,286**	**850,104**

7.6 INSECTICIDE USE AND SPRAY OPERATOR PERFORMANCE

In total, 93,435 sachets of insecticides were used to spray 228,985 structures. On average, 2.7 structures were sprayed per sachet of insecticide.

The performance tracker allowed AIRS Mali to follow the campaign's progress. At the end of each day, the districts coordinators, using mobile phones, called the supervisors of all sites to collect data on the number of structures sprayed and the quantity of insecticide used.

The district coordinators then sent the collected data to the operations manager, who aggregated the data daily. This approach allowed AIRS Mali to understand the campaign's progress and make decisions.

7.7 POST-SPRAY DATA QUALITY AUDIT

This section documents an M&E activity that was implemented midway between the 2012 and 2013 campaigns and, therefore, the results were not complete until after the submission of the 2012 AIRS Mali End of Spray Report. In 2013 AIRS Mali ran a PMI-supported Post-Spray Data Quality Audit (PSDQA) whose primary objective was to validate the spray coverage and the percentage of people protected reported by AIRS Mali for the 2012 spray campaign. With the results, we also identify lessons learned and institute improvements for data collection/entry in future IRS campaigns.

Through a three-stage sampling design, we selected a representative sample and surveyed 501 eligible structures in the three target districts. Audit data found that 97% [95.49; 98.52] of sampled structures (n=486) reported a visit by a mobilizer with IEC

messages before spray. Of these, 50.2% (n=244) could present their IRS card. AIRS Mali believes some eligible structures were not mobilized before spray because, due to political instability in the country, mobilization activities were carried out rapidly and later than planned.

Spray coverage audit data show that 90.22% [87.47; 92.97] of eligible structures were sprayed as compared to 98.13% reported in the 2012 End of Spray Report (EOSR). Because there is a statistically significant difference between the two spray coverage calculations, we can conclude that actual spray coverage is lower than what was reported for the 2012 campaign. The difference in reported campaign spray coverage and what was found during the PSDQA can be explained, in part, by the large amount of migration due to the heightened political instability in the country since March 2012. Additionally, the massive flooding in Bla during the spray season could have contributed to the difference in our spray coverage and people-protected estimates derived from the PSDQA. The PSDQA results showed AIRS Mali the importance of running a PSDQA before the start of the 2013 Spray Campaign.

8. ENTOMOLOGY

PMI Mali asked AIRS Mali to complete entomological surveillance for the 2013 IRS campaign.

Since most entomological surveillance results for the 2013 IRS campaign will be reported in the final entomological report (to be completed in December), this section provides a brief explanation of entomological surveillance that was completed before and during the IRS campaign.

8.1 ENTOMOLOGICAL SURVEILLANCE BASELINE

Entomological monitoring is essential in any insecticide-based vector control intervention such as IRS. It ensures the quality of the vector control intervention as well as its efficacy. The entomological monitoring data is used to justify decisions such as the type of insecticide and selection of target areas. AIRS Mali implemented entomology activities which were aimed at:

- Assessing malaria vector density and species composition in intervention and selected control areas;
- Establishing vector feeding time and location;
- Monitoring the quality of insecticide application and insecticide decay rates; and
- Assessing vector susceptibility to insecticides approved for IRS and mechanism of resistance

Vector Species Composition, Density, Feeding Time and Location

In July, AIRS Mali collected baseline data from four sentinel sites, Koulikoro and Kati districts in Koulikoro region and Bla and Segou districts in Segou region, to assess vector species composition, density and behavior using human landing collections (HLC) and pyrethrum spray catches (PSC). *An. gambiae* s.l. was the most prevalent vector species collected from all the sites surveyed. Vector density was calculated as the average number of *An. gambiae* s.l. collected per house per day from PSC data. The result indicated 8.05 and 17.7 *An. gambiae* s.l. per house per day for Koulikoro and Bla intervention districts, respectively. Data from the two control villages have shown 47.15 and 10.05 *An. gambiae* s.l. per house per day for Kati and Segou districts, respectively.

Feeding location of *An. gambiae* s.l. was assessed using data from human landing catches. The number of *An. gambiae* s.l. was counted at 104 indoors and 137 outdoors in Koulikoro (IRS target area), as compared to 496 indoors and 283 outdoors in Kati (the control) at the baseline. The vector seemed to be more endophagic in the control village as compared to the intervention site. This difference was not observed in Segou region. The number *An. gambiae s.l* was counted at 14 indoors and 9 outdoors in Bla (IRS target area); and 10 indoors and outdoors in Segou (the control) at the baseline.

Ovary dissection of the anophelines collected by HLC was done to determine the parity rates. The parity rates ranged from 48% Koulikoro (intervention area) to 95% Kati control area.

Insecticide susceptibility tests

Current insecticide resistance tests were carried out in three IRS targeted areas: Koulikoro, Baroueli and Bla. WHO tube bioassay tests were used to determine the susceptibility of the field collected An. gambiae s.l. to five insecticides recommended for use in IRS and/or ITNs.

The five insecticides tested were:

- Deltamethrin 0.05% and lambda-cyhalothrin 0.05% from the pyrethroid class;
- Fenitrothion 1.0% from the organophosphate class;
- DDT 4% from the organochlorine class, and;
- Bendiocarb 0.1% from the carbamate class.

WHO 2013 criteria was used to interpret susceptibility test result, as it was noted that:

- Susceptibility=Mortality rate of the exposed vector greater than 98%
- Possible Resistance= Mortality rates that are between 90% to 97%
- Resistance= Mortality rate after 24 recovery period is less than 90%

In all the tests control mortality was less than 5%, and therefore, a correction formula was not used

The results of the WHO tube tests indicated full susceptibility of An. gambiae s.l. to:

- Bendiocarb (test mortality of 98%-100% in all 3 sites)
- Fenitrothion (100% test mortality in all 3 sites)

A high resistance frequency to DDT was noted in all three IRS target areas with test mortality ranging from 10-52%. The vector was susceptible to deltamethrin (test mortality 98%) in Koulikoro, but significant resistance was observed in Baroueli and Bla with test mortality of 50% and 38%, respectively. Resistance to lambda-cyhalothrin was detected in all three sites (see annex).

8.2 Quality Control Testing and Residual efficacy monitoring

Cone bioassays were conducted in 10 sprayed structures in the three districts within 24 hours of spraying to assess the quality of spraying and one month after spraying to determine the insecticide decay rate. In each district 3-4 structures were sampled and used for the tests.

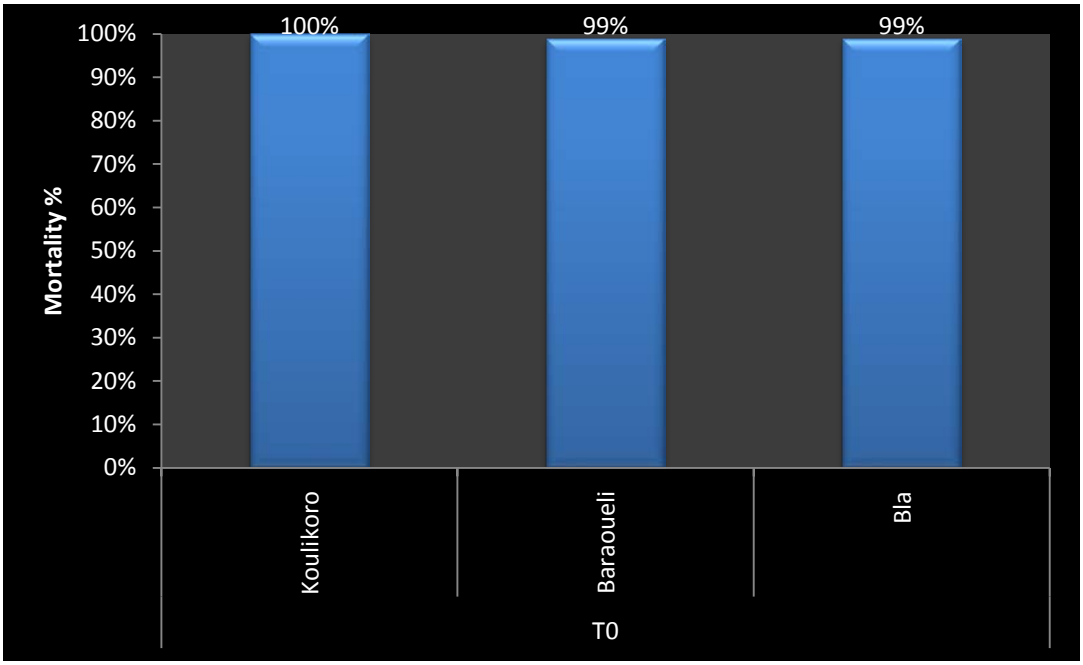
The cone bioassay test results have shown that 24 hours after spraying the test mortality rates of susceptible mosquitoes exposed to the insecticide sprayed surfaces ranged from 99% to 100%. This is an indication of good quality of spraying. But one month (at time 1=T1) after spraying the test mortality rates dropped below 80% in two districts of

Mali, Baroueli and Bla. The result was better in Koulikoro, which was greater than 80% (see annex).

At the beginning of the IRS campaign, a quality control assessment was carried out at four sentinel sites (Tienfala and N'Dentila in Koulikoro District, Tigui in Baroueli District, and Touna in Bla District). The assessment checked the efficacy and homogeneity of insecticide treatment. *Anopheles gambiae* strain KISUMU, which is susceptible to all insecticides, reared at the AIRS Mali insectary, were used to assess the quality of spraying and insecticide. Bioassays were performed 24 hours after IRS activities, following WHO procedures.

The test mortality rate of susceptible mosquitoes exposed to bendiocarb sprayed walls ranged from 99 to 100% in the three districts where the test was conducted. It was 100% in Koulikoro and 99% in both Bla and Baroueli districts (Figure 6). The quality assurance tests conducted in the three IRS targeted districts of Mali showed that the quality of spraying was good and homogeneous.

Figure 6: *An. gambiae* KISUMU Strain 24 Hour Mortality after 30 Minutes Exposure



9. POST-SPRAY ACTIVITIES

The 2013 IRS campaign was completed on September 19, 2013.

9.1 POST-SPRAY MEETINGS

District Review Meetings: In October 2013, AIRS Mali staff organized a review meeting in each spray district. The meetings were attended by community leaders (including the DTC, ASACO leaders, village chiefs, representatives from community women's and youth associations, and local NGOs). Additionally, where possible seasonal IRS campaign staff, including spray operators, spray team leaders, district coordinators, and storekeepers, attended the meeting. The meetings provided an opportunity for communities to assess the 2013 spray campaign and provide recommendations for improving IRS programming for the 2014 IRS campaign.

Overall, the communities covered by the spray campaign were appreciative. However, many communities stated that future IRS campaigns should begin their organization with the communities much earlier, to reduce the density of mosquitoes that are already numerous before the startup of the campaign in August.

9.2 POST-SPRAY ENVIRONMENTAL INSPECTION

The post-spray environmental inspection was performed from October 8 to October 31 in Koulikoro, Bla and Baroueli districts. The inspection team included ECO, DNACPN and NMCP representatives. The inspection's main objective was to make sure all operation sites were properly closed and to note any environmental issues that need to be resolved before the 2014 IRS campaign. The findings of post-spray environment inspection were as followed, but areas that needed work were resolved and/or fixed before the team left the districts.

- All IRS commodities had been successfully transported from the operation sites to the three district warehouses.
- Soak pits and rinsing areas are generally in good shape, although in some areas the inspection team needed to meet with the ASACO and ask for the community to remove weeds and brush that had started to grow in the soak pit drainage area.
- At all stores, the remaining insecticides, equipment and waste were sent to the district warehouse.
- Soak pits are closed with slabs and the surrounding area fenced and the door locked.
- Washing areas and their surrounding fences are in good condition.
- Danger signs are visible on stores door and washing areas' fences.
- Most of stores are expected to be used for the 2014 campaign.
- Many stores are not cleaned properly.

- Washing areas are generally surrounded with grasses.
- Some washing areas have got cracks.
- The floors of some stores are cracked.

9.3 Solid Waste Incineration

Solid waste incineration began on September 16, and ended on October 12, 2013. The ECO, DNACPN representative, the logistics and procurement coordinator, and the technical director supervised all incineration. Table 13 notes the solid wastes incinerated during that period.

TABLE 13: SOLID WASTE FROM 2013 IRS CAMPAIGN INCINERATED

Item	Quantity
Sachets	93,435
Masks	36,413

Other solid waste items, such as gloves and flashlights that would release toxins if they were burned, were washed thoroughly and either buried or disposed of as garbage.

9.4 Post-Spray Inventory

Starting in September, all PPE and insecticide were returned to the district warehouses, where the AIRS Mali logistics and procurement coordinator and district warehouse managers completed an inventory of all remaining commodities from the 2013 IRS campaign. The results of the inventory are in Annexes 5, 6 &7.

9.5 Post-Spray Campaign Radio Programs

Two weeks after the end of IRS campaign, 12 radio broadcasts in Baroueli, Bla, and Koulikoro districts consisted of short messages and programs that provided the following information:

- The advantages and importance of sleeping in sprayed structures, to prevent malaria transmission
- The importance of continuing to use insecticide-treated bed nets even after the spraying
- Noting that beneficiaries cannot apply paint or plaster to sprayed walls until January, to allow the carbamate to be effective against mosquitoes
- General information on malaria transmission, prevention, and treatment

10. LESSONS LEARNED AND RECOMMENDATIONS

1. In 2013, AIRS Mali created an electronic inventory management system to reduce inventory counting error where the internet is available, making inventory data as close to "real time" as possible. This system was implemented in Koulikoro district. It was not possible to do it in Baroueli and Bla because the internet was not available. Now that two districts' warehouses were moved to Segou where there is internet access, it will be possible to implement the system in 2014.
2. Due to the high cost of renting numerous vehicles in Mali for the spray campaign, and the need to get PMI approval for the vehicle rentals (as the cost for vehicle rentals is over $150,000), the procurement/bids and selection of vehicles to be rented for the IRS campaign must be made earlier.
3. Setting up payments for seasonal staff in the field via Ecobank has proven to be effective, and limits security risks related to AIRS Mali staff transporting large amounts of money to the field. However, the agreement with Ecobank must be signed earlier in the year, and a well-defined payment schedule needs to be developed and approved by AIRS core staff and Ecobank.
4. If IEC messaging was not received by a majority of the population (particularly due to absence, as populations are not at home, and are in their fields farming), it is best to continue door-to-door mobilization during the IRS campaign, in order to make sure households are sufficiently prepared for the IRS campaign.
5. Completing an incinerator inspection early in March 2014, help to avoid any repair before the IRS campaign.

11. ANNEXES

11.1 Annex 1: Health Areas Which Are Difficult to Access/Prone to Flood during Rainy Season

Bla District	Koulikoro District	Barouéli District
Bogoni	Kamani	Tesserela
Diena	Koula	Moabougou
Kazangasso	Tombougou	Gouendo
Somasso	Tougouni	Ngassola
Tienabougou	Niamina	Mpebougou
	Sirakorobougou	
	Tamani	
	Sizani	
	Tienfala	
	Sirakorola	
	Kenenkou	

11.2 Annex 2: Refurbishments of Operation Sites for the 2013 IRS Campaign

District	Operation Site Location	Storeroom Refurbished (Yes or No)	Soak pit Refurbished	Fencing Refurbished
Baroueli	BANIDO	YES	YES	YES
	BAROUELI TOWN	NO	YES*	YES
	BOIDIE	NO	YES*	YES
	DOTEMBOU GOU	YES	YES	YES
	DIOFORONGO	YES	YES	YES
	DOUGOUFE	NO	YES	YES
	GARNA	YES	YES	YES
	GOUENDO	YES	YES	YES
	KALAKE	YES	YES	YES

District	Operation Site Location	Storeroom Refurbished (Yes or No)	Soak pit Refurbished	Fencing Refurbished
	KONOBOUGOU	YES	YES	YES
	MOABOUGOU	YES	YES*	YES*
	M'PEBOUGOU	YES	YES	YES
	N'DJILLA	YES	YES	YES
	N'GASSOLA	YES	YES	YES
	NIANZANA	YES	YES	YES
	SANANDO	YES	YES	YES
	SEGUELA	YES	YES	YES
	SOMO	YES**	YES	YES
	TAMANI	YES	YES	YES
	TESSERELA	YES	YES	YES
	TIGUI	YES	YES	YES
	YEREBOUGOU	YES	YES	YES
	WONDOBOUGOU	YES	YES	YES
Bla	BENGUENE	YES	YES	YES
	BLA TOWN	YES	YES*	YES
	BOGONI	YES	YES	YES
	DIARAMANA	YES	YES*	YES
	DIEDALA	YES**	YES*	YES
	DIENA	YES	YES	YES
	DOUGOUOLO	YES	YES	YES
	FALO	YES	YES	YES
	KAZANGASSO	YES	YES	YES
	KEMENI	YES	YES*	YES

District	Operation Site Location	Storeroom Refurbished (Yes or No)	Soak pit Refurbished	Fencing Refurbished
	KOULANDOUNGOU	NO	YES	YES
	KOUTIENSO	NO	YES	YES
	MARELA	YES	YES	YES
	NAMPASSO	YES	YES	YES
	NIALA	YES	YES	YES
	NIAMANA	YES	YES	YES
	PENESSO	YES	YES	YES
	SAMABOGO	YES	YES	YES
	SAMBALA	YES	YES*	YES
	TIENABOUGOU	YES	YES	YES
	TONTO	YES	YES	YES
	SOMASSO	YES	YES	YES
	TOUNA	NO	YES	YES
	YANGASSO	YES	YES*	YES*
	BOUGOURA	YES	YES	YES
	FANI	YES	YES	YES
	TALO	YES**	YES	YES
Koulikoro	CHOLA	YES**	YES	YES
	DOUMBA	YES	YES	YES
	GOUNI	YES	YES*	YES*
	KAMANI	YES	YES	YES
	KENENKOUN	YES	YES	YES
	KOLEBOUGOU	YES	YES	YES
	KOULA	YES	YES	YES
	KOULIKOROBA	YES	YES	YES

District	Operation Site Location	Storeroom Refurbished (Yes or No)	Soak pit Refurbished	Fencing Refurbished
	MONZOMBALA	YES	YES	YES
	NYAMINA	YES	YES	YES
	SIRAKOROLA	YES	YES*	YES*
	SIRAKOROBOUGOU	YES	YES	YES
	SIZANI	YES	YES	YES
	TAMANI	YES	YES	YES

*New construction (supported by AIRS).
** New construction (supported by community).

11.3 ANNEX 3: PARTICIPANTS IN 2013 IRS CAMPAIGN TRAININGS

Categories of Persons Trained	Training on IRS Delivery						Other Trainings																					
	Training of Trainers		Spraying Operations training		Treatment of Intoxication Cases		Team Leader and Supervisor Training		Data Capture Training		Logistics Training		Coveralls Washing		Structure Enumeration/ IEC TOT Training		Structure Enumeration/ IEC Training		Transport/ Security training		Stores security training		District Team Training		Entomological monitoring training		Radio hosts Training	
	M	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*
Technical Directors of Community Health Center	**33**	**3**			**60**	**10**									**66**	**9**												
District Coordinators	**1**	**0**																					**3**	**0**				
Spray Operators			**539**	**11**																								
Data clerks									**10**	**11**																		
Community Supervisors			**66**	**2**			**66**	**2**									**66**	**2**										
Districts supervisors																							**3**	**2**				
Team Leaders			**148**	**12**			**148**	**12**																				
Washers													**0**	**114**														
District Logisticians																							**3**	**0**				
Storekeepers											**5**	**1**																

											8	**0**																
Warehouse keepers																							**3**	**0**				
Mobilizer agents																	**937**	**235**										
Entomologist Technicians																									5	3		
Security Guards																					**68**	**0**						
Drivers																			**93**	**0**								
Radio hosts																											**15**	**0**
TOTAL M/F District	**34**	**3**	**753**	**25**	**60**	**10**	**214**	**14**	**10**	**11**	**58**	**10**	**0**	**114**	**66**	**9**	**1003**	**237**	**93**	**0**	**68**	**0**	**12**	**2**	**5**	**3**	**15**	**0**
TOTAL/ training	**37**		**778**		**70**		**228**		**21**		**68**		**114**		**75**		**1,240**		**93**		**68**		**14**		**8**		**15**	

11.4 ANNEX 4: VEHICLES DURING THE IRS CAMPAIGN

District	Mini Buses	Pick-Up/4x4
Koulikoro	22	3
Bla	32	3
Baroueli	27	3
Total	**81**	**9**

11.5 ANNEX 5: INVENTORY OF IRS COMMODITIES AT THE KOULIKORO DISTRICT WAREHOUSE

Item	Initial Stock Before IRS Campaign	Number of Items Procured	Stock Before Campaign	Used/ Unusable Stock after IRS Campaign	Usable Stock Remaining for 2014	Notes
Insecticide (FICAM)	665	38,489	39,154	23,029	16,125	Exp April 15 Aug 15
Spray Pumps	226	0	226	251	251	(25 new from Bla)
Pump Goizper IC12	5	0	5	0	5	For test
Coveralls	535	61	596	1	595	1 poor status
Helmet	256	48	304	0	301	3 units Noummou bougou site
Gumboots	318	0	318	0	318	
Red Vests	41	0	41	0	41	
Green Vests	79	0	79	0	79	
Gloves	1,337	0	1,337	980	357	
Gloves for incineration	0	5	5	5	0	
Face Masks	4,871	14,760	19,631	9,147	10,484	
Face Shields	247	240	487	243	244	
Face Shield Brackets	233	180	413	9	404	
Spare parts kit Hudson	22	0	22	0	22	
Nozzle Tip	211	0	211	71	140	

Item	Initial Stock Before IRS Campaign	Number of Items Procured	Stock Before Campaign	Used/ Unusable Stock after IRS Campaign	Usable Stock Remaining for 2014	Notes
Hardened Stainless Steel 8002E						
Nozzle Tip Hardened Stainless Steel 8001	138	0	138	0	138	
Pump Filter (Strainer)	124	0	124	4	120	
Nozzle flow regulator	212	0	212	122	90	
Nozzle flow regulator assembly /153-400	180	0	180	133	47	
Leather Cup	270	0	270	192	78	
Electronic Thermo-meter	18	10	18	13	15	10 provided after spray camp
Pregnancy test	55	40	95	30	65	
First aid kit	0	46	46	34	12	
Bucket/ 30 40/60 Liters	142	20	162	12	150	
Metal Bucket/ 15 Liters	80	0	80	0	80	
Bucket Plastic, 10/ 15/20 Liters	40	0	40	2	38	
Waste bin Hard plastic	34	0	34	0	34	
Cup 1 Liter Metal /Plastic	62	36	98	1	97	
Shovel with short handle	49	0	49	0	49	
Fire extinguisher G Format	6	0	6	0	6	
Fire extinguisher S Format	17	0	17	0	17	

Item	Initial Stock Before IRS Campaign	Number of Items Procured	Stock Before Campaign	Used/ Unusable Stock after IRS Campaign	Usable Stock Remaining for 2014	Notes
Operator bag	60	188	248	213	35	
Tarpaulin	62	33	95	0	95	
Calculator	67	0	67	36	31	36 poor status
Water Filter	228	20	248	14	234	
Plastic drums/200/160/55 Liters	152	77	229	0	229	182 remain
Oval Bucket	0	18	18	0	18	For spray operators to wash their feet
Motorbikes	5	0	5	0	5	

11.6 ANNEX 6: INVENTORY OF IRS COMMODITIES AT THE BLA DISTRICT WAREHOUSE

Item	Initial Stock Before IRS Campaign	Number of Item Procured	Stock Before Campaign	Used/ Unusable Stock after IRS Campaign	Usable Stock Remaining for 2014	Notes
Insecticide (FICAM)	6,977	36,599	43,576	40,852	2,724	Exp Apr 15
Spray Pumps	387	0	337	32	305	
Pump Goizper IC12	5	0	5	0	5	For test
Overalls	813	140	953	25	928	
Helmet	369	80	449	10	439	10 poor status
Gumboots	408	81	489	25	464	
Red Bright Vests	42	0	42	0	42	
Green Bright vests	111	0	111	0	111	

Item	Initial Stock Before IRS Campaign	Number of Item Procured	Stock Before Campaign	Used/ Unusable Stock after IRS Campaign	Usable Stock Remaining for 2014	Notes
Gloves	1,315	0	1,315	1,238	77	1,238 poor status
Gloves for Incineration	0	0	0	0	0	Only required incineration site
Face Masks	376	22,400	22,776	16,566	6,210	
Face Shield	581	360	941	581	360	
Bracket for Face Shield	328	180	508	17	491	
Spare parts kit Hudson	45	0	45	02	43	02 consumed
Nozzle Tip Hardened Stainless Steel (8002E	1,080	0	1,080	310	770	
Nozzle Tip Hardened Stainless Steel 8001	0	0	0	0	0	
Pump Filter (Strainer)	558	0	558	46	512	
Nozzle flow regulator	270	0	270	82	188	
Nozzle flow regulator assembly /153-400E	497	0	497	0	497	
Leather Cup	361	0	361	0	361	
Retainer Cup	0	350	350	76	274	
Electronic Thermo-meter	30	0	30	10	20	10 poor status
Pregnancy test	70	70	140	62	78	
First aid kit	4	66	70	31	39	
Bucket/ 30 40/60 Liters	121	20	141	12	129	12 poor status
Bucket Metal, 15 Liters	95	0	95	0	95	
Bucket Plastic, 10/	49	0	49	7	42	

Item	Initial Stock Before IRS Campaign	Number of Item Procured	Stock Before Campaign	Used/ Unusable Stock after IRS Campaign	Usable Stock Remaining for 2014	Notes
15/20 Liters						
Waste Bin Hard plastic	44	0	44	0	44	
Cup 1 Liter Metal /Plastic	60	20	80	35	45	
Shovel with short handle	50	13	63	04	59	4 without Handle
Fire extinguisher GF	6	0	6	0	6	
Fire extinguisher SF	0	28	28	0	28	For stores
Operator bag	245	123	368	25	343	25 poor status
Tarpaulin	130	24	154	12	142	12 poor status
Calculator	50	24	74	22	52	22 poor status
Plastic drums/200/160/55 Liters	94	133	227	0	227	168 in H Centers
Oval Bucket	0	28	28	0	28	For spray operators to wash their feet
Motorbikes	5	0	5	0	5	

11.7 ANNEX 7: INVENTORY OF IRS COMMODITIES AT THE BAROUELI DISTRICT WAREHOUSE

Item	Initial Stock Before IRS Campaign	Number of Item Procured	Stock Before Campaign	Consumed/Unusable Stock after IRS Campaign	Usable Stock Remaining for 2014	Notes
Insecticide (FICAM)	332	32,399	32,731	29,554	3,177	Exp Apr 15
Spray Pumps	264	0	264	5	259	
Pump Goizper IC12	5	0	5	0	5	For test
Overalls	649	135	784	0	784	

Item	Initial Stock Before IRS Campaign	Number of Item Procured	Stock Before Campaign	Consumed/Unusable Stock after IRS Campaign	Usable Stock Remaining for 2014	Notes
Helmet	305	64	369	0	369	
Gum Boots	367	21	388	0	388	
Red Vests	42	0	42	0	42	
Green Vests	106	0	106	0	106	
Gloves	1,574	0	1,574	677	897	677 poor status
Gloves for Incineration	0	0	0	0	0	Only required incineration site
Respirator mask	8,580	1,9080	27,660	10,660	17,000	
Face Shield	271	270	541	259	282	
Supports Face Shield	270	160	430	11	419	11 poor status
Spare parts kits for Spray Pump	22	0	22	0	92	
Nozzle Tip Hardened Stainless Steel 8002E	111	0	111	61	50	
Nozzle Tip Hardened Stainless Steel 8001	0	0	0	0	0	
Pump Filter (Strainer)	106	0	106	0	106	
Nozzle flow regulator	138	0	138	0	138	
Nozzle flow regulator assembly /153-400E	177	0	177	0	177	
Leather Cup	250	0	250	3	247	
Electronic Thermo-	26	0	26	5	21	5 poor status

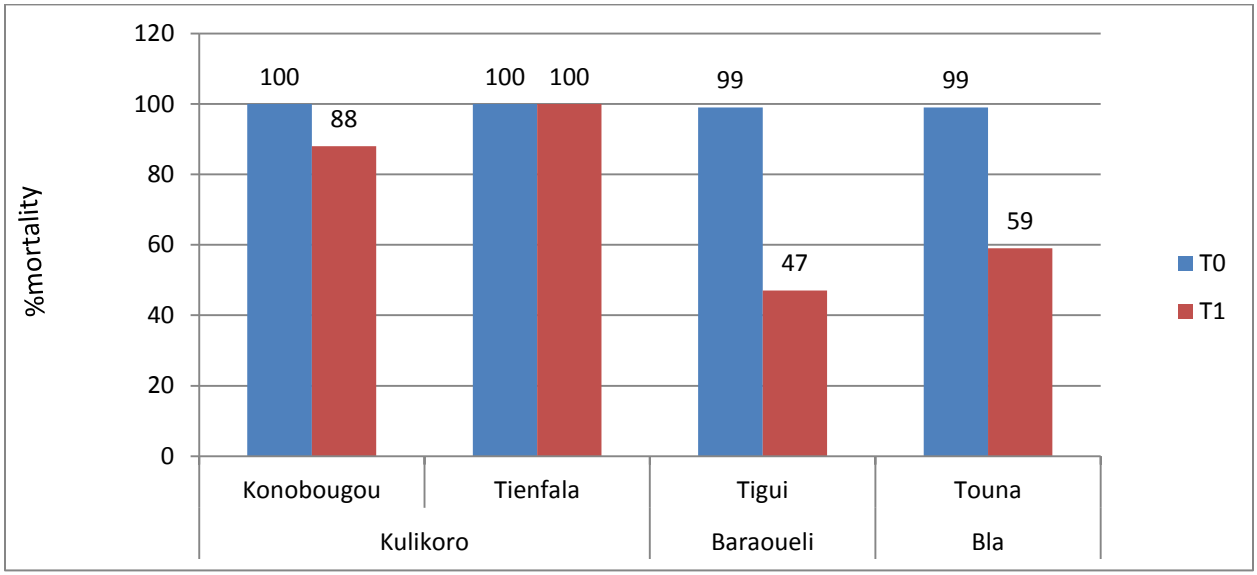
Item	Initial Stock Before IRS Campaign	Number of Item Procured	Stock Before Campaign	Consumed/Unusable Stock after IRS Campaign	Usable Stock Remaining for 2014	Notes
meter						
Pregnancy test	75	45	120	35	85	
First aid kit	5	58	63	50	13	
Bucket Plastic, 40/40/60 Liters	100	10	110	1	109	1 broken
Bucket metal 15 Liters	106	0	106	1	105	1 broken
Waste bin Hard plastic	32	0	32	0	32	
Cup 1 Liter Plastic/Metal	47	10	57	0	57	
Wood seat	23	15	38	0	38	
Scoreboard	25	0	25	0	25	
Support pallet	47	0	47	0	47	
Shovel with short handle	53	1	54	1	53	1 without handle
Fire extinguisher GF	6	0	6	0	6	
Fire extinguisher SF	0	23	23	0	23	
Operator bag	684	100	784	427	357	
Water Filter	163	50	213	115	98	
Plastic drums, 160 / 200/55 Liters	223	0	223	0	223	161 In H centers
Oval Bucket	0	23	23	0	23	For spray operators to wash their feet
Motorbikes	5	0	5	0	5	

Item	Initial Stock Before IRS Campaign	Number of Item Procured	Stock Before Campaign	Consumed/Unusable Stock after IRS Campaign	Usable Stock Remaining for 2014	Notes
Tarpaulin	76	23	99	1	98	
Calculator	31	0	31	1	30	1 in poor status

11.8 ANNEX 8: INSECTICIDE SUSCEPTIBILITY TEST RESULTS OF AN. GAMABIAE S.L TO VARIOUS INSECTICIDES FROM THE 3 SENTINEL SITES IN MALI USING WHO TUBE TEST

Sentinel Site	Insecticide tested	No of mosquitoes tested	% Observed test mortality	% Corrected mortality
Koulikoro	DDT 4%	99	10%	
	Deltamethrin 0.05%	104	98%	
	Lambda-cyhalothrin 0.05%	100	13%	
	Fenitrothion1%	99	100%	
	Bendiocarb 0.1%	102	100%	
Baroueli	DDT 4%	104	35%	
	Deltamethrin 0.05%	101	50%	
	Lambda-cyhalothrin 0.05%	103	45%	
	Fenitrothion1%	102	100%	
	Bendiocarb 0.1%	101	98%	
Bla	DDT 4%	104	52%	
	Deltamethrin 0.05%	103	38%	
	Lambda-cyhalothrin 0.05%	103	77%	
	Fenitrothion1%	102	100%	
	Bendiocarb 0.1%	103	98%	

11.9 ANNEX 9: WHO CONE BIOASSAY TEST RESULT 24 HOURS AND ONE MONTH AFTER SPRAY WITH BENDIOCARB



11.10 ANNEX 10: AIRS MALI M&E PLAN INDICATOR MATRIX

Updated: February 3, 2014

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target[3]	Results	Target	Results
Component 1: Establish cost-effective supply chain mechanisms including procurement, distribution and storage of IRS-related commodities and execute all aspects of logistical plans for IRS-related activities.											
1.1 Procurement											
1.1.1 Number and percentage of international insecticide procurement orders delivered in country, at port of entry, at least 30 days prior to the start of spray operations	[*Numerator:* Number of international insecticide procurements delivered in country, at port of entry, at least 30 days prior to the start of spray operations] [*Denominator:* Total number of international insecticide procurements] *Calculation:* [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	*Data source*: Project records – ex: international procurement documents, air way bills, commercial invoices *Reporting frequency*: Each spray season (annual/ semi-annual)	By Spray Campaign	AIRS	N.A; 80%	1;100%	1; 100%	3; 33%	2; 100%	
1.1.2 Number and percentage of international procurement orders for equipment, including PPE, received at port of entry, 30 days prior to start of spray operations.	[*Numerator:* Number of international procurements for equipment, including PPE, at port of entry, 30 days prior to start of spray operations] [*Denominator: Total number of* international procurements for	Y1, Y2, Y3	*Data source:* Project records *Reporting frequency*: Each spray season (annual/ semi-annual)	By Spray Campaign	AIRS	N.A.; 85%	1; 100%	1; 100%	1; 100%	1; 100%	

[3] Targets to be confirmed upon 2013 Work Plan approval

Performance Indicator	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	PMI/ AIRS Indicator	Annual Targets and Results					
						Year 1		Year 2		Year 3	
						Target	Results	Target[3]	Results	Target	Results
	equipment, including PPE.*]* *Calculation:* [Numerator ÷ Denominator] x 100										
1.1.3 Number and percentage of local PPE procurement orders that are delivered to the main warehouse 14 days before the start of spray operations	[*[Numerator:* Number of local PPE procurements delivered 14 days before the start of spray operations] [*Denominator*: *Total number of local PPE procurements.]* *Calculation:* [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	*Data source:* Project records – ex: such as delivery notes, goods receiving notes, inventory control cards *Reporting frequency*: Each spray season (annual/ semi-annual)	By Spray Campaign	AIRS	#N.A[4].; 80%	N.A.	1; 100%	1; 100%	1; 100%	
1.1.4 Successfully completed spray operations without an insecticide stock-out	Milestone: (Achieved/Not Achieved)	Y1, Y2, Y3	*Data source:* Project records – *ex:* inventory control cards *Reporting frequency*: Each spray season (annual/ semi-annual)	By Spray Campaign	AIRS	Achieved	Achieved	Achieved	Achieved	Achieved	

[4] Number of local procurements not targeted in Year 1.

1.2 In-country Logistics, Warehousing, and Training											
1.2.1 Number and percentage of logistics, warehouse managers, and storekeepers trained in IRS supply chain management	*[Numerator:* Total number of logistics and warehouse managers trained in IRS supply chain management using AIRS Project resources.] *[Denominator:* Total number of AIRS logistics and warehouse managers.] *Calculation*: [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	*Data source*: Routine training records *Reporting frequency*: Semi-annually	By Spray Campaign By Gender	PMI	74; 100%	74; 100%	74; 100%	74; 100%	74; 100%	
1.2.2 Number and percentage of base stores where physical inventories are verified by up-to-date stock records	*[Numerator:* Number of base stores where physical inventories are verified by up-to-date stock records] [*Denominator*: *Total number of base stores audited.]* *Calculation:* [Numerator ÷ Denominator] x 100 *(See PIRS for details on sample size for operational audits)*	Y2, Y3	*Data source:* Project records - ex: inventory control cards *Reporting frequency*: Each spray season (annual/ semi-annual)	By Spray Campaign	AIRS	69; 85%	69; 100%	69;100%	69; 100%	69; 100%	
1.2.3 Submit up-to-date inventory records to AIRS Home Office 30 days after the end of each spray campaign	Milestone: (Completed/Not Completed)	Y2, Y3	*Data source:* Project records - ex: warehouse inventory control cards *Reporting frequency*: Each spray season (annual/ semi-annual)	By Spray Campaign	AIRS	N.A.	N.A.	Completed	Completed	Completed	

Component 2: Implement safe and high-quality IRS programs and provide operational management support											
2.1 Planning and Design of IRS Programs											
2.1.1 Annual IRS country work plan developed and submitted on time	Milestone: (Completed/Not Completed)	Y1, Y2, Y3	*Data source:* Project records *Reporting frequency:* Annually		AIRS	Completed	Completed	Completed	Completed	Completed	
2.2 Support of Safety and Health Best Practices and Compliance with USAID and Host Country Environmental Regulations											
2.2.1 SEA/letter report submitted on time[5]	Milestone: (Completed/Not Completed)	Y1, Y2, Y3	*Data source:* Project records – submitted SEAs/ letter reports *Reporting frequency:* Each spray campaign	By Spray Campaign	AIRS	Completed	Completed	Completed	Completed		
2.2.2 Number and percentage of soak pits and warehouses/storerooms inspected and certified by an environmental officer/AIRS Environmental Compliance Officer prior to spraying	[Numerator: Number of soak pits and/or storehouses inspected and certified by AIRS Environmental Compliance Office] [Denominator: Total number of project soak pits and/or storehouses] Calculation: *[Numerator ÷ Denominator] x 100*	Y1, Y2, Y3	*Data source:* Project records – Reports submitted by environmental officers *Reporting frequency:* Each spray season	By Spray Campaign By soakpits and warehouses/ storerooms	AIRS	135 *66 Soak Pits* *69 Storehouses* 100% inspected and approved prior to spraying	135 *66 Soak Pits* *69 Storehouses* 100%	135; *66 Soak Pits* *69 Storehouses* 100%	137; *68 Soak Pits* *69 Storehouses* 101.4%	137; *68 Soak Pits* *69 Storehouses* 100.%	
2.2.3 Number of government environmental and health officers trained in IRS environmental compliance	Total number of government environmental and health officers trained in IRS environmental compliance using AIRS Project resources	Y1, Y2, Y3	*Data source:* Project training reports *Reporting frequency:* Semi-annually	By Spray Campaign By Gender	AIRS	30	30 M: 28 F: 2	30	36 *M:33* *F:3*	30	

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

2.2.4 Number of spray personnel trained in environmental compliance and personal safety standards in IRS implementation	Total number of spray personnel who attend a training in environmental compliance and personal safety standards in IRS implementation using AIRS Project resources, includes all staff who received environmental compliance training - spray operators, team leaders, washpersons, storekeepers, etc.	Y1, Y2, Y3	*Data source:* Project records – Training reports *Reporting frequency:* Each spray season	By Spray Campaign By Gender	AIRS	1,007	936 M: 909 F: 27	990	1,1142 M: 982 F: 160	1,104	
2.2.5 Number of health workers receiving insecticide poisoning case management training	Total number of clinical personnel trained in insecticide poisoning case management using AIRS Project resources	Y2, Y3	*Data source:* Project records – Training reports *Reporting frequency:* Each spray season	By Spray Campaign By Gender	AIRS	68.	61	68	70	68	
2.2.6 Number of adverse reactions to pesticide exposure documented	Total number of incidents of pesticide exposure reported that resulted in a referral for medical care	Y1, Y2, Y3	*Data source:* Incident report forms that are required for each incidence of pesticide exposure *Reporting frequency:* Each spray season	By Spray Campaign By residential/occupational exposure	AIRS	0	0	0	0	0	
2.2.7. Number of vehicular accidents reported	Total number of vehicular accidents reported	Y1, Y2, Y3	*Data source:* Vehicular incident report forms that are required for each accident *Reporting frequency:* Each spray season	By Spray Campaign	AIRS	0	0	0	2	0	

2.3 Support Entomological Monitoring Activities and Insecticide Resistance Strategies											
2.3.1 Number of sentinel sites supported by the AIRS project	Total number of entomological sentinel sites supported by the AIRS project	Y1, Y2, Y3	*Data source:* Entomological reports *Reporting frequency:* Annually	By Spray Campaign	AIRS	4[6]	4	5[7]	5	5	
2.3.2 Number and percentage of entomological monitoring sentinel sites measuring all five primary PMI entomological indicators	*[Numerator:* Number of entomological monitoring sites measuring all five primary PMI entomological indicators] *[Denominator:* Number of entomological monitoring sentinel sites] *Calculation:* [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	*Data source:* Entomological reports *Reporting frequency:* Annually	By Spray Campaign	AIRS	1 out of 4; 25%	1 out of 4; 25%	2 out of 5; 40%	2 out 5; 40%	2 out of 5 40%	
2.3.3 Number and percentage of entomological monitoring sites measuring at least one secondary PMI indicator	*[Numerator:* Number of entomological monitoring sites measuring at least one secondary PMI indicator] *[Denominator:* Number of entomological monitoring sites] *Calculation:* [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	*Data source:* Entomological reports *Reporting frequency:* Annually	By Spray Campaign	AIRS	2 out of 4; 50%	2 out of 4; 50%	4 out of 5; 80%	4 out of 5; 80%	4 out of 5; 80%	

[6] Spray sites: Koulikoro, Baroueli, Bla & Non-spray sites: Kati
[7] Spray sites: Koulikoro, Baroueli, Bla & Non-spray sites: Kati and Segou

2.3.4 Number and percentage of insecticide resistance testing sites that tested at least one insecticide from each of the four classes of insecticides recommended for malaria vector control	*[Numerator:* Number of insecticide resistance testing sites that tested at least one insecticide from each of the four classes of insecticides recommended for malaria vector control.] *[Denominator:* Number of insecticide resistance testing sites] *Calculation:* [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	*Data source:* Entomological reports *Reporting frequency:* Annually	By Spray Campaign By Type of Insecticide	AIRS	4; 100%	4[8]; 100%	5[6]; 100%	5[6]; 100%	5[6]; 100%	
2.3.5 Number of wall bioassays conducted within 2 weeks of spraying to evaluate the quality of IRS	Total number of wall bioassay studies conducted in established sentinel sites to evaluate quality of IRS spraying activities	Y1, Y2, Y3	*Data source:* Entomological reports *Reporting frequency:* Per spray campaign	By Spray Campaign	PMI	11 wall bioassays[9]	11 wall bioassays[7]	10 wall bioassays[10]	10 wall bioassays[8]	10 wall bioassays[8]	
2.3.6 Number of wall bioassays conducted after the completion of spraying at monthly intervals to evaluate insecticide decay	Total number of wall bioassay studies conducted at monthly intervals in established sentinel sites to evaluate the rate of insecticide decay on sprayed surfaces	Y1, Y2, Y3	*Data source:* Entomological reports *Reporting frequency:* *Per spray campaign*	By Spray Campaign	PMI	22 11 houses tested at T1 and T2	22 11 houses tested at T1 and T2	12 6 houses tested at T1 and T2	12 6 houses tested at T1 and T2	48 wall bioassays[11] Koulikoro 4 houses will be test 3 times= 12 wall biassays Baroueli 3 houses will be	

[8] Organochlorine: DDT; Pyrethroid: Lamdacyalothrine 0,05% et Deltamethrine 0,05%; Organophosphorine: Fenitrothion 1 %; Carbamate: Bendiocarb 0,1%
[9] 5 houses in Koulikoro, 3 houses in Baroueli, and 3 houses tested in Bla at T0
[10] 4 houses in Koulikoro, 3 houses in Baroueli, and 3 houses tested in Bla at T0
[11] Koulikoro 4 houses will be test 3 times= 12 wall biassays; Baroueli 3 houses will be test 6 times= 18 wall biassays; Bla 3 houses will be test 6 times= 18 wall biassays

										test 6 times= 18 wall biassays Bla 3 houses will be test 6 times= 18 wall biassays	
2.3.7 Number of vector susceptibility tests for different insecticides conducted in selected sentinel sites	Total number of vector susceptibility tests conducted to gauge the effectiveness of individual insecticides proposed for use in spray operations	Y1, Y2, Y3	*Data source:* Entomological reports *Reporting frequency:* Per spray campaign	By Spray Campaign By Type of Insecticide	PMI	13	13[12]	10[5]	10	12	
2.4 Conduct Communications Activities and Community Mobilization											
2.4.1 Number of radio spots and talk shows aired	Total number of radio spots and talk shows aired in target spray districts to stress the safety and benefits of IRS, ensure successful spray coverage, timely vacating of premises and adherence to IRS safety precautions by community members	Y1, Y2, Y3	*Data source:* Project records ex: payment receipts *Reporting frequency:* Semi-annually	By Spray Campaign	AIRS	N.A.	65	1,274	5,035	5,035	
2.4.2 Number of IRS print materials disseminated	Total number of IRS educational materials developed, printed and distributed to community members in target spray	Y1, Y2, Y3	*Data source:* Project records *Reporting frequency:* Semi-annually	By Spray Campaign By Type of printed	AIRS	340,000	65,000	150,000	32,565	32,565	

[12] Organochlorine: DDT; Pyrethroid: Lamdacyalothrine 0,05% et Deltamethrine 0,05%; Organophosphorine: Fenitrothion 1 %; Carbamate: Bendiocarb 0,1%

	districts using AIRS Project resources			material and message(s)							
2.4.3 Number of people reached with IRS messages via door-to-door mobilization	Total number of adults reached with IRS message during pre-spray community, door-to-door mobilization	Y1, Y2, Y3	*Data source:* Mobilization Data Collection Forms *Reporting frequency:* Daily per mobilization conducted	By Spray Campaign By Gender	AIRS	290,265	228,991 *M: 103,129* *F: 125,862*	308,097	351,830 *M: 171,553* *F: 180,277*	N.A.[13]	

[13] In 2014, AIRS Mali will only be completing mass mobilization

2.5 Spray Targeted Structures According to Technical Specifications											
2.5.1 Number of structures targeted for spraying[14]	Total number of structures found in targeted spray districts by Spray Operators	Y1, Y2, Y3	*Data source:* Daily Spray Operator Forms *Reporting frequency*: Daily per spray campaign	By Spray Campaign	PMI	215,000	210,217	210,217	233,789	233,789	
2.5.2 Number of structures sprayed with IRS[15]	Total number of structures sprayed in targeted districts	Y1, Y2, Y3	*Data source:* Daily Spray Operator Forms *Reporting frequency:* Daily per spray campaign	By Spray Campaign	PMI	182,750	206,295	206,295	228,985	198,721	
2.5.3 Percentage of total structures targeted for spraying that were sprayed with a residual insecticide (Spray Coverage)	[Numerator*:* Total number of structures sprayed in targeted districts] [Denominator*:* Total number of structures in targeted areas found by spray operators] Calculation*:* [Numerator ÷ Denominator] x 100	Y1, Y2, Y3	*Data source:* Daily Spray Operator Forms *Reporting frequency:* Daily per spray campaign	By Spray Campaign	PMI	85%	98%	85%	97,95%	85%	
2.5.4 Number of people residing in structures sprayed (Number of people protected by IRS)	Total number of people residing in structures sprayed (Actual numbers are collected during spray operations; population estimates are not used.)	Y1, Y2, Y3	*Data source:* Daily Spray Operator Forms *Reporting frequency*: Daily per spray campaign	By Spray Campaign By Number of pregnant women By Number of children <5 years old	PMI	697,512	762,146[16]	762,146[17]	850,104[18]	850,104	

14 *The yearly targets for this indicator are from the applicable work plan. The yearly results are the number of structures found by Spray Operators during the spray campaign.*

15 *The target per year for this indicator is based on 85% of the number of structures to be targeted as noted in the applicable workplan.*

16 *Number of Pregnant women: 18,561 and Number of Children less than 5 years old: 145,953*

17 *Number of Pregnant women: 18,561 and Number of Children less than 5 years old: 145,953*

18 *Number of Children less than 5 years old = 153,962 Number of Pregnant women = 22,405*

Component 3: Provide ongoing monitoring and evaluation and quality control measures											
3.1 Submit Monitoring and Evaluation Plan (MEP) to PMI- Mali	*Milestone:* (Completed/Not Completed)	Y1, Y2, Y3	*Data source:* Project records *Reporting frequency*: Semi-annual		AIRS	Completed	Complete d	Comple ted	Comple ted	Complet ed	
3.2 Submit a post-spray data quality audit (PSDQA) report to the AIRS M&E specialist in the home office within 60-180 days of completion of spray operations	*Milestone*: (Completed/Not Completed)	Y1, Y2, Y3	*Data source*: Spray operations reports *Reporting frequency*: Per spray campaign	By Spray Campaign	AIRS	Completed	Complete d	N.A.	N.A.	Complet ed	
3.3 Submit a country-specific Eligible Structure Definition Document to local PMI advisors and NMCP	*Milestone:* (Completed/Not Completed)	Y1	*Data source:* Project records *Reporting frequency*: Semi-annually		AIRS	Completed	Complete d	N.A.	N.A.	N.A.	N.A.

3.4 Supply chain review conducted by RTT	Milestone: (Completed/Not Completed)	Y1, Y2	*Data source:* RTT supply chain review reports *Reporting frequency*: Semi-annually	By Spray Campaign	AIRS	Completed	Complete d	Comple ted	Comple ted	Complet ed	
Component 4: Contribute to Global IRS Policy-Setting and Country-Level Policy Development of Evidence-Based IRS; Disseminate Experiences and Best Practices											
4.1 Number of guidelines/checklists /tools related to IRS operations developed or refined with project support	Total number of implementation guidelines, process checklists and program tools related to IRS operations developed or refined using the technical and/or financial resources of the AIRS Project	Y1, Y2, Y3	*Data source:* Project records – Activity reports *Reporting frequency*: Semi-annually	By Guideline/c hecklist/tool	AIRS	6	6	6	6	6	
4.2 Number of articles/best practices documents published	Total number of articles or other best-practice documents that have been published in relevant journals or through PMI/USAID communications vehicles	Y2, Y3	Data source: EOSPR Reporting frequency*:* Semi-annually	By Spray Campaign By IRS Technical Area	AIRS	N.A.	N.A.	TBD	2	2	
4.3 Number of best practice presentations given at national/ regional/internation al workshops and conferences	Total number of project-related oral and poster presentations delivered in national, regional and/or international meetings related to IRS.	Y2, Y3	Data source: Project records – Activity reports Reporting frequency: Semi-annually	By IRS Technical Area	AIRS	N.A.	1	1	1	1	
Component 5 (Cross-cutting): Capacity Building, Knowledge Transfer, Gender Inclusion											
5.1 Capacity Building (Gender Inclusion)											

5.1.1 Number of people trained in IRS implementation	Total number of personnel trained in IRS implementation using AIRS Project resources. This figure only includes spray personnel such as spray operators, team leaders, supervisors, clinicians; it excludes data clerks, IEC mobilizers, drivers, washers, porters, pump technicians, security guards, etc.	Y1, Y2, Y3	*Data source: Project* records – Training reports *Reporting frequency*: Semi-annually	By Spray Campaign By Gender Percentage of Women Trained	PMI	846	872 M: 837 F: 35 4%	876	853 *Males: 819* *Female: 34*	853	
5.1.2 Number of people trained to deliver or support IRS in target districts[19]	Total number of people trained using AIRS Project resources to implement/support elements of IRS in target districts. This figure includes all cadre that serve a role in IRS.	Y1, Y2, Y3	*Data source:* Project records – Training reports *Reporting frequency*: Semi-annually	By Spray Campaign By Gender By Role (e.g., spray operator, storekeeper) Percentage of women trained	AIRS	2,417	2371 M: 2068 F: 303 1%	2.403	2426 *M: 2017* *F: 409* *16.9%*	2074	
5.1.3 Number of personnel trained as IRS implementation trainers	Total number of personnel trained in Training of Trainers (TOT) for IRS delivery	Y1, Y2, Y3	*Data source:* Project records – Training reports *Reporting frequency*: Semi-annually	By Spray Campaign By Gender Percentage of women trained	AIRS	30	33 M: 31 F: 2	30	37. Male 34; Female 3	30	
5.1.4 Number of government environmental and/or health	Total number of national and sub-national/district government environmental and/or	Y1, Y2, Y3	*Data source:* Project records – Training reports	By Spray Campaign By Gender	AIRS	N.A.	N.A.	12	36 *M: 33* *F: 3* 9%	30	

[19] See Annex B for the breakdowns of the training targets as presented in the 2012 and 2013 AIRS Workplan, and 2012 End of Spray Report

officials trained in IRS oversight	health officials who are trained in oversight of IRS implementation using AIRS Project Mali resourc		*Reporting frequency*: Semi-annually	Percentage of Women Trained Type of government official (e.g. environmental/health)							
5.1.5 AIRS conducted a capacity assessment	AIRS program conducted an assessment of IRS capacity among national and sub-national/district government health officials	Y1, Y2	*Data source:* Project records – Capacity assessment reports *Reporting frequency*: Semi-annually		AIRS	N.A.	N.A.	N.A.	N.A	TBD	
5.1.6 Number of capacity-building MOUs signed by AIRS, NMCP and partners/ institutions	Total number of Memoranda of Understanding (MOU) on provision of local capacity building finalized and signed between AIRS, the National Malaria Control Program, and other local partners and institutions	Y1, Y2, Y3	*Data source:* Project records – MOUs *Reporting frequency*: Semi-annually	By Spray Campaign	AIRS	N.A.	N.A.	N.A.	N.A	TBD	