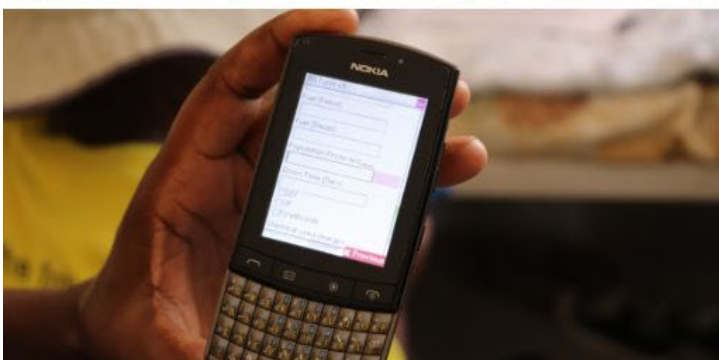

The PMI Evolve Project

Year 1 Annual Report

January 1, 2023-December 31, 2023



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Acronyms

AI	Active ingredient
AMP	Alliance for Malaria Prevention
ASTMH	American Society of Tropical Medicine and Hygiene
CAT	Capacity Assessment Tool
CBS	Community-based Surveillance
CDC	U.S. Centers for Disease Control and Prevention
CERMES	<i>Centre de Recherche Sanitaire et Médicale</i> (Health and Medical Research Center)
CNM	National Center for Parasitology, Entomology, and Malaria Control (Cambodia)
COR	Contracting Officer's Representative
CRID	Centre for Research in Infectious Diseases
CSRS	<i>Centre Suisse de Recherches Scientifiques</i> (Swiss Center for Scientific Research)
DHIS2	District Health Information Software 2
DM	Durability Monitoring
DRC	Democratic Republic of the Congo
ELISA	Enzyme-linked immunosorbent assay
ESPT	Entomological Surveillance Planning Tool
GDHF	Global Digital Health Forum
GESI	Gender equity and social inclusion
GHG	Greenhouse gas
GST	Global support team
HBO	Human behavior observation
HIS	Health information systems
HISP	Health Information Systems Program (Centre at University of Oslo)
HLC	Human landing catch
IDRC	Infectious Diseases Research Collaboration
IG2	Interceptor G2
INHP	<i>Institut National d'Hygiène Publique</i> (National Institute for Public Hygiene)
INS	Instituto Nacional de Saúde (National Institute of Health)
IRS	Indoor residual spraying
ITN	Insecticide-treated net
IVC	Integrated vector control

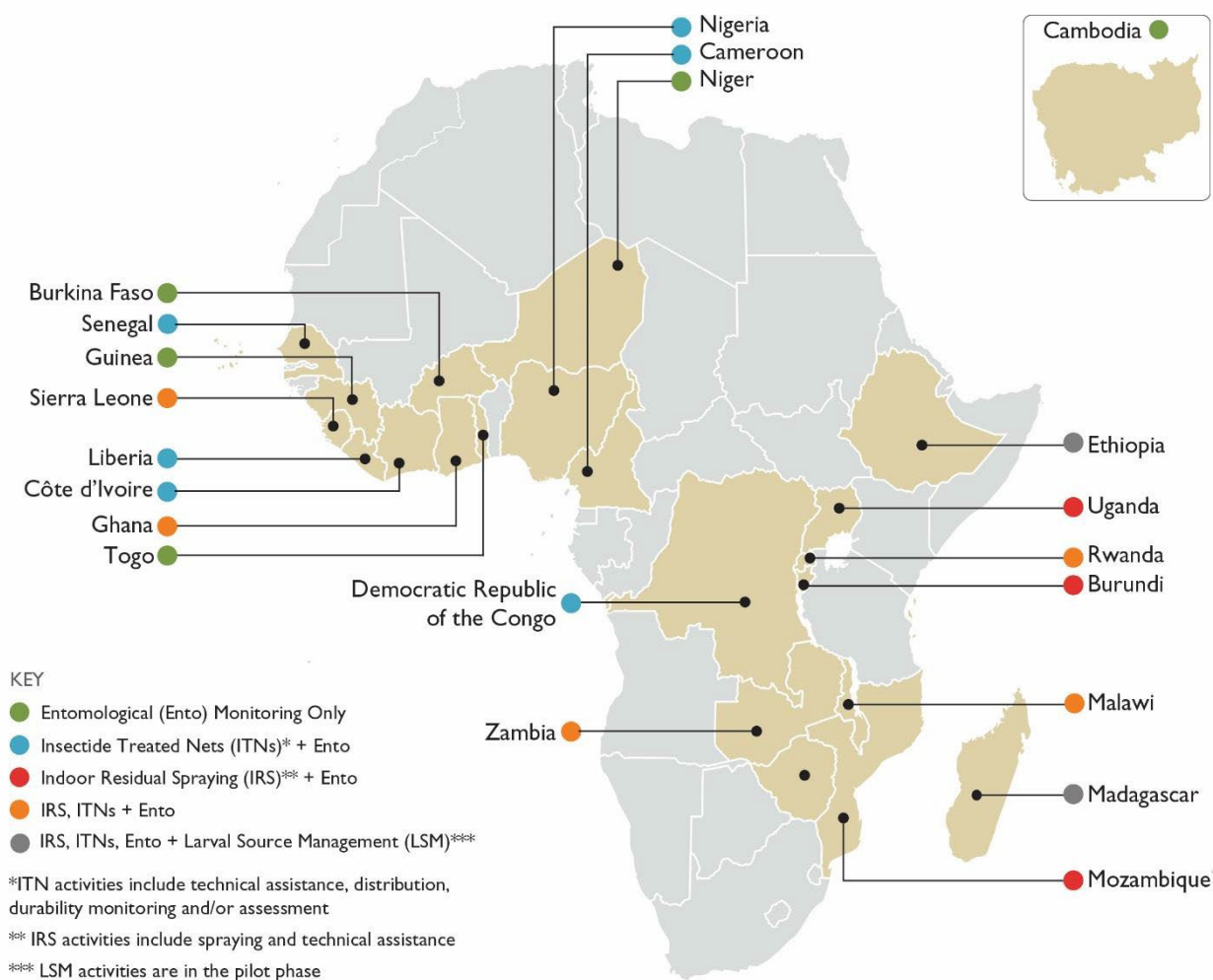
LIBR	Liberia Institute of Biomedical Research
LSM	Larval source management
LVCCAP	Local Vector Control Capacity Action Plan
MAAM	Mass Action Against Malaria
MEI	Malaria Elimination Initiative
MEL	Monitoring, evaluation, and learning
MOH	Ministry of Health
MOPDD	Malaria and Other Parasitic Diseases Division
NMCP	National Malaria Control Program
NMEP	National Malaria Elimination Program
NMP	National Malaria Program
PAMCA	Pan African Mosquito Control Association
PBO	Piperonyl butoxide
PCR	Polymerase chain reaction
PMI	U.S. President's Malaria Initiative
PSC	Pyrethrum spray catch
PSI	Population Services International
RCT	Randomized Control Trial
SBC	Social and behavior change
SEA	Supplemental environmental assessment
SIEE	Supplemental Initial Environmental Examination
UCSF	University of California San Francisco
USAID	United States Agency for International Development
VLC	VectorLink Collect
WHO	World Health Organization

1. Executive Summary

The U.S. President’s Malaria Initiative (PMI) Evolving Vector Control to Fight Malaria Project (PMI Evolve) is funded by the United States Agency for International Development (USAID), through PMI and was awarded to Abt Associates on December 19, 2022. PMI Evolve supports PMI, as well as USAID Missions and Bureaus with the planning, implementing, and monitoring of malaria vector control programs, including entomological monitoring, indoor residual spraying (IRS), insecticide-treated mosquito nets (ITNs), and larval source management (LSM). The project also strengthens the capacity of local institutions, including national malaria programs (NMPs), district health offices, and research institutions to independently conduct vector control programs. PMI Evolve is also responsible for program evaluation and conducting operations research on new vector control innovations. The project incorporates gender equity and social inclusion (GESI) and climate change initiatives as cross-cutting themes with the overall goal of ending malaria faster.

During Year 1, PMI Evolve worked across 20 countries in sub-Saharan Africa as well as in Cambodia (Figure 1). These countries transitioned to PMI Evolve from the predecessor PMI VectorLink project on a tiered transition schedule, with the first countries starting under PMI Evolve on April 1, 2023, with the final country transitioning on September 1, 2023.

FIGURE 1: PMI EVOLVE COUNTRIES IN YEAR 1

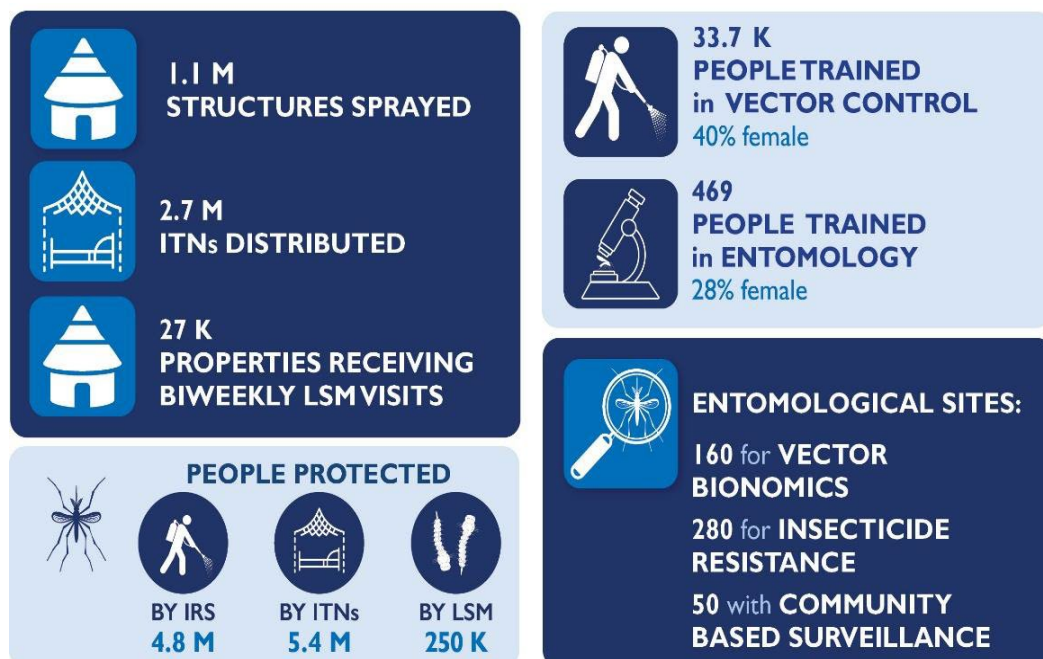


Project activities are supported by Abt’s core subcontract partners, EnCompass, PATH, Population Services International (PSI), Tropical Health and the University of California, San Francisco (UCSF) Malaria Elimination Initiative (MEI). Technical subcontractors include BAO Systems, the Centre for Research in Infectious Diseases (CRID), Crosscut, Dimagi, Health Information Systems Program (HISP) Centre at the University of Oslo (UiO) and its affiliates in West and Central Africa and Uganda, and Malaria Consortium. The project also partners with many local organizations (including governments, research institutions, non-governmental organizations, and private sector actors) to achieve its objectives, putting local actors in the lead wherever possible.

PMI Evolve’s Year 1 vector control achievements included conducting IRS campaigns in four countries – Madagascar, Malawi, Rwanda, and Zambia – protecting 4.8 million people from malaria. PMI Evolve also supported school-based ITN distributions in Senegal, Sierra Leone, and Ghana, and managed health facility distributions of ITNs in Senegal. In Zambia, PMI Evolve provided technical assistance for the nationwide mass ITN campaign, supporting the National Malaria Elimination Centre (NMEC) to distribute more than 11.5 million piperonyl butoxide (PBO) ITNs nationwide in 10 provinces. Of these, PMI Evolve distributed 2.7 million ITNs, protecting 5.3 million people. The project supported ITN durability monitoring (DM) survey rounds in 10 countries – Cameroon, Côte d’Ivoire, Democratic Republic of Congo (DRC), Liberia, Madagascar, Malawi, Rwanda, Sierra Leone, Uganda, and Zambia. These DM activities generated valuable data on ITN performance to aid countries’ decision-making around future ITN procurement and deployment. The project also supported LSM activities in Ethiopia.

Entomological achievements included two trainings for NMP partners on the Entomological Surveillance Planning Tool (ESPT), to support the project’s question-based approach to entomological surveillance. The project also completed insecticide resistance testing for broflanilide, the latest WHO Pre-qualified IRS insecticide, against wild populations for the first time in Ghana, Ethiopia, Madagascar, and Sierra Leone. See Figure 2, for Year 1 vector control and entomological highlights.

FIGURE 2: PMI EVOLVE YEAR 1 HIGHLIGHTS



In the area of capacity strengthening and localization, the project subcontracted \$1.26 million to five local subrecipients and designed the vector control-specific Capacity Assessment Tool (CAT), which will be used to develop country-specific Local Vector Control Capacity Action Plans (LVCCAPs) in Year 2.

This report covers the reporting period of January 1 through December 31, 2023. PMI Evolve country programs, highlighted in Section 8, joined the project on a tiered transition schedule, and their programmatic results encompass the period from when they transitioned to the project through the end of 2023.

2. Project Overview

2.1 Introduction

PMI Evolve is funded by USAID, through PMI. This project supports NMPs, PMI, and USAID missions and bureaus with the planning, implementing, and monitoring of malaria vector control programs, including entomological monitoring, IRS, ITNs, and LSM, with the overall goal of ending malaria faster. The project strengthens the capacity of NMPs, district health offices, and local research institutions to use data to make the best vector control decisions and to implement effective vector control programs. PMI Evolve is also responsible for evaluating the impact of and conducting operations research on new vector tools and approaches. The project incorporates GESI, safe-guarding, and climate change initiatives as cross-cutting themes in its support and implementation of vector control activities.

2.2 Project Start-Up

To support a strong start to PMI Evolve, the project convened a three-day workshop for Abt global support team (GST) members from February 22-24, 2023, which was also attended by PMI Contracting Officer's Representative (COR) team members. During this event, the team identified current strengths and management practices to carry forward under PMI Evolve, determined areas for improvement, and prioritized specific technical and managerial workstreams. These areas include integrated vector control (IVC) and innovation in vector control, capacity strengthening and localization, climate responsive programming, and core partner integration.

To coordinate start-up activities, communicate and discuss PMI priorities, and ensure that partner expertise was being maximized, PMI Evolve hosted the project kick-off meeting in Abt's Rockville office in March 2023, attended by all project partners.

Starting in April, the project transitioned operations and activities for 20 country programs from the PMI VectorLink project (Burkina Faso, Burundi, Cambodia, Cameroon, Côte d'Ivoire, Democratic Republic of Congo, Ethiopia, Ghana, Guinea, Liberia, Madagascar, Malawi, Mozambique, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Uganda, and Zambia) to PMI Evolve on a tiered transition schedule. The first group of countries started under PMI Evolve on April 1, 2023, and the final country transitioned on September 1, 2023.

In December 2023, PMI Evolve hosted a three-day, project-wide workshop to share lessons learned and best practices for planning, implementing, and monitoring a high-quality, high-performing vector control project. The workshop brought together chiefs of party, vector control managers, technical managers from all country programs, COR team and entomologists from the U.S. Centers for Disease Control and Prevention (CDC), as well as partner representatives from PSI, PATH, Tropical Health, Encompass, and the technical staff on the GST. The workshop addressed priority topic areas such as integrated data for vector control decision-making; capacity strengthening strategies; and the importance of climate, GESI, and safeguarding in all activity programming. The overarching objectives of the workshop were to share best practices, encourage standardization across the project, and promote accountability in PMI Evolve's interventions moving forward.

3. Integrated Vector Control Interventions

PMI Evolve is working with NMPs to make evidence-based, equity-focused decisions about vector control interventions that lead to sustainable and enhanced outcomes. This includes making recommendations about which vector control products to use, where, and when, by synthesizing national malaria strategic plans and existing priorities with the latest entomological, insecticide resistance, and climate data. Examples include selecting ITNs based on resistance status frequency and intensity; introducing and integrating PBO and dual active ingredient (AI) nets; including new classes of insecticides into country rotations for IRS; and initiating and evaluating the effects of LSM in response to shifting vector profiles, vector behaviors, and other emerging threats.

3.1 IRS Implementation Activities

3.1.1 IRS Campaigns

PMI Evolve successfully conducted IRS campaigns in four countries – Madagascar, Malawi, Rwanda, and Zambia – protecting 4.8 million people from malaria. In Madagascar, where PMI funds IRS in five districts, the PMI Evolve team supported the NMP to lead IRS implementation in one district, Ankazoabo Sud, with the NMP leading all planning, spraying, resource allocation, supervision, and monitoring and evaluation activities with close support from the project (see section 8.11). In Malawi, the team wrapped up its final PMI-funded campaign in Nkhotoakota district, as the Ministry of Health (MOH) will transition to ITNs as the country's primary vector control tool (see section 8.12). In Rwanda, where the PMI Evolve team conducted IRS in three districts, they also provided technical support to the Malaria and Other Parasitic Diseases Division (MOPDD) for the Government of Rwanda/Global Fund-supported IRS districts (see section 8.16). In Zambia, the IRS campaign was notable because it was the first-ever campaign conducted concurrently with the country's mass ITN distribution campaign. PMI Evolve successfully supported the planning process, partner coordination, budgeting and the roll-out of the ITN distribution (see section 8.21). In addition to these PMI Evolve-led campaigns, the project provided technical assistance to the Mozambique MOH's IRS campaign, which covered five districts and protected approximately 1.9 million people.

3.1.2 Digitized Microplanning

In Year 1, PMI Evolve project worked with CrossCut to tailor its existing geospatial planning tool with a supply planning module for IRS campaigns that offers an efficient alternative to the Excel-based tools. The IRS Supply Planning tool is freely available for use by the PMI Evolve team, Ministries of Health, and other implementing partners working in IRS. The current version of the tool has all the features required to produce a robust supply plan based on user-provided operations sites and structure counts and will continue to be iterated upon and improved during Year 2 of the project.

The PMI Evolve Ghana and Uganda projects were identified as pilot countries to begin using the CrossCut supply planning tool. The country teams are preparing a crosswalk of CrossCut-generated supply estimates against the team's own estimates. Preliminary findings indicate that the CrossCut supply planning tool is accurate when looking at human resource estimates determined by the CrossCut tool compared to traditional estimates provided by the Ghana and Uganda country teams. The goal is to continue to roll out this tool for additional IRS countries that are interested in digitalizing their microplanning quantification processes.

The main achievement for Year 1 was the release of the fully operational tool, which has produced the following opportunities for improving IRS quantification:

- Increased standardization of IRS campaign quantification
- Ease of sharing maps with district personnel
- Increased transparency of calculations
- Easier planning in areas without historical structure counts

▪ 3.1.3 Vectron T500 Pilot

PMI Evolve conducted a small pilot using Vectron T500 (broflanilide) in Madagascar during the 2023 IRS campaign. The project administered a questionnaire to 59 spray operators and 20 household members to learn more about community acceptance, evaluate operational use, and document adverse effects associated with the use of the new insecticide. Among the findings:

- Spray operators reported few cases of skin (8 cases; 14%) and eye (4 cases; 7%) irritation, while 4 household members (20%) interviewed reported experiencing skin irritation but no eye irritation. Household members reported some mild odor (11; 55%) and staining of wall surfaces (4; 20%), which they reported was not a major concern to them.
- Spray operators reported ease with use of the insecticide except for cases of clogging of the sprayer nozzle (35; 59%) which the project team will investigate further in upcoming larger campaigns with the product.
- The level of acceptability of the new insecticide among the household members was high (19; 95%) and they reported they would readily allow its use in future campaigns.

PMI Evolve Madagascar will continue to monitor the Vectron T500 residual efficacy in subsequent months.

In 2024, PMI Evolve plans to introduce larger-scale use of Vectron T500 in Sierra Leone targeting the use of approximately 34,000 sachets. A further pilot will also be conducted in Ethiopia.

3.2 ITN Implementation Activities

3.2.1 ITN Distribution

In Year 1, PMI Evolve began ITN distribution activities by recruiting staff and developing new tools such as the ITN Race to the Starting Line (RSL). The project supported school-based ITN distributions in Ghana, Senegal, and Sierra Leone; managed health facility distributions in Senegal; and led a nationwide mass campaign in Zambia. For the Zambia campaign, PMI Evolve supported the National Malaria Elimination Centre in distributing more than 11.5 million PBO ITNs nationwide in 10 provinces. The project also led planning activities and select trainings to support ITN mass campaigns planned to occur in Year 2 in Côte d'Ivoire, DRC, Ethiopia, Kenya, and Malawi. PMI Evolve actively engaged with stakeholders, attending the Alliance for Malaria Prevention (AMP) Annual Partners Meeting, participating in AMP weekly calls, and taking leadership roles, such as co-chairing AMP's Continuous Distribution Working Group. Demonstrating the project's commitment to knowledge sharing, the Senior ITN Technical Advisor led a webinar on ITN quantification for continuous distribution, and the project supported the dissemination of critical lessons learned to NMPs. To further PMI Evolve's commitment to continuous learning and empower staff to deliver IVC solutions, the project conducted internal training sessions aimed at enhancing the skills and capabilities of global project staff in various aspects of ITNs. These included new ITN types, distribution channels, quantification approaches, data collection methods, and ITN indicators.

3.2.2 Durability Monitoring

In Year 1, PMI Evolve supported standard or streamlined ITN DM survey rounds in 25 sites¹ across 10 countries, generating valuable data on ITN physical and insecticide field performance, household care, and recent use patterns to support decision-making around ITN procurement, and key messages. PMI Evolve used these data and experiences to contribute to the global community's continuously evolving thinking around post-market ITN monitoring. The project participated in the Post-Market Monitoring Working Group and presented preliminary data on the field performance of chlorfenapyr and PBO synergist ITNs in four countries at the annual RBM Partnership to End Malaria's Vector Control Working Group meeting in February. In October, PMI Evolve presented endline results at the American Society of Tropical Medicine and Hygiene (ASTMH) annual meeting during a scientific session that was co-chaired by a member of the PMI Evolve team. Finally, the project continued its efforts to ensure that DM tools and data remained openly and freely available. In addition to keeping the project's primary DM resource, www.durabilitymonitoring.org, current, PMI Evolve submitted endline DM data from seven countries² to USAID for upload to the Data Development Library.

3.3 LSM Implementation Activities

In Year 1, PMI Evolve supported PMI-led and local-led LSM implementation in three towns in Ethiopia. These towns were selected based on the confirmed presence of *Anopheles stephensi* mosquitoes for multiple years, malaria case incidence, and feasibility for LSM implementation. LSM activities in three towns were transitioned to local-led implementation by the municipal administrations by the end of December 2023. The project refined and introduced community-based LSM tools prior to the transition to promote a complete and seamless handover to the town administration and a more sustainable approach.

To help inform the NMEP on the feasibility of LSM implementation in Zambia, PMI Evolve conducted LSM feasibility assessments in two malaria pre-elimination districts in Eastern Province (Chipata and Katete). In anticipation of an upcoming LSM activity in Kebbi State, Nigeria, the PMI Evolve team began enumeration of larval habitats in Argungu. This will inform resource needs and provide critical information for development of the LSM protocol.

3.4 GESI and Safeguarding

In Year 1, PMI Evolve identified GESI and safeguarding focal points in all country teams with two exceptions: Ethiopia and Burkina Faso. In Ethiopia, the project is recruiting for a Human Resources, GESI, and Safeguarding manager (who will also serve as the focal point). In Burkina Faso, no project staff are based in-country. In December, the PMI Evolve Safeguarding Lead, GESI Lead, and the Abt Global Safeguarding Lead facilitated a virtual safeguarding orientation for focal points and chiefs of party, which provided an overview of safeguarding, priorities on the PMI Evolve project, roles and responsibilities, and next steps in the PMI Evolve safeguarding agenda. Two orientations were held – one in English and a second in French. A total of 24 PMI Evolve country staff attended the two trainings. The Safeguarding Lead also provided a safeguarding overview for the PMI Evolve GST and COR team.

Additionally, in preparation for spray campaigns in Madagascar, Malawi, Rwanda, and Zambia:

¹ Cameroon (Lagdo, Pitoa); Côte d'Ivoire (Abengourou, Aboisso); DRC (Nord Ubangi, Sud Ubangi, Tanganyika); Liberia (Bomi, Bong); Madagascar (Mananjary, Tamatave II, Vangaindrano); Malawi (Chikwawa, Kasungu, Salima); Rwanda (Karongi Burera, Kicukiro, Ruhango); Sierra Leone (Bo, Moyamba); Uganda (Apac, Mubende); and Zambia (Nyimba, Serenje)

² Burkina Faso, Burundi, Ghana, Kenya, Liberia, Madagascar, and Niger.

- The GESI Lead worked with the IVC team to update spray operator, team leader and storekeeper pocket guides created under PMI VectorLink. The guides contain current health, safety, and sexual harassment information; safeguarding reporting responsibilities, policies and procedures; and portray equal representation of females and males in leader roles in photos.
- The GESI and Safeguarding Leads worked with country teams to ensure that all staff and seasonal worker trainings included an overview of safeguarding and the reporting protocol.
- Country teams updated safeguarding posters with local and current contact information, including country GESI and safeguarding focal point contact details.

3.5 Environmental Compliance

In Year 1, the PMI Evolve environmental compliance and safety team developed the project's Environmental Monitoring and Mitigation Plan (EMMP), evaluated the environmental compliance and safety processes of all countries conducting IRS and LSM campaigns, and provided support virtually to those countries. In addition, the team:

- Started reviewing the incident reporting process with the PMI COR team with the goal of revising the process to include other categories for reporting and changing the reporting time framework for other categories.
- Developed a system for digitized supply chain management tools to address some weaknesses in warehouse inventory recordkeeping and reduce the use of paper for tracking stock transactions.

In addition, since the Supplemental Initial Environmental Examination (SIEE) for LSM activities in Ethiopia was prepared under the PMI VectorLink project, which ended in September 2023, and LSM activities are to continue in Ethiopia under the PMI Evolve project, the environmental compliance and safety team prepared a Memo to File to change the project name of the SIEE from PMI VectorLink Project to PMI Evolve Project to ensure no gap in LSM intervention.

The team will prepare new, updated, or amended environmental compliance documents, as needed, in Year 2.

In addition, PMI Evolve country programs continued to implement best practices established under PMI VectorLink for waste management, preferring (in order) to reduce, reuse, repurpose, recycle, responsibly landfill, and lastly, incinerate. In countries that implemented IRS, the project recycled plastic insecticide bottles, as well as the basins, bins, and barrels used in IRS operations, and recycled most of the cardboard waste generated by these activities. In countries where PMI Evolve supports ITN distribution, the project works with NMPs to develop waste management plans and support the collection, storage, and transport of ITN packaging, bundling material, and baling straps to waste disposal and recycling facilities.

3.6 Climate

PMI Evolve also developed a greenhouse gas (GHG) Inventory Management Plan and methodology to calculate country-level GHG emissions based on PMI Evolve country activities. Emissions estimates were established using an operational control boundary (i.e., emissions sources over which PMI Evolve and its managing partners and subcontractors have operational control). Emissions from project activities that are initiated or managed by local government agencies or affiliates were excluded. Following the GHG Protocol, which serves as the global standard for GHG accounting, PMI Evolve first focused on Scope 1 (direct emissions) and Scope 2 (indirect emissions associated with the purchase of electricity) emissions sources. Material emissions sources related to these scopes for PMI Evolve countries include vehicle fleets, generator fuel consumption, and purchased electricity. Scope 3 emissions include other indirect sources of emissions

including air travel taken during STTAs or international conferences and those in the supply chain (i.e., transport of internationally procured goods, such as insecticide, IRS, and entomology equipment). The Scope 3 emissions inventory for PMI Evolve is currently under development.

Data related to Scope 1 and 2 emissions for three PMI Evolve country programs (Côte d'Ivoire, Guinea, and Senegal) was captured through October 31, 2023, and used to establish a baseline. These countries were selected as they were among the first to prepare and submit their Year 2 workplans which reported on results from Year 1. Calculations used the Intergovernmental Panel on Climate Change (IPCC) AR5 Global Warming Potentials (GWPs), per industry best practice. Generator fuel and vehicle fleet calculations applied U.S. Environmental Protection Agency (EPA) Climate Leaders September 2023 emission factors for Distillate Fuel Oil #1 and vehicle type and year-specific emissions factors, as country-specific factors are not well established for these sources. Electricity calculations applied country-specific emissions factors when available through the International Energy Agency Emissions Factors 2023 database. The team will complete this process for Scope 3, and for the remaining countries, in Year 2.

4. Data Collection and Analysis to Inform Vector Control Interventions

4.1 Entomology

To support a question-based approach to entomological surveillance and further the co-development of PMI Evolve's annual surveillance objectives with NMPs, the project organized trainings in the use of the Entomological Surveillance Planning Tool (ESPT) in December 2023. See section 5.3 for more details.

PMI Evolve began insecticide resistance testing for broflanilide against wild populations for the first time in Ghana, Ethiopia, Madagascar, and Sierra Leone, testing a putative diagnostic concentration of 18µg/mL, building upon the work done with insectary-reared strains under PMI VectorLink. In addition, the team reviewed the recent reports of clothianidin and chlorfenapyr resistance, documenting the extent of the resistance at a sentinel site level, and identifying sites within Burkina Faso and Côte d'Ivoire for additional insecticide resistance testing to support the discovery of genetic resistance markers for these insecticides (see section 4.2).

PMI Evolve implemented the PMI-approved HBO data collection and analysis tools for country-funded HBO activities where mosquito collection methods are used that allow for hourly estimates of human biting rates. The project developed data management and dashboards for these HBO data using a combination of VectorLink Collect and Tableau Public. The project also developed guidance for when and where to carry out this activity. The next step will be to reformat this guidance in a decision-tree format for inclusion in project-branded publicly available HBO technical guidance documentation. Lastly, the project worked with the USAID Breakthrough Action Project's Malaria Behavior Survey team to identify opportunities for linking entomological indicators, leveraging the Malaria Behavior Survey indicators and using Malawi as a case study, for a forthcoming publication on the approach to integrating these data sets.

4.2 Laboratory Analysis

In Year 1, PMI Evolve established preliminary coordination with PMI and CDC for the surveillance of novel insecticide resistance markers for clothianidin, chlorfenapyr, and broflanilide. To support detection of novel insecticide resistance markers and the increasing demand for sequencing capacity on the African continent, PMI and CDC are providing leadership in the identification of partner institutions where sequencing capacity has been developed through other PMI projects.

To provide further molecular entomology support to francophone countries, the project hired a regional senior entomology specialist, based at CRID to serve, in addition to other duties, as a first line provider of technical support for routine molecular analysis activities. The regional senior entomology specialist is also the lead/co-lead on several centrally coordinated activities that benefit all countries, such as a biweekly molecular lab open office hours, support for procurement of molecular lab reagents, and the VectorLink Collect (VLC) molecular lab program roll-out. In Year 2, he will lead the *Anopheles stephensi* virtual training. This training had been postponed from Year 1 to accommodate the novel LAMP assay for *An. stephensi* identification recently developed at CDC.

4.3 Use of Routine Data to Monitor and Inform Vector Control Activities

In Year 1, PMI Evolve synthesized key findings from IRS and ITN evaluations conducted under PMI VectorLink and shared these results through a webinar. The webinar, "[Evaluating the Impact of IRS and ITNs: Lessons from PMI VectorLink](#)" explored how evaluation results were used for decision making, shared key lessons learned regarding methodological considerations based on the evaluations, and highlighted future areas for vector control evaluation to address existing gaps in knowledge. PMI Evolve also published a supporting [technical brief](#) and data use profile series on the PMI VectorLink website demonstrating how impact evaluations using routine data informed national decision-making in [Malawi](#), [Mali](#), and [Nigeria](#).

PMI Evolve also continued work initiated under PMI VectorLink to understand the effects of IRS withdrawal in PMI-supported areas and efforts underway to mitigate negative impacts. The project developed a concept note to guide future evaluations of the impact of IRS withdrawal and introduction of new ITNs in relevant PMI-supported countries.

The *American Journal of Tropical Medicine and Hygiene* published "[Process and methodological considerations for observational analyses of vector control interventions in sub-Saharan Africa using routine malaria data](#)" in August, written by PMI Evolve team members in collaboration with the RBM Partnership's Surveillance, Monitoring, and Evaluation Working Group. The article draws on the experience of implementing 22 vector control evaluations in 14 countries, as well as other literature on vector control impact evaluations using routine health information system data, to provide practical guidance on the design of future evaluations.

4.4 Integration of Vector Control Data into National Systems and in Harmonization with WHO Information Systems

PMI Evolve invested in foundational activities to support the development of a project-wide strategic approach to information system strengthening during Year 1. The team continued dialogue with key partners related to global digital goods and information system strengthening. The project held several meetings with the WHO Global Malaria Programme team to discuss data sharing and District Health Information Software 2 (DHIS2) metadata package updates. Furthermore, the project convened strategic planning discussions between the GST and HISP partners to gather insights on DHIS2 metadata package adoption and identify priorities for future project years.

In addition, the PMI Evolve team implemented the Rapid Health Information Systems (HIS) Assessment activity. The goal of this activity was to document the current status and overall readiness of PMI Evolve-supported countries for integration of vector control or entomological data into national information systems, through key informant interviews. In Year 1, the team developed a concept note for the activity, followed by the creation of three interview guides to support key informant interviews. The GST held two virtual training courses for PMI Evolve country points-of-contact designated to serve as interviewers for the Rapid HIS Assessment activity, training 21 project staff across 19 countries. Following the training, participants identified stakeholders to serve as key informants for the activity in their respective countries, verified key informant lists with PMI Missions, and began conducting interviews. Following initial discussions with Mission counterparts, the project excluded two PMI Evolve country programs from the activity – Mozambique and Ghana – based on the status of ongoing HIS work in these countries. In total, 71 key informants across 17 countries were identified. At the conclusion of Year 1, 12 countries had completed over 60 interviews. All interviews are expected to be completed and the team will share consolidated findings in early 2024.

5. Capacity Strengthening and Localization

5.1 Localization and Use of Partners

In its first year, the PMI Evolve project systematically recognized and leveraged local capacity through partnerships with NMPs, subnational health units, research institutions and universities, and non-governmental organizations across all 20 project countries. In addition to engaging in consultative processes with all relevant government stakeholders in designing, planning, and implementing tailored vector control activities, the project subcontracted a total of \$1.26 million in Year 1 to five local subrecipients, including one parastatal organization (see Section 8 for details). The project also received approval to engage eight existing local entomology partners who previously collaborated under the PMI VectorLink project.

To expand the role of local partners on the project and to cultivate a stronger cross-country support network between vector control experts in malaria endemic countries, the project engaged a local research institution, CRID, to fill a full time GST role supporting multiple countries in molecular entomology and serve as a regional resource center for troubleshooting laboratory protocols.

5.2 Local Vector Control Capacity Assessments & Action Plans

In Year 1, PMI Evolve developed a systematic approach for assessing and prioritizing opportunities for local organizations to strengthen their capacity to lead vector control activities and define their own measures of success. The project designed a vector control-specific **Capacity Assessment Tool (CAT)** designed to clarify relevant stakeholders' perceived strengths, competency needs, and skill gaps. The results will be used to collaboratively develop each country's tailored, specific, and achievable **Local Vector Control Capacity Action Plan (LVCCAP)**. This demand-driven capacity strengthening approach, aims to holistically address the full spectrum of technical and organizational capabilities (listed in Table 1) required to conduct a variety of vector control or monitoring activities (regardless of who is responsible for implementing or funding them). This approach, which is an adaptation of USAID's "[CBLD-9 steps](#)," will support the shift to increasing ownership to local partners, advancing their readiness to work directly with USAID, and creating the conditions for their continued success beyond the life of the PMI Evolve project.

TABLE 1: VECTOR CONTROL CAPACITY ASSESSMENT TOOL (CAT) MODULES

General/Organizational	Entomological Monitoring	Vector Control
<ul style="list-style-type: none"> - Compliance* - Human Resources - Financial Resource Mobilization and Management - Cross-Cutting - Data Generation, Data Management, Data Analysis and Data Use 	<ul style="list-style-type: none"> - Bionomics Field Collections - Insecticide Resistance Monitoring - Residual Efficacy and Bioassays - ITN Durability Monitoring - Molecular Analysis - Operational Research and Field Studies 	<ul style="list-style-type: none"> - IRS - ITN distribution - LSM

* Compliance with USAID and USG rules and regulations and award management requirements (or other donors' if applicable).

5.3 Strengthening the Capacity of Host Governments to Make Vector Control Decisions

Foundational to PMI Evolve's capacity strengthening efforts is the ESPT, a decision-support tool for planning entomological surveillance activities, interpreting entomological data, and guiding programmatic vector control decisions. The ESPT was developed by the Malaria Elimination Initiative (MEI) at UCSF and the University of Notre Dame in partnership with a working group of international experts in entomological surveillance. The tool represents a paradigm shift in the approach to programmatic entomological surveillance activities, focusing on the importance of question-driven methods and prioritizing minimum essential indicators and prioritizing surveillance activities in alignment with available resources. The ESPT provides practical guidance in these areas to help NMPs answer questions about local transmission drivers, gaps in protection with current vector control interventions (e.g., insecticide resistance, outdoor biting, etc.), and selecting supplemental vector control interventions to address these gaps.

In this reporting period, PMI Evolve offered an introductory ESPT workshop to NMP representatives from PMI countries with limited or no prior experience applying the tool. Two consecutive four-day events were held in Kigali, Rwanda in December 2023, and attended by 12 participants from Côte d'Ivoire, Cameroon, Niger, and Guinea (week 1, francophone) and Rwanda, Nigeria, Liberia, Kenya³, and Sierra Leone (week 2, anglophone). Following these trainings, participants are expected to participate in a minimum of two virtual follow-up sessions to share experiences and troubleshoot challenges, and they are receiving continuous remote support from facilitators to reinforce the application of this knowledge for national strategic planning and PMI Evolve work planning.

These trainings succeeded due primarily to a thoughtful participant selection process (clearly articulating selection criteria as well as participant expectations before, during, and after the training) and a participant to facilitator ratio (2:1) that was conducive to full engagement and individualized attention. Participants reported a high level of satisfaction (100% of evaluation form respondents agreed or strongly agreed with the statements "I was satisfied with the course overall", "I feel confident about and am committed to applying what I learned back on the job", and "I would recommend this course to colleagues") and expressed a need for the ESPT to be institutionalized for more efficient and effective malaria vector surveillance. Facilitators reported that participants have been frequently soliciting their support via WhatsApp.

5.4 Challenges and Opportunities for Future Project Years

This major strategic priority and agency commitment "to shift power toward local actors to support more robust and resilient communities that are more inclusive of diverse voices and backgrounds" comes with certain challenges. Learning from prior attempts to shift ownership of vector control activities to local actors, the PMI Evolve project aims to carry out gradual and supported shifts over the life of the project, with a strong emphasis on organizational development. In addition to increasing technical capacity, PMI Evolve will address identified gaps in key business functions, which could include financial management, workforce management, and procurement through the LVCCAP process. These are also the most significant opportunities for preparing technically and institutionally strong local actors to receive direct funding from USAID. With increasing pressure on financial resources, investments in organizational capacity strengthening are competing with other equally important activities that contribute to saving lives, generating evidence for

³ Although Kenya was not supported by PMI Evolve at the time of this training, it is a PMI focus country. Therefore, the project extended an invitation to the Kenyan MOH to strengthen their entomological surveillance capacity.

the global malaria community, or both. Yet, these investments also have high potential to result in substantially more cost-effective and localized PMI-supported vector control in future years.

With strong, established relationships with the local vector control actors who are likely to carry out the country's vector surveillance and vector control activities long term, the PMI Evolve project is optimally positioned to support PMI in realizing USAID's Good Practices for Local Leadership, resulting in more sustainable vector control efforts, and modeling effective transitions for other USAID-supported sectors.

6. Innovation and Knowledge Dissemination

6.1 Operational Research

Due to sample size challenges, concerns around the broader applicability of the study, and the shrinking geographical footprint of IRS campaigns, a decision was made not to pursue the partial IRS randomized controlled trial, originally proposed under PMI VectorLink, further. The operational research into the efficacy of partial spraying of SumiShield, Fludora Fusion, and Actellic against wild populations of *An. gambiae* s.l. in experimental huts in Tiassalé, Côte d'Ivoire was published under PMI VectorLink in [Scientific Reports in 2023](#).

The project is collaborating with IVCC to produce a joint publication on operational research in Côte d'Ivoire (completed under PMI VectorLink) and Tanzania (data collection completed in 2023) on the efficacy of attractive targeted sugar baits in experimental huts.

6.2 Communication and Knowledge Dissemination

With the launch of PMI Evolve, the communications team developed the project's Branding and Marking Implementation Plan, which was widely disseminated to the project countries, and organized a follow-up training for country leads, including chiefs of party and the project management team in March 2023. The team also developed branded templates for use across the project (for the work plan, technical documents, PowerPoint presentations, and other needs). In addition, the team updated and rebranded key technical documents, such as the IRS Pocket Guides, with the PMI Evolve branding and translated the guides into French.

During this reporting period, the PMI Evolve project published one success story and one malaria fighter profile (with another success story under review). These stories were published on the project's website in December, after the PMI VectorLink website was transitioned to PMI Evolve branding. (Note: Between January 1 and September 30, 2023, eight other success stories were published under PMI VectorLink as countries were wrapping up their PMI VectorLink contracts before transitioning to PMI Evolve).

In August, the project hosted a webinar, "[Evaluating the Impact of IRS and ITNs: Lessons from PMI VectorLink](#)" and published a supporting [technical brief](#) and data use profile series on the PMI VectorLink website demonstrating how impact evaluations using routine data informed national decision-making in [Malawi](#), [Mali](#), and [Nigeria](#). A total of 592 people registered for the webinar, with approximately 220 attending the event live. Attendees came from 25 countries and included WHO representatives, USAID and PMI staff, MOH and district health staff, entomologists, epidemiologists, technical specialists, program staff from other USG implementing partners, and representatives from private sector companies.

6.3 Conferences

Four PMI Evolve team members attended the **Alliance for Malaria Prevention (AMP) Annual Meeting** (May 8-9, 2023) in Nairobi, where they engaged with others in the global community who are focused on expanding access to and use of ITNs.

One Abt Associates team member attended the **DHIS2 Annual Conference** (June 12-15, 2023) in Oslo, presenting on how the project developed an automatic synchronization process solution to strengthen DHIS2 upgrades.

Representatives from five PMI Evolve countries – Cameroon, Côte d'Ivoire, Ethiopia, Nigeria, and Senegal, – took part in this year's **Pan African Mosquito Control Association (PAMCA) Annual Conference and**

Exhibition (September 17-21) in Addis Ababa, Ethiopia. This delegation made two oral presentations, sharing the results of work in Cameroon and Senegal, and three poster presentations, highlighting work in Côte d'Ivoire, Ethiopia, and Nigeria.

Seventeen PMI Evolve team members presented at the **ASTMH Annual Meeting** (October 18-22, 2023) in Chicago, showcasing the breadth of IRS, ITN, LSM, and entomological surveillance activities across the project. Two of the presentations were oral presentations, with a third oral presentation given by PMI Evolve partner, the *Institut de Recherche en Sciences de la Santé* (Institute of Research on Health Sciences) in Burkina Faso. Project staff presented 15 posters. A full list of presentations can be found in Annex B.

Two members of the PMI Evolve Zambia project, with representation from partner Akros, the Zambia NMEP, and the PMI Zambia Mission, held a panel discussion at this year's **Global Digital Health Forum (December 4-6, 2023)** highlighting the use of geospatial data and digital tools to conduct an LSM feasibility study in Zambia. PMI Evolve Zambia presented on entomological aspects, including spatiotemporal components, and the end-user experience with digital data tools for the LSM feasibility study.

7. Monitoring, Evaluation and Learning

As a data-driven project, PMI Evolve prioritized the development and operationalization of a comprehensive global Monitoring, Evaluation, and Learning (MEL) Plan in Year 1. The MEL Plan positions the project for continuous improvement by guiding the generation of data that inform activity design, delivery, and adaptations and maximize impact. All PMI Evolve partners will contribute to and use MEL data and the insights they generate.

7.1 PMI Evolve MEL Plan and Systems

The PMI Evolve MEL Plan was approved in May 2023. The MEL Plan provides the foundation for how the project will measure progress toward PMI's intended results. It was designed with the global nature of PMI Evolve in mind and balances it with the importance of locally tailored programming. The full MEL Plan includes a comprehensive set of performance indicators to measure life-of-project results, inclusive of indicators and measurement approaches that will capture PMI Evolve's progress and contributions related to localization, GESI, climate, and sustainability priorities.

The PMI Evolve MEL team has developed new processes, tools, and approaches to support the operationalization of the MEL plan and has led several orientations and trainings with the GST and country teams to ensure effective roll-out.

PMI Evolve uses the global DHIS2-based VLC platform as its core MEL system, supported by other data capture and analytical solutions as appropriate. VLC manages PMI Evolve's complex data management needs, to enable critical malaria control decisions in the countries where the project operates. The system also enables real-time access to data and insights by PMI and project staff, partners, and stakeholders.

PMI Evolve is leveraging previous PMI investments in VectorLink Collect by using DHIS2 modules and metadata packages that were successfully deployed on PMI VectorLink for community mobilization, IRS, LSM, vector bionomics, insecticide resistance, intervention quality, residual efficacy, and molecular data. In Year 1, PMI Evolve built upon this strong foundation and has ensured seamless continuity of use in countries where the system is currently deployed.

During Year 1, PMI Evolve initiated work to integrate climate data into the global database, starting with rainfall variables; added variables to capture human behavior observations in existing entomological programs; and continued to scale the use of VLC for molecular data management.

7.2 PMI Evolve Data-Sharing Framework

To advance PMI's commitment to strengthening data use, PMI Evolve is proactively positioning to ensure routine data sharing with key stakeholders. During Year 1, PMI Evolve collaborated with PMI to establish broad principles and a data-sharing framework to guide country-level data-sharing approaches. A standard template to guide country-level data sharing was approved by PMI in Year 1, and country-specific summaries will be developed and shared in early Year 2.

8. Country Programs

8.1 Burkina Faso (Transitioned to PMI Evolve in April 2023)

TABLE 2: PMI EVOLVE BURKINA FASO VECTOR CONTROL AT A GLANCE

Ento	Number of entomological sites	Vector bionomics monitoring sites: 11	Insecticide resistance monitoring sites: 22	Sites monitored with community-based surveillance (CBS): N/A
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Program Highlights

- Conducted monthly entomological surveys in partnership with the Institute of Research on Health Sciences during high transmission season from June to November 2023, focusing on vector bionomics and insecticide resistance. Monitoring of vector bionomics took place at 11 sites: two former IRS sites (Kampti and Solenzo) and their paired, unsprayed control sites (Gaoua and Nouna); five unsprayed sites (Bobo-Dioulasso, Diébougou, Koudougou, Ouagadougou, and Soumousso) where PBO ITNs were distributed; and two sites (Banfora and Boromo) where IG2 ITNs were distributed. The observation from the results concluded that:
 - The biting rate dynamics of *An. gambiae* s.l. were generally similar indoors and outdoors in former sprayed and control sites as well as at the PBO and IG2 ITN sites.
 - The mean density of *An. gambiae* s.l. was generally lower at the beginning of the rainy season (in June) at all sites and peaked in September, differing from previous years where the peaks were usually observed in October.
 - The hourly biting cycles were most intense from 9 p.m. to 5 a.m. in all sites indoors and outdoors.
 - At all sites, *An. gambiae* s.l. parity rate exceeded 50% with the highest parity rate observed in Ouagadougou (87.93%) and Nouna (79.14%).
 - Insecticide susceptibility assays showed full susceptibility of *An. gambiae* s.l. to pirimiphos-methyl at all sites. Possible and confirmed resistance to clothianidin was reported in all sentinel sites except Dedougou, Kaya, Kongoussi, Koudougou, and Orodara.
 - The pre-exposure of PBO followed by pyrethroids exposure has significantly increased *An. gambiae* s.l. mortalities.
- Drafted and submitted a manuscript to *Malaria Journal* in August 2023 (currently under review) summarizing the findings of an IRS evaluation in Burkina Faso. This evaluation found a consistent positive impact of IRS in the tropical Southwest region following campaigns in 2018, 2020, and 2021, where confirmed malaria case incidence decreased significantly in an IRS district when compared with a comparison district each year. In the drier Boucle du Mouhoun region, IRS had a significant impact in 2018, with greater incidence rate reductions in IRS areas than in comparison areas, but no significant impact in 2020 or 2021.

8.2 Burundi (Transitioned to PMI Evolve in August 2023)

TABLE 3: PMI EVOLVE BURUNDI VECTOR CONTROL AT A GLANCE

Ento	Number of entomological sites	Vector bionomics monitoring sites:	Insecticide resistance monitoring sites:	Sites monitored with CBS*:
			8	8
Ento	Number of people trained in entomology	Total:	Male:	Female:
		31	27	4

*Evolve Burundi uses a partial CBS approach in all 8 vector bionomics sites. Community members conduct all mosquito collections, and district teams staff conduct morphological identification.

Program Highlights

- Organized a one-week training in entomological surveillance in December 2023, for 31 staff from the National Malaria Control Program (NMCP), *Institut National de Santé Publique*, and district health teams to improve the quality of entomological surveillance activities at sentinel sites. This training served as a refresher from those given in previous years under PMI VectorLink and focused on species identification (including *An. stephensi*), techniques used in malaria entomology, insecticide resistance assays, and data analysis and reporting of entomological surveillance results/findings.
- Provided technical assistance to the NMCP for wall cone bioassays to monitor insecticide decay during the government-implemented IRS campaign in November-December 2023 in Kiremba and Gashoho districts. The mortality of the susceptible *An. gambiae* Kisumu strain in the wall cone bioassays was at 100% for both Actellic CS (Kiremba) and Fludora Fusion (Gashoho).
- Provided financial and technical assistance to the NMCP to supervise the Global Fund-implemented IRS campaign in November-December 2023. The project supported the daily house-to-house supervision to ensure that all targeted households were correctly sprayed.
- Conducted longitudinal entomological surveys in August, October, and December 2023 at eight sentinel sites, using human landing catch (HLC), PSC, CDC light trap, and outdoor resting collections. The results indicated that *An. gambiae* s.l. represented 74 % of the total mosquito collections, followed by *An. funestus* s.l. (14%), *An. ziemanni* (6%), *An. maculipalpis* (4%), *An. squamosus* (1%), and *An. coustani* (1%).
- At all sites where the tests were conducted, the vector was susceptible (100% mortality) to the five tested insecticides in August and October 2023: Pirimiphos-methyl (0.25%), deltamethrin (0.05%), permethrin (0.75%), alpha-cypermethrin (0.05%), and chlorfenapyr (100µg per bottle).

8.3 Cambodia (Transitioned to PMI Evolve in August 2023)

TABLE 4: PMI EVOLVE CAMBODIA VECTOR CONTROL AT A GLANCE

Ento	Number of entomological sites	Foci cases responded to:	Insecticide resistance monitoring sites**:	Sites monitored with CBS:
		0*	4	0

*Between August and December 2023, no malaria cases meeting the definition of an L1 foci case (as established with Cambodia's National Center for Parasitology, Entomology and Malaria Control) were identified for response by the Evolve Cambodia team.

**Planned IR sites, given that IR testing was not conducted during the August to December 2023 period.

Program Highlights

- Carried out human behavioral surveys in sentinel villages of Mondulkiri and Stung Treng provinces to measure human behavior as it relates to mosquito host-seeking behavior. Results indicated that approximately 35% of the people in Mondulkiri and 11% of the people in Stung Treng remained outdoors between 6 and 11 p.m., coinciding with malaria vector peak biting time. This highlights the need for vector control tools that can be used outdoors, such as topical repellents and hammock nets.
- In collaboration with the National Center for Parasitology, Entomology, and Malaria Control (CNM), PMI Evolve Cambodia updated entomology training materials which cover five main topics: (1) Introduction to *Anopheles* mosquito lifecycle, morphological identification, and difference between *Anopheles*, *Culex* & *Aedes*; (2) Introduction to stereomicroscope; (3) Introduction to adult *Anopheles* mosquitoes' external morphological characteristics; (4) Taxonomy of primary malaria vectors in Cambodia; and (5) Cambodia primary vectors' pictorial key. The training materials were in two languages, Khmer and English.
- Continued developing a comprehensive molecular training curriculum at the University of Puthisastra, targeting undergraduate and graduate students as well as staff involved in molecular work. The curriculum includes mosquito sample preparation and handling, mosquito bisection, and molecular analysis for sporozoite detection and species confirmation.
- Participated in a 'Training of Trainers' program on malaria surveillance in Kampong Speu province as PMI Evolve Cambodia staff will be a core trainer to sub-national level trainings scheduled for 2024.
- Became a member of the steering committee organizing the CNM annual malaria conference in February 2024 and attended the pre- conference preparedness meeting in Siem Reap from December 13-15, 2023.

8.4 Cameroon (Transitioned to PMI Evolve in May 2023)

TABLE 5: PMI EVOLVE CAMEROON VECTOR CONTROL AT A GLANCE

Ento	Number of entomological sites	Vector bionomics monitoring sites: 5	Insecticide resistance monitoring sites: 10	Sites monitored with CBS: 0
	Number of people trained in entomology	Total: 17	Male: 9	Female: 8

Program Highlights

- Supported vector bionomics monitoring monthly, between May and December 2023, in two northern sentinel sites (Gounougou, Simatou) and bimonthly in three southern sentinel sites (Keleng, Ngam, Tindamba), using HLC, PSCs, CDC LTs, and Prokopack aspirators.
- Conducted insecticide susceptibility testing using WHO tube tests and WHO bottle assays in 10 sentinel sites (Akonolinga, Bandjoun, Batouri, Dibombari, Dschang, Ebolowa, Esse, Mokolo, Monatele, and Yagoua) representing different ecological settings found in Cameroon. Five classes of insecticides were tested: pyrethroids (deltamethrin, permethrin, alpha-cypermethrin), carbamates (bendiocarb), organophosphates (pirimiphos-methyl), neonicotinoids (clothianidin) and pyrroles (chlorfenapyr).
- Conducted larval collections in August and November 2023 in the Gashiga health district to determine whether *An. stephensi* is present in this area. Gashiga borders Gombe State, Nigeria, where *An. stephensi* was detected in 2020.

- Trained 17 health workers from the Central region in basic entomology in July 2023. The top five trainees (based on a post-training assessment) were involved in insecticide susceptibility testing activities in the Central region in August 2023.
- Presented results of an assessment of local research institutions' capacity to carry out entomological monitoring activities to PMI, NMCP, and representatives of the institutions. Discussions with the NMCP and Vector Control Committee on their key priorities are planned to help inform the project's capacity strengthening support in the coming years.
- Sponsored one NMCP staff member to attend the 2023 PAMCA Conference, where the PMI Evolve Cameroon Chief of Party presented project findings on the diverse biting and resting behavior of malaria vectors found in different geographic localities in the country.
- Supported the NMCP in conducting the 12-month survey round of streamlined durability monitoring in Lagdo and Pitoa districts, Northern Region. A sample of ITNs were collected and sent to CRID for pre-distribution ITN bioassays and to the CDC for chemical residue testing (results pending).

8.5 Côte d'Ivoire (Transitioned to PMI Evolve in April 2023)

TABLE 6: PMI EVOLVE CÔTE D'IVOIRE VECTOR CONTROL AT A GLANCE

Ento	Number of entomological sites	Vector bionomics monitoring sites: 4	Insecticide resistance monitoring sites: 14	Sites monitored with CBS: 0
	Number of people trained in entomology	Total: 49	Male: 37	Female: 12

Program Highlights

- Completed the 24-month round of standard ITN durability monitoring covering two ITN brands distributed during the 2021 mass campaign at two sites (Abengourou department: PermaNet 3.0; Aboisso department: IG2).
- Conducted longitudinal entomological vector surveillance at four sites, including the two former IRS sites (Nassian and Sakassou) and two control sites (Béoumi and Dabakala) using three collection methods for adult mosquitoes (human landing catch, pyrethrum spray catch, and CDC light trap). Also conducted susceptibility tests to the insecticides used for malaria vector control in 14 geographically representative sites nationwide (Agboville, Bouafle, Bondoukou, Bongouanou, Dimbokro, Divo, Ferkessedougou, Guiglo, M'Bahiakro, Sassandra, Seguela, Soubre, Tingrela, and Touba). The insecticides tested included pyrethroids (alpha-cypermethrin, deltamethrin, permethrin), organophosphate (pirimiphos-methyl), carbamate (bendiocarb), neonicotinoid (clothianidin) and pyrrole (chlorfenapyr). This testing was done through subcontractor *Centre Suisse de Recherches Scientifique* (CSRS) and in collaboration with the three local research institutes and the NMCP.
- Investigated the presence of *An. stephensi* using backlogged samples from Abidjan and San Pedro, two coastal districts (former insecticide resistance monitoring sites). Findings showed that among 600 mosquitoes that were previously collected in San Pedro and Abidjan between 2019 and 2021 and tested for *An. gambiae* susceptibility, none were identified as *An. stephensi*.
- Provided technical assistance to the NMCP at national and district levels for planning and preparation for the 2024 national mass ITN distribution campaign. As part of these preparations, PMI Evolve supported the development of the Operational Action Plan, assisted the NMCP and its partners in revising and validating the ITN campaign data collection tools (both physical data sheets and digital forms), and completed microplanning at the district level.
- Strengthened the NMCP's organizational capacity through the support of the vector control specialist who is seconded to the NMCP, serving as the project's main point of contact and

coordinating all entomology monitoring and vector control activities in collaboration with the subcontractor CSRS, research institutes, and other stakeholders.

- Completed a one-day refresher training virtually on entomological data collection procedures and protocols including representatives from the NMCP and entomology technicians from the four research institutes.
- Worked with the *Institut National d'Hygiène Publique* (National Institute for Public Hygiene, INHP) to develop a capacity-strengthening plan to perform biomolecular analyzes. As part of this process, PMI Evolve is procuring key equipment for a molecular laboratory and preparing to rehabilitate the INHP's molecular laboratory.

8.6 Democratic Republic of the Congo (Transitioned to PMI Evolve in August 2023)

TABLE 7: PMI EVOLVE DRC VECTOR CONTROL AT A GLANCE

Ento	Number of entomological sites	Vector bionomics monitoring sites: 3	Insecticide resistance monitoring sites: 13	Sites monitored with CBS: 7
IVC	Number of people trained to support vector control	Total: 10	Male: 7	Female: 3

Program Highlights

- Supported NMCP and *Institut National de Recherche Biomédicale* (INRB) staff to utilize and improve data visualization skills in VectorLink Collect.
- Pending the parastatal approval of the subcontract with INRB under PMI Evolve, the team continued the following activities:
 - Conducted insecticide susceptibility testing and molecular identification of *An. gambiae* complex species from Kalima, Karawa, and Fungurume sentinel sites. Susceptibility status, intensity and PBO synergist assays were conducted for alpha-cypermethrin, deltamethrin and permethrin. In addition, susceptibility to chlorfenapyr was also tested.
 - Determined *plasmodium falciparum* infection in the *Anopheles* species collected from the monthly bionomics monitoring sentinel sites of Karawa, Kenge, and Mikalayi.
 - Finalized report on 36-month durability monitoring in Sud Ubangi.
 - Finalized report on pilot CBS activity in Kasai Oriental Province. The report showed that community-based entomological monitoring was completed at a lower cost in comparison to traditional routine entomological surveillance.
 - Collaborated with ANOSPP Project at the Wellcome Sanger Institute for amplicon sequencing of sub-samples of *An. gambiae* s.l. and *An. funestus* s.l. from Kasai-Oriental and *An. gambiae* s.l. from 22 other provinces (Aketi, Boende, Buta, Inongo, Kabondo, Kalemie, Kapolowe, Karawa, Katana, Kenge, Kimpese, Kingasani, Lisala, Lodja, Mbandaka, Mikalayi, Muanda, Mweka, Mweneditu, Nyankunde, Pawa, Rutshuru, and Sud Ubangi). The ANOSPP Project aims to improve understanding of *Anopheles* species diversity, population structure, and malaria transmission across Africa.

8.7 Ethiopia (Transitioned to PMI Evolve in September 2023)

TABLE 8: PMI EVOLVE ETHIOPIA VECTOR CONTROL AT A GLANCE

Ento	Number of entomological sites	Vector bionomics monitoring sites: 6	Insecticide resistance monitoring sites: 14	Sites monitored with CBS: 4
	Number of people trained in entomology	Total: 35	Male: 3	Female: 32
LSM	Dates and length of PMI-supported LSM implementation	September 1–December 31, 2023 (102 operational days)		
	Number of districts	3		
	Number of properties/structures receiving an LSM intervention	26,836 structures visited and 17,715 larval habitats treated biweekly		
	Number of people trained and hired to implement and monitor LSM	Number trained: 138 (Male: 39, Female: 99)		
	Population protected by PMI-supported LSM (Number of people residing in properties that receive LSM intervention)	Total 249,691	Pregnant Women 5,230	Children < 5 30,427

Program Highlights

- From September–December 2023, PMI Evolve collaborated with 10 local partners, including five universities, two research institutes, and three plants/factories to conduct entomological surveillance, laboratory analysis, and IRS waste disposal.
- Conducted monthly vector bionomics entomological monitoring activities in collaboration with Assosa University at six sites (Bambasi in Benishangul Gumuz; Gelana and Goro in Oromia; Jawi in Amhara; Lare in Gambela; and Mierab Abaya in South Ethiopia). *Anopheles gambiae* s.l. was the most prevalent species in all six sites.
- In collaboration with Adama Science and Technology University and Addis Ababa University, conducted pirimiphos-methyl, clothianidin and broflanilide resistance tests on *An. gambiae* s.l. in nine sites (Abaya, Amibara, Genet, Goro, Halaba, Hawasa, Lare, Misrak Badawacho, Mirab Abaya, and Wondo). At all sites, *An. gambiae* s.l. were susceptible (mortality 100%) to the three insecticides. Resistance testing of *An. stephensi* conducted in Erer, Hawassa, and Semera-Logia towns found this vector susceptible to clothianidin and broflanilide but resistant to pirimiphos-methyl in Erer and Hawassa. The vector was susceptible to pirimiphos-methyl in Semera-Logia (98% mortality).
- Assessed the residual efficacy of insecticides deployed in the 2023 PMI-supported IRS campaign. SumiShield was found to be efficacious for at least seven months, killing 100% of mosquitoes tested in Abaya on all wall surfaces. Fludora Fusion was found to be efficacious for at least seven months in Lare (mosquito mortality of 95.8% in December 2023). Monitoring will continue until mortality falls below 80% for two consecutive months.
- Provided technical assistance (mainly supervision) and larvicide to the town health bureaus in four towns (Batu, Degehabour, Godey, and Meki) where LSM implementation was successfully transitioned to the municipal authorities in July/August 2023. One town, Semera-Logia, was transitioned to the government but to date has not implemented LSM. In November 2023, PMI Evolve participated in an advocacy visit made by the U.S. Ambassador to re-engage the community and local stakeholders. At the end of the visit, all stakeholders agreed to re-initiate and sustain LSM implementation for the community and are now awaiting PMI Evolve training and larvicide provision.

- Continued to support all aspects of LSM implementation in three towns (Awash, Dire Dawa, and Kebridehar) while preparing to transition implementation to the respective town administrations on January 1, 2024. The project facilitated review meetings in all three towns to document successes and lessons learned and generate solutions to existing and potential challenges, which can be applied in the upcoming transition. In December 2023, the project trained 138 community LSM personnel from the three towns on simplified job aids, data collection forms, and other LSM implementation related activities to promote a smooth transition.
- Developed and printed a job aid for community-led LSM on the use of Sumilarv 0.5G, in anticipation of all eight LSM transitioned towns using this product starting in January 2024. Community LSM personnel from Awash, Dire Dawa, and Kebridehar were trained in December on this new tool as stated above; the project will provide a one-day training in the remaining five towns in early 2024.
- Shared experiences and best practices in LSM implementation more broadly at two high-level events held in Addis Ababa in September 2023: the PAMCA Annual Conference and a global meeting on *An. stephensi* hosted by the Gates Foundation.
- In accordance with PMI's Best Management Practices, incinerated 1,500 kg of contaminated waste (e.g., empty insecticide sachets, used face masks) generated during the 2023 IRS campaign at the Reppie waste-to-energy plant. In addition, 29,746 empty bottles and 1,691 kg of cardboard from the campaign were recycled at the Tewodros Fikru Plastic and Wonji Pulp and Paper Recycling Factories into non-consumable products.
- Held initial planning discussions with the NMCP and PMI on key expectations (e.g., target districts, implementation approach, etc.) for the distribution of 550,000 IG2 nets, expected to arrive in country in the first quarter of 2024.
- Completed an evaluation of the epidemiological and entomological impact of IRS and standard pyrethroid ITNs compared to PBO ITNs in Amhara region. The evaluation found that confirmed malaria cases declined in areas that received IRS plus standard ITNs, as well as those that received PBO ITNs. However, the decline was only significant in those areas that received IRS plus standard ITNs. Results from the entomological analyses found that there was no statistically significant difference in vector density per trap and indoor resting density between the two intervention arms during either season of the post-intervention period. These results will be shared with the NMCP at an in-person meeting in January 2024 and are included in a manuscript that will be submitted to *BMJ Global Health*.

8.8 Ghana (Transitioned to PMI Evolve in August 2023)

TABLE 9: PMI EVOLVE GHANA VECTOR CONTROL AT A GLANCE

Ento	Number of entomological sites	Vector bionomics monitoring sites: 12	Insecticide resistance monitoring sites: 15	Sites monitored with CBS: 0
	Number of people trained in entomology	Total: 54	Male: 50	Female: 4
ITN	ITN distribution channel(s) and dates of distribution	School-Based ITN distribution Phase 1 (13 regions): August 14-25, 2023 Phase 2 (2 regions): November 20-30, 2023		
	Number of districts included in distribution	235		

	Number and type of ITNs distributed	Distributed by PMI Evolve: Total: 0		Distributed by partners with PMI Evolve support: Total: PBO & Dual AI 1,437,255
IVC	Number of people trained to support vector control	Total: 2,714	Male: 2,009	Female: 705

Program Highlights

- Provided technical assistance to the NMEP and partners in August and November 2023, to support the distribution of 1,442,140 ITNs to pupils in primary 2 and 6 basic schools in 15 regions.
- To facilitate the above, supported the training of 2,714 school improvement support officers on the ITN distribution process, ITN use and care, social and behavior change (SBC), and the use of the Net4Schs application for data collection.
- Conducted comprehensive longitudinal entomological monitoring activities at 12 sentinel sites (IRS sites Banda-ya, Bunbuna, Gbalo, Gbullung, Kata-Banawa, Nansoni, Sanguli and Zaratinga; and non-IRS sites Galinkpegu, Gbrimah, Kulaa and Tugu) from 10 districts in Northern and Northeast Ghana.
- Conducted insecticide resistance monitoring tests at 15 sites (Banda-ya, Bunbuna, Binkura, Dimabi, Galinkpegu, Gbullung, Kata-Banawa, Kulaa, Namborigu, Nansoni, Sanguli, Tugu, Wundua, Yagaba, and Zaratinga).
- Performed residual efficacy tests in 6 IRS sites (Banda-ya, Bunbuna, Gbullung, Kata-Banawa, Sanguli, and Zaratinga).
- As part of efforts to strengthen the country's local capacity, PMI Evolve Ghana handed over four national entomology sites (Asutifi North district in Ahafo region, Fanteakwa North district in Eastern region, Krachi East district in Oti region, and Sefwi Wiawso district in Western North region) and two PMI-supported entomology sites (Gbullung in Kumbungu district and Kata Banawa in West Mamprusi district) to the Navrongo Health Research Center to continue entomological data collection.
- Donated 20 microscopes, which had been purchased under PMI VectorLink, to support the NMEP entomological monitoring activities.
- Provided technical assistance to Killpest Services, a local private company, in conducting pre-spray environmental compliance assessment to support its preparations to implement Ghana's government-funded IRS campaign in two districts in the Bono Region.

8.9 Guinea (Transitioned to PMI Evolve in April 2023)

TABLE 10: PMI EVOLVE GUINEA VECTOR CONTROL AT A GLANCE

Ento	Number of entomological sites	Vector bionomics monitoring sites: 4	Insecticide resistance monitoring sites: 7	Sites monitored with CBS: 4
	Number of people trained in entomology	Total: 27	Male: 23	Female: 4

Program Highlights

- Conducted nine consecutive months of vector bionomic monitoring at four sentinel sites: Kabak and Maferinyah (Dual AI ITN sites) and Kakossa and Kounsounta (Standard ITN sites), using HLC, PSC, and CDC-LT.
- Completed insecticide resistance monitoring at seven sentinel sites (Boffa, Dabola, Faranah, Forecariah, Kankan, Kissidougou, and Labe).

- Trained 19 MOH staff on malaria entomology: 11 from the *Direction Departemental de la Santé* (Departmental Health Directorate), 4 from Gamal University, and 4 from the NMCP.
- Trained eight community volunteers on community-based entomological surveillance.
- Established community based entomological surveillance in four prefectures with high malaria incidence: Daboula, Fria, Koundara, and Yomou.

8.10 Liberia (Transitioned to PMI Evolve in August 2023)

TABLE 11: PMI EVOLVE LIBERIA VECTOR CONTROL AT A GLANCE

Ento	Number of entomological sites	Vector bionomics monitoring sites: 4	Insecticide resistance monitoring sites: 8	Sites monitored with CBS: 0
	Number of people trained in entomology	Total: 46	Male: 33	Female: 13

Program Highlights

- Performed bimonthly vector surveillance activities in collaboration with the NMCP, at four sentinel sites (Gbedin Camp 3 in Nimba, Jackson Farm in Margibi, Suehn Town in Bomi, and Zeansue in Bong) to assess indicators such as malaria vectors distribution, composition, behavior, and density. Data showed the major vectors of malaria are *An. gambiae* s.l. and *An. funestus* s.l.
- Conducted the 24-month post-distribution streamlined DM at sites in Bomi and Bong that showed total attrition across both study sites was 17%.
- Assessed the susceptibility of *An. gambiae* s.l. to alpha-cypermethrin with and without synergist piperonyl butoxide (PBO) by testing wild type samples from larva collected at eight selected sites (Barclayville, Bensonville, Bopolu, Cestos City, Compound 3, Firestone, Greenville, and Zorzor). The results showed that *An. gambiae* s.l. populations were resistant to alpha-cypermethrin alone. *An. gambiae* s.l. susceptibility increased after a pre-exposure to PBO, but full susceptibility was not restored at all the sites. Molecular analysis from subsamples showed high prevalence of knockdown resistance mutations.
- Conducted tests to assess the susceptibility of *An. gambiae* s.l. to chlorfenapyr, which showed *An. gambiae* s.l. was susceptible in all sites.
- Continued processing of mosquito samples using enzyme-linked immunosorbent assay at the Liberia Institute of Biomedical Research (LIBR) to determine the sporozoite rate on field samples. The local team completed all troubleshooting with remote support from CDC Atlanta and the GST molecular backstop team.
- Processed samples of *An. gambiae* s.l. for species identification using polymerase chain reaction (PCR), and *An. gambiae* and *An. coluzzii* were the two main species detected. The LIBR team was able to identify the origin of blood meal source on these samples and the results indicated that most mosquitoes collected indoors by PSC were fed on humans.
- The rearing of a susceptible *An. coluzzii* laboratory colony is ongoing in one container of the new insectary funded by PMI, located at LIBR according to an agreement between the NMCP and the National Public Health Institute of Liberia. In 2024, a resistant mosquito colony will be reared in a second container converted into an insectary. The aim of these new insectaries is to strengthen the country capacity to rear insecticide-resistant mosquitoes for ITN durability and other assessments.
- Conducted larval collections during three consecutive months (July-August-September) as part of enhanced surveillance for *An. stephensi* in the country. Out of the 82 total people trained in entomology, four received *An. stephensi*-specific training (3 male; 1 female). *Densely* populated, urban communities around the seaport of Monrovia were prioritized for the survey, as the port is the main

point of entry for goods coming from countries where this vector may be endemic or invasive. There were no *An. stephensi* specimens identified among the 1,358 adult *Anopheles* that emerged from the larvae and pupae collected.

8.11 Madagascar (Transitioned to PMI Evolve in July 2023)

TABLE 12: PMI EVOLVE MADAGASCAR VECTOR CONTROL AT A GLANCE

Ento	Number of entomological sites	Vector bionomics monitoring sites: 13	Insecticide resistance monitoring sites: 11	Sites monitored with CBS: 0
IRS	Timing of PMI Evolve supported IRS campaign	October 30, 2023 – December 01, 2023 (23 operational days)		
	Number of districts covered by PMI-supported IRS	5 Districts: Ankazoabo Sud, lakora, Isandra, Ivohibe, Taolagnaro		
	Insecticide(s) and units	18,300 sachets of Klypson, 14,820 sachets of Fludora Fusion, 7,488 bottles of Actellic and 100 sachets of Vectron T500		
	IRS Results	Structures Sprayed: 170,013	Structures Found: 172,815	Spray Coverage: 98.4%
	Population protected by PMI-supported IRS	Total: 720,920	Pregnant Women: 24,166	Children < 5: 108,990
IVC	Number of people trained to support vector control	Total: 2,088	Male: 1,577	Female: 511

Program Highlights

- Conducted the 2023 IRS campaign in five districts. The project used four different IRS insecticides: Klypson (neonicotinoid) in Isandra and lakora, Fludora Fusion (clothianidin & deltamethrin combination) in Taolagnaro, Actellic 300 CS (pirimiphos-methyl) in Ivohibe and Ankazoabo Sud, and Vectron T500 (broflanilide 50WP) as a pilot activity in three fokontany in Ankazoabo Sud.
- Strengthened the capacity of national, regional, district, and local health authorities to manage IRS operations, including the planning, spraying, resource allocation, supervision, and monitoring, evaluation, and learning activities. Through a Memorandum of Understanding with PMI Evolve, the NMP assumed responsibility for the overall implementation of the IRS campaign in the district of Ankazoabo Sud, with close supervision and support from the PMI Evolve team. As a result, government staff successfully led all training sessions prior to the campaign, established the timeline/calendar for spray operations, implemented and coordinated spray operations, coordinated SBC activities, ensured environmental compliance, handled logistics and warehouse management, oversaw the data entry center in collaboration with the PMI Evolve Madagascar M&E Manager, and managed the SOP-level mobile data collection via the use of smartphones.
- Conducted wall cone bioassays using a susceptible colony, *Anopheles gambiae* Kisumu strain, to assess the spray quality in four of the five districts within a week of the start of the spray campaign. The assessment locations were: Andasy, Ambabo, and Ambala Mary (Ankazoabo Sud district); Ranotsara Nord (lakora district), Isody (Isandra district), and Ampasy (Taolagnaro district). Results showed 100% mortality after a 24-hour post exposure on sprayed mud and wood/or falafa surfaces in all tested sites, except in Isody and Ranotsara, which were sprayed with Klypson. In these two sites, 100% mortality was recorded after a 96-hour post exposure for both wall surfaces. The fifth district (Ivohibe), where Actellic® 300CS was sprayed, could not be tested due to insecurity reasons and the inability to set up an insectary in a secured location.
- Conducted the 24-Month Streamlined DM, which showed attrition due to wear and tear increased between the 12-month and 24-month survey rounds across the three districts surveyed (Mananjary:

2% to 27%; Toamasina II: 1% to 9%; Vangaindrano: 4% to 32%). At 24 months, the proportion of cohort nets remaining in serviceable condition was statistically similar for Yahe® ITNs in Mananjary (90%) and PermaNet® 3.0 ITNs in Toamasina II (83%). However, significantly fewer cohort SafeNet® ITNs remained in serviceable condition in Vangaindrano (67%, p=0.031). In this survey round, the proportion of cohort nets hanging over sleeping spaces (tied or untied) was highest in Vangaindrano (70%), followed by Toamasina II (67%), and Mananjary (53%).

- Began a preliminary NMP assessment of CBS, which will be completed by February 2024.
- The Madagascar Acceptability Survey Report on the Use of Drones for Larviciding in Rice Fields was finalized and approved.
- *BMJ Global Health* published the article [“Using routine health data to evaluate the impact of indoor residual spraying on malaria transmission in Madagascar”](#) in July 2023. This study demonstrated that non-pyrethroid IRS appeared to substantially reduce malaria incidence in Madagascar and that sustained implementation of IRS over three years conferred additional benefits. Written by project and NMCP authors, with PMI, PATH, and CDC contributors during the PMI VectorLink Project, the study was cited in the PMI Evolve technical brief published later in Year 1 (see section 6.2).

8.12 Malawi (Transitioned to PMI Evolve in April 2023)

TABLE 13: PMI EVOLVE MALAWI VECTOR CONTROL AT A GLANCE

Ento	Number of entomological sites	Vector bionomics monitoring sites: 17	Insecticide resistance monitoring sites: 8	Sites monitored with CBS: 0
	Number of people trained in entomology	Total: 2	Male: 2	Female: 0
IRS	Timing of PMI Evolve supported IRS campaign	October 2– November 3, 2023 25 operational days		
	Number of districts covered by PMI-supported IRS	1 District (Nkhotakota)		
	Insecticide(s) and units	6,457 bottles of Actellic 300CS, 35,141 sachets of Fludora Fusion, and 33,450 sachets of SumiShield 50WG		
	IRS Results	Structures Sprayed: 115,991	Structures Found: 123,894	Spray Coverage: 93.6%
	Population protected by PMI-supported IRS	Total: 464,195	Pregnant Women: 8,581	Children < 5: 71,075
	<i>IRS TA Only</i> : Number of structures sprayed by other partners with PMI Evolve support	526,227		
IVC	Number of people trained to support vector control	Total: 1,272	Male: 736	Female: 536

Program Highlights

- Trained 1,272 temporary workers (536 female, 42%), using PMI funds, to support IRS activities in Nkhotakota District.
- Worked with the NMCP, district health offices, and the Environmental Affairs Department to ensure environmental compliance through inspections before, during, and after the spray campaign.
- Supported quarterly meetings of the national Vector Control Technical Working Group and provided technical support to the NMCP during the ITN mass distribution campaign.
- Conducted comprehensive longitudinal entomological monitoring activities through local partner Malaria Alert Centre in 17 sentinel sites in eight districts across Malawi. *An. gambiae* s.l. (47.3%) and *An. funestus* s.l. (47.4%) were the dominant species identified.
- Conducted insecticide resistance monitoring tests in selected sites. *An. funestus* s.l. and *An. gambiae* s.l. are fully susceptible to pirimiphos-methyl, chlorfenapyr, and clothianidin. Both species are highly resistant to the pyrethroids deltamethrin, permethrin, and alpha-cypermethrin. Pre-exposure of *An. funestus* s.l. and *An. gambiae* s.l. to 4% PBO restored their susceptibility to pyrethroids.
- Conducted spray quality assessment and residual efficacy tests in selected IRS sites. Overall, spray quality was satisfactory in the three IRS districts of Nkhotakota (PMI-supported); and in Nkhata Bay and Mangochi (Global Fund-supported). Residual efficacy monitoring is ongoing.
- Implemented the GESI and Safeguarding framework developed to increase women’s participation in vector control activities, ensure access of vector control benefits by socially excluded groups and ensure safeguarding of seasonal staff and communities.

8.13 Mozambique (Transitioned to PMI Evolve in April 2023)

TABLE 14: PMI EVOLVE MOZAMBIQUE VECTOR CONTROL AT A GLANCE

Ento	Number of entomological sites	Vector bionomics monitoring sites: 7	Insecticide resistance monitoring sites: 9	Sites monitored with CBS: 0
IRS	<i>IRS TA Only:</i> Number of structures sprayed by other partners with PMI Evolve support	Structures sprayed by Gov't of Mozambique under G2G mechanism: 377,250 Structures found: 381,838; Spray Coverage: 106.1%		

Program Highlights

- Provided technical and financial assistance to the *Direção Provincial de Saúde* (Provincial Health Department), *Serviços Provinciais de Saúde* (Provincial Health Services), and District Services for Health, Women and Social Welfare during the planning and implementation of the 2023 IRS campaign in Zambezia Province. The campaign ran from November 20 to December 23, 2023, in five districts (Maganja da Costa, Milange, Molumbo, Mopeia, and Morrumbala), and protected approximately 1.9 million people using one of three insecticides (Actellic 300CS, Fludora Fusion, or Ficam). Key aspects of PMI Evolve Mozambique’s support included: procurement of personal protective equipment, engagement of an environmental compliance consultant to support vehicle inspections and the training of spray actors, supervision during the campaign, and post-campaign demobilization of the 19 operational sites.
- Performed cone wall bioassays using *An. arabiensis* KGB susceptible strain to assess the quality of spray in four districts in Zambezia Province: Morrumbala (Fludora Fusion), Mopeia and Maganja da Costa (Actellic 300 CS), and Milange (Ficam). In all four districts, 100% mortality was observed on all wall types tested. The project also assessed spray quality in two districts in Nampula Province

(Nampula and Ribáuè), where the government deployed Actellic 300 CS. In both districts and all surface types, 100% of exposed mosquitoes were dead after 24 hours.

- Conducted vector bionomics monitoring in four districts in Zambezia (Milange, Mopeia, and Morrumbala, and a non-IRS control district, Lugela) and three in Nampula (two IRS districts, Nampula district and Ribáuè, as well as in a control district, Mogovolas) to monitor trends in vector density, behavior, and malaria parasite infectivity. Insecticide susceptibility tests were conducted in six districts in Zambezia (Lugela, Maganja da Costa, Milange, Molumbo, Mopeia, and Morrumbala) and three districts in Nampula (Mogovolas, Nampula, and Ribáuè).
- Supported the entomological capacity of the *Instituto Nacional de Saúde* (National Institute of Health, INS) and the NMCP by seconding a senior entomologist to the NMCP, three laboratory technicians to INS, and an entomology coordinator to Nampula Province. The project also procured materials and reagents for the INS laboratory, enabling them to process samples collected in Zambezia and Nampula by PMI Evolve and by the NMCP in Cabo Delgado, Manica, Niassa, Sofala, and Tete provinces.

8.14 Niger (Transitioned to PMI Evolve in April 2023)

TABLE 15: PMI EVOLVE NIGER VECTOR CONTROL AT A GLANCE

Ento	Number of entomological sites	Vector bionomics monitoring sites: 5	Insecticide resistance monitoring sites: 15	Sites monitored with CBS: 0
	Number of people trained in entomology	Total: 20	Male: 16	Female: 4

Program Highlights

- Provided technical assistance to the *Centre de Recherche Sanitaire et Médicale* (CERMES), the research institute responsible for conducting field and laboratory activities, to ensure Niger is ready to autonomously conduct high-quality entomological monitoring after the project ends.
- Conducted routine entomological monitoring including:
 - Vector bionomic surveillance in five sentinel sites (Balleyara, Gaya Guidimouni, Keita, and Niamey V) between April and December 2023.
 - Insecticide resistance monitoring at 15 sites (Agadez, Balleyara, Boboye, Dakoro, Gaya, Guidimouni, Keita, Konni, Niamey V, Sabon Kafi, Say, Tessaoua, Tchintabaraden, Tillabery, and Zinder City).
 - Assessment to determine if *An. stephensi* was present in urban areas around Gaya and Niamey, by sampling the vector in its aquatic stages at the beginning and end of the rainy season.
- Supported the training of local technicians on basic entomological techniques in Balleyar, Gaya, and Keita as part of the capacity strengthening of health district agents. These technicians contributed to HLC, PSC and CDC LT techniques, species identification, and data form filling at each field collection mission under the supervision of the entomologist technician.
- Supported the rehabilitation of the health center in Gaya health district as a field laboratory, to improve conditions for the NMCP to conduct entomological surveillance activities. This included repairing damaged surfaces, reinforcing the security of windows and doors, and installing air conditioning units to promote temperature and humidity control and thereby create favorable conditions for mosquito rearing. In addition, the rooms were repainted and given improved lighting.
- Provided the five sentinel sites with microscopes, magnifying glasses, and a CDC LT.

- Provided technical assistance to the NMCP and CERMES entomological technicians for the review and interpretation of entomological data, which can be used to inform strategic and cost-efficient deployments.

8.15 Nigeria (Transitioned to PMI Evolve in August 2023)

TABLE 16: PMI EVOLVE NIGERIA VECTOR CONTROL AT A GLANCE

Ento	Number of entomological sites	Vector bionomics monitoring sites: 6	Insecticide resistance monitoring sites: 72	Sites monitored with CBS: 2
	Number of people trained in entomology	Total: 16	Male: 11	Female: 5
IVC	Number of people trained to support vector control	Total: 32	Male: 28	Female: 4

Program Highlights

- Began the CBS pilot in Bauchi and initiated preparatory activities for CBS introduction in Oyo State.
- Continued vector bionomics entomological surveillance in Akwa Ibom, Ebonyi, Kebbi, Oyo, Plateau, and Sokoto States.
- Supported the participation of two NMEP staff in the ESPT workshop in Rwanda.
- Began enumeration of breeding sites in Argungu in Kebbi State for proposed LSM pilot activity planned to begin toward the end of 2024; trained 32 enumerators to capture the breeding sites data using Android devices embedded on the ODK application.
- Completed enhanced *An. stephensi* surveillance in urban/peri-urban centers in seven states (Bauchi, Cross River, Enugu, Gombe, Kebbi, Lagos, and Rivers) in September 2023, bringing an end to year-long PMI-supported surveillance in those states.
- Attended and financially supported the participation of principal investigators from 14 universities in the national entomology review meeting, where entomological data from all sites in Nigeria were evaluated and discussed for vector control decision-making.

8.16 Rwanda (Transitioned to PMI Evolve in April 2023)

TABLE 17: PMI EVOLVE RWANDA VECTOR CONTROL AT A GLANCE

Ento	Number of entomological sites	Vector bionomics monitoring sites: 7	Insecticide resistance monitoring sites: 0	Sites monitored with CBS: N/A
IRS	Timing of PMI Evolve supported IRS campaign	August 21–September 15, 2023 (20 operational days)		
	Number of districts covered by PMI-supported IRS	3 districts (Kirehe, Ngoma, Nyagatare)		
	Insecticide(s) and units	Actellic 300CS (18,603 units), Fludora Fusion WP-SB (226,791 units)		
	IRS Results	Structures Sprayed: 363,305	Structures Found: 364,890	Spray Coverage: 99.6%
	Population protected by PMI-supported IRS	Total: 1,387,690	Pregnant Women: 18,062	Children < 5: 182,420

	<i>IRS TA Only</i> : Number of structures sprayed by other partners with PMI Evolve support	949,175		
IVC	Number of people trained to support vector control	Total: 7,045	Male: 4,856	Female: 2,189

Program Highlights

- Trained 7,045 workers (4,856 men and 2,189 women) to support all IRS activities in Kirehe, Ngoma, and Nyagatare districts.
- Hired 6,876 people (4,745 men and 2,131 women) as seasonal workers, 31.0% of whom were women. Of the 1,011 people hired for leadership positions, 47.4% (n= 479) were women.
- Protected a total of 1,387,690 people from malaria through IRS, including 18,062 pregnant women and 182,420 children under age 5 in the three districts.
- Provided technical support to the Malaria and Other Parasitic Diseases Division (MOPDD) for the Government of Rwanda (Global Fund)-supported IRS districts, specifically IRS supervision as well as support for spray campaign data entry and management using project-procured laptop computers and internet routers.
- Conducted comprehensive entomological monitoring across seven sites in three IRS districts (Kirehe, Ngoma, and Nyagatare) and one non-IRS district (Gicumbi) in collaboration with the MOPDD.
- Completed 36-month ITN DM on four brands of ITN (Olyset, PermaNet 3.0, Yahe, and IG2).

8.17 Senegal (Transitioned to PMI Evolve in April 2023)

TABLE 18: PMI EVOLVE SENEGAL VECTOR CONTROL AT A GLANCE

Ento	Number of entomological sites	Vector bionomics monitoring sites: 26*	<i>An. stephensi</i> surveillance 3	Insecticide resistance monitoring sites: 14	Sites monitored with CBS: 13
	Number of people trained in entomology	Total: 52	Male: 38	Female: 14	
IVC	ITN distribution channel(s) and dates of distribution	<ul style="list-style-type: none"> • Health Facilities channel: April–December 2023 • Community based organizations channel: April–December 2023 • School based distribution channel: August 2023 			
	Number of districts included in distribution	74			
	Number and type of ITNs distributed	Distributed by PMI Evolve: 17,893 PBO ITNs		Distributed by partners with PMI Evolve support: <ul style="list-style-type: none"> • Total: 1,159,157 ITNs • Pyrethroid-only (229,700 ITNs) PBO (128,407 ITNs) • Dual AI (801,050 ITNs) 	
	Number of people protected by ITNs	35,786			
	Number of people trained to support vector control	Total: 91	Male: 32	Female: 59	

*The 26 vector bionomics monitoring sites include: 13 routinely monitored sites and 13 CBS sites.

Program Highlights

- Distributed 1,159,157 ITNs including 229,700 pyrethroid-only ITNs, 128,407 PBO ITNs and 801,050 Dual AI ITNs through routine distribution in Year 1.
- Distributed 17,893 ITNs to *Daaras* (Koranic schools), reaching 35,239 *Daaras* residents including 28,036 Talibé children and 7,203 non-Talibé residents, representing 100% of residents registered.
- Organized eight routine ITN supervision visits in 74 health districts.
- Rolled out community-based entomology data collection using PSC and CDC-LT at 7 new sentinel sites for a total of 13 sentinel sites implementing community-based entomology data collection under PMI Evolve Senegal.
- Collected a total of 6,403 *Anopheles* species (predominantly *An. gambiae* s.l.) which are pending laboratory analysis for species identification, sporozoite infection, origin of blood meal, and resistance mechanisms of insecticide susceptibility-tested mosquitoes.
- In coordination with the NMCP and other relevant stakeholders, developed and finalized the guidance for the management of malaria vectors' resistance to insecticide.
- Provided assistance to the development of the terms of reference for the national vector control technical working group and, with the NMCP, organized two ITN steering committee meetings.
- Published an article in *Parasites & Vectors*, "[Urban malaria vector bionomics and human sleeping behavior in three cities in Senegal](#)," describing urban malaria indicators, particularly in Koranic schools in three cities. The data supported strategic deployment of vector control tools to the school children in those cities.

8.18 Sierra Leone (Transitioned to PMI Evolve in August 2023)

TABLE 19: PMI EVOLVE SIERRA LEONE VECTOR CONTROL AT A GLANCE

Ento	Number of entomological sites	Vector bionomics monitoring sites: 10	Insecticide resistance monitoring sites: 8	Sites monitored with CBS: 0
	Number of people trained in entomology	Total: 8	Male: 6	Female: 2

Program Highlights

- Trained the locally based entomology partner, Njala University, on molecular enzyme-linked immunosorbent assay (ELISA) of circumsporozoites to detect malaria infected mosquitoes, as part of the capacity strengthening and localization efforts in country. The project also equipped Njala University's laboratory with basic equipment to support all molecular entomology work.
- Developed an action plan for *An. stephensi* monitoring.
- Completed a microplanning meeting with the district health management teams and district stakeholders in Bo and Bombali districts for the upcoming 2024 spray campaign.
- Conducted interviews with key informants for the rapid HIS Assessment.
- Began final analysis for the IRS and PBO ITN co-deployment study and held a series of collaborative data review workshops with the NMCP and PMI to review initial results. This evaluation will be completed in January 2024.
- Results from spray quality assessment in Bo and Bombali districts sprayed with SumiShield 50WG and Actellic 300CS in 2023 showed that mortality of the *An. gambiae* s.s. Kisumu strain in cone bioassays on walls was 100% within the standard five days post-exposure holding time.

- Conducted vector bionomic monitoring at routine sentinel sites in five districts, which led to the determination that *An. gambiae* s.l. was the main vector in Sierra Leone, followed by *An. funestus* s.l. (collected mainly in Bo and Bombali).
- Results from insecticide resistance monitoring in sentinel sites indicated susceptibility of *An. gambiae* s.l. to clothianidin, pirimiphos-methyl, and chlorfenapyr. The team also observed resistance of *An. gambiae* s.l. to permethrin, deltamethrin, and alpha-cypermethrin, with high resistance intensity. Pre-exposure to PBO partially restored susceptibility.

8.19 Togo (New PMI Evolve Country)

Program Highlights

- Began start-up activities in late 2023, including registering Abt Global in Togo and engaging in discussions with the PMI team to establish work plan priorities for 2024.
- The Regional Entomology Technical Advisor and Regional Finance and Operations Advisor traveled to Togo to meet with the potential partner research institution, explore office spaces, conduct laboratory assessments, and gather the necessary inputs for the project's first year work plan. Candidates were also selected for the Chief of Party and the F&A Manager positions.

8.20 Uganda (Transitioned to PMI Evolve in August 2023)

TABLE 20: PMI EVOLVE UGANDA VECTOR CONTROL AT A GLANCE

Ento	Number of entomological sites	Vector bionomics monitoring sites:	Insecticide resistance monitoring sites:	Sites monitored with CBS:
		6	16	6

Program Highlights

- Conducted routine longitudinal (bionomics) studies in the six sentinel districts of Bugiri, Butebo, Namutumba, and Tororo (current IRS districts) and Lira and Kumi (non-IRS districts). The study methodologies included PSC, HLC, and Window Exit traps.
- Conducted monthly monitoring of insecticide residual efficacy in the sentinel districts of Bugiri, Butaleja, Butebo, and Tororo from September to December 2023, to determine the residual efficacy of Actellic 300CS, SumiShield, and Fludora Fusion on the different wall surfaces sprayed during the March 2023 IRS campaign.
- In support of MOH/National Malaria Control Division-led IRS in West Nile and Lango sub-regions, the project conducted IRS quality assurance monitoring wall bioassays in Kalaki and four West Nile IRS districts of Adjumani, Koboko, Madi-Okollo, and Moyo.
- Continued to conduct molecular analysis tests at the PMI Evolve-supported Vector Control Division's molecular laboratory to determine vector species composition and infection rates.
- Continued to support community-based entomological surveillance in former FCDO-supported IRS districts of Alebtong, Amolatar, Dokolo, Kaberamaido, Kalaki, and Otuke. The Vector Control Officers received supplies and reported results in the national HMIS systems.
- Working in collaboration with PMI Evolve, Infectious Diseases Research Collaboration (IDRC) conducted field data collection for the 36-month follow-up ITN Durability Monitoring Study in Apac and Mubende districts. They also completed the ITN bioassays in November 2023 and submitted the results to PSI. For the chemical analysis, IDRC has prepared the nets for shipment to CDC Atlanta.

- In preparation for the March-April 2024 IRS campaign:
 - CDFU, in collaboration with the project's operations and logistics staff, conducted district and sub-county advocacy and micro planning meetings involving 218 district and 573 subcounty government participants in all the seven IRS districts. During these meetings, participants reflected on lessons learned from previous IRS campaigns and best practices and approaches to mobilize communities to improve IRS acceptance.
 - The project team coordinated district government-led recruitment of seasonal workers in preparation in all seven IRS districts. The recruitment that targeted village health team members involved individual level knowledge, suitability assessment, and community approvals. Women and disadvantaged populations were encouraged to apply for relevant roles on the spray teams. The project recruited a total of 5,078 people, including 166 site supervisors, 166 storekeepers, 2,923 spray operators, 291 team leaders, 332 mobilizers, 70 pump technicians, 498 security persons, 358 washer persons, and 8 mobile data supervisors.
 - In collaboration with CDFU, held an SBC boot camp on malaria prevention and control, for 29 participants including District Health Educators, CDFU staff, PMI Evolve staff, and NMCD representatives, who discussed the appropriate IRS SBC strategies to improve demand and uptake to sustain best practices during and after IRS implementation. These included the Malaria-Free Smart homes and the school-based Mass Action Against Malaria (MAAM) strategies to be piloted in targeted communities that have consistently resisted IRS.
 - To kickstart implementation of the MAAM strategy in the pilot districts of Budaka, Mutuma, and Pallisa, CDFU collaborated with local districts health education departments to orient 16 teachers from selected schools on drama skit guides and key malaria prevention and control messages for inclusion in skits.
 - Ensured that the VectorLink Collect system was configured for the upcoming spray campaign, confirmed venues for data centers, and recruited data entry clerks.

8.21 Zambia (Transitioned to PMI Evolve in April 2023)

TABLE 21: PMI EVOLVE ZAMBIA VECTOR CONTROL AT A GLANCE

Ento	Number of entomological sites	Vector bionomics monitoring sites: 6	Insecticide resistance monitoring sites: 12	Sites monitored with CBS**: 6
	Number of people trained in entomology	Total: 76	Male: 53	Female: 23
IRS	Timing of PMI Evolve supported IRS campaign	September 26 – November 06, 2023 (28 operational days)		
	Number of districts covered by PMI-supported IRS	12 districts (Chadiza, Chienge, Chipangali, Chipata, Kasenengwa, Kawambwa, Lusangazi, Mambwe, Nyimba, Nchelenge, Petauke, Vubwi,)		
	Insecticide(s) and units	Fludora Fusion WP-SB (126,510 units), 2Gard (1,335 units)		
	IRS Results	Structures Sprayed: 479,984	Structures Found: 483,907	Spray Coverage: 99.2%
	Population protected by PMI-supported IRS	Total: 2,260,059	Pregnant Women: 55,129	Children < 5: 278,201
	<i>IRS TA Only</i> : Number of structures sprayed by other partners with PMI Evolve support	N/A		

ITN	ITN distribution channel(s) and dates of distribution	ITN Mass Campaign (door-to-door) October 16, 2023 – January 15, 2024		
	Number of districts included in distribution	10 Provinces (includes 2 PMI Evolve and 8 GF-supported regions)		
	Number and type of ITNs distributed	Distributed by PMI Evolve: Total (PBO): 2,685,943 ⁴		Distributed by partners with PMI Evolve support ⁵ : Total (PBO): 8,979,084 ⁶
	Number of people protected by ITNs	5,371,886		
IVC	Number of people trained to support vector control	Total: 20,304	Male: 11,016	Female: 9,288

**Evolve Zambia uses a partial CBS approach in all 6 vector bionomics sites. Community members conduct all mosquito collections, and district teams and project staff conduct morphological identification.

Program Highlights

- Conducted an incident-free 2023 IRS campaign as scheduled, protecting more than 2.2 million people.
- Provided central-level technical assistance to the NMEP in environmental compliance, monitoring and supervision of IRS, entomological surveillance, and coordination meetings.
- Provided technical assistance to the NMEP for the 2023 ITN mass campaign.
- Successfully integrated IRS and ITN microplanning for the first time, enabling the simultaneous planning of the two interventions.
- Conducted wall bioassays in 30 households within 24-48 hours of spraying and recorded 100% mortality of susceptible *An. gambiae* (Kisumu strain) after 24 hours on all wall surface types sprayed with Fludora Fusion, signifying a high-quality spray.
- A larval source management (LSM) feasibility study was completed in two pre-elimination districts.

⁴ Data is still in the process of being finalized.

⁵ PMI Evolve provided limited technical and financial support to 8 GF supported provinces through assistance with trainings, monitoring, and supervision. Furthermore, the project provider support to 4/8 provinces in the procurement process and delivery of data collection registers, purchasing of PPEs (raincoats and gum boots) and register carrier bags and zip lock backs for mobile phones

⁶ Data is still in the process of being finalized.

Annex A. MEL Results Summary

TABLE 22. PMI EVOLVE YEAR 1 SUMMARY RESULTS FOR INTEGRATED VECTOR CONTROL ACTIVITIES

Country	IRS						ITN			LSM	
	Structure s Sprayed by Evolve	Spray Coverage	People Protecte d by IRS	People Protected by IRS: Pregnant Women	People Protected by IRS: Children <5	Structures Sprayed by other partners with Evolve Support	ITNs Distributed by PMI Evolve	People Protected by ITNs (Estimate* *)	ITNs Distribute d by other partners with PMI Evolve support	Structure s visited biweekly for LSM	People protecte d by LSM
Ethiopia	--	--	--	--	--	--	--	--	--	49,141	249,691
Ghana	--	--	--	--	--	--	--	--	1,437,255	--	--
Madagascar	170,013	98.4%	720,920	24,166	108,990	--	--	--	--	--	--
Malawi	115,991	93.6%	464,195	8,581	71,075	526,227	--	--	--	--	--
Mozambique	--	--	--	--	--	377,250	--	--	--	--	--
Rwanda	363,305	99.6%	1,387,690	18,062	182,420	949,175	--	--	--	--	--
Senegal	--	--	--	--	--	--	17,893	35,786	1,159,157	--	--
Zambia	479,984	99.2%	2,260,059	55,129	278,201	--	2,685,943	5,371,886	8,979,084	--	--
Total	1,129,293	99.7% (avg)	4,832,864	105,938	640,686	1,852,652	2,703,836	5,407,672	11,580,381	49,141	249,691

TABLE 23. PMI EVOLVE YEAR 1 PEOPLE TRAINED TO SUPPORT VECTOR CONTROL

Country	People Trained to Support VC		
	Total	Male	Female
DRC	10	7	3
Ethiopia	138	39	99
Ghana	2,714	2,009	705
Madagascar	2,088	1,577	511
Malawi	1,272	736	536
Mozambique	--	--	--
Nigeria	32	28	4
Rwanda	7,045	4,856	2,189
Senegal	91	32	59
Zambia	20,304	11,016	9,288
Total	33,694	20,300	13,394
		60%	40%

TABLE 24. PMI EVOLVE YEAR 1 ENTOMOLOGICAL SITES

	PMI Evolve Entomological Sites:			People Trained in Entomology		
	Vector Bionomics	Insecticide Resistance	Sites monitored with CBS	Total	Male	Female
Burkina Faso	11	22	0	0	--	--
Burundi	8	8	8	31	27	4
Cambodia	--	4	0	0	--	--
Cameroon	5	10	0	17	9	8
Côte d'Ivoire	4	14	0	49	37	12
DRC	3	13	7	0	--	--
Ethiopia	6	14	4	35	3	32
Ghana	12	15	0	54	50	4
Guinea	4	7	4	27	23	4
Liberia	4	8	0	82	61	21
Madagascar	13	11	0	0	--	--
Malawi	17	8	0	2	2	0
Mozambique	7	9	0	0	--	--
Niger	5	15	0	20	16	4
Nigeria	6	72	2	16	11	5
Rwanda	7	0	0	0	--	--
Senegal	26	14	13	52	38	14
Sierra Leone	10	8	0	8	6	2
Uganda	6	16	6	0	--	--
Zambia	6	12	6	76	53	23
Total	160	280	50	469	336	133

TABLE 25. PMI EVOLVE YEAR 1 PEOPLE TRAINED IN ENTOMOLOGY

People Trained in Entomology			
	Total	Male	Female
Burkina Faso	0	--	--
Burundi	31	27	4
Cambodia	0	--	--
Cameroon	17	9	8
Côte d'Ivoire	49	37	12
DRC	0	--	--
Ethiopia	35	3	32
Ghana	54	50	4
Guinea	27	23	4
Liberia	82	61	21
Madagascar	0	--	--
Malawi	2	2	0
Mozambique	0	--	--
Niger	20	16	4
Nigeria	16	11	5
Rwanda	0	--	--
Senegal	52	38	14
Sierra Leone	8	6	2
Uganda	0	--	--
Zambia	76	53	23
Total	469	336 (72%)	133 (28%)

Annex B: Communications

CONFERENCE PRESENTATIONS

DHIS2 (POSTER)

- Automatic synchronization between disparate DHIS2 versions for simpler roll-back options with less risk for data loss

ASTMH (Oral Presentations)

- Insecticidal effectiveness and chemical content of insecticide-treated net brands containing chlorfenapyr and piperonyl butoxide-synergist over 36 months of field use in Burkina Faso, Rwanda, Sierra Leone, and Burundi
- Evidence Supporting Deployment of Next Generation Insecticide Treated Nets in Burkina Faso: Bioassays with Chlorfenapyr and Piperonyl Butoxide Increase Mortality of Pyrethroid-Resistant *Anopheles Gambiae*
- Reduction of malaria case incidence following the introduction of clothianidin-based indoor residual spraying in previously unsprayed districts: an observational analysis using health facility register data from Cote d'Ivoire, 2018-2022 (Lightning Talk)

(POSTER PRESENTATIONS)

- The Impact of Four Years of Indoor Residual Spraying with No-Pyrethroid Insecticides (Pirimiphos-Methyl and Chlothianidin) on Entomological Drivers of Malaria Transmission in Burkina Faso, West Africa
- Field performance of Interceptor®, Interceptor® G2, and PermaNet® 3.0 brand insecticide-treated nets across three districts in Burkina Faso over 36 months: Results from a 2019-2022 durability monitoring study
- Changes in the biting behavior of *Anopheles gambiae* s.l. following the combination of mass-distribution campaigns of insecticide-treated nets and indoor residual spraying over five years in Kiremba, Northern Burundi
- Reduction of malaria case incidence following the introduction of clothianidin-based indoor residual spraying in Côte d'Ivoire: A previously unsprayed districts: An observational analysis from 2018-2022
- Impact of indoor residual spraying on entomological indices in Sakassou, Central Côte d'Ivoire
- Larval source management implementation for the control of *Anopheles stephensi* in Ethiopia (August 2022-April 2023)
- Larval source management for the control of *Anopheles stephensi* in Ethiopia: Entomological monitoring results
- Targeting animal structures for indoor residual spraying in response to shifting vector behaviors reduces malaria cases in Northern Ghana
- Assessing insecticide resistance profile of *Anopheles gambiae* s.l. for strategic vector control decision making in Guinea
- Composition and seasonality of *Anopheles gambiae* s.l. and *Anopheles funestus* s.l. in Liberia
- Assessing entomological impact of a larviciding pilot study using aerial spraying of rice fields with drones in two districts of Madagascar
- Differential risk of exposure to *An. gambiae* s.l. and *An. funestus* s.l. biting estimated from human behavior observation adjusted analysis in Malawi
- Monitoring pyrethroid resistance intensity in populations of *Anopheles gambiae* s.l. across five ecological zones in Nigeria: Implications for vector control decisions

- Impact of a new insecticide-treated nets and indoor residual spraying on entomological indicators of malaria transmission in Rwanda
- Key entomological and malaria indicators during the periods of indoor residual spraying with pirimiphos-methyl and clothianidin-based products in Zambia

PAMCA (ORAL PRESENTATIONS)

- Biting and resting behavior heterogeneity of malaria vectors from different eco-geographic localities in Cameroon: Challenge for effective vector control
- Profiling insecticide resistance of *Anopheles gambiae* (s.l.) from 2018-2021 for prioritization and deployment of ITNs in Senegal

(Poster Presentations)

- Entomological profile of *Anopheles gambiae* s.l. from Sakassou, Central Côte d'Ivoire; a suitable site for experimental research
- Assessment of the entomological impact of PBO ITNs compared to a combined intervention of IRS plus standard ITNs in Amhara Region, Ethiopia
- Range Expansion of the Populations of *Anopheles coluzzii* across five ecozones in Nigeria (2019-2022)

GDHF (VIRTUAL PANEL PRESENTATION)

- Use of Geospatial Data and Digital Tools to conduct a larval source management feasibility study in Zambia

SUCCESS STORIES

- [Malaria Fighter: Juliet Murakatete, Vice Mayor, Nyagatare District, Rwanda](#)
- [In Guinea, a Peace Corps Volunteer Supports Mosquito Monitoring](#)

TECHNICAL BRIEFS

- [Evaluating the Impact of IRS and ITNs: Lessons from PMI VectorLink, August 2024 \(and in French: *Évaluation de l'impact des interventions de lutte contre les vecteurs: résultats du projet PMI VectorLink*\)](#)

WEBINARS

- [Evaluating the Impact of IRS and ITNs: Lessons from PMI VectorLink](#)