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THE PRESIDENT'S MALARIA INITIATIVE

Ninth Annual Report to Congress | April 2015



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Foreword

I am pleased to present the President's Malaria Initiative's (PMI's) Ninth Annual Report, which describes the U.S. Government's extraordinary commitment to the fight against malaria and highlights results achieved during this past year. Thanks to the generosity of the American people, lives are being saved every day from a disease that is entirely preventable and treatable. In just over a decade, the rollout of malaria control interventions has resulted in 4.3 million fewer deaths worldwide. Since its launch in 2005, PMI has been a major contributor to this historic progress.

This year marked an important milestone for PMI as we launched the next PMI Strategy for 2015–2020, which sets forth our approach for the future. Our goal is to continue to work closely with PMI-supported countries to further reduce malaria deaths and illnesses, toward the long-term goal of elimination. Together with our partners, we are eager to embark on this next phase in our collective efforts to reach a world without malaria.

Malaria control remains one of the best investments in global health today, and it remains a critical component of the U.S. Government's commitment to ending preventable child and maternal deaths and ending extreme poverty. I thank the U.S. Congress for its steadfast bipartisan support over two administrations, which has resulted in better lives, more stable communities, and hope for millions of people across Africa.



R. Timothy Ziemer
Rear Admiral, United States Navy (Retired)
U.S. Global Malaria Coordinator

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Abbreviations and Acronyms

ACT	Artemisinin-based combination therapy
AFRO	Africa Regional Office (WHO)
ANC	Antenatal care
ARI	Acute respiratory infection
BCC	Behavior change communication
CDC	U.S. Centers for Disease Control and Prevention
CHV	Community health volunteer
CHW	Community health worker
DHS	Demographic and Health Survey
DFID	U.K. Department for International Development
DHA	Dihydroartemisinin
DOD	Department of Defense
DRC	Democratic Republic of the Congo
EPCMD	Ending preventable child and maternal deaths
EPI	Expanded Program on Immunization
FY	Fiscal year
GH-FDA	Ghana Food and Drug Authority
Global Fund	The Global Fund to Fight AIDS, Tuberculosis and Malaria
HMIS	Health management information systems
iCCM	Integrated community case management
IPTp	Intermittent preventive treatment for pregnant women
IRS	Indoor residual spraying
ITN	Insecticide-treated mosquito net
MCH	Maternal and child health
NAFDAC	National Agency for Food and Drug Administration (Nigeria)
NMCP	National Malaria Control Program
OTSS	Outreach training and supportive supervision
PEPFAR	U.S. President's Emergency Plan for AIDS Relief
PMI	President's Malaria Initiative
RBM	Roll Back Malaria
RDT	Rapid diagnostic test
SMC	Seasonal malaria chemoprevention
SMS	Short messaging system
SP	Sulfadoxine-pyrimethamine
UNICEF	United Nations Children's Fund
USAID	U.S. Agency for International Development
WHO	World Health Organization

EXECUTIVE SUMMARY



The fight against malaria is making historic gains across sub-Saharan Africa. In countries where insecticide-treated mosquito nets (ITNs), indoor residual spraying (IRS), improved diagnostic tests, and highly effective antimalarial drugs have been scaled up, mortality rates in children under five years of age have fallen markedly. According to the World Health Organization's (WHO's) *2014 World Malaria Report*, in Africa, between 2000 and 2013, the estimated number of malaria cases in all age groups decreased from 174 million to 163 million. The estimated malaria mortality rate in children under five decreased by 58 percent in the Africa region between 2000 and 2013, while the scale-up of malaria control interventions over the same period resulted in an estimated 4.3 million fewer malaria deaths globally.

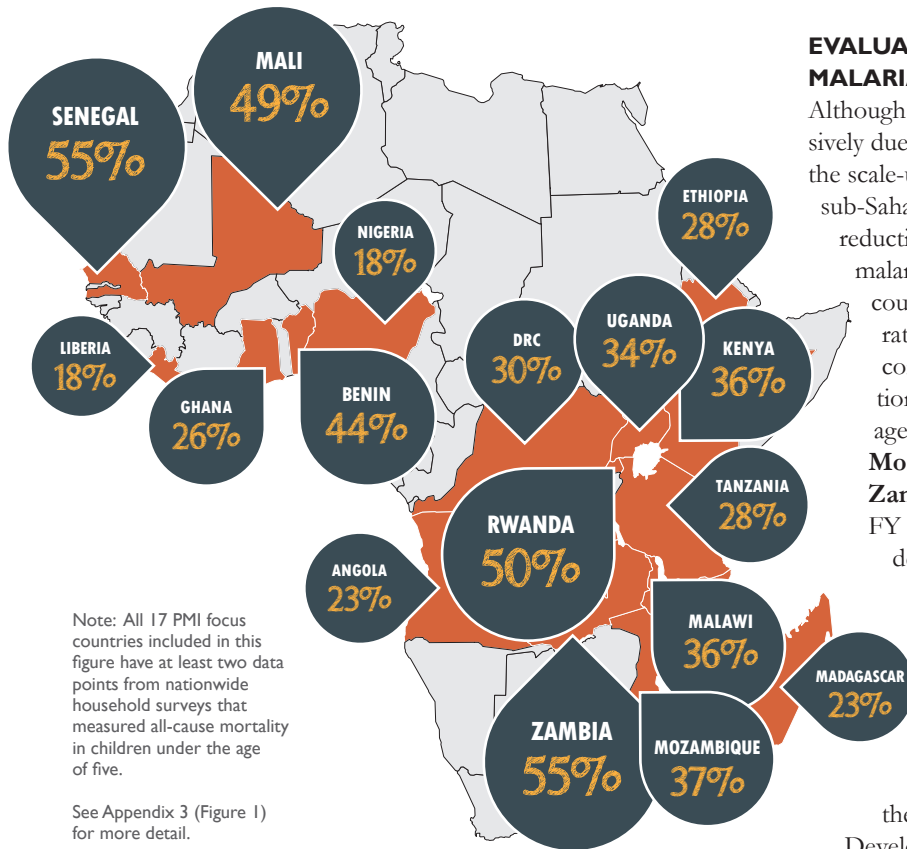
These successes in reducing malaria's burden are the result of a tremendous increase in financing for malaria control and the expansion of malaria control interventions. The cumulative efforts of the President's Malaria Initiative (PMI), national governments, the Global Fund to Fight AIDS, Tuberculosis and Malaria

(Global Fund), and many other partners are clearly working. The U.S. Government's financial and technical contributions, through PMI, have been key in this remarkable progress. In the nearly 10 years since it was launched, PMI has garnered recognition as a highly effective program that successfully combines solid support at the country level with global leadership on malaria prevention and control with other funding and technical partners.

In spite of the progress achieved, malaria remains a major cause of mortality among young children. More than 1,000 children still die from malaria every day, and without sustained and vigilant efforts, the great progress made could be quickly reversed, and successful investments in malaria control could be lost. To avoid a resurgence of malaria, PMI, with the global malaria community, must redouble efforts, sustain financial resources, and accelerate the scale-up of malaria prevention and treatment measures. Malaria places an economic burden on countries and has wide-ranging effects, such as reducing school attendance and lowering worker productivity, in addition to the significant out-

FIGURE 1

Reductions in All-Cause Mortality Rates of Children Under Five



Note: All 17 PMI focus countries included in this figure have at least two data points from nationwide household surveys that measured all-cause mortality in children under the age of five.

See Appendix 3 (Figure 1) for more detail.

of-pocket spending on malaria treatment by households. Fighting malaria not only saves lives, but also directly supports the achievement of broader development goals.

SAVING CHILDREN'S LIVES

The decreases in malaria illnesses and deaths have contributed significantly to the reductions in all-cause child mortality across PMI focus countries as measured through nationwide household surveys. To date, 17 of the 19 PMI focus countries have data from paired nationwide surveys that were conducted since PMI activities began. These surveys indicate that, in all 17 of these PMI-supported countries, all-cause mortality rates among children under five years of

age have significantly decreased. These declines range from 18 percent (in both Liberia and Nigeria) to 55 percent (in both Senegal and Zambia) (see Figure 1).

EVALUATING THE IMPACT OF MALARIA CONTROL EFFORTS

Although declines in all-cause under-five mortality are not exclusively due to malaria interventions, there is growing evidence that the scale-up of malaria prevention and treatment measures across sub-Saharan Africa is playing a major role in these unprecedented reductions. PMI is carefully estimating the contribution of malaria control efforts to declines in mortality in PMI focus countries through in-depth impact evaluations. In collaboration with Roll Back Malaria (RBM) partners, PMI has completed evaluations of the impact of malaria interventions on all-cause mortality in children under five years of age in nine countries to date (Angola, Ethiopia, Malawi, Mozambique, Rwanda, Senegal, Tanzania, Uganda, and Zanzibar). Three impact evaluations were conducted during FY 2014 (Mozambique, Uganda, and Zanzibar), and these demonstrated strong linkages between declines in all-cause mortality among children under five years of age and the rollout of malaria control interventions.

CONTRIBUTING TO INTERVENTION SCALE-UP

Since PMI's announcement in 2005, the efforts of national governments, together with PMI, the Global Fund, the World Bank, the U.K. Department for International Development (DFID), and many other partners, have resulted in a massive scale-up of malaria prevention and treatment measures across focus countries. PMI's contributions to this global effort have been significant, protecting and treating millions of people through procurement of millions of long-lasting ITNs, rapid diagnostic tests (RDTs), ACTs, and sulfadoxine-pyrimethamine (SP) treatments as well as training thousands of people on malaria case management and IRS operations (see Appendix 2).

In addition, PMI continued to collaborate closely with other donors who support malaria control efforts. For example, in eight PMI focus countries (Angola, Democratic Republic of the Congo [DRC], Guinea, Malawi, Nigeria, Tanzania, Uganda, and Zambia), PMI provided financial and technical assistance for the

IN FY 2014, PMI:



Procured **+31M** long-lasting insecticide-treated nets



Sprayed **+5M** houses with insecticides, protecting **+18M** people



Procured **+13M** preventive treatments for pregnant women and trained **+27,000** health workers in their use



Procured **+80M** antimalarial treatments and **+59M** rapid diagnostic tests

distribution of more than 24 million long-lasting ITNs that were procured by other donors. In addition, PMI supported distribution of nearly 4 million ACTs in Nigeria that were procured by the Global Fund and the World Bank.

The coverage of malaria control interventions in PMI focus countries has improved significantly since the start of the Initiative, and PMI's contributions, together with those of host governments and other partners, have been key in achieving these results. In the 19 focus countries where at least two comparable nationwide household surveys have been conducted since PMI activities were launched:

- Household ownership of at least one ITN doubled from a median of 29 percent to 60 percent.
- Usage of an ITN the night before the survey increased from a median of 18 percent to 46 percent among children under five years of age.
- Usage of an ITN the night before the survey more than doubled from a median of 17 percent to 41 percent among pregnant women.

In all 17 focus countries where intermittent preventative treatment for pregnant women (IPTp) is national policy and where at least two comparable nationwide household surveys have been conducted since PMI activities were launched:

- The proportion of pregnant women who received two or more doses of IPTp for the prevention of malaria increased from a median of 13 percent to 25 percent.

In terms of malaria prevention, while enormous progress in ITN ownership and use has been recorded in PMI focus countries, these

improvements have not been uniform. Although some countries are nearing or exceeding PMI targets for these indicators, others still are scaling up. Furthermore, median coverage of pregnant women with at least two doses of IPTp in PMI focus countries has increased more modestly but continues to fall short of the target. To increase the number of pregnant women receiving SP, PMI is supporting the implementation of WHO's revised IPTp guidelines (2012), which recommend providing SP at every scheduled antenatal care (ANC) visit after the first trimester. In addition to supporting the rollout of ITNs and IPTp, PMI continued to support the implementation of IRS activities, and in fiscal year (FY) 2014, more than 90 percent of houses targeted were successfully sprayed, protecting more than 18 million people in 13 countries.

Effective case management remains an essential component of malaria prevention and control. During FY 2014, in all focus countries, PMI supported the scale-up of diagnostic testing for malaria at the health facility and community levels to ensure that all patients with malaria are properly identified and receive a quality-assured and recommended malaria treatment. Throughout PMI focus countries, RDTs and ACTs are now widely available, and health workers have been trained in their use. Through PMI's efforts and those of partners and national malaria control programs (NMCPs), the proportion of suspected malaria cases that are confirmed with laboratory tests and treated with a recommended antimalarial drug combination continues to increase in nearly every focus country.

LEVERAGING PARTNERSHIPS IN THE FIGHT AGAINST MALARIA

PMI is one of the major international financers of malaria control along with the Global Fund and the United Kingdom, which has recently substantially increased its effort. Partnerships at the country and global levels are central to the continued success of PMI's malaria control efforts. PMI strategically targets its investments to support



The President's Malaria Initiative Strategy 2015–2020

Launched in June 2005 by President George W. Bush, the President's Malaria Initiative (PMI) represented a major 5-year, \$1.265 billion expansion of U.S. Government resources for malaria control. The Initiative is led by the U.S. Agency for International Development (USAID) and implemented together with the U.S. Centers for Disease Control and Prevention (CDC). PMI funds programs in 19 focus countries in Africa and one regional program in the Greater Mekong Subregion of Southeast Asia (see Appendix 1). In addition, USAID provides malaria funding to Burkina Faso, Burundi, and South Sudan in Africa and the regional Amazon Malaria Initiative in Latin America (which includes Brazil, Colombia, Ecuador, Guyana, Peru, and Suriname).

When it was first launched, PMI's goal was to reduce malaria-related mortality by 50 percent across 15 high-burden countries in sub-Saharan Africa through a rapid scale-up of four proven and highly effective malaria prevention and treatment measures: ITNs; IRS; accurate diagnosis, and prompt treatment with ACTs; and IPTp. With the passage of the Tom Lantos and Henry J. Hyde Global Leadership against HIV/AIDS, Tuberculosis, and Malaria Act in 2008, PMI developed a U.S. Government Malaria Strategy for 2009–2014.

In February 2015, PMI launched its next 6-year strategy for 2015–2020. The Strategy takes into account the progress over the past decade and the new challenges that have arisen, setting forth a vision, goal, objectives, and strategic approach for PMI through 2020, while reaffirming the longer-term goal of a world without malaria. Malaria prevention and control remains a major U.S. foreign assistance objective, and this strategy fully aligns with the U.S. Government's vision of ending preventable child and maternal deaths and ending extreme poverty. It is also in line with the goals articulated in the draft Roll Back Malaria (RBM) Partnership's second Global Malaria Action Plan and the World Health Organization's (WHO's) draft Global Technical Strategy.

The U.S. Government shares the long-term vision of affected countries and global partners of a world without malaria. This vision will require sustained, long-term efforts to drive down malaria transmission and reduce malaria deaths and illnesses, leading to country-by-country elimination and eventual eradication by 2040–2050. The U.S. Government's goal under the PMI Strategy 2015–2020 is to work with PMI-supported countries and partners to further reduce malaria deaths and substantially decrease malaria morbidity, toward the long-term goal of elimination. Building upon the progress to date in PMI-supported countries, PMI will work with national malaria control programs (NMCPs) and partners to accomplish the following objectives by 2020:

1. Reduce malaria mortality by one-third from 2015 levels in PMI-supported countries, achieving a greater than 80 percent reduction from PMI's original 2000 baseline levels.
2. Reduce malaria morbidity in PMI-supported countries by 40 percent from 2015 levels.
3. Assist at least five PMI-supported countries to meet the WHO criteria for national or sub-national pre-elimination.

To achieve these objectives, PMI will take a strategic approach that emphasizes the following five areas:

1. Achieving and sustaining scale of proven interventions
2. Adapting to changing epidemiology and incorporating new tools
3. Improving countries' capacity to collect and use information
4. Mitigating risk against the current malaria control gains
5. Building capacity and health systems

These areas of focus are informed by PMI's experiences to date, which include building on the successes that countries have achieved with the support of PMI and other partners, incorporating the lessons learned from implementation thus far, and addressing directly the ongoing and new challenges that could prevent further progress toward malaria control and elimination.

The strategy is available for download at www.pmi.gov.



Responding to the 2014–2015 Ebola Epidemic

PMI, in partnership with the governments of **Guinea** and **Liberia** as well as other U.S. Government and international partners, supported the global community's unprecedented response to the Ebola epidemic of 2014–2015, while simultaneously continuing to combat malaria in these countries. As a result of the Ebola epidemic, a number of activities were postponed in both countries, including planned Malaria Indicator Surveys, laboratory and case management trainings and supervision visits, and a health facility survey in Guinea. Although some PMI-supported activities were put on hold or delayed during the Ebola response, others continued throughout the crisis and played a central role in supporting the health system. For example, PMI's direct support to the Liberian Government helped to sustain services at facilities in Bong, Nimba, and Lofa counties, and in both countries, PMI assisted with revising malaria case management and ITN distribution guidelines. In addition, PMI coordinated its support for supply chain and logistics for malaria commodities closely with the Global Fund in order to maintain the supply of essential medicines at health facilities. Furthermore, PMI staff assisted with Ebola epidemiologic investigations and infection prevention and control, as well as overall coordination and management efforts.

each focus country's malaria control strategy and plans and coordinates activities with a wide range of partner organizations. These include multilateral and bilateral institutions such as WHO and UNICEF; private foundations such as the Bill & Melinda Gates Foundation, Clinton Foundation, UN Foundation, and Malaria No More; and other U.S. Government programs. Furthermore, PMI has supported implementation of malaria activities through more than 200 nonprofit organizations, approximately one-third of which are faith-based.

CONDUCTING CRITICAL MALARIA RESEARCH

Research to support malaria control efforts and reduce the burden of malaria remains a high priority of the U.S. Government. The U.S. Government malaria research effort involves the U.S. Centers for Disease Control and Prevention (CDC) and the National Institutes of Health of the Department of Health and Human Services, the Naval Medical Research Center, and the Walter Reed Army Institute of Research of the Department of Defense, and the U.S. Agency for International Development (USAID).

USAID supports the development of novel antimalarial drugs and malaria vaccines and of new and more effective insecticides to combat insecticide resistance. PMI complements upstream malaria vaccine and drug development efforts by supporting operational research to help guide its program investments, make policy recommendations to NMCPs, and target interventions to increase their cost-effectiveness. As the burden of malaria falls in sub-Saharan Africa, operational research will help programs adjust to the changing epidemiological landscape. PMI carries out operations research in collaboration with local investigators and institutions, thus strengthening in-country capacity to undertake research.

Examples of PMI-supported operational research in FY 2014 include:

- In **Kenya**, PMI is supporting an ongoing study of an innovative “screen-and-treat” approach for pregnant women compared to

conventional IPTp with SP, a strategy that could prove useful in settings where resistance to SP is high. The approach involves screening pregnant women with an RDT at each antenatal care visit and treating them with dihydroartemisinin (DHA)-piperaquine if they are found to have malaria.

- To address the growing threat of pyrethroid resistance, PMI is currently supporting field trials of synergist nets in a pyrethroid-resistant area of Mali. Forthcoming results will shape new PMI policy on if, where, and how to deploy these new tools to prevent malaria.
- In partnership with a local research institute in **Madagascar**, *Institut Pasteur*, PMI is implementing an operational research study to identify simple and cost-effective methods to determine the intensity of malaria transmission in order to prioritize where to target IRS activities.
- To improve the implementation of case management activities, PMI launched an expanded operational research project on text messaging in **Malawi** to evaluate the effectiveness of text message reminders to health care workers in improving integrated diagnosis and management of malaria, diarrhea, and pneumonia.

BUILDING NATIONAL CAPACITY AND STRENGTHENING HEALTH SYSTEMS

PMI supports the strengthening of the overall capacity of health systems, both directly and indirectly. In addition to providing assistance to countries to roll out malaria-specific activities, PMI also helps build national capacity in a variety of cross-cutting areas that benefit both malaria and other health programs. This support includes capacity building and training, and strengthening supply chain management, laboratory diagnosis, and monitoring and evaluation systems. In highly endemic countries, malaria typically accounts for up to 40 percent of outpatient visits and hospital admissions. Reducing malaria transmission levels in these countries has a

positive effect on the rest of the health system by allowing health workers to focus on managing other important childhood illnesses, such as pneumonia, diarrhea, and malnutrition. A PMI-funded study in **Zambia** showed substantial reductions in inpatient admissions and outpatient visits for malaria after the scale-up of malaria control interventions, and hospital spending on malaria admissions also decreased by a factor of 10.¹

Through support to the CDC's Field Epidemiology and Laboratory Training Program, PMI helps build a cadre of ministry of health staff with technical skills in the collection, analysis, and interpretation of data for decision-making and epidemiologic investigations in 12 PMI focus countries in Africa (**Angola, DRC, Ethiopia, Ghana, Kenya, Mozambique, Nigeria, Rwanda, Tanzania, Uganda, Zambia, and Zimbabwe**) and one PMI program in the Greater Mekong Subregion (Burma), supporting more than 100 trainees globally to date.

In FY 2014, PMI efforts to strengthen health systems included:

- Providing technical assistance and programmatic support for forecasting malaria commodity requirements (e.g., diagnostic tests and drugs), conducting quality testing of those commodities, strengthening supply chain management systems, and improving the tracking of those commodities in all PMI focus countries in Africa to ensure an uninterrupted supply of commodities and to protect their quality and safety.
- Building the capacity of ministries of health, local governments, and other relevant institutions to manage key aspects of IRS implementation on their own or with limited PMI support; to date,

13 PMI focus countries have implemented country capacity assessments, and 9 have developed action plans that identify key areas where PMI could strengthen the government's capacity, with the goal of gradually transferring responsibilities to the government.

- Building quality assurance systems for laboratories that conduct malaria diagnosis and improve the overall quality of healthcare in collaboration with ministries of health and other partners.

Furthermore, fostering country ownership is at the core of PMI's strategic and implementation approach. PMI carries out annual planning visits with NMCPs and their partners to collaboratively develop annual PMI Malaria Operational Plans that directly support national malaria control strategies and priorities.

MOVING AHEAD

While the progress in the global fight against malaria is to be celebrated, the scale-up of malaria control measures and the resulting decline in malaria illnesses and deaths since 2000 has not been even throughout Africa. In some countries, further efforts to attain high coverage with malaria control interventions are needed before substantial reductions in malaria burden can be expected. In contrast, other countries have progressed to a point where malaria is no longer a leading public health problem. The changing landscape of malaria control has prompted shifts in the goals and targets of many partners in the global malaria community, including the Bill & Melinda Gates Foundation, the RBM Partnership, and WHO. While the progress to date is historic, the continued control and ultimate elimination of malaria remains fraught with serious challenges, including resistance to the artemisinin family of drugs, widespread availability of substandard and counterfeit malaria treatments, resistance to key insecticides, inadequate disease surveillance systems, waning country and donor attention as malaria burden drops, and unexpected crises (see the box on the Ebola epidemic on page 9).

The U.S. Government, through PMI, remains unwavering in its commitment to working together with host country governments and the broader malaria partnership to maintain the momentum against malaria and overcome these and other challenges in program implementation. As PMI looks to the future and the implementation of PMI's Strategy for 2015–2020 (see page 8), the U.S. Government through PMI remains firmly dedicated to fighting malaria and saving lives.



1. Comfort, A.B., et al. 2014. Hospitalizations and Costs Incurred at the Facility Level after Scale-up of Malaria Control: Pre-post Comparisons from Two Hospitals in Zambia. *American Journal of Tropical Medicine and Hygiene*, 90: 20-32.

I. OUTCOMES AND IMPACT



HIGHLIGHTS

- In 17 PMI focus countries, all-cause mortality among children under the age of five has declined since baseline; reductions range from 18 percent (in both Liberia and Nigeria) to 55 percent (in both Senegal and Rwanda).
- PMI, in collaboration with Roll Back Malaria partners, has completed evaluations of the impact of malaria interventions on all-cause mortality in children under five years of age in nine countries to date (Angola, Ethiopia, Malawi, Mozambique, Rwanda, Senegal, Tanzania, Uganda, and Zanzibar).
- Three impact evaluations were conducted during FY 2014 (Mozambique, Uganda, and Zanzibar), and these demonstrated strong linkages between declines in all-cause mortality among children under five years of age and the rollout of malaria control interventions.

The continued support by the President's Malaria Initiative (PMI) to scale up key malaria interventions in 19 focus countries in sub-Saharan Africa has had a major impact on malaria illnesses and deaths in the Africa region. According to the World Health Organization's (WHO's) *2014 World Malaria Report*, the estimated malaria mortality rate in children under five decreased by 58 percent in the Africa region between 2000 and 2013, while the scale-up of malaria control interventions over the same period resulted in an estimated 4.3 million fewer malaria deaths. These gains were attributed primarily to increased use of insecticide-treated mosquito nets (ITNs), accurate diagnostic tests, and effective drug therapies. The estimated number of malaria cases in all age groups in Africa has decreased from 174 million in 2000 to 163 million in 2013, and the estimated number of overall deaths due to malaria in Africa also decreased 34 percent from 801,000 in 2000 to 528,000 in 2013.

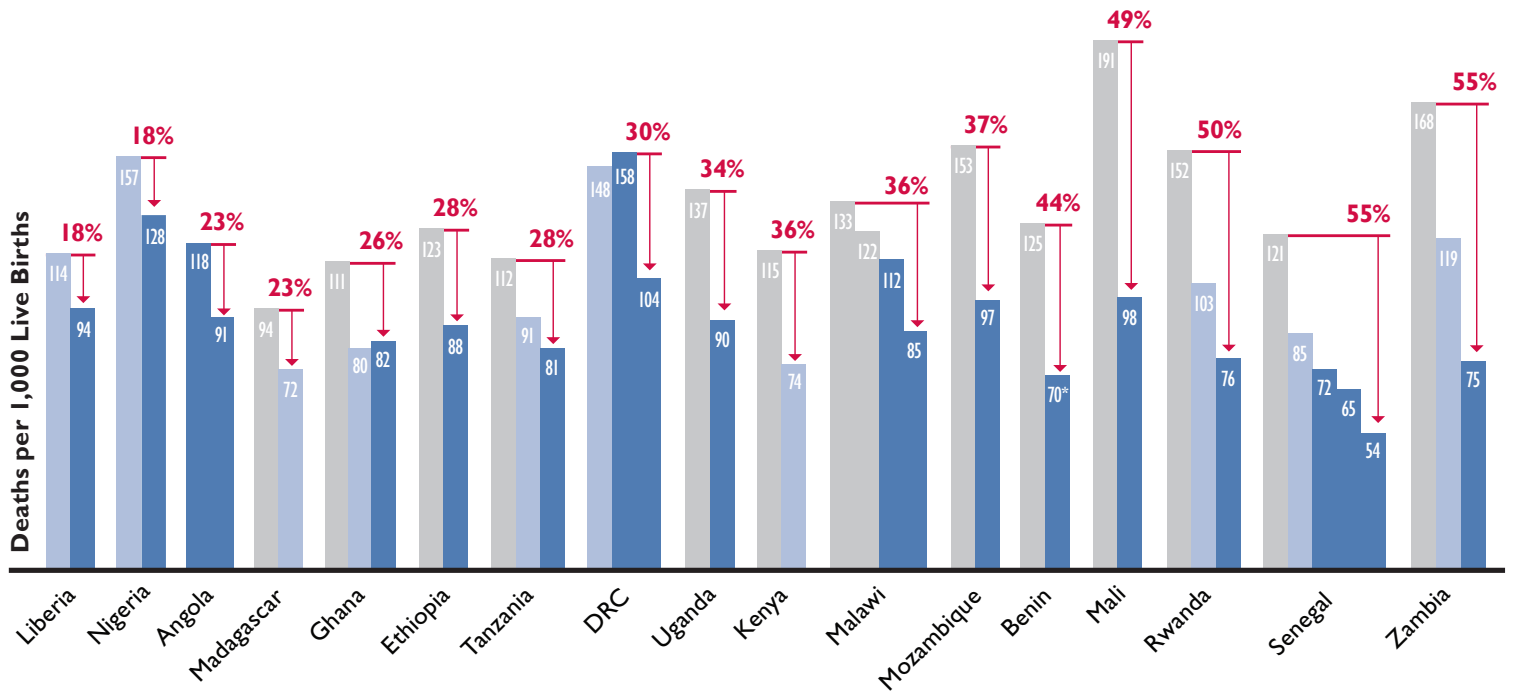
These reductions in malaria illnesses and deaths have contributed significantly to the reductions in all-cause child mortality across the PMI focus countries as measured through nationwide household surveys. To date, 17 of the 19 PMI focus countries have data from paired nationwide surveys that have been supported by PMI. These surveys indicated that all 17 of these PMI-supported countries documented reductions in all-cause childhood mortality. The decline in under-five mortality rates ranged from 18 percent (in both **Liberia** and **Nigeria**) to 55 percent (in both **Senegal** and **Zambia**) (see Figure 1).

IMPACT EVALUATIONS

PMI, in collaboration with Roll Back Malaria (RBM) partners, including the Global Fund to Fight AIDS, Tuberculosis and Malaria, has completed nine comprehensive evaluations of the impact of malaria interventions on all-cause mortality in children under five years of age (in **Angola, Ethiopia, Malawi, Mozambique, Rwanda, Senegal, Tanzania, Uganda, and Zanzibar**). Through these evaluations, PMI continues to correlate the reductions in all-cause mortality rates with the scale-up of malaria control interventions. In all nine countries, there has been a decline in all-cause under-five mortality (see Figure 1) as well as a decline in malaria morbidity (as measured by declines in anemia, malaria parasitemia, and/or malaria cases). Similarly, all nine countries have seen increases in malaria control intervention coverage. The coverage

FIGURE 1

Reductions in All-Cause Mortality Rates of Children Under Five



The PMI focus countries included in this figure have at least two data points from nationwide household surveys that measured mortality in children under the age of five. These data are drawn from Demographic and Health Surveys, Multiple Indicator Cluster Surveys, and, in a small number of cases, from Malaria Indicator Surveys with expanded sample sizes. All under-five mortality estimates for Angola are derived from the 2011 Malaria Indicator Survey.

■ 2002–2006 surveys
 ■ 2007–2009 surveys
 ■ 2010–2014 surveys

*The final report of the DHS 2011–2012 notes that, while mortality among children under five in Benin has declined, there may have been significant under-reporting of neonatal and child deaths by respondents.

Roll Back Malaria Framework for Impact Evaluation

Evaluating the impact of malaria control on morbidity and mortality is difficult. In sub-Saharan Africa, health management information systems (HMIS) and civil registries record only a fraction of malaria cases and deaths, and when children die at home, establishing the cause of death is challenging. Because malaria contributes to child mortality both directly and indirectly, PMI's impact evaluations use all-cause child mortality to measure the impact of malaria interventions, in accordance with the recommendations of the RBM Monitoring and Evaluation Reference Group. It recommends that a "plausibility" assessment be used to establish a relationship between malaria control and impact on all-cause mortality per the following steps:

1. Determine that in fact a decrease in all-cause child mortality has occurred during the period in which malaria interventions were deployed.
2. Document whether the two main malaria morbidity indicators (i.e., anemia and malaria prevalence) have been reduced sufficiently to anticipate the impact on all-cause mortality.
3. Establish that malaria control interventions have reached sufficient coverage, within a sufficient time frame, to expect morbidity and mortality impact at population level.
4. Thoroughly investigate whether changes in other child health interventions, environmental conditions, or climatic factors, have also contributed to declines in all-cause mortality during the period under study.

According to the RBM Monitoring and Evaluation Reference Group, if the first three conditions are met and alternative explanations for the decline in all-cause mortality are limited or cannot be found, then it is "plausible" to conclude that malaria control is a major cause for the decline in mortality.

increases have been substantial in some countries (e.g., Ethiopia, Rwanda, Senegal, Tanzania, and Zanzibar) but remain low overall in other countries (e.g., Angola). After considering other causes for the decline in all-cause under-five mortality, the evaluations have concluded that the scale-up of malaria control interventions has likely contributed in large part to the decline in mortality in most of the countries.

The findings from three impact evaluations conducted during FY 2014 (Mozambique, Uganda, and Zanzibar) are summarized below.

MOZAMBIQUE

Mozambique achieved declines in malaria morbidity during the evaluation period (2003–2011). While malaria parasitemia prevalence in children 6–59 months of age remained high at 36 percent in 2011, it had declined from 52 percent in 2007. Malaria cases (confirmed and non-confirmed clinical cases) increased from 2000 to 2005, but then declined 55 percent between 2005 and 2012. Similarly, the proportion of confirmed malaria deaths for all ages out of all health facility deaths declined 62 percent between 2005 and 2012 according to the National Malaria Control Program’s (NMCP’s) routine inpatient data. During this time Mozambique scaled up its indoor residual spraying (IRS) program with 19–25 percent of households nationwide covered by IRS between 2007 and 2011. In addition, households with at least one ITN or that had received IRS increased from 35 percent in 2007 to 60 percent in 2011. These increases in malaria control interventions likely contributed to the 36 percent decline in all-cause under-five mortality between 2003 and 2011.

The greatest malaria morbidity and mortality declines occurred later in the evaluation period, during the time when malaria interventions were also being scaled up.

UGANDA

Uganda has seen a 41 percent decline in all-cause mortality among children under five years of age between 2001 and 2011, from 151 to 90 deaths per 1,000 live births. Likewise severe anemia among children 6–59 months of age declined 70 percent, from 17 percent in 2001 to 5 percent in 2011. Household ITN ownership increased from near 0 in 2001 to 60 percent in 2011, ITN use by children under five years of age increased from near 0 to 63 percent, and ITN use by pregnant women reached 71 percent. Uganda experienced improvements in non-malaria related health interventions and socioeconomic factors including increases in access to improved water sources, immunizations, care seeking for acute respiratory infection (ARI) and diarrhea, and gross domestic product. However, improvements in these other factors are unlikely to explain the entire 41 percent decline in all-cause mortality. The scale-up of malaria control interventions is likely a major contributor to the observed decline in mortality.

ZANZIBAR

Zanzibar and Mainland Tanzania each have their own independent malaria control programs. Given the separate control programs and differing malaria endemicity, separate impact evaluations were conducted in Mainland Tanzania (reported in the 2012 PMI Annual Report to Congress) and Zanzibar. On the islands of Zanzibar,

PMI supports the Case Management Notification System in Zanzibar, where all malaria cases diagnosed using rapid diagnostic tests (RDTs) or microscopy are immediately reported electronically. Patients can be tracked back to their homes where all family members are tested using an RDT and treated if they test positive for malaria.

RTI International





Strengthening Malaria Reporting in Mali

For a number of years, PMI and other partners have supported the NMCP in Mali to develop a reporting system for routine malaria data. The purpose of this reporting system is to increase the availability and quality of malaria data in order to help monitor trends in disease burden and the impact of interventions.

The NMCP's malaria information system, supported by PMI, was designed to collect data on all the indicators needed for management including data on testing, confirmed malaria cases, and treatment with artemisinin-based combination therapy (ACT). The system also collects data on stock-outs of essential malaria drugs (e.g., ACT and sulfadoxine-pyrimethamine [SP]) and commodities (e.g., ITNs and rapid diagnostic tests [RDTs]). To improve the availability and usefulness of the data, two novel approaches to transfer data were tested: (1) mobile reporting through short messaging system (SMS) directly from the community health facilities, and (2) electronic entry and uploading of data at the district level. These data are then available through a password-protected website for managers at all levels of the system. The system was initially rolled out to 18 health districts in 3 regions of Mali with plans to expand to additional districts in the coming year.

A recent evaluation found that SMS reporting directly from the facility was associated with significant improvements in the timeliness and completeness of routine monthly reports when compared with reporting systems that rely on the transfer of paper records to the district. Mali is beginning implementation of a new software tool for routine reporting at the health facility level. The PMI-funded team is ensuring that this malaria information system will eventually be incorporated into the HMIS, so quality data on malaria programming will be collected from all regions of the country.

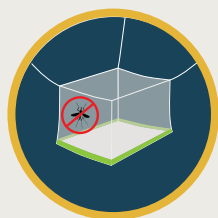
coverage with malaria vector control interventions has reached unprecedented levels. In 2012, 98 percent of households in Pemba and 93 percent of households in Unguja had at least one ITN or received IRS. The scale-up and maintenance of high vector control coverage and availability of antimalarial treatments have contributed to keeping malaria parasitemia prevalence below 1 percent between 2007 and 2012 and contributed to the 8-fold decline in confirmed malaria incidence in children under five years of age between 2005 and 2010. Likewise, hospital admissions for malaria have fallen from 30–50 percent of all admissions in 2000 to about 5 percent in 2012. These achievements in malaria control are enabling Zanzibar to move toward malaria elimination

LOOKING FORWARD

While malaria morbidity and mortality have declined across Africa, the decreases in malaria burden have been uneven within and between countries, with some areas experiencing significant reductions and other areas lagging behind. Going forward, NMCPs are in need of more detailed information on malaria burden to better target their resources. While PMI will continue to collect data through national and subnational population surveys to continue to monitor and evaluate the impact of malaria control, it will increase its focus on assisting countries with collecting detailed and complete data that is timely and of good quality through their HMIS, disease surveillance systems, and facility assessments.

PMI will continue to expand ongoing support for activities to strengthen the routine information systems in countries by building capacity, improving quality, and improving the analysis and use of data at all levels of a country's health system. Since the start of the Initiative in 2006, more than half of PMI's investments in monitoring and evaluation activities have supported the strengthening of routine systems and capacity within countries.

2. MALARIA PREVENTION



Vector Control: Insecticide-Treated Mosquito Nets

HIGHLIGHTS

- Household ownership of at least one ITN has increased from a median of 29 percent to 60 percent in 19 PMI focus countries during the past 9 years.
- Use of ITNs among children under five years of age has increased from a median of 18 percent to 46 percent in 19 PMI focus countries during the past 9 years.
- To date, PMI has procured more than 155 million ITNs and has supported the distribution of more than 73 million ITNs procured by other donors.
- PMI supports research to improve ITN longevity through preventive care, to maintain high ITN coverage through continuous distribution channels, and to combat pyrethroid resistance through trials of synergist ITNs.

Long-lasting insecticide-treated nets (ITNs) are the primary tool for malaria prevention worldwide. High ownership and consistent use of ITNs reduces the incidence of uncomplicated malaria episodes by 50 percent and all-cause mortality in children under five by about 20 percent.¹ When a community has a high level of ITN use, which is associated with greatly reduced populations and longevity of mosquitoes that transmit malaria, the risk of malaria infections can be reduced even among people not using an ITN.

The President's Malaria Initiative's (PMI's) ITN strategy is guided by the World Health Organization (WHO) 2007 position statement, recommending universal coverage of the entire population at risk for malaria with effective vector control interventions, primarily long-lasting ITNs and indoor residual spraying (IRS). PMI's policy is to support countries to achieve and maintain universal coverage (commonly defined as one ITN for every two people at risk) with long-lasting ITNs. PMI supports distribution of ITNs through mass campaigns and continuous distribution channels, such as antenatal and child immunization clinics at health facilities and the private sector, to ensure consistent, high coverage in target populations.

In fiscal year (FY) 2014, PMI procured 31.8 million ITNs. PMI's contributions represent approximately one-fifth of the 145 million ITNs that were delivered to PMI focus countries in 2014, second only to the Global Fund to fight AIDS, Tuberculosis, and Malaria (Global Fund) as the primary global ITN supplier. Regardless of the source of ITN procurement, in PMI focus countries, PMI provides significant technical assistance for ITN distribution and monitoring and evaluation efforts.

Across PMI focus countries, there has been enormous progress in ITN ownership and use. Overall, ITN ownership has increased from a baseline of 29 percent to 60 percent (range: 35 percent to 91 percent), and ITN use in children under five has increased from 18 percent to 46 percent (range: 17 percent to 72 percent) (see Appendix 3). However, this progress is not

1. Lengeler, C. Insecticide-treated bed nets and curtains for preventing malaria (Review). In: The Cochrane Library, Issue 2, 2009. Chichester: Wiley. <http://www.thecochranelibrary.com/userfiles/cooch/file/CD000363.pdf>.

Protecting all Ugandans from Malaria: Completion of the Universal ITN Coverage Campaign

Malaria is endemic in all of Uganda and continues to be a leading killer of children as well as a significant detriment to the country's economy. To protect the most vulnerable populations (i.e., pregnant women and children under the age of five) from malaria-carrying mosquitoes, PMI and the Global Fund have supported the Uganda Government to distribute ITNs through antenatal facilities. In 2013, recognizing the need to accelerate and extend ITN coverage to all Ugandans, the country embarked on a historic mass universal coverage ITN distribution campaign that concluded in 2014. More than 22 million mosquito nets were distributed nationwide in all 112 districts of the country, and Uganda achieved its goal of distributing one net for every two people based on the number of households targeted.

PMI supported this effort by procuring 1,752,577 ITNs and supporting the distribution of more than 19 million ITNs (procured by the U.K. Department of International Development [DFID], Global Fund, and World Vision). The Uganda People's Defense Force worked with Ugandan police and other partners to distribute the ITNs, transporting them and ensuring security at the distribution points. This is the largest universal coverage campaign ever in Africa, achieving 91 percent coverage in rural areas at an estimated distribution cost per net of \$0.89.

The committed leadership of the Ministry of Health, combined with the effective partnership among major donors and implementing partners (e.g., PMI, DFID, Global Fund, World Vision), was a key factor that contributed to the success of the campaign. The campaign also benefited from a well-coordinated stakeholders forum, a national coordinating committee with hard-working and diligent members, clear guidelines for the distribution of ITNs, dedicated campaign taskforces at multiple levels (district, sub-county, parish, and village), highly committed village health workers, the presence of security personnel at all levels, and the support of communities throughout the country.

Mr. Fred Okunyo, a beneficiary of the campaign, noted the impact that ITNs have had: "There is a great, great change. Since the nets, children seem healthier. You can see them now, happy and playing. Their faces look good. Before, you would not find them playing like this, you would mostly find them in bed, sleeping. Even us old ones, we look good, too. We are now stronger and can do our farming to better support everyone."



Uganda concluded a mass ITN campaign in 2014 with the distribution of more than 22 million ITNs.

Kim Burns Case, Stop Malaria Project

uniform across PMI focus countries, which requires tailoring unique approaches for each country's systems and epidemiology. Data suggest that in many countries, the main limiting factor to ITN use is insufficient ITNs to protect all household members; thus, increasing the number of ITNs available would improve use. While some countries are nearing or exceeding PMI targets for ITN ownership and use (**Benin, Mali, Rwanda, and Tanzania**), others still are scaling up (see Figures 1 and 2).

In addition to procuring ITNs, PMI supports activities to maintain high net ownership, ensure that ITNs are used correctly and consistently, monitor net durability and insecticidal effectiveness under field conditions, and prolong ITN longevity.

MAINTAINING HIGH NET OWNERSHIP – MASS DISTRIBUTION CAMPAIGNS

Mass campaigns continue to be the major distribution channel for nets, as they enable countries to quickly achieve equitable, universal ITN coverage. All PMI focus countries in sub-Saharan Africa have completed national or sub-national campaigns between 2009 and 2014, further increasing the proportion of the population protected by an ITN. In FY 2014, PMI supported mass campaigns in nine countries (**Angola, Benin, Democratic Republic of the Congo [DRC], Guinea, Kenya, Mali, Nigeria, Uganda, and Zimbabwe**), Highlights include:

- In **Angola**, PMI distributed more than 2 million ITNs in five provinces (Zaire, Kwanza Norte, Malange, Bie, and Huambo), as part of the country's mass distribution campaign. PMI will continue supporting the National Malaria Control Program (NMCP) to reach their goal of nationwide universal coverage by the end of 2015.
- In **Guinea**, PMI supported the final phase of a mass distribution campaign that included all five communes of Conakry and 14 rural prefectures, distributing 2,540,409 ITNs and reaching 717,551 households. As part of PMI's support, 13,869 people were trained in micro-planning, enumeration, distribution, net-hanging, and promotion activities. To promote consistent and correct ITN use, PMI supported social mobilization activities, including round-table discussions, radio and television spots, SMS messages, and branded products promoting sleeping under an ITN every night.
- In **Mali**, PMI procured and distributed 1.2 million ITNs for the 2014 mass campaign. Furthermore, as part of World Malaria Day, and continued throughout the year, PMI disseminated malaria messages through television broadcasts, brochures, and household visits by community health volunteers to promote the use of long-lasting ITNs. During the past year, 23,271 radio and television messages were delivered via the national television network and community radios stations across eight regions and Bamako.
- In **Nigeria**, PMI supported the distribution of 2,490,141 ITNs in December 2013 through mass campaigns, reaching 1,020,252 households. PMI procured 1,296,200 of the ITNs with the balance procured by the Global Fund. In addition, PMI supported the logistics for the campaign, including: training of campaign personnel, social mobilization, and behavior change communication

activities before, during, and after the campaign; and monitoring and supervision. PMI and Global Fund supported a post-distribution process evaluation that informed the planning and implementation of subsequent ITN campaigns.

- In **Zimbabwe**, PMI procured 655,680 ITNs for the 2014 mass campaign, bringing PMI’s cumulative contribution to the rolling national campaign to 2 million. With coordination between PMI, Global Fund, and the NMCP, Zimbabwe was able to make one net available for every two people in malaria-vulnerable areas of the country at the end of 2014.

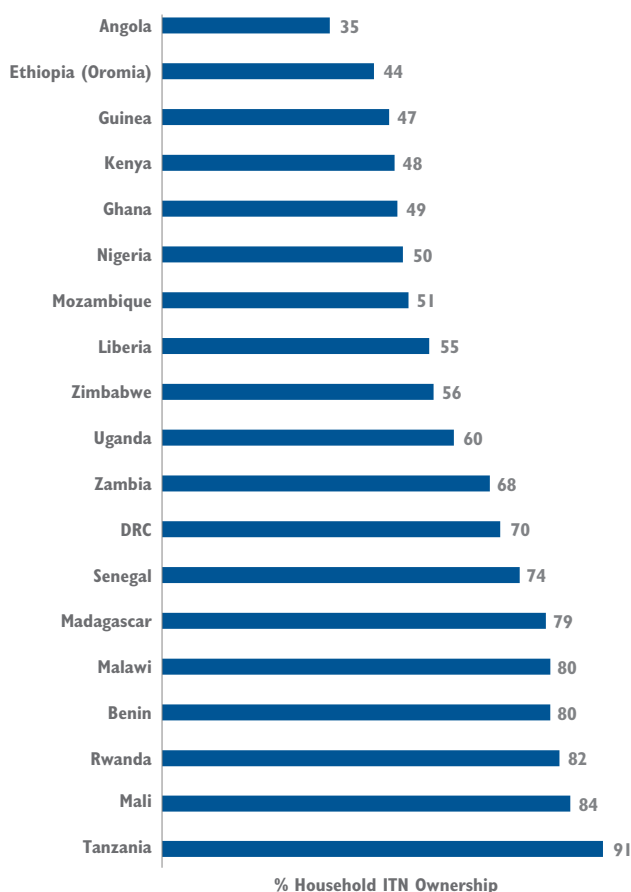
MAINTAINING HIGH NET OWNERSHIP – CONTINUOUS DISTRIBUTION

As more PMI focus countries reach target ITN coverage through mass campaigns, continuous distribution remains an important method of maintaining high ITN coverage over time. PMI encourages each country to assess its infrastructure, resources, and cultural norms to determine the most appropriate combination of distribution channels to maintain high coverage effectively and equitably. The most common channels are facility-based distribution to pregnant women through antenatal care (ANC) clinics and to chil-

dren through Expanded Program on Immunization (EPI) clinics. However, even together, these targeted channels are not sufficient to maintain universal coverage. PMI is supporting pilot studies of new channels, such as school- and community-based distributions, and has found that these channels can contribute to maintaining high ownership levels without over supplying ITNs; examples of this include:

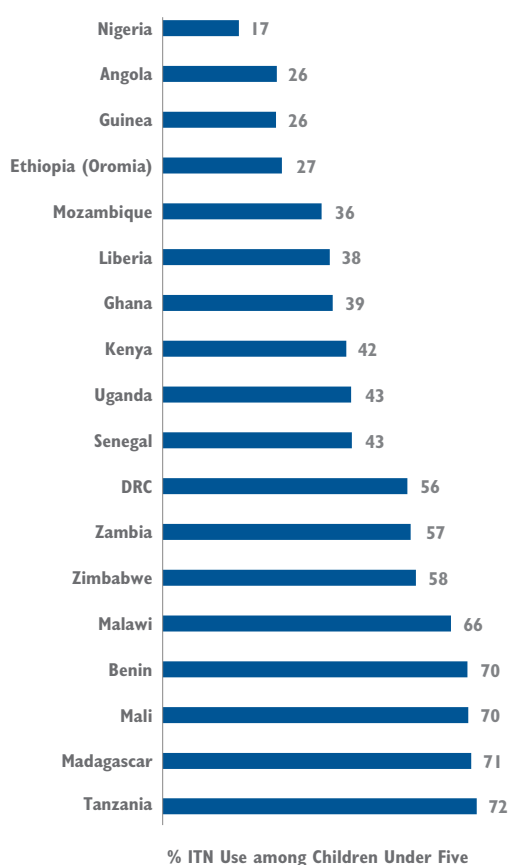
- Following the successful implementation of universal coverage campaigns in all ten regions, PMI sponsored a pilot in **Ghana’s** Eastern Region, focusing on sustaining high ITN ownership through continuous distribution at primary schools, ANC, EPI, and e-coupons in the commercial sector and workplace programs. The program was a success, with the proportion of households that had one net for two people increasing to 33–40 percent. In an evaluation to measure the impact of continuous distribution channels on household ownership of nets, PMI confirmed that Ghana’s channels made a significant contribution to household ownership and succeeded at ensuring that all households owned at least one ITN. In FY 2014, Ghana began scaling up this continuous distribution program nationwide.

FIGURE 1
Household Ownership of at Least One ITN



Data shown are from the most recent nationwide household survey conducted in the country. Household ownership is defined as the percentage of households surveyed that owned at least one ITN. Refer to Appendix 3 (Figure 2) for more detail.

FIGURE 2
ITN Use among Children Under Five



Data shown are from the most recent nationwide household survey conducted in the country as of 2014. ITN use is defined as the percentage of children under the age of five who slept under an ITN the night before the survey. Refer to Appendix 3 (Figure 3) for more detail.



- In 2014, PMI procured 1,218,900 ITNs to supply **Senegal's** expanded multi-channel routine distribution system. The health facility-based channel is established nationwide, with 233,560 ITNs distributed at ANC and EPI clinics. Following a pilot program supported by PMI in 2013, distribution conducted by community-based organizations contracted through health districts was expanded to five new regions this year and delivered 39,710 ITNs. School-based distribution was expanded to four regions and delivered 165,988 ITNs. Social marketing of ITNs through private sector outlets was expanded to include gas station shops, reaching a total of 122,106 ITNs sold.

MONITORING ITN DURABILITY

The current global recommendation is to replace ITNs every 3 years. However, some studies have shown that ITNs may physically deteriorate more quickly under certain field conditions, and that ITN longevity is strongly dependent on cultural and environmental conditions, factors that vary significantly across malaria-affected areas worldwide. In order to understand the effective life of ITNs and identify the causes of early ITN deterioration, PMI has monitored ITN durability and insecticide retention of various net brands in nine countries since 2008. In FY 2014, PMI began developing new guidance on routine ITN durability monitoring to be conducted after mass campaigns in all focus countries. Obtaining standardized durability data from all countries will enable PMI to analyze trends in ITN performance and identify when and where interventions are needed to increase ITN longevity. PMI continues to work with manufacturers and WHO on approaches to improve ITN durability.

PMI CONTRIBUTIONS AT THE GLOBAL LEVEL

PMI remains a key contributor to global malaria ITN activities. In FY 2014, PMI continued to support the Roll Back Malaria (RBM) Partnership through active participation and leadership in the Vector Control Working Group and supporting two work-streams: Continuous ITN Distribution Systems and Durability of ITNs in the Field. PMI contributes to the RBM Alliance for Malaria Prevention and WHO's Technical Expert Group on Malaria Vector Control. This ongoing engagement ensures that PMI-funded research and field experiences continue to inform global malaria prevention policies and ensures that state-of-the-art practices have the full endorsement and backing of the global community. PMI has also played an active role in a multi-stakeholder effort to streamline development, evaluation, and procurement of new vector control technologies, such as durable wall liners and new classes of insecticides.

RESEARCH AND INNOVATION

Improving ITN longevity: In FY 2014, PMI supported research in **Uganda** and **Nigeria**, which confirmed that exposure to behavior change communication (BCC) messaging about correct care of ITNs can maintain the quality and significantly improve the longevity of ITNs, more so than BCC messages on repairing nets after damage occurs. A combination of radio messaging, community gatherings, house-to-house visits, and school activities were used to promote preventive care. Increased exposure to BCC messaging was correlated with a more positive attitude on ITN care and an increase of up to 1 year in the effective lifetime of ITNs.

Maintaining ITN ownership: In FY 2014, PMI completed a school-based continuous distribution pilot in **Nigeria**. At the end of the pilot, local government areas with school-based distribution showed an increase in household ITN ownership from 50 percent to 75 percent, while ITN ownership in control areas had decreased. Importantly, school-based distribution was efficient: rather than oversupplying the community, it supplied households that had not received enough nets from the last campaign. It also proved to be flexible, as more students could be added to increase coverage as needed.

Addressing pyrethroid resistance: All ITNs currently approved by WHO are treated with a pyrethroid insecticide, and recent data from many African countries shows increasing pyrethroid resistance in malaria vectors. New ITNs that are more effective against resistant mosquitoes have been developed, using a synergist that inhibits the detoxification enzymes that are one of the major causes of pyrethroid resistance. PMI is currently supporting field trials of these synergist nets in a pyrethroid-resistant area of **Mali**. Forthcoming results will shape new PMI policy on where and how to deploy these new tools to prevent malaria.



Vector Control: Indoor Residual Spraying

HIGHLIGHTS

- In FY 2014, PMI-supported IRS programs sprayed more than 5 million houses in 13 PMI focus countries, protecting more than 18 million residents.
- More than 24,000 people were trained on IRS operations, building local capacity to implement safe and effective IRS programs and promoting sustainability.
- PMI is advancing the global IRS agenda by testing and deploying innovative tools and approaches to address challenges in IRS implementation, including testing and mainstreaming mobile technology to improve IRS operations, disposing of insecticides with mobile soak pits, and recycling plastic insecticide containers.
- PMI is fostering sustainability by building the capacity of ministries of health, local governments, and other relevant institutions to manage key aspects of IRS implementation on their own or with limited PMI support.

Indoor residual spraying (IRS) remains a primary malaria prevention tool. This proven, high impact intervention is designed to interrupt malaria transmission by killing malaria mosquitoes that rest on the interior walls of houses through the application of a residual insecticide. Under the umbrella of the national malaria control program (NMCP) strategy and leadership, the President's Malaria Initiative (PMI) supports implementation of a comprehensive package of IRS activities in 13 countries. This includes support for environmental compliance, entomological monitoring, procurement and supply chain management, training and operations, and monitoring and evaluation.

ENSURING SUSTAINABILITY OF IRS PROGRAMS

PMI has increasingly focused on building the capacity of ministries of health, local governments, and other relevant institutions to manage key aspects of IRS implementation on their own or with limited PMI support. This is consistent with PMI's goal of building sustainable and country-led IRS programs. As countries go through this transition, PMI places particular focus on environmental compliance and supervision. To facilitate this shift, 13 PMI focus countries have implemented country capacity assessments, and 9 developed capacity building action plans that identified key areas where PMI could strengthen the government's capacity with the goal of gradually transferring responsibilities to the government. For example, during fiscal year (FY) 2014:

- In **Senegal**, the government received direct funding from PMI to implement and manage directly all IRS community mobilization activities, and no external technical assistance was required. In addition, the University of Cheikh Anta Diop conducts all entomo-

logical monitoring activities and provides data to the NMCP to guide management of the IRS program.

- In **Benin**, the NMCP took sole responsibility for the monitoring and supervision of one of the nine IRS districts this year and continued to jointly monitor and supervise with PMI in the remaining eight. This monitoring and oversight role is expected to transition fully to the Benin NMCP in the next few years.

IMPROVING IRS THROUGH MOBILE PHONE TECHNOLOGY

Over the past fiscal year, PMI has also placed greater emphasis on the development of innovations aimed at making PMI-supported IRS programs even more cost-effective and high quality. PMI has developed several innovative ways to utilize mobile phone technology to improve implementation of spray operations. These successful innovations will be further scaled up in additional PMI countries in 2015. For example:

- **Benin, Senegal and Madagascar** piloted the use of mobile phones by spray team leaders to collect real-time information on important indicators, including spray progress, coverage, and insecticide use, among others. This allows supervisors, government officials, and PMI staff to use these data to make timely adjustments to spray operations while in the field.
- In **Angola, Senegal, and Madagascar**, supervisors were given user-friendly smart phones loaded with supervisory checklists to fill out during the spray campaign. When a supervisor indicated on the phone that a proper procedure was not adhered to, the



In Madagascar, an environmental compliance officer shows spray operators how to build a mobile soak pit before beginning to spray.

Peter Chandonait, Abt Associates

Innovation Drives Improvements in IRS Environmental Compliance

PMI's IRS programs undertake robust environmental compliance procedures to ensure operations have a minimal impact on the environment from start to finish. During the end-of-day clean-up process, the liquid waste that is generated from rinsing spray tanks and washing personal protective equipment that have come in contact with insecticide is removed using large, in-ground filters known as soak pits. In most spray areas, soak pits are permanent installations located in a central area that is accessible to spray teams at the end of their work day.

Mobile soak pits can be installed almost anywhere and consist of a large container with layers of stone, activated carbon, and sawdust that is placed in the ground. After spray operations and clean-up is complete, the mobile soak pit is dug up, removed, and is ready for use at the next location, while the hole for the soak pit is refilled to restore the site to its original condition. As a result, spray operations leave as close to a zero environmental footprint as possible in spray areas.

To increase efficiency and improve environmental safety, PMI piloted the use of mobile soak pits during the 2013–2014 IRS campaign in remote areas of Madagascar, where difficult roads require spray operators to access villages by foot. The mobile soak pits enabled spray operators to clean up immediately after completion of daily spraying, rather than having to travel to a central location. The mobile pits also improved control over potentially hazardous wastes because the wastes remained in the mobile soak pit, rather than in the ground.

The mobile soak pits also provided operational flexibility and reduced construction and labor costs as compared with building permanent soak pits. For the 2013–2014 IRS campaign in Madagascar, PMI used 36 mobile soak pits, compared to the 500 permanent soak pits built for the 2012–2013 IRS campaign. In FY 2014, PMI expanded the mobile soak pit pilot to include Ethiopia, Mali, and Senegal. Mobile soak pits are being evaluated and, based on results, PMI may expand this innovation further in 2015.

phone automatically provided a prompt on what corrective action needed to be taken. This helped to ensure that all IRS activities were systematically supervised, and corrective solutions were immediately implemented.

- In **Benin**, daily text messages were sent to spray operators during the campaign that contained reminders about performance and key information, such as the importance of always using full personal protective equipment.
- **Mali** piloted the use of a short messaging system (SMS) as a means to rapidly disseminate IRS and malaria reminders to community members in spray areas.
- Lastly, in **Madagascar**, thousands of seasonal workers were paid using an innovative mobile banking system, thus streamlining operations and reducing costs.

USING CHALLENGES TO FUEL NEW INNOVATIONS

In many PMI focus countries, spray operators have to travel long distances to reach remote villages. It is often not practical for spray operators to travel back and forth to the central IRS operational base to dispose of insecticide waste and clean their spray equipment, which is traditionally done in a cement or earthen soak pit. To address this challenge, PMI developed a mobile soak pit, which can travel with spray teams for use in remote locations (see Madagascar story at left for more details).

A new challenge has arisen as an increasing number of PMI focus countries transition from using pyrethroid and carbamate classes of insecticides to novel and longer-lasting organophosphate formulations. While the previously-used insecticides were contained in plastic packaging, which was carefully incinerated at the end of spray campaigns, the new insecticide is packaged in plastic bottles, which cannot be disposed of in the same manner. To minimize the risk to both the environment and communities, PMI devised a unique solution: recycling the bottles into usable items. For example, in **Benin** and **Madagascar**, the plastic bottles are recycled into paving blocks while **Rwanda** and **Senegal** have also found local solutions to recycle IRS-related waste into useful items, such as garbage pails and scrubbing brushes.

GATHERING DATA TO DRIVE DECISION-MAKING

With widespread insecticide resistance forcing many IRS programs to shift to more expensive insecticides and thereby decrease their coverage targets, PMI continues to invest in entomological and epidemiological monitoring to best target IRS programs. PMI has been a global leader in supporting countries to use entomological and epidemiological data to drive important IRS decisions, such as where to spray and which insecticide to use. In many countries, local research institutions are contracted to implement these monitoring activities. For example, during FY 2014:

- In **Zambia**, PMI used mapping technology, paired with health facility malaria case data, to identify malaria hot spots within districts that were targeted for spraying. This information was coupled with population and structure density data to determine the most cost-effective areas to spray.

- In **Ghana**, data collected with PMI support detected insecticide resistance to pyrethroids in PMI's spray areas, which prompted a switch to the new long-acting organophosphate insecticide in 2013. After the switch, a substantial reduction in entomological inoculation rates, which measure exposure to infectious mosquitoes, was seen after PMI's IRS program began. In addition, the prevalence of parasitemia in children under five significantly decreased by more than half, from 48 percent in 2012 to 21 percent in 2013. Other health indicators also improved, such as the proportion of children with anemia and the percentage of children who tested positive for malaria with a rapid diagnostic test.

PMI CONTRIBUTIONS AT THE GLOBAL LEVEL

PMI continues to engage with key partners within the global community, including the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund), Roll Back Malaria (RBM), World Health Organization's (WHO's) Technical Expert Group and Vector Control Advisory Group, and the private sector. As the two main funders of IRS, PMI and the Global Fund are making efforts to harmonize decision-making surrounding insecticide procurement and adherence to quality assurance standards.

Through active participation in the RBM Vector Control Working Group, PMI shares lessons learned and best practices from country

programs and helps to tackle important challenges facing the vector control community.

At global forums such as the American Society for Tropical Medicine and Hygiene annual meeting and the Multilateral Initiative on Malaria meeting, PMI disseminates relevant data that informs spray programs globally and makes all such data available on PMI's website.

Lastly, PMI continues to engage with GBCHealth and *Santé en Entreprise* to promote the inclusion of IRS and malaria control activities within private sector programs in Africa.

RESEARCH AND INNOVATION

To address operational questions such as determining which geographical areas to target for focal spraying and the optimal combination of vector control interventions, PMI supports operational research and actively engages with other donors, research and academic institutions, and the WHO. For example, PMI is currently partnering with a local research institute in Madagascar, *Institut Pasteur*, to implement an operational research study to identify simple and cost-effective methods to determine the intensity of malaria transmission in order to prioritize where to spray.

Women are becoming more involved in IRS activities, and in some countries, they are moving beyond the traditional roles of washers and cooks to become managers and spray operators.

Jessica Scranton, Abt Associates





Vector Control: Entomological Monitoring

HIGHLIGHTS

- PMI has supported its focus countries to successfully establish entomological monitoring capacity in order to strengthen the knowledge base available to inform vector control policy and decision-making.
- In FY 2014, across PMI's 19 focus countries, data on mosquito density and behavior were collected at 119 sentinel sites, and data on insecticide resistance were collected at 190 sites. PMI collects these data because increased insecticide selection pressure from scaled-up IRS and ITN programs can lead to changes in the species composition and behavior of malaria mosquitoes, as well as changes in susceptibility to insecticides.

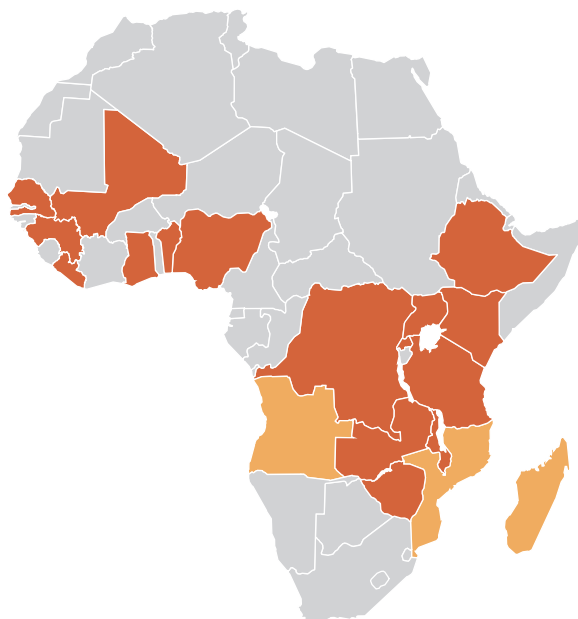
The President's Malaria Initiative (PMI) supports the two main recommended vector control interventions: insecticide-treated mosquito nets (ITNs) and indoor residual spraying (IRS). Since both of these prevention measures depend on the ability of insecticides to kill, reduce the lifespan of, or repel mosquitoes that transmit malaria, understanding the composition of the mosquito vector population, mosquito behavior, and mosquito insecticide

resistance are critical to help target interventions and maintain their continued effectiveness. All 19 PMI focus countries and the Mekong Subregion conduct regular entomological monitoring, and PMI is continuing to invest in scaling up entomological monitoring and entomological capacity building, working with national research institutes and national malaria control programs (NMCPs). In fiscal year (FY) 2014, data on mosquito density and behavior was

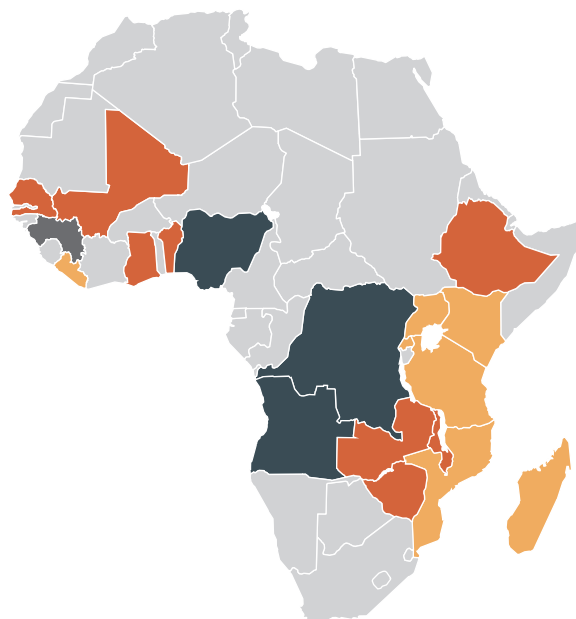
FIGURE 3

Current Status of Resistance to Pyrethroid and Carbamate Insecticides among Malaria Vectors in PMI Focus Countries, 2014

PYRETHROID RESISTANCE STATUS



CARBAMATE RESISTANCE STATUS



■ SUSCEPTIBLE ■ POSSIBLE RESISTANCE ■ RESISTANCE ■ NO DATA

collected at 119 sentinel sites, and data on insecticide resistance was collected at 190 sites across PMI's 19 focus countries in Africa. In collaboration with NMCPs, PMI is at the forefront of building entomological monitoring capacity throughout sub-Saharan Africa in order to strengthen the knowledge base available to inform vector control policy and decision-making.

SUPPORTING CAPACITY BUILDING

PMI supports formal and on-the-job training of entomology technicians. PMI has supported entomological trainings in all PMI focus countries and the Mekong Subregion over the last few years. In FY 2014, 13 countries conducted such trainings. For example:

- In **Angola**, PMI supported a 6-day entomological training for 38 participants, in preparation for an insecticide susceptibility study that will be implemented in 9 provinces during 2015. Participants included provincial and municipal malaria focal points from the provinces that will be covered by the study.
- In **Burma**, 45 participants from the NMCP were trained during a two-week entomology short-course jointly organized by the Japan International Cooperation Agency and PMI. Two additional 5-day workshops were conducted for 15 NMCP entomologists and assistant entomologists, focusing on hands-on training in testing procedures to identify, monitor, and manage resistance to insecticides among malaria vectors, as well as detect sporozoites in mosquitoes.

- In **Nigeria**, PMI supported a 3-day training for principal investigators from research institutions and entomology technicians on basic entomological monitoring techniques including collecting adult mosquitoes using pyrethrum spray catches and U.S. Centers for Disease Control and Prevention (CDC) light traps, larval sampling, conducting insecticide susceptibility tests with CDC bottle bioassays, and recording and reporting data. There were 22 participants at the training – 18 from sentinel sites and 4 from the national malaria elimination program.

- In **Uganda**, PMI supported a 3-day training for district vector control personnel on malaria vector bionomics, identification, surveillance, and use of the CDC bottle bioassay for resistance testing. More than 40 people including primary investigators and technicians attended.

ESTABLISHING FUNCTIONING INSECTARIES

PMI also has supported the refurbishment of insectaries or the establishment of container insectaries (i.e., converted 40-foot shipping containers) in countries previously lacking dedicated insectary buildings. PMI has supported the establishment of container insectaries in four countries (**Angola, Mali, Liberia, and Mozambique**), with the **Liberia** container insectary becoming functional in FY 2014. Overall, 18 of 19 PMI focus countries have functioning insectaries, which are needed for the rearing of mosquitoes for quality control of IRS and ITNs and for insecticide resistance testing.

Mosquito identification is one component of entomological monitoring activities that are supported by PMI.

Brant Stewart, RTI





This insectary is one of PMI's contributions to building capacity for entomological monitoring in Liberia.

Jerry Gardiner, USAID/Liberia

Empowering Liberia to Understand the Ecology of Local Malaria Vectors

Malaria is the major cause of morbidity and mortality in Liberia. The disease accounts for an estimated 33 percent of all inpatient deaths and 41 percent of deaths among children under five. Monitoring local malaria mosquito vector populations is an important component of efforts to reduce the morbidity and mortality associated with this deadly disease, but Liberia has lacked this capacity for much of the past decade. Assistance from PMI has helped to rebuild national capacity for entomological monitoring in support of Liberia's NMCP.

Prior to Liberia's civil war, the Liberia Institute for Biological Research laboratory made significant contributions to the fields of medicine and public health, but their facilities were damaged during the war. Starting in 2008, to support malaria control efforts, the NMCP began working to establish a functional insectary – a facility to rear and monitor malaria in mosquito populations – on the Liberia Institute for Biological Research campus. However, the location of the facility, far from NMCP offices, combined with lack of reliable power and water supply, presented formidable barriers to operating an insectary, which requires daily access to feed, raise, and sustain mosquitoes for testing.

To address these challenges, PMI supported the Liberian Government to establish an “insectary-in-a-box” using two converted shipping containers, modeled after a similar approach implemented in other PMI focus countries. In FY 2014, PMI helped to establish the new insectary directly inside the NMCP compound, just a short walk from the offices of technical staff. With ready access to the laboratory, technicians can now monitor the mosquito population more closely to ensure their survival and easily conduct insecticide resistance tests.

Establishment of the laboratory on-site has allowed the NMCP to begin routine surveillance at two designated sites. Liberian technicians now use the laboratory to conduct testing against the four current classes of insecticides to determine resistance or susceptibility in the majority of counties within a 1-day drive of Monrovia. Information gained from routine surveillance and insecticide-resistance mapping will provide local data that can be used to assess the impact of long-lasting ITNs, and inform decisions around future use of insecticides for IRS.

The new insectary established with PMI support represents a success in building Liberian capacity to lead and manage malaria control efforts; despite the Ebola crisis, the facility continued its operations without external entomological staff support.

MANAGING INSECTICIDE RESISTANCE

Through its support for entomologic monitoring efforts, PMI has played a significant role in mapping and sharing insecticide resistance data globally on the four classes of insecticide currently approved for public health use in all PMI countries. Documentation of expanded resistance to pyrethroid class insecticides is particularly worrisome as pyrethroids are the only insecticides currently approved for use on ITNs. But PMI is actively monitoring this evolving situation. All PMI focus countries now have sites with either confirmed or suspected resistance to pyrethroid insecticides (see Figure 3). It is not yet fully understood how current levels of pyrethroid resistance have an impact on the effectiveness of ITNs. However, PMI is working with countries to design and implement resistance management strategies that involve conducting IRS with non-pyrethroid insecticides. Because growing resistance to other insecticide classes is also concerning, PMI works with countries to plan rotations of insecticide classes for IRS to prevent or mitigate resistance.

PMI CONTRIBUTIONS AT THE GLOBAL LEVEL

Because PMI recognizes the urgent need for the development of new insecticide-based products for public health use, PMI collaborates with and provides support to the Innovative Vector Control Consortium, a product development partnership that aims to advance three insecticide candidates to the final stages of development by 2019. PMI also engages with the Roll Back Malaria Vector Control Working Group and World Health Organization around technical issues concerning the monitoring and management of insecticide resistance.

RESEARCH AND INNOVATION

Durable wall liners are a potential new alternative to IRS. They are designed to last for a minimum of 3 years. PMI will soon be testing a second generation durable wall lining product in Tanzania in a cluster randomized trial. This second generation wall liner is made of a durable, breathable fabric and is incorporated with a combination of two non-pyrethroid insecticides not currently used in public health. The trial is being implemented in Muheza District in northeastern Tanzania where malaria is intense and perennial and offers an opportunity to test a product that may be useful in managing pyrethroid resistance.



Malaria in Pregnancy

HIGHLIGHTS

- ITN use among pregnant women continues to increase in most PMI focus countries and has risen from a median of 17 percent to 41 percent over the past 9 years.
- Median coverage of two doses of IPTp has increased more modestly from 13 percent to 25 percent during the same period.
- Over the past year, more than 27,000 health workers were trained in IPTp with PMI's support.
- To fill commodity gaps, PMI procured more than 13 million SP treatments in FY 2014.
- PMI is supporting a number of efforts aimed at improving the metrics used to monitor success in malaria in pregnancy programming, including revisions to household survey and facility level data collection tools used across malaria endemic countries.

Malaria infection during pregnancy is a major threat to the health of mothers and their babies. Approximately 125 million pregnant women are at risk annually. Complications of malaria infection result in up to 10,000 maternal deaths per year. Malaria-associated premature delivery and low birth weight in newborns contribute to approximately 200,000 infant deaths each year.

Prevention of malaria in pregnancy has been shown to significantly reduce the risk of maternal anemia, low birth weight, and perinatal deaths.^{1,2} In line with World Health Organization (WHO) guidelines, the President's Malaria Initiative (PMI) supports a three-pronged approach to reducing malaria in pregnancy: (1) provision and promotion of the use of insecticide-treated mosquito nets (ITNs); (2) administration of intermittent preventive treatment in pregnancy (IPTp) with sulfadoxine-pyrimethamine (SP); and (3) prompt diagnosis and appropriate treatment of malaria and anemia. To improve the coverage of malaria in pregnancy interventions, PMI supports implementation of these activities through integrated antenatal care (ANC) platforms, including focused antenatal care,³ and promotes collaboration between national malaria control, reproductive health, and maternal and child health (MCH) programs in focus countries.

ITNs are crucial for protecting women and their fetuses throughout pregnancy and especially during the first trimester of pregnancy, when IPTp is contraindicated. To ensure that pregnant women receive ITNs as early as possible in their pregnancy, PMI supports coverage of ITNs through mass campaigns as well as continuous distribution during ANC visits. ITN use among pregnant women continues to increase in most PMI focus countries and has risen from a median of 17 percent to 41 percent (range: 16–75 percent) (see Appendix 3). While some countries (**Mali, Rwanda, and Tanzania**) are approaching the 85 percent PMI target, others are still scaling up (see Figure 4).

To date, median coverage of pregnant women with at least two doses of IPTp in PMI focus countries has increased more modestly from a baseline of 13 percent to 25 percent (range: 14–73 percent) (see Appendix 3). Although there are remaining challenges, scale-up has been most successful in **Ghana and Zambia**, which have reached 65 percent and 73 percent coverage, respectively (see Figure 5).

Recognizing challenges in improving IPTp coverage, WHO revised its guidelines for IPTp in 2012 to recommend providing SP at every scheduled ANC visit after the first trimester, with doses administered at least 1 month apart. If properly implemented, this approach should increase the number of pregnant women who will receive at least two doses of SP.

PMI works across all focus countries to prevent malaria in pregnancy by:

- Procuring and strengthening the supply chain for SP, ITNs, and other essential commodities.
- Training and supervising health workers on IPTp guidance.
- Integrating malaria activities with focus countries' MCH and reproductive health programs.

1. ter Kuile, F. O., van Eijk, A. M., et al. (2007). Effect of Sulfadoxine-Pyrimethamine Resistance on the Efficacy of Intermittent Preventive Therapy for Malaria Control During Pregnancy. *Journal of the American Medical Association*. 297 (23): 2603-2616.

2. Eisele, T. P., Larsen, D. A., et al. (2012). Malaria prevention in pregnancy, birthweight, and neonatal mortality; a meta-analysis of 32 national cross-sectional datasets in Africa. *The Lancet* 12 (12): 942-949.

3. Focused antenatal care, a comprehensive package of ANC services, strives to ensure healthy pregnancies by identifying pre-existing health conditions; detecting complications early; promoting health and disease prevention, including delivering IPTp and ITNs; and preparing for birth and planning for possible complications.

FIGURE 4
ITN Use among Pregnant Women

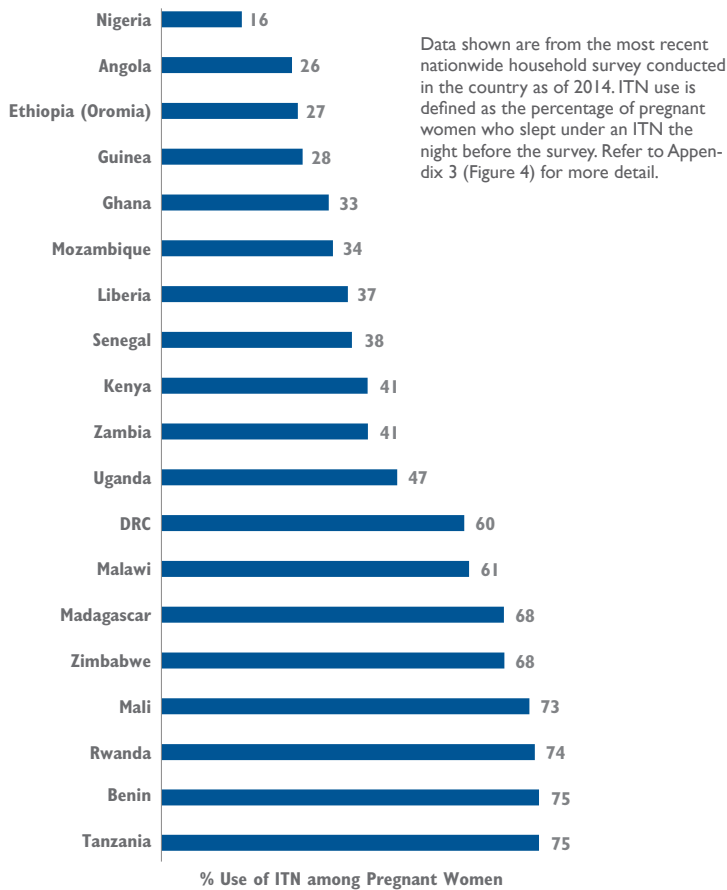
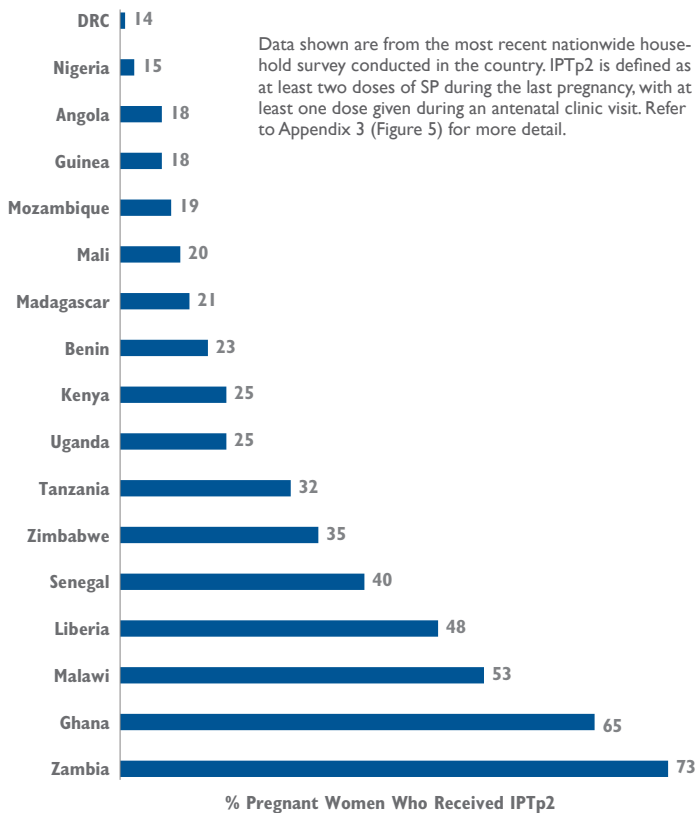


FIGURE 5
IPTp2 Received by Pregnant Women



- Implementing behavior change communication (BCC) activities to improve uptake of IPTp and ITNs by pregnant women.
- Contributing to global policies on malaria in pregnancy.
- Supporting operations research to improve intervention coverage.

HEALTH SYSTEMS STRENGTHENING AND CAPACITY BUILDING

PMI is a major contributor to the strengthening of health systems through its support to MCH programs, including the integrated training of antenatal care providers, promoting ANC attendance through community health workers, and providing SP and related supplies. PMI also provides support to countries to strengthen drug management systems, including for malaria in pregnancy commodities, and to health management information systems used to monitor progress of these programs.

PMI supports the integrated training of healthcare workers on the implementation of focused antenatal care, including the prevention of malaria in pregnancy through IPTp. These training activities are designed in collaboration with staff from national malaria control, reproductive health, and MCH programs within ministries. Over the past year, more than 27,000 health workers were trained in IPTp with PMI's support. Examples of health systems strengthening include:

- In **Senegal**, promising evidence-based approaches to increase the uptake of SP have been implemented in 15 districts in the Dakar and Thies regions with PMI support. In these areas, IPTp2 coverage doubled from an average baseline of 30 percent in 2013 to an average of 60 percent in early 2014. This approach included conducting formative research with health workers and community members to develop key messages for BCC activities as well as providing refresher training to improve health workers' understanding of the national IPTp policy.
- In **Benin**, the national policy supports free distribution of SP and long-lasting ITNs to pregnant women presenting at ANC clinics. In fiscal year (FY) 2014, PMI conducted refresher training of 543 public health workers and training of 156 private health workers on IPTp. Furthermore, PMI supported the Ministry of Health to supervise health workers to improve quality of services, to strengthen logistics management for malaria in pregnancy commodities, to improve BCC activities to promote ANC attendance, procure approximately 1 million treatments of SP, and educate pregnant women and communities on the risks of malaria in pregnancy and the benefits of IPTp.
- In **Mali**, PMI procured 1.8 million SP treatments, trained 471 health workers on the new malaria in pregnancy strategy, and enhanced communications targeting religious leaders, traditional leaders, grandmothers, women in positions of authority, women of childbearing age, and men. PMI helped produce a technical guide for providers with key malaria in pregnancy BCC messages; developed information, education, and communication outreach materials for community health volunteers, and radio and TV campaigns on IPTp.



A health worker observes as a pregnant woman swallows a dose of SP during an ANC visit in Nigeria.

HC3 Project

- In **Nigeria**, PMI facilitated the review of the national guidelines and strategy for malaria prevention during pregnancy to include new WHO guidelines on IPTp. With PMI's support, 1,630 health workers were trained on this new malaria in pregnancy strategy as well as interpersonal communication. PMI also sponsored key staff from the National Malaria Elimination Program and the Reproductive Health unit of the Federal Ministry of Health to attend the RBM Malaria in Pregnancy Working Group meeting held in Ghana to facilitate peer learning. To improve malaria in pregnancy coordination, PMI also supported the inauguration of state-level malaria in pregnancy working groups in nine states.
- PMI's program in **Zambia** trained 504 healthcare workers in IPTp, trained provincial and district-level clinical care teams to provide supervision for IPTp, and funded behavior change communication to encourage early and frequent ANC attendance to receive IPTp. The national program is updating guidelines for IPTp to recommend preventive treatment as early as possible during the second trimester of gestation, with subsequent monthly doses given up to the time of delivery. The 72 percent national coverage of at least two doses of IPTp achieved in Zambia is among the highest in the Africa region.

INCREASING SP AVAILABILITY

In order to meet country-level needs for IPTp drugs and commodities, PMI funds the procurement and distribution of SP drugs to antenatal clinics. In FY 2014, PMI procured more than 13 million SP treatments for 7 focus countries. To improve forecasts and minimize stockouts, PMI supports all focus countries to track and report on availability of commodities, including SP as appropriate, at the central level on a quarterly basis. As a result of PMI's efforts to emphasize routine monitoring of central SP stocks and routine distribution to and management of stocks at peripheral health facilities, as well as its procurement of SP to fill gaps, the number of reported SP stockouts has decreased. PMI also works to identify and address other bottlenecks in the supply chain, including provi-

sion of clean water and drinking cups at health facilities to promote direct observation of IPTp administration.

- In **Liberia**, the national quantification of SP was revised to reflect the expected increased demand with the implementation of the new IPTp policy. PMI supported nationwide distribution of SP, procuring and distributing some 273,660 treatments. Ministry of Health data indicate that, in PMI-supported counties (Bong, Nimba, and Lofa), an average of 57 percent of pregnant women were receiving IPTp2 as of December 2013 (IPTp2 coverage had been 48 percent, according to the 2013 Demographic and Health Survey [DHS]).
- In FY 2014, **Nigeria** identified severe SP stockouts as a key factor limiting IPTp uptake in the country. In response, PMI supported the distribution of 535,162 SP treatments and assisted state governments to quantify SP needs in each state, better budget and manage SP procurement and supply, and thus minimize future stockouts.

INTEGRATION WITH MATERNAL, CHILD, AND REPRODUCTIVE HEALTH PROGRAMS

Malaria in pregnancy interventions are delivered in an integrated fashion through routine antenatal care. Malaria control programs in PMI focus countries work closely with Reproductive Health programs to develop policies and guidance and integrated training modules for health workers. Over the past year, more than 27,000 health workers were trained in malaria in pregnancy interventions, including IPTp, with PMI's support. Examples of PMI-supported training activities during FY 2014 include:

- More than 88 percent of women in the **Democratic Republic of the Congo (DRC)** attended ANC at least once during their pregnancy, providing the potential for administration of IPTp, distribution of ITNs, and provision of HIV and AIDS-related services. During FY 2014, PMI purchased 1,600,000 ITNs for routine dis-



Improving Malaria in Pregnancy from the Ground Up in Guinea

To increase uptake of IPTp, PMI supported the NMCP to revise the Guinea malaria in pregnancy guidance in accordance with the latest WHO recommendations. Participants updated the training manuals and protocol for malaria prevention during pregnancy. PMI trained 18 national ANC staff trainers, 1,052 chiefs of health centers and heads of health posts, ANC staff, and staff from private facilities on IPTp using the revised manual. PMI also distributed approximately 25,425 SP treatments to cover the 19 PMI-supported prefectures and Global Fund zones.

To complement the revised policies and extend access to malaria in pregnancy services, Guinea developed an approach using community health workers (CHWs) to promote ANC attendance. A total of 680 CHWs were trained to deliver targeted messages on ANC (including use of long-lasting ITNs, sanitation, early care-seeking) and IPTp. These messages were integrated into the CHW training manual, and CHWs were encouraged during their home visits to verify whether pregnant women were: (1) keeping their ANC appointment; (2) receiving SP after the 13th week; (3) sleeping under a net; and (4) seeking early care in case of fever. The CHWs were equipped with information, education, and communication materials and data collection tools. They received forms to monitor their home visits and notebooks to record their daily activities. The CHWs conducted 75,606 home visits and were able to reach 425,748 people (of whom 233,504 were women).

In the context of the ongoing Ebola epidemic in Guinea, it is even more critical than ever to minimize febrile illness particularly among pregnant women, a high-risk group for malaria requiring prompt and effective treatment. More comprehensive coverage of malaria interventions should result in fewer episodes of malaria.

tribution through ANC and vaccination clinics and trained 2,210 health workers according to the new ministry of health guidelines (recommending four SP doses during pregnancy). In addition, 508,904 SP treatments for IPTp were distributed to pregnant women attending ANC in PMI-supported health zones.

- In **Mali**, with support from PMI, a malaria in pregnancy working group, composed of staff from the division of Reproductive Health of the National Directorate of Health, the National Malaria Control Program (NMCP) and malaria donor organizations, meets regularly to identify priorities and harmonize malaria in pregnancy programming. In particular, this group has helped to facilitate integration of the new WHO recommendations regarding IPTp into reproductive health provider training programs.

IMPROVING METRICS FOR MONITORING AND EVALUATION

Monitoring malaria in pregnancy activities presents some unique challenges. Traditional cross-sectional survey methods do not adequately capture data over the full duration of a pregnancy. Routine information systems are similarly not configured to follow the scope of a woman's care through pregnancy. Recognizing that data collection issues can hamper our ability to track progress and scale-up of malaria in pregnancy activities, PMI undertook a number of efforts to improve monitoring and evaluation for malaria in pregnancy programming. In order to improve the key survey tools, PMI has helped revise the core questionnaires and tabulation plans for both household and facility-level surveys. These revisions will enable countries to collect data on the increased number of IPTp doses recommended by WHO, improve measurement of quality of ANC care, and track the source of ITNs used by pregnant women, including those given during routine antenatal care. PMI also contributed to an assessment of the content and quality of data collected on MCH through routine information systems in 13 priority countries. One issue that came to light through this assessment was the fact that most routine information systems in PMI focus countries have not yet been redesigned to capture the 3+ doses of IPTp that are now recommended. The results of the assessment will be used to guide future investments in health information systems.

To address the concerns around low coverage in many countries, PMI supported a number of studies this year to better understand the obstacles to scale-up of malaria in pregnancy interventions. These studies looked at patterns of ANC use to identify “missed opportunities” for IPTp. In particular, one study examined the successful efforts to reach high coverage of tetanus toxoid vaccination through ANC visits to see if lessons could be learned for IPTp scale-up. The data point to the fact that ANC usage patterns in terms of timing of initiation and number of visits in most countries are sufficient to allow for two or more doses of SP during pregnancy, so the emphasis has shifted to improving provider training and supervision. Studies supported in FY 2014 included, for example:

- In **Kenya**, PMI partners worked with community health volunteers to identify and track pregnant women to determine the number of SP doses taken during the entire pregnancy period. These data allowed local health authorities to track progress and identify areas that required strengthening. This led to the development of a standardized data collection tool that can be used routinely by community health volunteers during their monthly home visits.

- In **Malawi**, a qualitative study was conducted in tandem with a large facility survey to collect information on the integration of HIV and malaria services into the ANC platform. The findings highlighted the inconsistent understanding among health care workers regarding IPTp dosing and pointed to a need to work more closely with prevention of mother-to-child transmission providers to ensure that HIV-positive women also benefit from malaria prevention services.

GLOBAL CONTRIBUTIONS

PMI contributes to the development and implementation of global malaria in pregnancy policies through partnerships with WHO and Roll Back Malaria (RBM). During the past year, PMI drew on data collected across all PMI focus countries and lessons learned from the field to contribute substantially to the consensus statements “Continuous distribution of long-lasting insecticide-treated nets in Africa through Antenatal and Immunization Services: A Joint Statement by the RBM Working Groups on Malaria in Pregnancy, Vector Control and the Alliance for Malaria Prevention” and “Malaria in Pregnancy Working Group Consensus Statement on Folic Acid during Pregnancy.” PMI continued its activities as a core member of the RBM Malaria in Pregnancy Working Group in FY 2014, contributing to the prioritization and implementation of the working group’s annual workplan. PMI is also represented on WHO’s Evidence Review Group on Intermittent Preventive Treatment in Pregnancy.

In 2014, PMI supported RBM to produce a report in the Progress and Impact Series entitled “The Contribution of Malaria Control to Maternal and Child Health.” This report demonstrates the important contributions that malaria in pregnancy program-

ming make toward reducing maternal and neonatal morbidity and mortality and achieving Millennium Development Goals 4, 5, and 6. The report highlighted research indicating that malaria in pregnancy interventions contribute to an 18 percent decrease in neonatal mortality and a 21 percent decrease in low birth weight. The report also emphasized the need for overcoming obstacles and scaling up malaria in pregnancy interventions to improve coverage, including an increased emphasis on harmonizing malaria control and reproductive health programming.

PMI provides support to WHO’s Africa Regional Office to provide technical assistance to countries to help them revise their malaria in pregnancy policies to be in line with WHO guidance and to update training and supervision materials.

RESEARCH AND INNOVATION

PMI supports an operations research portfolio aimed at collecting data on the obstacles to scaling up all facets of malaria in pregnancy prevention and treatment, as well as testing innovative strategies to improve access and use malaria in pregnancy services, including:

- In **Kenya**, PMI is supporting a study of an innovative “screen-and-treat” approach for pregnant women compared to the traditional IPTp with SP. This approach involves screening pregnant women with a rapid diagnostic test at each antenatal care visit and treating them with dihydroartemisinin-piperaquine if they are found to have malaria. This strategy could prove useful in settings where resistance to SP is high. The study is ongoing, and results are expected in the coming year.

PMI Support for Innovative Malaria Control Strategies: Seasonal Malaria Chemoprevention

Seasonal malaria chemoprevention (SMC) is an innovative approach to prevent malaria among young children. In areas where malaria transmission is highly seasonal, this new WHO-recommended malaria control intervention involves administering a curative dose of a combination of antimalarial drugs monthly to children without symptoms of malaria aged 3–59 months during the period of high malaria transmission to reduce the risk of contracting malaria in this age group. In FY 2014, PMI supported the pilot implementation of SMC in **Mali** and **Senegal**:

- In 2014, a SMC campaign was implemented in 21 districts in **Mali**, covering 1,424,826 children under five. In one of these districts – the Kita District in the Kayes Region – PMI conducted a case control study to evaluate the implementation and impact of this new malaria intervention. The study reached and treated 103,681 children under five. Preliminary results show an 82 percent reduction in confirmed malaria cases in the study district compared to the control district.
- In **Senegal**, PMI technical and financial assistance supported the implementation of a SMC campaign in four regions. While PMI directly managed commodity procurements, PMI support for operational costs for the campaign were channeled to the NMCP for their direct management. By the third month, 616,736 children had received at least one dose, of the estimated 624,139 eligible children, resulting in 98 percent coverage. Sentinel sites in the SMC zone reported a 50 percent decrease in the number of cases among children under the age of five and a 60 percent decrease in the number of cases among children aged 5–9 years. Two regional hospitals in the SMC zone reported decreases of 68 percent and 76 percent in the number of children hospitalized with severe malaria and decreases of 78 percent and 80 percent in the number of deaths of children hospitalized with malaria.

3. MALARIA DIAGNOSIS AND TREATMENT



Maggie Hallahan Photography

HIGHLIGHTS

- To date, PMI has procured more than 318 million ACTs and more than 174 million RDTs to support appropriate malaria case management in focus countries.
- In FY 2014, PMI supported training of more than 85,000 health workers in malaria case management and more than 58,000 health workers in diagnostic testing for malaria.
- Integrated Community Case Management programs to diagnose and treat malaria, diarrhea, and pneumonia were supported in 18 PMI focus countries.
- Supply chain strengthening has led to steady increases in the number of PMI focus countries (90 percent in FY 2014) with sufficient ACTs stock available at the central level.

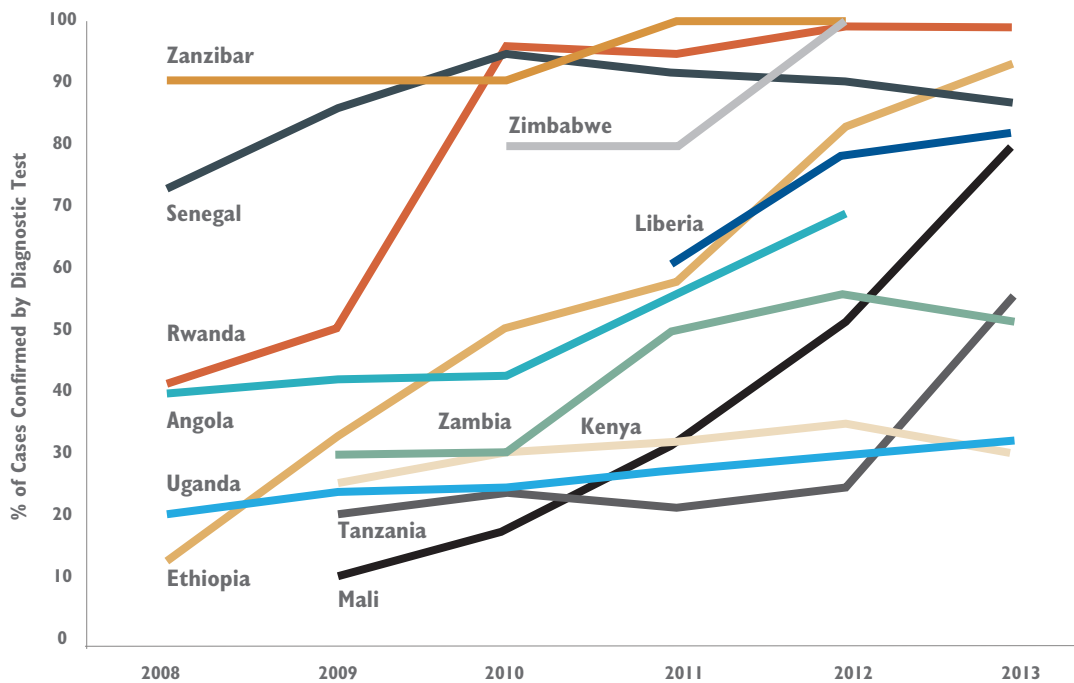
Effective case management remains an essential component of malaria prevention and control. The President's Malaria Initiative (PMI) supports universal diagnostic testing and rapid treatment with a recommended antimalarial drug when a test is positive. In all focus countries, PMI supports the scale-up of diagnostic testing for malaria at the health facility and community levels to ensure that all patients with malaria are properly identified and receive a quality-assured and recommended malaria treatment. This approach ensures that only confirmed malaria cases receive treatment for malaria, facilitates the detection and appropriate treatment of other causes of fever, and strengthens malaria surveillance systems. Through the efforts of PMI, partners, and national malaria control programs (NMCPs), the proportion of suspected malaria cases that are confirmed with laboratory tests and treated with a recommended antimalarial drug combination continues to increase in nearly all focus countries (Figure 1).

PMI works closely with ministries of health to build capacity and scale up malaria case management by supporting all elements of a comprehensive program to diagnose and treat patients appropriately for malaria, including:

- Preparation of up-to-date diagnosis and treatment policies, guidelines, training curricula, and supervision materials
- Procurement and distribution of essential commodities and equipment, including microscopes, laboratory reagents and supplies, rapid diagnostic tests (RDTs), severe malaria drugs, and artemisinin-based combination therapies (ACTs)
- Support for strengthening of pharmaceutical and supply chain systems
- Supervision and training of health workers at all levels of the health system, including in the community
- Development and support for quality assurance systems for diagnostic testing and anti-malarial drug efficacy monitoring
- Development and implementation of behavior change communication (BCC), interpersonal communication, and community mobilization activities to support diagnostic and treatment guidelines

FIGURE I

Percentage of Reported Malaria Cases Confirmed by Diagnostic Test in 12 PMI Focus Countries, 2008–2013



- Support of operations research to evaluate and improve implementation of diagnostic and treatment interventions

IMPROVING QUALITY ASSURANCE AND QUALITY CONTROL IN CASE MANAGEMENT

Provision of quality-assured diagnostic and treatment services is a primary focus of PMI’s efforts in malaria case management. Only quality-assured RDTs and ACTs are procured, and these products undergo pre-shipment lot testing¹ to assess their quality prior to delivery to countries. PMI promotes quality assurance of diagnostic services by supporting development of national microscopy slide banks and through training and supervision activities, such as outreach training and supportive supervision (OTSS) visits to health facilities. OTSS incorporates on-site training, mentoring, and troubleshooting with routine supervision that assesses health worker performance through direct observation, facility, and record review, and re-checking of blood slides.

Quality Assurance/Quality Control activities in FY 2014 include:

- With support from PMI, the Ethiopian Public Health Institute is developing a national archive of malaria slides to train laboratory technicians and work toward World Health Organization (WHO) external accreditation of malaria microscopy. In **Ethiopia**, two species of malaria are common, *Plasmodium falciparum* and *Plasmodium vivax*. Thus, Ethiopian Public Health Institute staff are trained to correctly identify each parasite species to ensure that patients are properly treated for their infection, and surveillance data accurately reflect malaria trends. National slide banks are also being developed with PMI support in the **Democratic Republic**

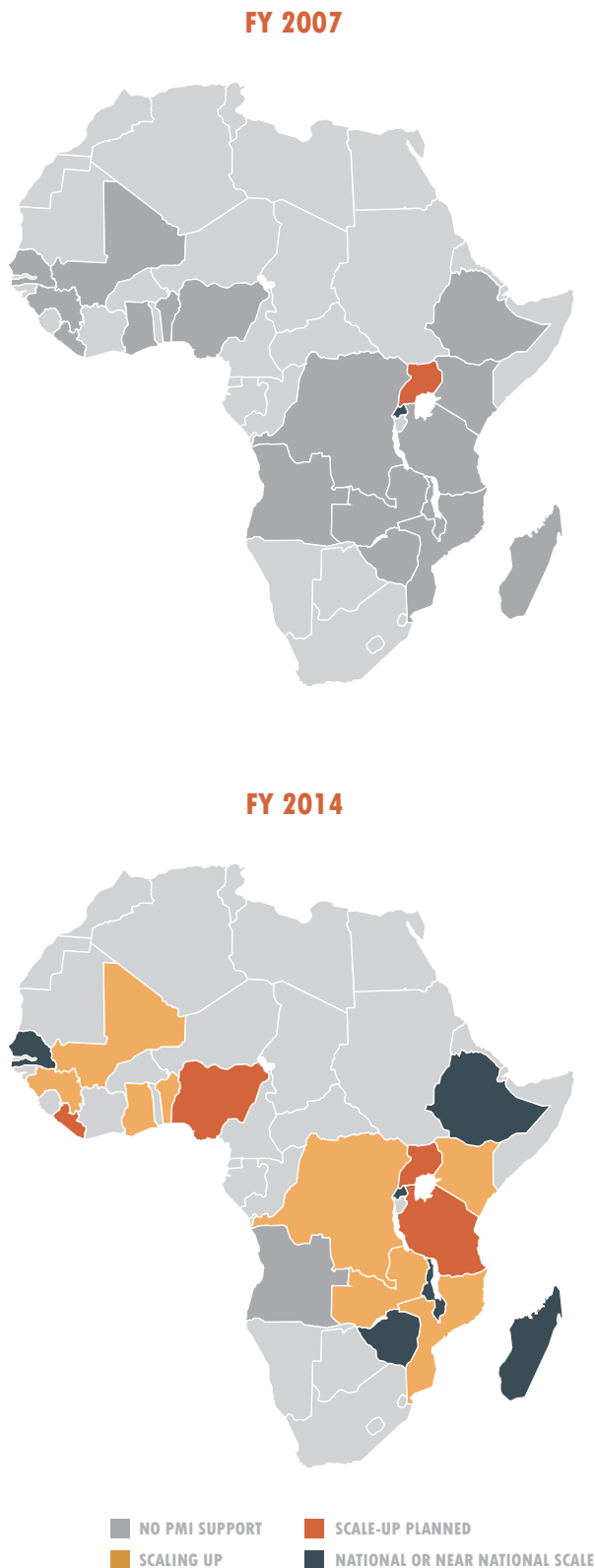
of the Congo (DRC), Ghana, Malawi, Nigeria, Tanzania, Zambia, and Zanzibar.

- A pool of 15 national laboratory technicians were selected to serve as local diagnostic trainers in **Guinea** and, in collaboration with the NMCP, three joint supervision visits for both diagnosis and treatment services in regional and national hospitals were conducted. Through these efforts, 99 hospital laboratory technicians were trained in malaria diagnosis, and 995 public and private health facility staff were trained on updated case management protocols and training curricula. Additionally, PMI supported the first round of OTSS visits and supervision of health care providers by the Regional Health Directorate and Prefectural Health Directorate.
- Onsite mentoring for more than 400 health workers was conducted in **Zambia** with the goal of increasing quality of malaria diagnosis and treatment at the health facility level. Health facilities enrolled in the OTSS program have achieved or are approaching program targets, including key goals for malaria microscopy slide reading, RDT performance, and the provision of appropriate care following negative test results. In facilities receiving 6 or more supportive visits over the past 2 years, provider compliance with malaria test results has increased from 30 percent to more than 80 percent.

1. The exception is for those ACTs and other medicines used in the treatment of malaria that have marketing authorization from a stringent regulatory authority, such as the U.S. Food and Drug Administration or the European Medicines Agency.

FIGURE 2

Increasing PMI Support for iCCM (FY 2007 vs. FY 2014)



EXPANDING ACCESS TO CARE THROUGH INTEGRATED COMMUNITY CASE MANAGEMENT

As a part of the U.S. Government’s efforts in ending preventable child and maternal deaths (EPCMD) and to reach people with limited or no access to facility-based care, PMI supports the strengthening and extension of public health services through integrated community case management (iCCM). iCCM provides a platform for diagnosis, treatment, and referral for malaria, pneumonia, and diarrhea by trained community health workers using standardized treatment algorithms. PMI’s iCCM efforts are coordinated with the U.S. Agency for International Development’s (USAID’s) maternal and child health programs, as well as other key partners, including UNICEF.

With a renewed interest by countries to include iCCM as part of a comprehensive case management package to reduce child mortality, PMI’s contribution to this program has grown over the past several years, from supporting 2 countries in FY 2007 to 18 countries in FY 2014 (see Figure 2). Several PMI countries – including **Ethiopia, Malawi, Rwanda, and Senegal** – have now scaled up national iCCM programs with PMI funding, and many other countries are at various stages of implementing iCCM. Examples of progress in this area in FY 2014 include:

- In **Rwanda**, PMI supports the national community health program in seven districts. More than 30,000 community health workers (CHWs) provide iCCM throughout the country’s 30 districts. These CHWs have been trained in diagnosing malaria with RDTs, and more than 90 percent of all cases are now confirmed using an RDT. If the test is positive, the child receives an ACT. If the test is negative, CHWs follow an iCCM algorithm to identify other possible causes of the illness and treat it effectively. In fiscal year (FY) 2014, PMI supported the training of 5,898 CHWs (94 percent of the targeted number) on the use of RDTs and ACTs in managing malaria in children less than five years of age.
- **Malawi’s** iCCM program is implemented by community-based health surveillance assistants who are trained to assess, classify, and provide first-line treatment of selected childhood illnesses, as well as to refer to the next level of care, according to iCCM guidelines. PMI supports implementation of iCCM by equipping village health clinics and providing training, supervision, and monitoring to health surveillance assistants in 15 PMI-supported districts. PMI currently provides support to 1,728 village health clinics (88 percent coverage), with plans to scale up to reach a target of 100 percent in the 15 targeted districts.
- PMI continued to support iCCM activities in five high priority health zones in northern **Benin**. In collaboration with UNICEF and the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund), PMI supported a joint implementation plan to train and equip more than 1,200 CHWs in iCCM. CHWs were also trained on RDT use and follow-up of pregnant women and their newborns. Working jointly with the Ministry of Health and five local non-governmental organizations, PMI supported supervision of CHWs and reporting of iCCM data. In two of the health zones, information is reported via mobile phone with alerts to notify local health professionals of referrals for severe malaria cases and potential stockouts or shortages of commodities.

Cambodia invests in village malaria workers to improve malaria case management in rural areas. They performed malaria blood tests for students during malaria week activities in Pursat Province.

Sam Sokharun, CAP-Malaria Cambodia



- In **Ghana**, a pilot program linking community health officers with mentors at district health facilities focused on improving adherence to negative malaria test results. Seven districts from five regions were selected to participate, based on their performance from the first round of Outreach Training and Support Supervision visits. Eighty-three community health officers participated in an intensive 5-day skills-building and mentoring workshop with district health facility staff aimed at strengthening their ability to provide correct febrile illness diagnosis and treatment services, while improving communication and linkages to referral facilities. The Ghana Health Service and NMCP plan to implement this activity as part of the standard community health officer training program nationwide.

ENSURING AVAILABILITY OF QUALITY ASSURED, ESSENTIAL COMMODITIES

Malaria control through case management cannot be implemented without a steady supply of good quality diagnostic tests and recommended antimalarial drugs. A key aspect of PMI's health system strengthening efforts is support for procurement and supply chain management systems to ensure that products of high quality are available when and where they are needed. To this end, PMI supports the implementation of two tools to assist ministries of health in tracking malaria commodities in country:

1. The Procurement Planning and Monitoring Report for malaria is a quarterly report, tracking stock levels of RDTs and antimalarial drugs at central warehouses. Data on commodity availability facilitates better stock management, improved pharmaceutical

management, and the development of more robust forecasting and drug tender management capacity, leading to improved overall commodities security. In FY 2014, more than 90 percent of PMI focus countries had sufficient levels of ACTs on hand, and nearly 70 percent were adequately stocked with RDTs.

2. The end-use verification tool, implemented biannually or quarterly, is used to help ensure that malaria commodities reach end users at health facilities. Information on ACT and RDT levels in clinics and hospitals is collected to identify and rapidly address stockouts (see Figures 3 and 4). In the longer term, the end-use verification tool uncovers localized weaknesses in the supply chain and helps mobilize central-level oversight by the national malaria control program. Both tools also help PMI country teams identify and target the best use of funds for further supply chain strengthening activities.

PMI activities to strengthen supply chains within PMI focus countries in FY 2014 included:

- PMI continued to support district-level reporting of RDT and ACT consumption to **Mozambique's** central medical stores to improve forecasting, supply planning, procurement, and distribution of essential health commodities. In 2013, only 42 districts (38 percent) reported the rate of RDT consumption. However, quarterly provincial meetings and reinforced supervision visits resulted in much more effective reporting in FY 2014, with 91 and 88 percent of districts reporting ACT and RDT consumption, respectively.

- In **Guinea**, PMI has supported emergency distributions of antimalarial products (artesunate-amodiaquine [ASAQ], injectable quinine, sulfadoxine-pyrimethamine), and RDTs to public health facilities to help address stockouts of these commodities. To avoid future stockouts, PMI worked closely with the NMCP, central pharmacy, and other stakeholders to develop a new system for quarterly product orders and deliveries for malaria commodities. PMI also introduced a new monthly reporting template to simplify data transmission from health facilities to the central level. To support NMCP transition to internet-based reporting, PMI provided data managers with internet keys and monthly internet access. PMI has also initiated quarterly malaria review meetings at the regional level to discuss reporting issues and follow up on recommendations that need action at the district, regional, and national levels.

ENHANCED METHODS FOR MONITORING DRUG RESISTANCE

There is evidence of resistance to artemisinin in much of the **Greater Mekong Subregion**, including parts of **Burma, Cambodia, Thailand, Laos, and Vietnam**. Although there is no evidence of similar resistance outside of the Mekong, monitoring of anti-malarial efficacy is now even more essential to monitor for possible emergence of resistance to ACTs in new areas. PMI supports WHO guidance to conduct therapeutic efficacy surveys of first-line malaria treatments every 2 years to help inform national malaria treatment guidelines. PMI supports a number of activities to monitor drug resistance including:

- In the Greater Mekong Subregion, PMI supports a regional network of therapeutic efficacy surveys, which expanded from 36 sites in FY 2013 to 46 in FY 2014. These surveys continue to provide crucial information on the extent of resistance to both artemisinin and ACT partner drugs in the region.
- PMI supports therapeutic efficacy surveys for current first-line malaria treatments in 18 of the 19 PMI focus countries in Africa. In **Nigeria**, in partnership with the Global Fund, PMI is supporting therapeutic efficacy testing in 14 sites on a rotating basis, with seven sites conducting tests each year.
- In 2013, a therapeutic efficacy survey supported by PMI in **Angola** was one of the first published therapeutic efficacy surveys to include testing for molecular markers of artemisinin resistance and resistance to ACT partner drugs. While this monitoring activity found no molecular evidence for artemisinin resistance, it did detect molecular evidence of resistance to lumefantrine, the partner drug in Coartem.

Recent studies have identified molecular markers associated with artemisinin resistance in the Mekong. In rapid response to the new findings, the PMI Antimalarial Resistance Monitoring in Africa Network was initiated in FY 2014 to supplement future therapeutic efficacy surveys with molecular testing for artemisinin resistance markers that will help us determine whether these molecular markers can be found in areas outside of the Greater Mekong Subregion. Finding such markers among circulating parasites may serve as an early warning sign of artemisinin resistance in those areas.

FIGURE 3
ACT Availability at Health Facilities in 9 PMI Focus Countries, 2014

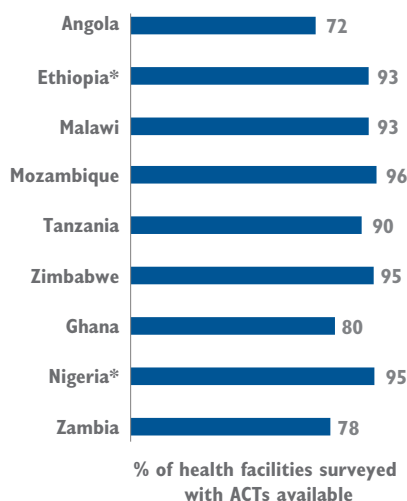
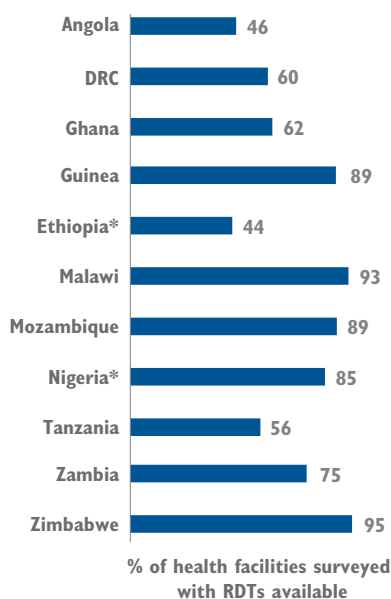


FIGURE 4
RDT Availability at Health Facilities in 11 PMI Focus Countries, 2014



Source for both figures: End-use verification surveys
* PMI-supported regions

COMBATTING COUNTERFEIT DRUGS

Fake and substandard malaria medicine continues to be a major global concern. To help reduce the availability of counterfeit drugs in informal private sector outlets and marketplaces, PMI is teaming up with local police, customs agents, national medicines regulatory authorities, and drug sellers and is also working programmatically with USAID's Office of the Inspector General.

- In **Benin**, in a mostly unregulated market in which shop owners and street vendors sell drugs, including antimalarials, PMI is partnering with USAID's Office of the Inspector General, local law enforcement, and Ministry of Health officials to launch an anti-counterfeit outreach program by educating and incentivizing shopkeepers to report suspected counterfeit medicine networks, while informing consumers on the dangers of substandard drugs and how to recognize them. Information sharing on the detection of falsified medicines, close collaboration on tracking of donor-funded commodities, and investigation of illegal distributors led to a series of arrests and the closure of distribution networks in the country.

Furthermore, in all 19 focus countries in Africa, PMI is partnering with national medicines regulatory authorities to help strengthen local capacities regarding drug quality as part of the U.S. Government's overall technical assistance for health systems strengthening. PMI is helping countries improve surveillance capacity to better monitor drug quality by randomly testing drugs commonly found in both the private and public sectors, including mini-laboratory sentinel sites, and pilot activities in collaboration with the U.S. Food and Drug Administration.

These efforts have contributed to important progress in strengthening medicines regulatory authorities. For example, two national drug reference laboratories in sub-Saharan Africa recently received ISO-17025 accreditation – an internationally recognized standard regarding laboratory competency:

- After sustained support from PMI to build capacity in the **Ghana** Food and Drugs Authority (GH-FDA) for quality control of medicines, the GH-FDA attained ISO-17025 accreditation. Trained GH-FDA laboratory staff continue to conduct field testing at sentinel sites throughout the country to identify products that are potentially counterfeit or substandard. As a result of these efforts, the overall failure rate for antimalarial medicines in the marketplace fell from 18 percent in 2010 to 4 percent in 2013.
- In **Nigeria**, PMI has been supporting the Lagos Central Drug Control Laboratory of the National Agency for Food and Drug Administration and Control (NAFDAC) to reach international accreditation standards, and in January 2015, the NAFDAC laboratory received ISO 17025 certification. In addition, to improve consumer confidence in the medicines being sold in Nigeria and to fight against counterfeit medicines, NAFDAC has established the Mobile Authentication Service, which enables consumers to send a free short messaging system (SMS)-based message to confirm authenticity of an antimalarial before purchase.

Supply Points Provide Malaria Commodities in Remote Areas of Madagascar

Jean-Marie François, a married father of two children, is a very important person in his community. He is responsible for managing a stock of malaria, family planning, and child survival commodities to supply 40 community health volunteers (CHVs) in his Commune of Anteteszambaro, in the District of Toamasina II, on the East Coast of Madagascar.

Jean-Marie's community praises his dynamism and commitment to development. Before the establishment of his supply point in 2010, the 40 CHVs scattered throughout the commune did not have a reliable commodity supply channel. Supply points, like the one run by Jean-Marie, are privately owned and regularly monitored and restocked with PMI support to ensure uninterrupted availability of life-saving commodities, including RDTs and ACTs. Jean-Marie, like the other supply point managers, volunteered to invest his time and resources into this activity. He received an initial on-the-job training, an initial stock of drugs and social marketing products, and stock management tools.

For Jean-Marie, stocking and distribution of lifesaving commodities is a great source of satisfaction. During the 4 years he has volunteered as a supply point manager, he created new relationships with CHVs from remote villages; the community members know him and appreciate highly the work he is doing. And, he has observed a significant reduction of malaria cases referred to health facilities by CHVs. "Cases of severe malaria decreased from 1 case per month to 1 case every 4 months," he says. "I'm aware that my work is really important for the community, and it makes me proud."

A total of 1,200 supply points are operational across 20 regions of Madagascar to ensure availability of life-saving commodities including ACTs and RDTs, serving more than 17,000 CHVs in rural areas.



Jean-Marie François, supply point manager in Eastern Madagascar, fills out a stock management tool.

Dr. Lanto, PSI Madagascar

Finally, as a major procurer of artemisinin-based antimalarials, PMI employs a stringent quality assurance and quality control strategy, ensuring that only good quality drugs are used in support of U.S. Government malaria programs not only in sub-Saharan Africa, but also the greater Mekong Subregion.

CONTRIBUTIONS AT THE GLOBAL LEVEL

PMI continues to provide leadership in case management activities at the global level. In FY 2014, PMI co-chaired the Roll Back Malaria Partnership's Case Management Working Group and led the Diagnosis Work Stream, which supported efforts to examine the feasibility of developing a harmonized format for RDTs, which would lessen the need to re-train health workers with each introduction of a new RDT kit. PMI also participated in the WHO Technical Expert Group on Antimalarial Drug Resistance and Containment.

In partnership with USAID's maternal and child health program, PMI continued to host the Secretariat and participate on the Steering Committee of the Global iCCM Task Force, which coordinates bilateral, multilateral and non-governmental partners in the implementation of iCCM worldwide. In March 2014, the Global Task Force supported UNICEF in planning and hosting an iCCM Evidence Review Summit in Accra, Ghana. The objectives were to review the current landscape and status of evidence in key iCCM program areas and to assist African countries to integrate and take action on key frontline iCCM findings. The Summit was attended by 400 participants from more than 30 countries and 50 international organizations.

In addition, PMI is supporting the development of a regional quality management and accreditation system for diagnostics by the WHO. Support of this comprehensive system included revision of training materials, expansion of training activities to include participants from Francophone Africa, external quality assurance, and a proficiency testing program. PMI also provided technical support to WHO in the revision of its guidelines for quality assurance of malaria microscopy.

RESEARCH AND INNOVATION

PMI supports operational research and testing of innovative approaches to improve the implementation of case management activities, such as:

- Since previous research² showed text message reminders to health workers in **Kenya** to be highly effective in improving malaria case management, in FY 2014, PMI launched an expanded operational research project on text messaging in **Malawi**. This study is currently evaluating the effectiveness of text message reminders to health care workers in improving integrated diagnosis and management of malaria along with two other common childhood illnesses, diarrhea and pneumonia.
- In **Senegal**, a pilot activity in February 2014 used tablet computers to collect information on case management and availability of commodities at health facilities during supervisory visits. Digital data collection allows for rapid feedback on areas for improvement in diagnosis and treatment practices, identification of stockouts, and analysis of trends in indicators across facilities and regions. Based on results from the pilot, the NMCP plans to introduce the tablet-based tool to all centrally organized supervision programs during 2015.

2. Dejan Zurovac, Raymond K. Sudoi, Willis S. Akhwale, Moses Ndiritu, Davidson H. Hamer, Alexander K. Rowe, Robert W. Snow: The effect of mobile phone text-message reminders on Kenyan health workers' adherence to malaria treatment guidelines: a cluster randomised trial. *Lancet* 2011; 378: 795–803

4. GLOBAL AND U.S. GOVERNMENT PARTNERSHIPS FOR ENSURING SUCCESS



HIGHLIGHTS

- Through active partnership with other donors, in eight PMI focus countries (**Angola, Democratic Republic of the Congo, Guinea, Malawi, Nigeria, Tanzania, Uganda, and Zambia**) PMI assisted with the distribution of more than 24 million ITNs during FY 2014 that were procured by other donors or host governments. In addition, during FY 2014, PMI distributed more than 3.9 million ACTs in **Nigeria** that were procured by the Global Fund and the World Bank.
- To extend the reach of malaria control interventions into communities, PMI partners with the U.S. Peace Corps; 605 Peace Corps volunteers in 14 PMI focus countries reached nearly 270,000 people with malaria control activities, including outreach and communication on malaria prevention, training of community health workers, and distribution of long-lasting ITNs.
- To date, PMI has supported implementation of malaria activities through more than 200 nonprofit organizations, approximately one-third of which are faith-based.
- PMI, in partnership with the governments of Guinea and **Liberia** as well as other U.S. Government and international partners, supported the global community's unprecedented response to the Ebola epidemic of 2014–2015, while simultaneously continuing to combat against malaria in these countries.

The President's Malaria Initiative (PMI) relies on strong partnerships at the national and international level to support national malaria control programs (NMCPs) to expand the impact of malaria control. PMI works closely with the government of each focus country and with a variety of local and international partners to ensure that investments are strategically contributing to the country's overall malaria control plan, while leveraging the support of other partners. Some of PMI's most important partners in this effort include:

- Multilateral and bilateral organizations
- Other U.S. Government agencies and initiatives
- Private sector partners
- Foundations
- Community-based organizations

MULTILATERAL AND BILATERAL COLLABORATION

- *Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund)*: PMI works very closely with the Global Fund at the country and global level to coordinate investments for malaria control to maximize impact. The U.S. Government is the Global Fund's largest financial contributor, and PMI is represented on the U.S. delegation to the Global Fund Board. Worldwide, PMI and Global Fund technical and management staff convene regularly to ensure coordinated technical approaches and policies. PMI focus countries have received substantial malaria financing from the Global Fund, and this source of funding will remain critical for most countries going forward. Because the Global Fund is a financing mechanism with no in-country technical personnel, the PMI team on the ground in each focus country works to improve communication between Global Fund headquarters and in-country counterparts; ensures that the Global Fund is aware of critical developments and technical and programmatic issues; and assists with reviewing progress. The PMI team works with NMCPs to facilitate implementation of Global Fund malaria grants in concert with PMI projects. Under the new funding model, PMI staff participate actively in the country dialogue and development of the concept note, and PMI staff at the global level are represented on the Global Fund Grant Technical Review Panel and the Grant Approvals Committee.



U.S. Peace Corps Mozambique Country Director, Sanjay Mathur (right), and Vodacom Mozambique CEO, Salimo Abdula, celebrate the signature of the memorandum of understanding.

Vodacom

Peace Corps and Vodacom Join Together to Increase ITN Use

Since 2013, PMI has supported a third year Peace Corps Volunteer in Mozambique who is working as the National Malaria Coordinator. This volunteer was instrumental in establishing an innovative collaboration with the mobile communications company Vodacom; which included organizing meetings between the NMCP, Peace Corps, and Vodacom to define the terms of the agreement for the partnership. In November 2014, this culminated in the signing of a memorandum of understanding between Peace Corps and Vodacom, which outlined their commitment to work together to fight malaria.

As part of their social responsibility work, Vodacom has agreed to provide long-lasting ITNs to communities where Peace Corps Malaria Volunteers are promoting behavior change education for malaria prevention. Peace Corps volunteers will provide information about malaria, including the signs and symptoms, transmission, prevention, and treatment, through a variety of different community projects such as murals, theater group presentations, and trainings of community health workers and community leaders. Peace Corps is able to do these community projects in conjunction with the net distributions with the support of PMI funding they receive each year. Through this new partnership with Vodacom, volunteers will be able not only to educate individuals about sleeping under mosquito nets, but also provide the ITNs to the beneficiaries who need them. With PMI funding, two trainings of trainers and net distributions are planned for Guija, Gaza and Pemba City, and Cabo Delgado next month.

Vodacom also works with other partners on this initiative, including Televisao de Mozambique, the Ministry of Health, the Ministry of Education, Grupo Soico, and Radio Mozambique. As part of this initiative, Vodacom already has distributed more than 20,000 long-lasting ITNs, of which 1,300 were distributed with Peace Corps.

- **Roll Back Malaria (RBM):** PMI is an active member of the RBM Partnership, providing financial support for numerous RBM activities, serving on the Partnership's Board of Directors, and participating in many of its working groups, including the Harmonization Working Group, the Case Management Working Group, the Vector Control Working Group, the Malaria Advocacy Working Group, the Malaria in Pregnancy Working Group, and the Monitoring and Evaluation Reference Group. In FY 2014, PMI played a leadership role in support of the Harmonization Working Group's efforts to coordinate technical assistance to PMI focus countries around Global Fund grants, much of which was oriented toward producing high-quality concept notes and the related national documents where needed (e.g., updated national strategic plans, costed monitoring, and evaluation plans) for the new funding model. This assistance proved to be extremely successful. As of the end of FY 2014, all countries supported by the Harmonization Working Group for concept note development had malaria grants recommended for approval by the Global Fund's reviewers. These included the following PMI focus countries: **Democratic Republic of the Congo (DRC), Ethiopia, Ghana, Nigeria, Rwanda, Senegal, Uganda, Zambia, and Zimbabwe.**
- **United Kingdom Department for International Development (DFID):** PMI and DFID collaborate for enhanced impact and coverage at the country level. During FY 2014, PMI and DFID continued their partnership in **Zambia**, where DFID has been channeling funds to PMI for the procurement of commodities since 2010. In FY 2014, using DFID funds, PMI procured 400,000 insecticide-treated mosquito nets (ITNs), 9.5 million rapid diagnostic tests (RDTs), and 1,000,200 artemisinin-based combination therapies (ACTs) for Zambia. In addition, during the FY 2014, PMI's collaboration with DFID expanded to Uganda, where PMI procured 1,047,378 ITNs with a donation from DFID. With \$5 million in funding from DFID, PMI/Uganda supported the universal coverage net campaign and the process evaluation of the campaign. PMI and DFID teams in country collaborate closely across all technical malaria interventions. This ongoing, strong collaboration with DFID will make it possible to fill commodity gaps and improve access to commodities in both countries.
- **United Nations Children's Fund (UNICEF):** PMI works closely with UNICEF on integrated community case management (iCCM) and seasonal malaria chemoprevention (SMC) activities.
 - **iCCM:** UNICEF, PMI, and the World Health Organization (WHO) supported the rapid expansion of iCCM in **DRC, Malawi, Mozambique, and Nigeria.** In addition to coordinating closely at the global level to promote best practices for iCCM, PMI, and UNICEF jointly support iCCM in five high priority health zones in **Benin** (see Case Management chapter). PMI works closely with UNICEF to support integrated community health interventions through more than 500 health huts in **Senegal**, and coordinates with UNICEF on joint training for case management in Nigeria.
 - **SMC:** In **Mali**, PMI works closely with the Government of Mali and other donors including UNICEF, Doctors Without



Brent Stewart, RTI

Borders, World Vision as well as other national non-governmental organizations to train and supervise health workers and distribute SMC drugs. In **Senegal**, UNICEF supports operations in one region, while PMI supports operations in the remaining three regions (see Prevention chapter for more about SMC).

- **World Health Organization:** PMI provides financing to the WHO headquarters in Geneva as well as to the WHO regional offices in Africa, South East Asia, and South America. At the central level, PMI provides financing to the WHO Global Malaria Program to support activities related to antimalarial drug resistance surveillance, vector control, malaria diagnosis policy development, and monitoring and evaluation. In FY 2014, with PMI support, WHO produced its World Malaria Report with estimates of malaria financing, program coverage, cases, and deaths for the 2000–2013 period; expanded insecticide resistance monitoring in seven PMI countries; and initiated the global insecticide resistance database. WHO also convened a Technical Evidence group on drug resistance and containment and continued to map resistance globally and manage the global database on ACT efficacy against *P. falciparum*. PMI supported a Technical Consultation to recommend updates to the WHO Malaria Microscopy Quality Assurance Manual and the establishment of minimum technical requirements for malaria slide banks.

PMI has supported WHO national and international program officers in selected PMI focus countries; a U.S. Centers for Disease Control and Prevention (CDC) epidemiologist seconded to the Global Malaria Programme at WHO headquarters; and provides funding to strengthen a regional antimalarial drug surveillance

network in the **Greater Mekong Subregion** and to non-PMI focus countries in the Horn of Africa. In addition, the U.S. Agency for International Development (USAID) has continued to support malaria control efforts in six countries in the Amazon Region of South America (**Brazil, Colombia, Ecuador, Guyana, Peru, and Suriname**) through the Pan American Health Organization.

PMI provides financing to WHO's Africa Regional Office (AFRO); activities of WHO AFRO are jointly funded with other bilateral donors and the RBM Partnership. In **Zambia and Zimbabwe**, WHO helped to develop critical maternal and child health scorecards, which include data on malaria. This PMI-funded activity also assisted several countries to review and improve their strategies for addressing malaria in pregnancy and provided support to **Mozambique and Uganda** to implement new intermittent preventive treatment for pregnant women (IPTp) recommendations. Furthermore, eight PMI focus countries benefitted from workshops on monitoring drug efficacy in FY 2014, and seven PMI focus countries participated in capacity building activities for improved malaria diagnosis. WHO AFRO supported six PMI focus countries to conduct malaria program performance reviews and contributed to the development of monitoring and evaluation plans for malaria in nine PMI focus countries, as well as Burundi, Cameroon, and South Sudan.

OTHER U.S. GOVERNMENT-SUPPORTED HEALTH PROGRAMS

PMI works closely with other U.S. Government health programs, both on the ground in focus countries, and at the headquarters level to synchronize U.S. Government investments and maximize combined impact and decrease duplication. PMI's efforts to decrease the burden of malaria represent a major contribution to the broader



Community members learn about malaria transmission, prevention, and treatment through health communications and capacity building activities.

HC3 Project

goals of USAID’s commitment to ending preventable child and maternal deaths. During FY 2014, PMI partnered with other U.S. Government-supported global health programs, including:

- **Peace Corps:** During FY 2014, 605 Peace Corps volunteers in 14 PMI focus countries (**Benin, Ethiopia, Ghana, Guinea, Kenya, Liberia, Madagascar, Malawi, Mozambique, Rwanda, Senegal, Tanzania, Uganda, and Zambia**) worked on joint malaria prevention activities with NMCPs, implementing partners, and PMI in-country teams, reaching nearly 270,000 beneficiaries. Peace Corps volunteers trained almost 5,000 health workers in areas including net distribution, home-based care, diagnostics, and reporting. They also trained more than 18,000 community mobilizers to conduct behavior change communication on malaria prevention and prompt care seeking and more than 2,000 teachers on incorporating malaria prevention into their lesson plans. Furthermore, Peace Corps volunteers helped to distribute more than 136,000 ITNs.
- **U.S. President’s Emergency Plan for AIDS Relief (PEPFAR):** In FY 2014, PMI and PEPFAR continued to coordinate activities in the 13 countries where both programs are present. For example, in **DRC**, PMI has collaborated with PEPFAR on refurbishing a central commodities warehouse, which both initiatives use to store

drugs. In **Mozambique**, PMI and PEPFAR have worked collaboratively to strengthen the supply chain management system and support the rollout of the new District Health Information System-2, which will be a crucial step toward receiving timely, quality data on malaria indicators among others. In addition, in **Uganda**, the PEPFAR team has developed and implemented an integrated monitoring checklist where malaria activities are recorded during PEPFAR monitoring visits in the field.

- **U.S. Department of Defense (DOD):** PMI accesses technical expertise from the DOD through Navy entomologists, who provide technical assistance in vector control and insecticide resistance management at both the country level and at PMI headquarters. Members of the Armed Forces Pest Management Board routinely participate in PMI monthly entomology strategy and coordination meetings, and DOD entomology staff are seconded to CDC for backstopping PMI activities. In **Kenya**, PMI works with the U.S. Army Medical Research Unit – Kenya, Walter Reed Project, Malaria Diagnostics Center, to improve and implement the national quality assurance program. In **Cambodia**, the Armed Forces Research Institute of Medical Sciences and the Naval Medical Research Unit – Asia works with PMI in assisting the NMCP to apply research evidence into national policy on malaria.

PRIVATE SECTOR PARTNERSHIPS

PMI works with private sector partners to ensure that private resources are being invested into appropriate and effective interventions to leverage efforts for increased impact and to ensure coordination with government strategies and plans. Historically, this has primarily involved partnering with large companies who wish to protect their workforce through vector control and who support corporate social responsibility activities. In FY 2014, examples of private sector partnerships included:

- In **Angola**, PMI continued to maintain a successful partnership with the ExxonMobil Foundation, which supports ITN distribution, and training of laboratory technicians.
- In **Benin**, PMI supports 21 private corporations affiliated with the *Coalition des Entreprises Béninoises et Associations Privées Contre le SIDA, la Tuberculose, et le Paludisme* benefiting 300,000 employees and their families (approximately 1,000 long-lasting ITNs were used during training events and distributed to women's groups and other organizations). To date, they have distributed 98,866 socially marketed nets, which have generated a revenue of more than \$82,000. Earned revenue is used to fund the distribution of the long-lasting ITNs; implement malaria-related promotion and education activities; and conduct trainings for private sector health providers on diagnosis, malaria case management, and malaria information systems.
- In **Burma**, PMI partners with selected private bus companies to print important messages about malaria prevention and treatment on bus tickets and seatbacks and works with private mining and plantation companies to ensure outreach assistance to migrant employees. As a contribution, the companies provide the necessary logistic and labor support for long-lasting ITN distribution and screening and treatment in the workplace.
- In **Cambodia**, PMI supports case management activities in the private sector and private workplace programs. PMI supports 167 registered private clinicians to provide quality case management according to national malaria control strategies and policies. In addition, PMI partners work closely with 15 private companies that employ large numbers of mobile migrant workers in malaria-endemic areas.
- In **DRC**, PMI has engaged in a public/private collaboration with the Tenke Fungurume Mining Company (a branch of the U.S.-based Freeport McMoran Mining Company) to perform vector control and provide case management services in the health zone in which the mine is located.
- In **Guinea**, under a partnership between PMI and the Alcoa Foundation, 7 mobile clinics in 12 villages covered by Alcoa mining activities reached 1,304 persons with general information on malaria, 343 persons with fever were tested using RDTs, and 42 persons with positive results received treatment with an ACT.

- In **Tanzania**, through the Malaria Safe Initiative, PMI is encouraging private sector participation in malaria education, prevention, and advocacy. In Tanzania, 52 companies have joined to support activities including sponsoring the 2014 World Malaria Day and providing long-lasting ITNs and case management services to their employees.

FOUNDATIONS

PMI works closely with several foundations, including Malaria No More, the Bill & Melinda Gates Foundation, the Clinton Foundation, and the UN Foundation to advance the global malaria control agenda.

In FY 2014, PMI worked closely with the Bill & Melinda Gates foundation on the design of the vision for “Achieving Innovation to Impact in Vector Control,” a global plan that seeks to improve the value chain for developing and delivering life-saving vector control products, by fostering incentives to invest in innovation; enabling new products to be brought to market; and ensuring product quality throughout the supply chain. Country-level partnerships with foundations, include:

- With support from the Bill & Melinda Gates Foundation, PMI has worked with the Clinton Foundation, Spain's La Caixa Foundation, and Mozambique's *Fundação Manhiça* to establish a partnership for the elimination of malaria in Mozambique. This partnership, named MALTEM, has been working to guide the implementation of malaria elimination activities in Mozambique, to ensure ownership of these activities by the Ministry of Health and to ensure coordination and harmonization with other malaria control activities in the country. PMI is also working with these same partners to provide technical assistance to the Ministry of Health, strengthen the national routine surveillance system, and pilot SMS-based reporting of malaria data from health facilities.
- In Malawi, PMI is working closely with Clinton Health Access Initiative and the NMCP to train facility-based health workers in case management, including treatment of severe malaria with injectable artesunate. Through this collaboration, all 8,368 health care workers providing case management services will be trained.

COMMUNITY-BASED ORGANIZATIONS

PMI has long-standing relationships with nonprofits and faith-based community organizations, which often have the ability to reach remote, marginalized, and underserved populations in PMI focus countries. In order to effectively control malaria, it is important to work among these highly-affected groups that local government programs may not be reaching. Through support to community-based organizations, and in close coordination with NMCPs and local health authorities, PMI is improving community-level access to critical malaria prevention and treatment services while also building local capacity and ensuring program sustainability. To date, PMI has supported more than 200 local and international nonprofit organizations to deliver critical malaria services in all PMI focus countries.

Appendix I: PMI Funding FY 2006–FY 2014 (in US\$)

	Country ¹	FY 2005 Jump-Start Funding	FY 2006	FY 2007 ²	FY 2008 ³	FY 2009	FY 2010 ⁴	FY 2011 ⁵	FY 2012 ⁶	FY 2013 ⁷	FY 2014 ⁹	Total
Round 1	Angola	1,740,000	7,500,000	18,500,000	18,846,000	18,700,000	35,500,000	30,614,000	30,750,000	28,547,000	29,000,000	219,697,000
	Tanzania	2,000,000	11,500,000	31,000,000	33,725,000	35,000,000	52,000,000	46,906,000	49,000,000	46,057,000	46,000,000	353,188,000
	Uganda	510,775	9,500,000	21,500,000	21,822,000	21,600,000	35,000,000	34,930,000	33,000,000	33,782,000	34,000,000	245,644,775
Round 2	Malawi		2,045,000	18,500,000	17,854,000	17,700,000	27,000,000	26,447,000	24,600,000	24,075,000	22,000,000	180,221,000
	Mozambique		6,259,000	18,000,000	19,838,000	19,700,000	38,000,000	29,241,000	30,000,000	29,023,000	29,000,000	219,061,000
	Rwanda		1,479,000	20,000,000	16,862,000	16,300,000	18,000,000	18,962,000	18,100,000	18,003,000	17,500,000	145,206,000
	Senegal		2,168,000	16,700,000	15,870,000	15,700,000	27,000,000	24,451,000	24,500,000	24,123,000	24,000,000	174,512,000
Round 3	Benin		1,774,000	3,600,000	13,887,000	13,800,000	21,000,000	18,313,000	18,500,000	16,653,000	16,500,000	124,027,000
	Ethiopia		2,563,000	6,700,000	19,838,000	19,700,000	31,000,000	40,918,000	43,000,000	43,772,000	45,000,000	252,491,000
	Ghana		1,478,000	5,000,000	16,862,000	17,300,000	34,000,000	29,840,000	32,000,000	28,547,000	28,000,000	193,027,000
	Kenya		5,470,000	6,050,000	19,838,000	19,700,000	40,000,000	36,427,000	36,450,000	34,257,000	35,000,000	233,192,000
	Liberia			2,500,000	12,399,000	11,800,000	18,000,000	13,273,000	12,000,000	12,372,000	12,000,000	94,344,000
	Madagascar		2,169,000	5,000,000	16,862,000	16,700,000	33,900,000	28,742,000	27,000,000	26,026,000	26,000,000	182,399,000
	Mali		2,490,000	4,500,000	14,879,000	15,400,000	28,000,000	26,946,000	27,000,000	25,007,000	25,000,000	169,222,000
	Zambia		7,659,000	9,470,000	14,879,000	14,700,000	25,600,000	23,952,000	25,700,000	24,027,000	24,000,000	169,987,000
Round 4	DRC						18,000,000	34,930,000	38,000,000	41,870,000	50,000,000	182,800,000
	Nigeria						18,000,000	43,588,000	60,100,000	73,271,000	75,000,000	269,959,000
	Guinea							9,980,000	10,000,000	12,370,000	12,500,000	44,850,000
	Zimbabwe							11,977,000	14,000,000	15,035,000	15,000,000	56,012,000
	Mekong ⁸							11,976,000	14,000,000	3,521,000	3,000,000	32,497,000
	Burma									6,566,000	8,000,000	14,566,000
	Cambodia									3,997,000	4,500,000	8,497,000
Headquarters			1,500,000	10,000,000	21,596,500	26,100,000	36,000,000	36,000,000	36,000,000	37,500,000	37,500,000	242,196,500
PMI Total			30,000,000	154,200,000	295,857,500	299,900,000	500,000,000	578,413,000	603,700,000	608,401,000	618,500,000	3,688,971,500
Jump-Start Total		4,250,775	35,554,000	42,820,000	0	0	36,000,000	0	0	0	0	118,624,775
Total Overall		4,250,775	65,554,000	197,020,000	295,857,500	299,900,000	536,000,000	578,413,000	603,700,000	608,401,000	618,500,000	3,807,596,275

(1) This table does not include other U.S. Government funding for malaria activities from the U.S. Agency for International Development (USAID), the U.S. Centers for Disease Control and Prevention (CDC), the National Institutes of Health or the Department of Defense. (2) \$25 million plus-up funds include \$22 million allocated to 15 PMI focus countries (\$19.2 million for Round 2 countries and \$2.8 million for jump-starts in Round 3 countries). (3) Levels after USAID 0.81 percent rescission. (4) In FY 2010, USAID also provided funding for malaria activities in Burkina Faso (\$6 million), Burundi (\$6 million), Pakistan (\$5 million), South Sudan (\$4.5 million), the Amazon Malaria Initiative (\$5 million), and the Mekong Malaria Programme (\$6 million). (5) In FY 2011, USAID also provided funding for malaria activities in Burkina Faso (\$5,988,000), Burundi (\$5,988,000), South Sudan (\$4,491,000), and the Amazon Malaria Initiative (\$4,990,000). (6) In FY 2012, USAID also provided funding for malaria activities in Burkina Faso (\$9,000,000), Burundi (\$8,000,000), South Sudan (\$6,300,000), and the Amazon Malaria Initiative (\$4,000,000). (7) In FY 2013, USAID also provided funding for malaria activities in Burkina Faso (\$9,421,000), Burundi (\$9,229,000), South Sudan (\$6,947,000), and the Amazon Malaria Initiative (\$3,521,000). (8) Starting in FY 2011, PMI funding to the Greater Mekong Subregion was programmed through the Mekong Regional Program. With FY 2013 funding, PMI began supporting activities in Burma and Cambodia directly. In addition, PMI continued to provide FY 2013 funding to the Mekong Regional Program for activities in the region outside of the PMI Burma and PMI Cambodia bilateral programs. (9) In FY 2014, USAID also provided funding for malaria activities in Burkina Faso (\$9,500,000), Burundi (\$9,500,000), South Sudan (\$6,000,000), and the Amazon Malaria Initiative (\$3,500,000).

Appendix 2: PMI Contributions Summary

The reporting time frame for this PMI annual report is the 2014 fiscal year (October 1, 2013 to September 30, 2014). PMI counts commodities (ITNs, SP tablets, ACT treatments, RDTs) as “procured” once a purchase order or invoice for those commodities has been issued by the procurement service agent during the reporting fiscal year. Depending on the country, commodities are reported as “distributed” once they have reached the central medical stores or once they have transitioned beyond the central medical stores to regional warehouses, health facilities, or other distribution points.

I. INDOOR RESIDUAL SPRAYING

RESIDENTS PROTECTED BY PMI-SUPPORTED INDOOR RESIDUAL SPRAYING (IRS) ¹										
	Country	Year 1 (2006)	Year 2 (2007)	Year 3 (2008)	Year 4 (2009)	Year 5 (2010)	Year 6 ² (FY 2011)	Year 7 ³ (FY 2012)	Year 8 (FY 2013)	Year 9 (FY 2014)
Round 1	Angola	590,398	612,776	992,856	485,974	650,782	650,782	689,668	676,090	419,353
	Tanzania	1,018,156	1,279,960	1,569,071	2,087,062	4,861,179	4,502,814	7,107,010	4,429,410	3,020,451
	Uganda	488,502	1,865,956	2,211,388	2,262,578	2,794,839	2,839,173	2,543,983	2,581,839	2,565,899
Round 2	Malawi	–	126,126	106,450	299,744	364,349	364,349	321,919	0	0
	Mozambique	–	2,593,949	1,457,142	2,263,409	2,945,721	2,945,721	2,825,648	2,716,176	2,181,896
	Rwanda	–	720,764	885,957	1,329,340	1,365,949	1,571,625	1,025,181	990,380	705,048
	Senegal	–	678,971	645,346	661,814	959,727	887,315	1,095,093	690,029	708,999
Round 3	Benin	–	–	521,738	512,491	636,448	426,232	652,777	694,729	789,883
	Ethiopia	–	3,890,000	5,921,906	6,484,297	2,064,389	2,920,469	1,506,273	1,629,958	1,647,099
	Ghana	–	–	601,973	708,103	849,620	926,699	941,240	534,060	570,572
	Kenya	–	3,459,207	3,061,967	1,435,272	1,892,725	1,832,090	2,435,836	0 ⁴	0
	Liberia	–	–	–	163,149	420,532	827,404	876,974	367,930	0
	Madagascar	–	–	2,561,034	1,274,809	2,895,058	2,895,058	2,585,672	1,781,981	1,588,138
	Mali	–	–	420,580	497,122	440,815	697,512	762,146	850,104	836,568
	Zambia	–	3,600,000	4,200,000	6,500,000	4,056,930	4,056,930	4,581,465	2,347,545	1,805,174
Round 4	Nigeria	–	–	–	–	–	–	346,115	346,798	0
	Zimbabwe	–	–	–	–	–	–	–	1,164,586	1,431,643
TOTAL		2,097,056	18,827,709	25,157,408	26,965,164	27,199,063	28,344,173	30,297,000	21,801,615	18,270,723

(1) A cumulative count of the number of people protected is not provided because many areas have been sprayed on more than one occasion. (2) Angola, Malawi, Mozambique, Madagascar, and Zambia implemented spray rounds during the first quarter of FY 2011 and these activities are therefore also reported in the Year 5 (2010) column. (3) During FY 2012, USAID also provided support for an IRS campaign in Burkina Faso, which protected 115,538 people. (4) In FY 2013, PMI did not carry out IRS activities in Kenya due to a policy change in the type of insecticide approved for IRS, which delayed the procurement of the insecticide and thus the timing of the spray operations.

IRS SPRAY PERSONNEL TRAINED WITH PMI SUPPORT ¹										
	Country	Year 1 (2006)	Year 2 (2007)	Year 3 (2008)	Year 4 (2009)	Year 5 (2010)	Year 6 ² (FY 2011)	Year 7 ³ (FY 2012)	Year 8 (FY 2013)	Year 9 (FY 2014)
Round 1	Angola	350	582	2,104	585	834	834	0	691	671
	Tanzania	536	734	688	2,806	5,890	4,397	10,756	10,046	7,196
	Uganda	450	4,062	4,945	4,412	5,171	1,771	541	3,881	3,660
Round 2	Malawi	–	300	309	462	929	929	885	765	1,140
	Mozambique	–	1,190	1,282	1,343	1,996	1,996	1,121	1,128	1,354
	Rwanda	–	655	2,091	2,276	2,088	2,357	1,986	1,925	1,501
	Senegal	–	275	706	570	1,024	911	1,097	933	933
Round 3	Benin	–	–	335	347	459	617	825	804	1,642
	Ethiopia	–	–	1,198	3,017	4,049	3,855	2,260	2,684	2,886
	Ghana	–	–	468	577	572	636	992	669	750
	Kenya	–	4,697	1,452	1,719	2,496	2,118	5,921	0 ⁴	0
	Liberia	–	–	–	340	480	793	802	292	0
	Madagascar	–	–	1,673	851	1,612	1,612	4,634	2,894	834
	Mali	–	–	413	424	549	816	872	853	911
	Zambia	–	1,300	1,413	1,935	2,396	2,396	929	926	822
Round 4	Nigeria	–	–	–	–	–	–	351	381	0
	Zimbabwe	–	–	–	–	–	–	158	0	0
TOTAL		1,336	13,795	19,077	21,664	30,545	26,038	34,130	28,872	24,300

(1) A cumulative count of the number of people trained is not provided because many areas have been sprayed on more than one occasion. Spray personnel are defined as spray operators, supervisors, and ancillary personnel. This definition does not include many people trained to conduct information and community mobilization programs surrounding IRS campaigns. (2) Angola, Madagascar, Malawi, Mozambique, and Zambia implemented spray rounds during the first quarter of FY 2011 and these activities are therefore also reported in the Year 5 (2010) column. (3) During FY 2012, USAID also provided support for an IRS campaign in Burkina Faso, which trained 332 people. (4) In FY 2013, PMI did not carry out IRS activities in Kenya due to a policy change in the type of insecticide approved for IRS, which delayed the procurement of the insecticide and thus the timing of the spray operations.

HOUSES SPRAYED WITH PMI SUPPORT ¹										
	Country	Year 1 (2006)	Year 2 (2007)	Year 3 (2008)	Year 4 (2009)	Year 5 (2010)	Year 6 ² (FY 2011)	Year 7 ³ (FY 2012)	Year 8 (FY 2013)	Year 9 (FY 2014)
Round 1	Angola	107,373	110,826	189,259	102,731	135,856	135,856	145,264	141,782	98,136
	Tanzania	203,754	247,712	308,058	422,749	889,981	833,269	1,338,953	852,103	573,926
	Uganda	103,329	446,117	575,903	567,035	878,875	908,627	823,169	855,698	852,358
Round 2	Malawi	–	26,950	24,764	74,772	97,329	97,329	77,647	0	0
	Mozambique	–	586,568	412,923	571,194	618,290	618,290	660,064	536,558	414,232
	Rwanda	–	159,063	189,756	295,174	303,659	358,804	236,610	230,573	173,086
	Senegal	–	169,743	153,942	176,279	254,559	240,770	306,916	207,116	204,159
Round 3	Benin	–	–	142,814	156,223	166,910	145,247	210,380	228,951	254,072
	Ethiopia	–	778,000	1,793,248	1,935,402	646,870	858,657	547,421	635,528	667,236
	Ghana	–	–	254,305	284,856	342,876	354,207	355,278	197,655	205,230
	Kenya	–	1,171,073	764,050	517,051	503,707	485,043	643,292	0 ⁴	0
	Liberia	–	–	–	20,400	48,375	87,325	99,286	42,708	0
	Madagascar	–	–	422,132	216,060	576,320	576,320	502,697	371,391	343,470
	Mali	–	–	107,638	126,922	127,273	202,821	205,066	228,985	228,123
	Zambia	–	657,695	762,479	1,189,676	1,102,338	1,102,338	916,293	460,303	432,398
Round 4	Nigeria	–	–	–	–	–	–	58,704	62,592	0
	Zimbabwe	–	–	–	–	–	–	–	501,613	622,299
TOTAL		414,456	4,353,747	6,101,271	6,656,524	6,693,218	7,004,903	7,127,040	5,553,556	5,068,725

(1) A cumulative count of the number of houses sprayed is not provided because many areas have been sprayed on more than one occasion. (2) Angola, Madagascar, Malawi, Mozambique, and Zambia implemented spray rounds during the first quarter of FY 2011 and these activities are therefore also reported in the Year 5 (2010) column. (3) During FY 2012, USAID also provided support for an IRS campaign in Burkina Faso, which sprayed 36,870 houses. (4) In FY 2013, PMI did not carry out IRS activities in Kenya due to a policy change in the type of insecticide approved for IRS, which delayed the procurement of the insecticide and thus the timing of the spray operations.

2. INSECTICIDE-TREATED MOSQUITO NETS

INSECTICIDE-TREATED NETS (ITNS) PROCURED AND DISTRIBUTED WITH PMI SUPPORT

		ITNs Procured									
		ITNs Distributed									
Country	Year 1 (2006)	Year 2 (2007)	Year 3 (2008)	Year 4 (2009)	Year 5 (2010)	Year 6 (FY 2011)	Year 7 ¹ (FY 2012)	Year 8 ² (FY 2013)	Year 9 (FY 2014)	Cumulative ³	
Round 1	Angola	540,949	294,200	734,198	395,748	1,353,298	1,011,800	727,700	1,265,000	600,000	5,911,093
		540,949	0	339,440	446,348	294,169	630,000	207,000	798,000	894,529	4,150,435
	Tanzania	130,000	0	143,560	1,468,966	623,441	0	697,201	1,245,097	550,000	4,858,265
		130,000	0	113,560	1,498,966	623,441	0	697,201	1,245,097	500,000	4,808,265
	Uganda	376,444	1,132,532	480,000	765,940	1,009,000	709,000	1,200,000	5,000,000	1,752,577 ⁴	11,716,493
		305,305	683,777	999,894	651,203	294,139	221,325	225,890	956,571	114,930	4,449,857
Round 2	Malawi	–	1,039,400	849,578	1,791,506	850,000	1,659,700	1,261,285	521,864	900,000	8,873,333
		–	211,995	849,578	851,436	457,822	1,142,938	1,768,951	1,011,915	477,261	6,603,626
	Mozambique	–	786,000	720,000	1,450,000	500,000	1,200,000	1,200,000	1,200,000	1,150,000	8,206,000
		–	565,000	842,802	930,000	500,000	1,494,277	850,000	1,328,379	0	6,403,295
	Rwanda	–	0	550,000	912,400	100,000	310,000	1,000,500	0	1,400,000	4,272,900
		–	0	0	500,000	962,400	0	806,100	604,400	0	2,872,900
	Senegal	–	200,000	790,000	408,000	1,025,000	2,880,000	500,000	1,362,550	1,218,900	8,384,450
		–	196,872	792,951	380,000	28,000	1,546,617	1,614,563	540,980	561,364	5,661,347
Round 3	Benin	–	221,000	385,697	875,000	634,000	905,000	510,000	1,420,000	1,420,000	6,370,697
		–	215,627	45,840	879,415	315,799	699,300	360,000	429,000	1,420,000	4,364,981
	Ethiopia	–	102,145	22,284	1,559,500	1,845,200	1,845,200	2,540,000	5,700,000	4,300,000	16,069,129
		–	102,145	22,284	559,500	1,000,000	1,845,200	2,510,746	3,600,000	3,560,624	13,200,499
	Ghana	–	60,023	350,000	955,000	2,304,000	1,994,000	1,600,000	2,600,000	1,340,000	9,729,023
		–	60,023	0	350,000	955,000	2,313,546	1,616,400	1,654,200	2,537,900	9,124,969
	Kenya	–	–	60,000	1,240,000	455,000	2,212,500	1,299,195	1,740,000	1,807,500	8,814,195
		–	–	60,000	550,000	690,000	2,589,180	35,090	1,298,259	1,034,262	5,935,991
	Liberia	–	197,000	0	430,000	830,000	650,000	0	0	250,000	2,007,000
		–	0	184,000	430,000	480,000	350,000	300,000	0	0	1,744,000
	Madagascar	–	–	351,900	1,875,007	1,715,000	0	2,112,000	2,729,750	3,749,450	12,533,107
		–	–	351,900	1,005,007	2,579,720	2,217,074	0	2,085,671	77,261	6,099,559
	Mali	–	369,800	858,060	600,000	2,110,000	3,037,150	600,000	3,076,850	2,000,000	11,111,860
		–	369,800	258,060	600,000	0	2,040,964	1,510,000	800,000	2,169,004	7,747,828
Zambia	–	808,332	186,550	433,235	1,800,000	1,760,146	833,000	2,728,980	1,090,000 ⁵	8,240,243 ⁶	
	–	550,017	444,865	433,235	400,000	1,760,146	833,000	0	1,448,055	5,869,318	
Round 4	DRC	–	–	–	–	824,100	2,000,000	455,000	3,950,000	2,850,000	10,079,100
		–	–	–	–	589,553	314,111	2,113,864	142,306	1,284,770	4,395,639
	Mekong	–	–	–	–	–	–	298,573	658,000	176,100	1,132,673
		–	–	–	–	–	–	0	118,059	94,201	212,260
	Burma	–	–	–	–	–	–	–	–	100,000	100,000
		–	–	–	–	–	–	–	–	254,560	254,560 ⁷
	Cambodia	–	–	–	–	–	–	–	–	130,000	130,000
		–	–	–	–	–	–	–	–	69,542	69,542
	Nigeria	–	–	–	–	614,000	1,000,000	3,315,675	4,200,000	4,000,000	13,129,675
		–	–	–	–	0	614,000	204,635	2,496,730	2,357,149	5,672,514
Guinea	–	–	–	–	–	–	800,000	779,900	180,000	1,759,900	
	–	–	–	–	–	–	0	0	1,307,722	1,307,722	
Zimbabwe	–	–	–	–	–	–	457,000	699,500	888,000	2,044,500	
	–	–	–	–	–	–	457,000	699,500	655,680	1,812,180	
TOTAL	1,047,393	5,210,432	6,481,827	15,160,302	18,592,039	23,174,496	21,407,129	40,877,491	31,852,527	155,473,636	
	976,254	2,955,256	5,305,174	10,065,110	10,170,043	19,778,678	16,110,440	19,809,067	20,818,814	102,761,287	

(1) During FY 2012, USAID also provided support for ITN activities in Burundi; 530,000 ITNs were procured. (2) During FY 2013, USAID also provided support for ITN activities in Burundi and Bukina Faso; 350,000 ITNs and 1,275,000 ITNs were procured in each country, respectively. (3) The cumulative column takes into account the 3-month overlap between Year 5 (covering the 2010 calendar year) and Year 6 (covering the 2011 fiscal year). (4) In addition to these ITNs procured with U.S. Government funds, 1,047,378 ITNs were procured in FY 2014 for Uganda with a donation from DFID. (5) Of this total, 600,000 ITNs were procured with PEPFAR funds. (6) In addition to these ITNs procured with U.S. Government funds, PMI procured ITNs for Zambia with a donation from DFID: one million ITNs were procured in FY 2011, 271,945 ITNs were procured in FY 2013, and 400,000 ITNs were procured in FY 2014. (7) This is the first year that Burma is reporting separately from Mekong. Therefore, the number of ITNs distributed exceeds ITNs procured because these distributed ITNs include some that had been reported as procured under the Mekong row last year.

ITNS PROCURED BY OTHER DONORS AND DISTRIBUTED WITH PMI SUPPORT											
	Country	Year 1 (2006)	Year 2 (2007)	Year 3 (2008)	Year 4 (2009)	Year 5 (2010)	Year 6 (FY 2011)	Year 7 ¹ (FY 2012)	Year 8 (FY 2013)	Year 9 (FY 2014)	Cumulative ²
Round 1	Angola	–	0	109,624	17,089	540,851	0	0	484,577	669,503	1,821,644
	Tanzania	–	0	350,000	117,400	871,680	615,010	1,077,840	0	108,502	3,140,432
	Uganda	–	369,900	0	0	2,431,815	125,017	0	3,503,651	19,959,762	26,274,145
Round 2	Malawi	–	–	0	10,700	9,600	20,000	0	0	444,580	484,880
	Mozambique	–	–	78,000	179,730	0	0	0	0	0	257,730
	Senegal	–	–	0	1,875,456	621,481	385,427	0	0	0	2,882,364
Round 3	Madagascar	–	–	–	290,636	3,204,647	2,772,824	0	0	0	3,495,283
	Mali	–	–	–	–	–	–	258,000	800,000	0	1,058,000
	Ethiopia	–	–	–	475,000	0	0	0	0	0	475,000
	Ghana	–	–	750,000	0	82,600	0	6,788,328	0	0	7,620,928
	Zambia	–	–	–	–	–	–	–	–	951,945	951,945
Round 4	DRC	–	–	–	–	3,966,000	0	0	2,700	75,267	4,043,967
	Mekong	–	–	–	–	–	–	951,019	348,502	0	1,299,521
	Guinea	–	–	–	–	–	–	–	–	951,787	951,787
	Nigeria	–	–	–	–	0	15,389,478	1,852,604	749,033	1,229,902	18,356,908
	TOTAL	–	369,900	1,287,624	2,966,011	11,728,674	19,307,756	10,927,791	5,888,463	24,391,248	73,114,534

(1) During FY 2012, USAID also provided support for distribution of 327,000 Global Fund-procured ITNs in South Sudan. (2) The cumulative column takes into account the 3-month overlap between Year 5 (covering the 2010 calendar year) and Year 6 (covering the 2011 fiscal year).

3. MALARIA IN PREGNANCY

SULFADOXINE-PYRIMETHAMINE (SP) TREATMENTS PROCURED AND DISTRIBUTED WITH PMI SUPPORT¹

		SP Treatments Procured									
		SP Treatments Distributed									
Country	Year 1 (2006)	Year 2 (2007)	Year 3 (2008)	Year 4 (2009)	Year 5 (2010)	Year 6 (FY 2011)	Year 7 ² (FY 2012)	Year 8 ^{3,4} (FY 2013)	Year 9 (FY 2014) ⁵	Cumulative ⁶	
Round 1	Uganda	0	0	18,333	72,666	39,367	26,666	26,667	0	0	171,033
		0	0	2,556	45,780	40,063	26,666	0	0	0	107,270
Round 2	Rwanda	–	583,333	0	0	0	0	0	0	0	583,333
		–	583,333	0	0	0	0	0	0	0	583,333
Round 3	Benin	–	0	766,666	0	0	405,863	227,550	900,000	505,845	2,805,924
		–	0	0	307,121	150,000	309,546	227,550	227,550	450,200	1,571,967
	Ghana	–	–	0	0	25,000	0	0	900,000	2,700,000	3,625,000
		–	–	0	0	0	25,000	0	900,000	2,700,000	3,625,000
	Kenya	–	–	0	840,000	0	0	0	0	0	840,000
		–	–	0	840,000	0	0	0	0	0	840,000
	Liberia	–	–	0	78,666	85,333	85,333	79,667	331,667	0	575,333
		–	–	0	78,666	0	71,333	7,667	79,667	273,667	511,000
	Madagascar	–	–	–	–	–	–	–	–	750,000	750,000
		–	–	–	–	–	–	–	–	0	0
	Malawi	–	–	–	–	–	–	–	2,070,333	2,070,333	4,140,667
		–	–	–	–	–	–	–	0	282,667	282,667
	Mali	–	–	1,000,000	0	0	0	531,000	633,333	5,400,000 ¹⁰	7,564,333
		–	–	0	1,000,000	0	0	531,000	333,333	1,555,300	3,419,633
	Mozambique	–	–	0	0	3,645,052 ⁷	0	2,000,000	577,000	1,125,000	7,347,052
		–	–	0	0	0	3,645,052	0	1,485,900	0	5,130,952
Zambia	–	–	0	666,666	0	3,083,300	0	0	0	3,749,966	
	–	–	0	0	666,666	3,083,300 ⁸	0	0	0	3,749,966	
Round 4	DRC	–	–	–	–	2,470,000 ⁹	1,100,000	300,000	1,000,000	0	3,770,000
		–	–	–	–	1,370,000	0	223,683	563,786	508,904	2,666,373
	Nigeria	–	–	–	–	–	–	1,000,000	4,000,000	0	5,000,000
		–	–	–	–	–	–	0	498,200	535,162	1,033,362
	Guinea	–	–	–	–	–	–	108,333	280,000	0	388,333
		–	–	–	–	–	–	108,057	233,333	25,425	366,815
	Zimbabwe	–	–	–	–	–	–	220,000	189,267	787,500	1,196,767
		–	–	–	–	–	–	220,000	189,267	787,500	1,196,767
TOTAL	–	583,333	1,784,999	1,657,998	6,264,752	4,701,162	4,493,217	10,881,600	13,338,679	42,507,741	
	–	583,333	2,556	2,271,567	2,226,729	7,160,897	1,317,957	4,511,036	7,118,825	25,085,105	

(1) Please note that one treatment consists of three tablets. (2) In FY 2012, 826,667 SP treatments were procured for Tanzania with funds from the Royal Embassy of the Kingdom of Netherlands. (3) In FY 2013, 2,308,800 SP tablets and 6,926,454 amodiaquine tablets were procured for Senegal for seasonal malaria chemoprevention for approximately 600,000 children. (4) During FY 2013, USAID also procured 1,376,000 SP treatments for approximately 625,000 children. (5) In FY 2014, 1,132,800 SP tablets and 1,098,409 amodiaquine tablets were procured for Senegal for seasonal malaria chemoprevention for approximately 625,000 children. (6) The cumulative column takes into account the 3-month overlap between Year 5 (covering the 2010 calendar year) and Year 6 (covering the 2011 fiscal year). (7) All treatments were procured with non-malaria U.S. Government funds. (8) In addition to the SP treatments procured with U.S. Government funds, 2,250,000 SP treatments were procured in FY 2011 for Zambia with a donation from DFID. (9) Of this total, 1,370,000 treatments were procured with non-malaria U.S. Government funds. (10) In FY 2014, in addition to these SP tablets for IPTp, 900,000 SP tablets and 2,700,000 amodiaquine tablets were procured for Mali for seasonal malaria chemoprevention, protecting approximately 104,750 children.

HEALTH WORKERS TRAINED IN INTERMITTENT PREVENTATIVE TREATMENT FOR PREGNANT WOMEN (IPTP) USE WITH PMI SUPPORT ¹

	Country	Year 1 (2006)	Year 2 (2007)	Year 3 (2008)	Year 4 (2009)	Year 5 (2010)	Year 6 (FY 2011)	Year 7 ² (FY 2012)	Year 8 (FY 2013)	Year 9 (FY 2014)
Round 1	Angola	1,450	290	1,481	2,554	2,695	1,488	1,308	686	729
	Tanzania	376	1,158	2,532	2,288	2,157	4,634	1,210	162	2,973
	Uganda	168	807	649	724	870	5,341	5,651	874	579
Round 2	Malawi	–	–	2,747	348	181	0	31	134	1,100
	Mozambique	–	–	–	–	–	–	776	569	158
	Rwanda ³	–	250	436	0	964	225	0	0	0
	Senegal	–	43	2,422	865	1,025	1,563	672	512	3,842
Round 3	Benin	–	605	1,267	146	80	0	0	805	1,970
	Ghana	–	–	464	1,170	2,797	7,577	2,665	1,087	4,201
	Kenya	–	–	0	5,107	93	1,844	4,950	5,523	4,310
	Liberia	–	–	417	750	535	404	289	289	95
	Madagascar	–	–	0	0	1,576	3,370	3,808	0	0
	Mali	–	–	142	0	1,173	1,983	270	351	471
	Zambia	–	–	–	63	0	0	387	350	504
Round 4	DRC	–	–	–	–	0	443	1,347	3,265	2,210
	Nigeria	–	–	–	–	0	0	3,456	1,466	1,630
	Guinea	–	–	–	–	–	–	313	0	1,052
	Zimbabwe	–	–	–	–	–	–	215	86	1,382
	TOTAL	1,994	3,153	12,557	14,015	14,146	28,872	27,348	16,159	27,206

(1) A cumulative count of individual health workers trained is not provided because some health workers have been trained on more than one occasion. (2) During FY 2012, USAID also provided support for malaria in pregnancy activities in Burkina Faso and South Sudan; 2,077 health workers were trained in IPTp. (3) Health workers in Rwanda have been trained in focused antenatal care because IPTp is not national policy.

4. CASE MANAGEMENT

RAPID DIAGNOSTIC TESTS (RDTs) PROCURED AND DISTRIBUTED WITH PMI SUPPORT

		RDTs Procured									
		RDTs Distributed									
Country	Year 1 (2006)	Year 2 (2007)	Year 3 (2008)	Year 4 (2009)	Year 5 (2010)	Year 6 (FY 2011)	Year 7 ¹ (FY 2012)	Year 8 ² (FY 2013)	Year 9 (FY 2014)	Cumulative ³	
Round 1	Angola	129,875	375,000	375,000	600,000	832,000	1,637,000	862,150	2,930,000	2,800,000	10,091,025
		0	101,000	380,875	975,000	282,000	1,637,500	1,762,150	900,000	2,030,000	8,068,525
	Tanzania	875,000	550,200	1,075,000	950,000	292,000	117,000	212,500	364,500	6,623,800	11,060,000
		250,000	1,025,200	425,000	989,500	661,900	194,574	212,500 ⁴	202,000	3,254,475	7,150,649
Round 2	Uganda	0	0	0	0	1,309,000	1,346,650	2,061,000	525,000	0	3,916,650
		0	0	0	0	34,000	296,985	0	500,000	0	795,055
Round 2	Malawi	-	-	-	-	-	2,966,675	9,227,000	4,000,000		16,193,675
		-	-	-	-	-	2,966,675	5,227,825	4,476,150		12,670,650
	Mozambique	-	0	0	0	0	5,000,000	1,000,000	9,956,375	14,450,000	30,406,375
		-	0	0	0	0	3,452,550	1,000,000	2,485,753	0	6,938,303
Round 2	Rwanda	-	0	0	0	200,010	200,010	500,010	500,010	1,162,020	2,362,050
		-	0	0	0	0	109,991	349,219 ⁵	240,000	500,010	1,199,220
Round 2	Senegal	-	0	0	0	0	700,000	300,000	0	0	1,000,000
		-	0	0	0	0	700,000 ⁶	300,000	0	0	1,000,000
Round 3	Benin	-	178,400	0	0	600,000	600,000	980,000	1,000,000	1,500,000	4,258,400
		-	73,815	104,585	0	0	600,000	490,000	1,190,000	961,825	3,420,225
	Ethiopia	-	-	0	1,680,000	1,560,000	0	0	0	0	3,240,000
		-	-	0	820,000	2,420,000	0	0	0	0	3,240,000
	Ghana	-	-	0	74,000	725,600	725,600	3,048,000	0	5,700,000	9,547,600
		-	-	0	0	0	725,600	1,000,000	0 ⁷	3,000,000	4,725,600
	Kenya	-	-	0	0	547,800	547,800	1,745,120	6,547,680	100,000	8,940,600
		-	-	0	0	0	292,040	667,960	3,298,320	4,500,000	8,758,320
	Liberia	-	-	0	850,000	1,200,000	0	1,900,000	2,500,000	0	6,450,000
		-	-	0	850,000	1,116,275	83,725	0	1,506,450	1,846,525	5,402,975
Round 3	Madagascar	-	-	0	0	270,000	1,500,000	778,000	1,000,000	2,780,000	6,328,000
		-	-	0	0	202,031	248,329	1,491,589	0	2,780,000	4,612,469
Round 3	Mali	-	-	0	30,000	500,000	500,000	1,000,000	3,000,000	2,000,000	7,030,000
		-	-	0	0	530,000	500,000	600,000	1,253,800	3,832,475	6,716,275
Round 3	Zambia	-	979,000	1,639,000	2,070,000	4,804,500	2,337,450	3,056,250	3,530,000	4,000,000	20,162,100 ⁸
		-	0	979,000	1,250,000	2,550,400	2,337,450	999,975	5,586,250	4,000,000	15,448,975
Round 4	DRC	-	-	-	-	500,000	0	3,500,000	4,000,000	8,000,000	16,000,000
		-	-	-	-	0	400,425	428,175	1,710,676	1,739,736	4,279,012
	Mekong	-	-	-	-	-	61,000	248,500	424,000	378,700	1,112,200
		-	-	-	-	-	61,000	5,250	120,126	152,075	338,451
	Burma	-	-	-	-	-	-	-	-	50,000	50,000
		-	-	-	-	-	-	-	-	232,100	232,100 ⁹
	Cambodia	-	-	-	-	-	-	-	-	0	0
		-	-	-	-	-	-	-	-	10,850	10,850 ¹⁰
	Nigeria	-	-	-	-	-	0	2,700,000	4,000,000	2,500,000	9,200,000
		-	-	-	-	-	0	428,400	1,084,425	2,870,612	4,383,437
Round 4	Guinea	-	-	-	-	-	100,000	1,000,000	1,520,000	1,520,000	2,620,000
		-	-	-	-	-	100,000	1,000,000	1,520,000	1,520,000	2,620,000
Round 4	Zimbabwe	-	-	-	-	-	1,599,700	1,135,375	2,266,000	5,001,075	5,001,075
		-	-	-	-	-	1,599,700	1,135,375	2,266,000	5,001,075	5,001,075
TOTAL		1,004,875	2,082,600	3,089,000	6,254,000	13,340,910	14,572,510	28,957,905	51,939,940	59,830,520	174,969,750
		250,000	1,200,015	1,889,460	4,884,500	7,796,606	10,940,169	14,801,593	27,741,000	39,972,833	107,012,166

(1) During FY 2012, USAID also provided support for case management activities in Burkina Faso, Burundi, and South Sudan; 1,600,000 RDTs were procured and 900,000 were distributed. (2) During FY 2013, USAID also provided support for case management activities in Burkina Faso, Burundi, and South Sudan; 7,741,300 RDTs were procured and 3,000,000 were distributed. (3) The cumulative column takes into account the 3-month overlap between Year 5 (covering the 2010 calendar year) and Year 6 (covering the 2011 fiscal year). (4) During FY 2012, an additional 259,200 RDTs were distributed in Tanzania. These RDTs were originally procured for Rwanda and transferred to Tanzania to avoid expiry. (5) Of the 500,010 RDTs Rwanda procured in FY 2012, 259,200 were relocated to Tanzania to avoid expiry. These RDTs are included in this total but were distributed in Tanzania. (6) In FY 2012, an additional 250,000 RDTs procured by other donors were distributed with U.S. Government support in Senegal. (7) In FY 2013, 2,800,000 RDTs procured by the Global Fund were distributed with U.S. Government support in Ghana. (8) In addition to these RDTs procured with U.S. Government funds, PMI procured RDTs for Zambia with a donation from DFID: 1,350,000 RDTs were procured in FY 2011, 2,000,000 RDTs were procured in FY 2013, and 9,500,000 RDTs were procured in FY 2014. (9) This is the first year that Burma is reporting separately from Mekong. Therefore, the number of RDTs distributed exceeds ITNs procured because these distributed RDTs include some which had been reported as procured under the Mekong row last year. (10) This is the first year that Cambodia is reporting separately from Mekong. Therefore, the number of RDTs distributed exceeds ITNs procured because these distributed RDTs include some that had been reported as procured under the Mekong row last year.

HEALTH WORKERS TRAINED IN MALARIA DIAGNOSIS WITH PMI SUPPORT ¹

	Country	Year 1 (2006)	Year 2 (2007)	Year 3 (2008)	Year 4 (2009)	Year 5 (2010)	Year 6 (FY 2011)	Year 7 ² (FY 2012)	Year 8 (FY 2013)	Year 9 (FY 2014)
Round 1	Angola	–	374	1,356	691	1,022	1,028	225	487	1,092
	Tanzania	–	0	0	247	388	338	83	159	1,256
	Uganda	–	0	100	1,115	941	1,651	427	1,281	893
Round 2	Malawi	–	–	0	0	307	549	1,039	579	1,063
	Mozambique	–	391	0	136	0	0	0	8	0
	Rwanda	–	–	0	0	29	0	172	556	5,898
	Senegal	–	–	90	19	4,158	2,920	1,239	2,212	835
Round 3	Benin	–	605	0	24	583	232	884	967	2,546
	Ethiopia	–	–	0	0	0	7,666	9,068	563	738
	Ghana	–	–	0	46	4,511	8,680	2,540	1,292	19,864
	Kenya	–	–	77	0	485	210	408	3,257	346
	Liberia	–	–	0	22	906	39	0	0	0
	Madagascar	–	–	0	108	2,701	8,932	535	4,620	9,194
	Mali	–	–	40	412	1,276	1,957	1,292	375	765
Zambia	–	–	0	36	0	37	2,017	719	524	
Round 4	DRC	–	–	–	–	28	499	1,762	5,157	4,121
	Mekong	–	–	–	–	0	0	63	1,975	103
	Burma	–	–	–	–	–	–	–	–	1,887
	Cambodia	–	–	–	–	–	–	–	–	865
	Nigeria	–	–	–	–	0	2	3,555	1,919	1,629
	Guinea	–	–	–	–	–	–	835	20	1,821
	Zimbabwe	–	–	–	–	–	–	2,066	86	2,984
	TOTAL	–	1,370	1,663	2,856	17,335	34,740	28,210	26,232	58,424

(1) A cumulative count of individual health workers trained is not provided because some health workers have been trained on more than one occasion. (2) During FY 2012, USAID also provided support for case management activities in Burkina Faso and Burundi; 1,789 health workers were trained in malaria diagnostics.

ARTEMISININ-BASED COMBINATION TREATMENTS (ACTS) PROCURED AND DISTRIBUTED WITH PMI SUPPORT
ACTs Procured
ACTs Distributed

	Country	ACTs Distributed									Cumulative ⁴
		Year 1 (2006)	Year 2 (2007)	Year 3 (2008)	Year 4 (2009)	Year 5 (2010)	Year 6 (FY 2011)	Year 7 ^{1,2} (FY 2012)	Year 8 ³ (FY 2013)	Year 9 (FY 2014)	
Round 1	Angola	587,520	2,033,200	3,035,520	5,572,860	3,767,040	3,770,010	7,429,800	1,539,000	720,390	24,685,330
		0	1,689,321	3,109,089	1,947,188	3,567,360	3,770,010	3,600,000	3,829,800	1,539,000	23,051,768
	Tanzania	380,160	694,050	146,730	4,001,760	8,751,150	7,608,900	8,201,910	6,278,820	1,674,840	34,166,760
		380,160	494,050	346,730	544,017	4,873,207	8,819,640	8,663,280	1,593,300	7,668,300	31,075,294
	Uganda	261,870	0	1,140,480	0	2,085,120	2,085,120	1,169,820	799,800	762,150	6,219,240
227,827		0	0	1,140,480	0	545,310	52,501	1,054,490	43,140	3,063,748	
Round 2	Malawi	–	4,695,450	8,449,920	1,169,280	1,634,520	214,500	7,691,970	6,520,260	2,378,520	32,539,920
		–	4,694,013	3,579,278	3,693,510	2,198,460	215,100	6,536,307	3,908,910	7,026,480	31,636,958
	Mozambique	–	218,880	4,988,160	0	5,331,840	7,064,040	8,731,950	7,469,790	9,138,480	40,138,020
		–	218,880	1,440,000	2,210,320	1,553,430	4,920,990	2,830,380	11,643,402	0	23,838,982
	Rwanda	–	714,240	0	0	0	0	0	300,150	1,356,330	2,370,720
–		0	714,240	0	0	0	0	300,150	269,430	1,283,820	
Senegal	–	0	0	443,520	670,080	659,790	355,000	346,110	789,600	3,206,020	
	–	0	0	0	443,520	455,756	468,776	210,378	486,621	2,065,051	
Round 3	Benin	–	–	1,073,490	215,040	1,002,240	509,100	1,841,190	132,000	2,032,170	6,805,230
		–	–	326,544	812,232	1,002,600	470,749	1,181,091	396,716	1,147,590	5,330,476
	Ethiopia	–	–	600,000	1,081,000	2,268,000	0	1,365,000	3,610,000	3,000,000	11,924,000
		–	–	0	1,681,000	648,000	1,620,000	1,365,000	1,821,000	3,600,000	10,735,000
	Ghana	–	–	1,142,759	0	0	0	2,090,130	849,460	3,698,170	7,780,519
		–	–	0	1,028,000	114,759	0	2,090,130	849,460	3,729,850	7,812,199
	Kenya	–	–	1,281,720	7,804,800	6,997,080	6,960,390	9,578,970	4,168,414	13,743,240	47,904,214
		–	–	1,281,720	6,015,360	7,667,310	3,268,260	2,410,810	10,422,328	6,084,137	36,682,445
	Liberia	–	496,000	0	1,303,175	1,631,625	4,444,875	2,375,525	2,703,000	1,101,000	13,483,600
		–	0	496,000	1,303,175	1,631,625	1,623,781	2,375,525	1,865,775	1,066,150	10,362,031
Madagascar	–	–	0	0	0	100,025	400,000	0	881,000	1,381,025	
	–	–	0	0	0	0	84,948	387,035	802,154	1,274,137	
Mali	–	–	0	241,720	739,200	1,289,190	2,400,030	2,289,720	1,506,300	7,726,960	
	–	–	0	241,720	0	1,289,190	900,000	2,274,682	2,923,072	7,628,664	
Zambia	–	–	495,360	0	2,390,400	1,688,160	2,721,060	3,379,830	6,799,260	16,837,110 ⁵	
	–	–	80,640	173,160	2,257,920	1,688,160	2,721,060	3,080,970	6,799,260	16,164,210	
Round 4	DRC	–	–	–	–	3,780,000	0	7,000,000	2,378,400	9,537,400	22,695,800
		–	–	–	–	639,075	855,948	1,007,387	4,344,124	4,041,801	10,792,196
	Mekong	–	–	–	–	0	0	68,070	102,060	10,000	180,130
		–	–	–	–	0	0	0	17,415	0	17,415
	Burma	–	–	–	–	–	–	–	–	24,540	24,540
		–	–	–	–	–	–	–	–	25,040	25,040
	Cambodia	–	–	–	–	–	–	–	–	0	0
		–	–	–	–	–	–	–	–	0	0
	Nigeria	–	–	–	–	0	0	7,201,535	3,584,060	17,955,180	28,740,775
		–	–	–	–	1,043,352 ⁶	0	1,241,363	3,184,730	7,357,739	12,827,184
Guinea	–	–	–	–	–	1,450,000	754,750	1,401,300	1,201,580	4,807,630	
	–	–	–	–	–	0	915,500	754,725	1,461,581	3,131,806	
Zimbabwe	–	–	–	–	–	744,120	969,150	581,460	2,251,940	4,546,670	
	–	–	–	–	–	520,884	1,192,386	581,460	2,251,940	4,546,670	
TOTAL	1,229,550	8,851,820	22,354,139	21,833,155	41,048,295	38,588,220	72,345,860	48,433,634	80,562,090	318,164,213	
	607,987	7,096,264	11,374,241	20,790,162	27,640,618	30,063,778	39,636,444	52,520,850	58,323,285	243,345,094	

(1) During FY 2012, USAID also provided support for case management activities in Burkina Faso, Burundi, and South Sudan; 4,991,250 ACTs were procured and 2,367,675 were distributed. (2) During FY 2012, PMI also procured 786,305 ACT treatments for emergency stockpile purposes. These will be counted in next year's annual report once they have been allocated to specific countries. (3) During FY 2013, USAID also provided support for case management activities in Burkina Faso, Burundi, and South Sudan; 4,289,850 ACTs were procured and 1,830,475 were distributed. (4) The cumulative column takes into account the 3-month overlap between Year 5 (covering the 2010 calendar year) and Year 6 (covering the 2011 fiscal year). (5) In addition to these ACTs procured with U.S. Government funds, PMI procured ACTs for Zambia with a donation from DFID: 1,599,360 ACTs were procured in 2010, 3,805,560 ACTs were procured in FY 2011, 4,686,750 ACTs were procured in FY 2012, 4,432,140 ACTs were procured in FY 2013, and 1,000,200 ACTs were procured in FY 2014. (6) These ACTs were distributed in 2010 with U.S. Government funds but were procured before Nigeria became a PMI focus country.

ACTS PROCURED BY OTHER DONORS AND DISTRIBUTED WITH PMI SUPPORT

	Country	Year 1 (2006)	Year 2 (2007)	Year 3 (2008)	Year 4 (2009)	Year 5 (2010)	Year 6 (FY 2011)	Year 7 (FY 2012)	Year 8 (FY 2013)	Year 9 (FY 2014)	Cumulative ¹
Round 1	Uganda	–	8,709,140	112,330	4,459,918	0	0	0	0	0	13,281,388
Round 2	Malawi	–	–	0	2,056,170	0	5,015,490	0	0	0	6,779,580
	Mozambique	–	–	0	1,423,350	2,857,590	1,428,630	0	0	0	4,951,070
	Rwanda	–	–	–	396,625	282,494	114,471	966	0	0	794,556
	Senegal	–	–	–	0	0	0	275,000	0	0	275,000
Round 3	Madagascar	–	–	–	519,338	396,470	124,118	674,273	0	0	1,699,579
	Mali	–	–	–	–	–	–	184,319	0	0	184,319
Round 4	Nigeria	–	–	–	–	–	311,100	0	0	3,918,793	4,229,893
	Guinea	–	–	–	–	–	–	938,480	0	0	938,480
	Zimbabwe	–	–	–	–	–	–	344,160	0	0	344,160
	TOTAL	–	8,709,140	112,330	8,855,401	3,536,554	6,993,809	950,239	1,466,959	3,918,793	33,478,025

(1) The cumulative column takes into account the 3-month overlap between Year 5 (covering the 2010 calendar year) and Year 6 (covering the 2011 fiscal year).

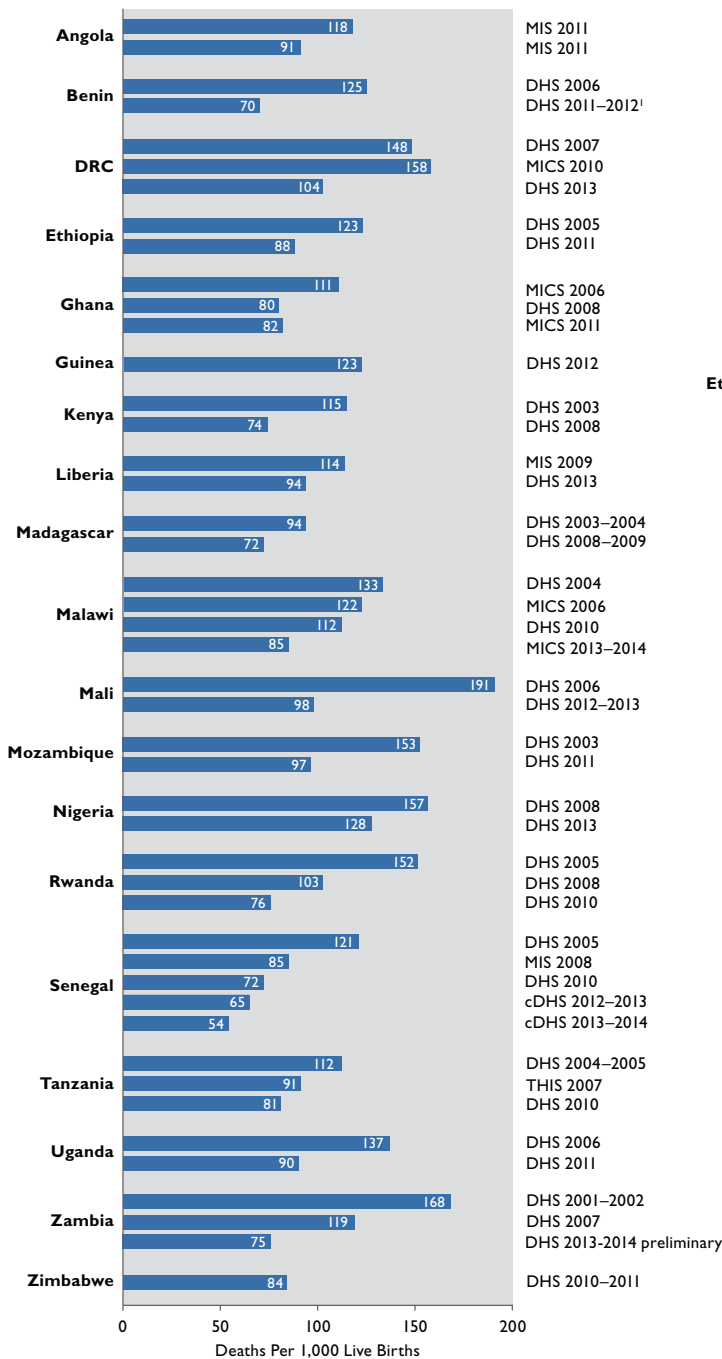
HEALTH WORKERS TRAINED IN ACT USE WITH PMI SUPPORT¹

	Country	Year 1 (2006)	Year 2 (2007)	Year 3 (2008)	Year 4 (2009)	Year 5 (2010)	Year 6 (FY 2011)	Year 7 ² (FY 2012)	Year 8 (FY 2013)	Year 9 (FY 2014)
Round 1	Angola	1,283	290	1,357	2,784	2,868	238	1,489	2,492	3,164
	Tanzania	4,217	1,011	1,767	1,018	1,162	1,520	2,218	162	3,493
	Uganda	2,844	12,637	9,159	1,356	0	485	5,651	767	2,047
Round 2	Malawi	–	0	5,315	809	1,813	378	204	540	1,124
	Mozambique	–	174	422	16,768	219	0	2,383	1,190	0
	Rwanda	–	5,127	8,565	7,672	7,180	8,911	3,098	1,707	5,898
	Senegal	–	1,020	4,776	1,162	4,158	2,375	1,196	2,124	4,098
Round 3	Benin	–	605	–	762	1,178	1,207	678	907	2,610
	Ethiopia	–	–	2,786	0	1,740	7,666	8,694	4,560	6,570
	Ghana	–	–	368	1,144	2,952	7,954	1,318	10,278	19,619
	Kenya	–	–	–	4,747	390	0	0	0	0
	Liberia	–	–	595	746	1,008	498	289	60	97
	Madagascar	–	–	–	1,696	4,575	8,039	580	4,582	9,194
	Mali	–	–	101	412	1,283	1,957	1,260	328	765
	Zambia	–	–	186	197	0	493	542	655	503
Round 4	DRC	–	–	–	–	874	462	1,525	5,097	3,811
	Mekong	–	–	–	–	0	0	291	1,804	103
	Burma	–	–	–	–	–	–	–	–	1,790
	Cambodia	–	–	–	–	–	–	–	–	808
	Nigeria	–	–	–	–	5,058	0	5,608	24,195	14,923
	Guinea	–	–	–	–	–	–	707	20	1,675
	Zimbabwe	–	–	–	–	–	–	2,066	86	2,984
	TOTAL	8,344	20,864	35,397	41,273	36,458	42,183	39,797	61,554	85,276

(1) A cumulative count of individual health workers trained is not provided because some health workers have been trained on more than one occasion. (2) During FY 2012, USAID also provided support for case management activities in Burkina Faso and Burundi; 1,727 health workers were trained in ACT use.

Appendix 3: Mortality Rates and Intervention Coverage in PMI Focus Countries

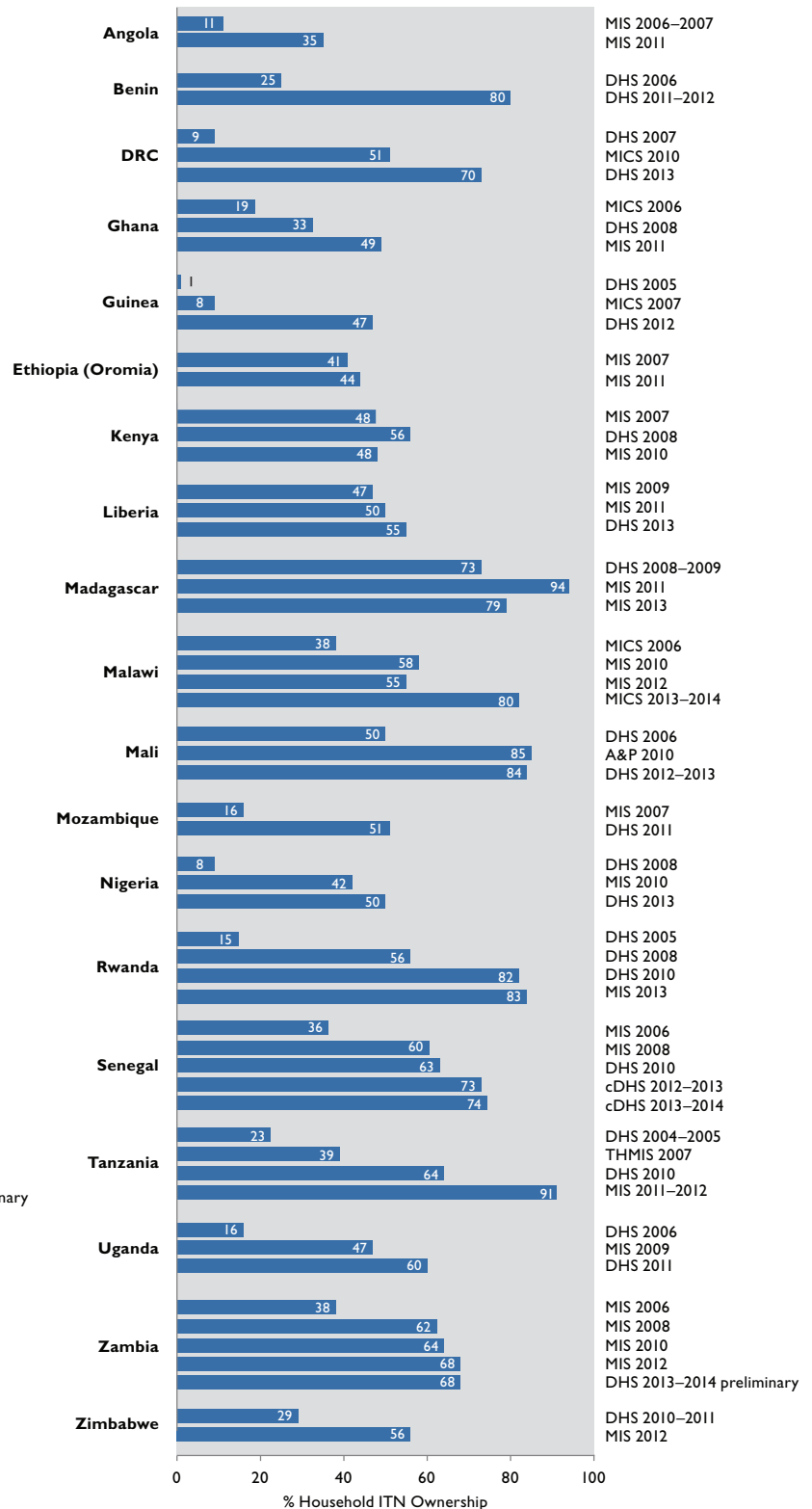
Figure 1: All-Cause Mortality Rates among Children Under Five in PMI Focus Countries



1. The final report of the DHS 2011–2012 notes that, while mortality among children under five in Benin has declined, there may have been significant under-reporting of neonatal and child deaths by respondents.

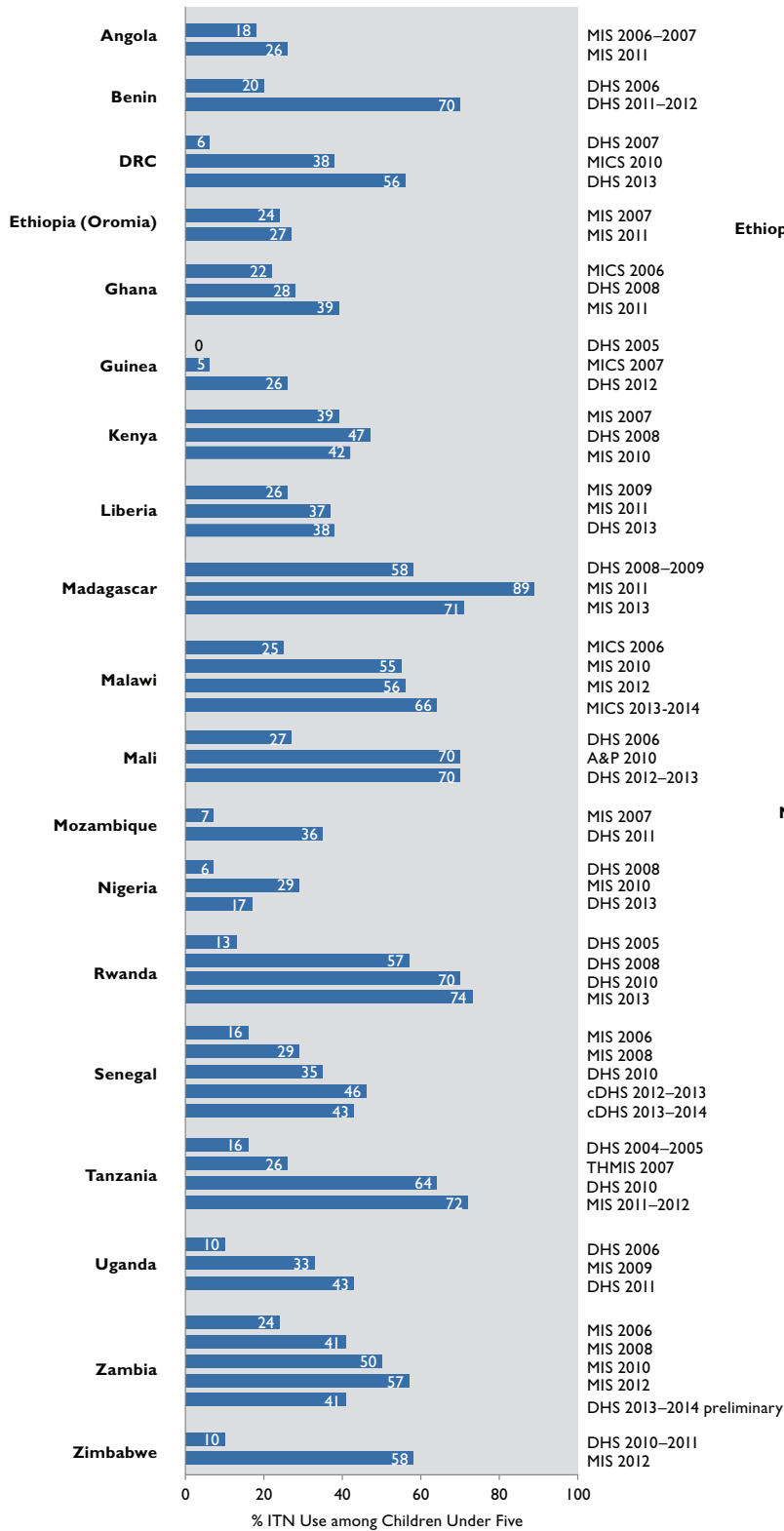
Note: The PMI focus countries included in this figure have at least two data points from nationwide household surveys that measured all-cause mortality in children under the age of five.

Figure 2: ITN Ownership in PMI Focus Countries



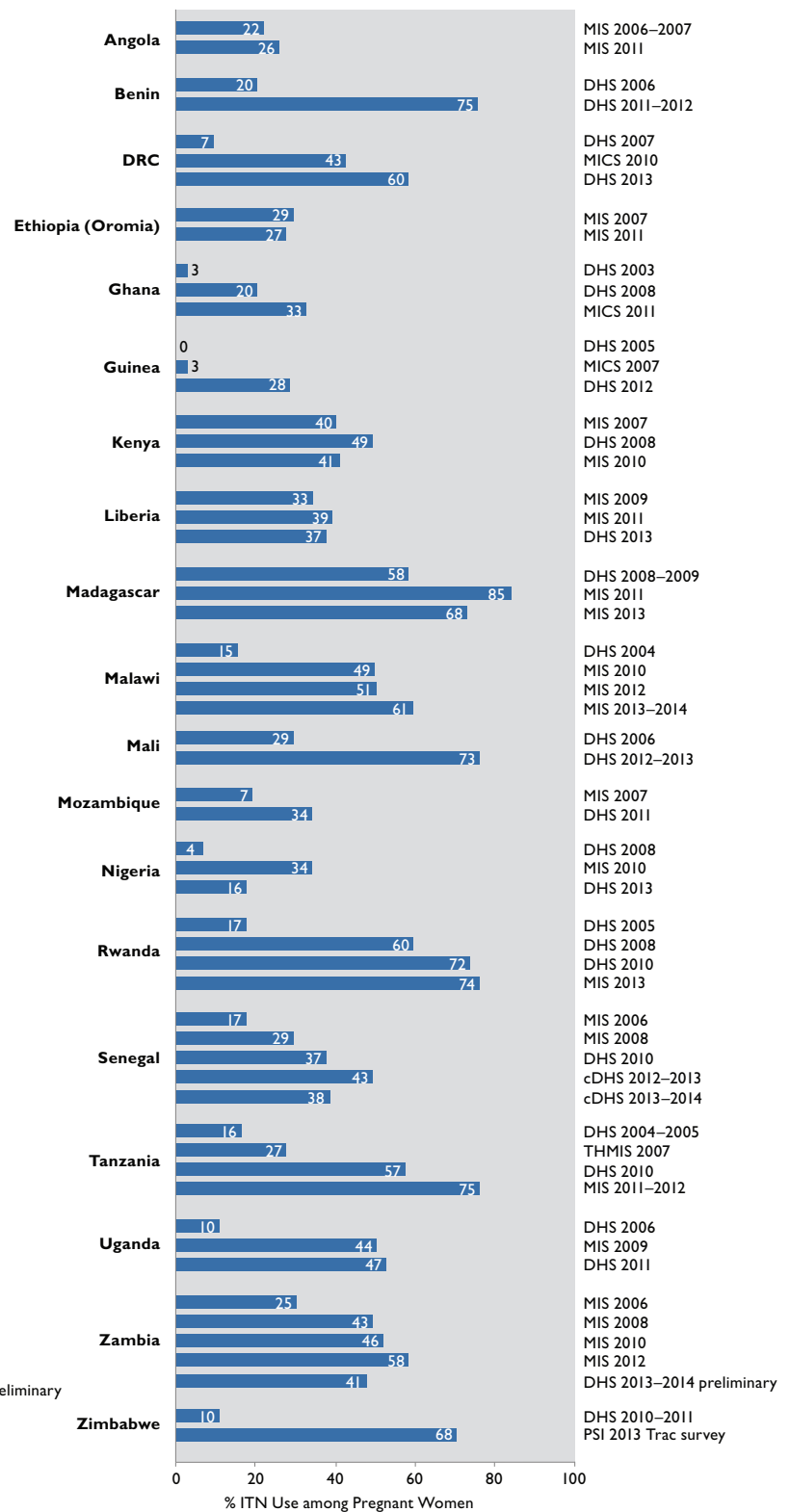
Note: The PMI focus countries included in this figure have at least two data points from nationwide household surveys that measured ITN ownership, defined as the percentage of households that own at least one ITN.

Figure 3: ITN Use among Children Under Five in PMI Focus Countries



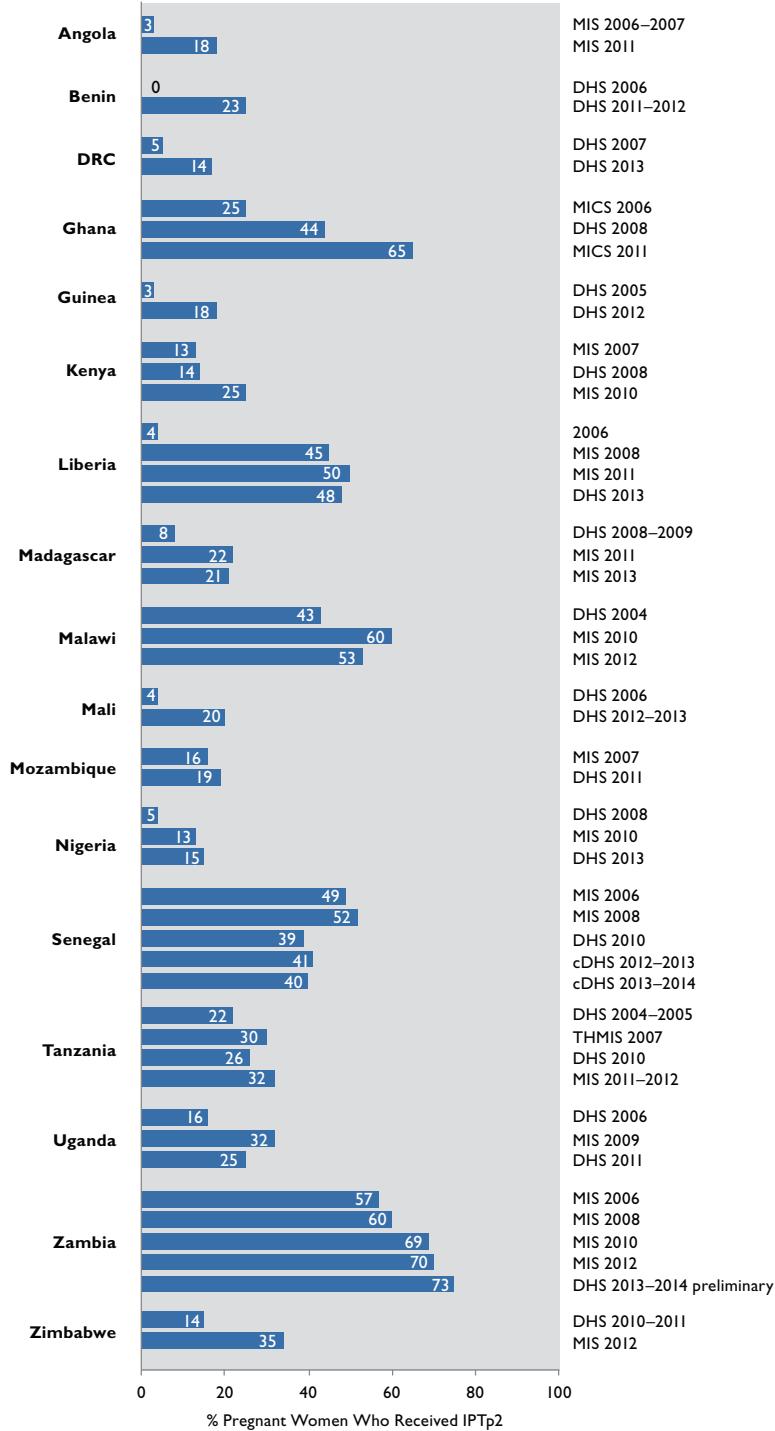
Note: The PMI focus countries included in this figure have at least two data points from nationwide household surveys that measured ITN use among children under five, defined as the percentage of children under five who slept under an ITN the night before the survey.

Figure 4: ITN Use among Pregnant Women in PMI Focus Countries



Note: The PMI focus countries included in this figure have at least two data points from nationwide household surveys that measured ITN use among pregnant women, defined as the percentage of pregnant women who slept under an ITN the night before the survey.

Figure 5: IPTp2 Coverage in PMI Focus Countries



Note: The PMI focus countries included in this figure have at least two data points from nationwide household surveys that measured IPTp 2 coverage for pregnant women, defined as the percentage of women who received at least two doses of SP during their last pregnancy, with at least one dose given during an antenatal clinic visit. IPTp is not part of the national policy in Ethiopia and Rwanda.

ACKNOWLEDGMENTS

The Ninth Annual Report of the President's Malaria Initiative is dedicated to the staff of host governments, international and local partners, and all U.S. Government staff who have contributed to the achievements described in these pages.

COVER PHOTO CREDITS

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USAID
FROM THE AMERICAN PEOPLE

PRESIDENT'S MALARIA INITIATIVE



U.S. Agency for International Development

1300 Pennsylvania Avenue, NW

Washington, DC 20523

Tel: (202) 712-0000

Fax: (202) 216-3524

www.usaid.gov