


THE PRESIDENT'S MALARIA INITIATIVE

Eighth Annual Report to Congress | April 2014





USAID
FROM THE AMERICAN PEOPLE

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

DEPARTMENT OF HEALTH & HUMAN SERVICES · USA

THE PRESIDENT'S MALARIA INITIATIVE

Eighth Annual Report to Congress | April 2014

Table of Contents

Abbreviations and Acronyms

ACT	Artemisinin-based combination therapy
AFRO	Africa Regional Office (WHO)
ANC	Antenatal care
BCC	Behavior change communication
CBO	Community-based organization
CDC	U.S. Centers for Disease Control and Prevention
CHW	Community health worker
DFID	U.K. Department for International Development
DHIMS	District health information management system
DHS	Demographic and Health Survey
DOD	U.S. Department of Defense
DRC	Democratic Republic of the Congo
FANC	Focused antenatal care
FY	Fiscal year
GHS	Ghana Health Service
Global Fund	The Global Fund to Fight AIDS, Tuberculosis and Malaria
HIV and AIDS	Human Immunodeficiency Virus and Acquired Immune Deficiency Syndrome
HMIS	Health management information systems
iCCM	Integrated community case management
IMCI	Integrated management of childhood illness
IPTp	Intermittent preventive treatment for pregnant women
IRS	Indoor residual spraying
ITN	Insecticide-treated mosquito net
LMHRA	Liberia Medicines and Health Products Regulatory Authority
MCH	Maternal and child health
MERG	Monitoring and Evaluation Reference Group
MICS	Multiple Indicator Cluster Survey
MIS	Malaria Indicator Survey
NGO	Non-governmental organization
NIH	National Institutes of Health
NMCP	National malaria control program
PEPFAR	U.S. President's Emergency Plan for AIDS Relief
PMI	U.S. President's Malaria Initiative
RBM	Roll Back Malaria
RDT	Rapid diagnostic test
SMC	Seasonal malaria chemoprevention
SP	Sulfadoxine-pyrimethamine
THMIS	Tanzania HIV/AIDS and Malaria Indicator Survey
UNICEF	United Nations Children's Fund
USAID	U.S. Agency for International Development
WHO	World Health Organization
WHOPES	World Health Organization's Pesticide Evaluation Scheme
WRAIR	Walter Reed Army Institute of Research

Maggie Hallahan Photography

Executive Summary

Across sub-Saharan Africa, where countries have scaled up insecticide-treated mosquito nets (ITNs), indoor residual spraying (IRS), improved diagnostic tests, and highly effective antimalarial drugs, mortality in children under five years of age has fallen dramatically. The risk of malaria is declining, and it is apparent that the cumulative efforts by the President's Malaria Initiative (PMI), national governments, The Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund), and many other partners are working. According to the World Health Organization's (WHO's) *2013 World Malaria Report*, the malaria mortality rates in children under five years of age in Africa were reduced by an estimated 54 percent between 2000 and 2012. Over the same period, the estimated number of malaria cases in all age groups in Africa dropped from 174 million to 165 million, together with a decrease in deaths due to malaria from 802,000 to 562,000. The U.S. Government's financial and technical contributions have played a major role in this remarkable progress.

Nonetheless, malaria control is now at a key juncture. 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. Therefore, we must redouble our efforts, sustain our financial resources, and accelerate the scale-up of malaria prevention and treatment measures lest we risk a resurgence of malaria. Fighting malaria not only saves lives, but also directly supports the achievement of broader development goals as better health contributes to poverty alleviation.

SAVING CHILDREN'S LIVES

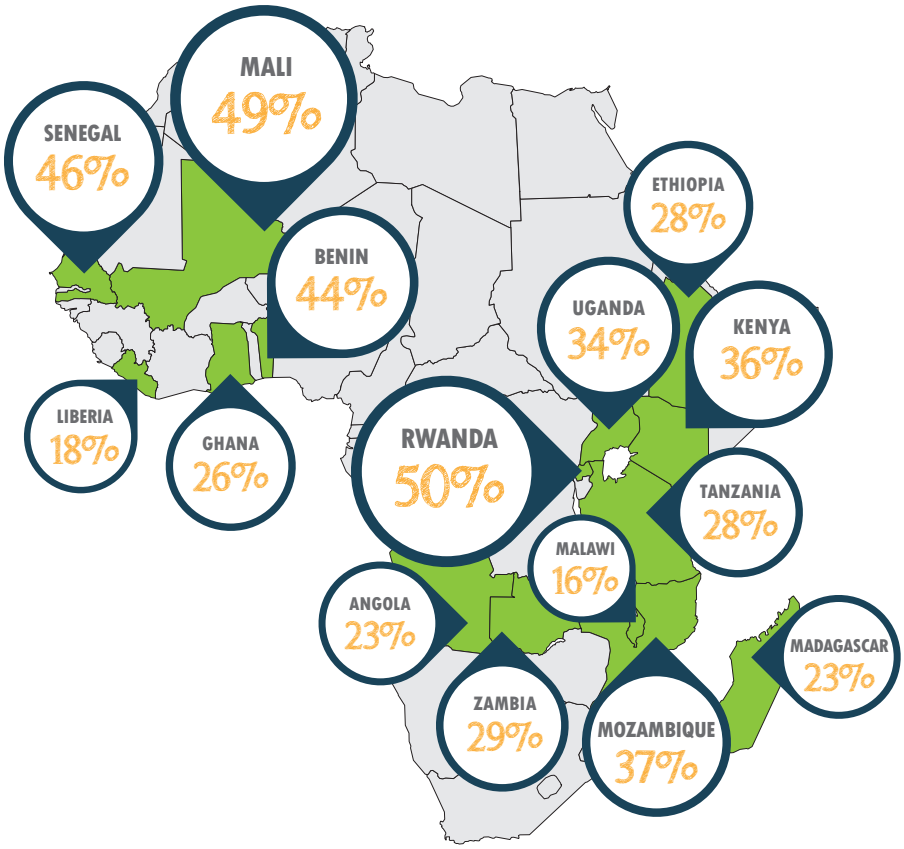
In PMI focus countries, the achievements in malaria control have been impressive since PMI was first launched in June 2005. To date, all of the original 15 PMI focus countries have data from paired nationwide surveys that were conducted since PMI activities began. In all 15 focus countries, all-cause mortality rates among children under five years of age have significantly decreased. These declines have ranged from 16 percent in **Malawi** to 50 percent in **Rwanda** (see Figure 1).

EVALUATING IMPACT

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. These evaluations examine mortality reductions

FIGURE 1

Reductions in All-Cause Mortality Rates of Children Under Five



Note: All 15 original 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. Refer to Appendix 3 (Figure 1) for more detail.

over the decade 2000–2010, whereas PMI calculates mortality reductions using baseline data corresponding to when countries joined PMI (see Figure 1). Six impact evaluations have been completed or are nearing completion (**Angola, Ethiopia, Malawi, Rwanda, Senegal,** and **Tanzania**). Furthermore, PMI is working with countries to continue to track reductions in disease burden. The findings from the three impact evaluations conducted during FY 2013 are summarized below:

- In **Ethiopia**, a 47 percent reduction in all-cause mortality among children under five years of age occurred in the period 2000–2011 together with improvements in access to health services and increases in coverage of malaria control interventions. More than 35,000 health extension workers were trained to provide malaria case management services, ownership of ITNs increased tenfold to 55 percent in 2011, and households with at least one ITN or IRS in the last 12 months reached 71 percent in 2011. The proportion of malaria cases that were confirmed with a diagnostic test increased from less than 10 percent in 2000 to 83 percent in 2012. These improvements resulted in a very low malaria prevalence of only 1.3 percent in 2011.

- **Rwanda** has achieved some of the highest coverage of malaria control interventions in all of sub-Saharan Africa: 82 percent of all households own an ITN, 70 percent of children under the age of five and 72 percent of pregnant women either sleep under an ITN or sleep in a household that has been sprayed with an insecticide, and 99 percent of malaria cases are confirmed by a diagnostic test. Malaria prevalence in children under five years of age declined from 2.6 percent in 2007 to only 1.4 percent in 2010. These malaria control interventions have contributed substantially to all-cause under-five mortality decreasing by 61 percent between 2000 and 2010.

- Between 2005 and 2010, **Senegal** reduced its all-cause under-five mortality rate by 40 percent from 121 to 72 deaths per 1,000 live births. Household ITN ownership increased to 63 percent by 2010 and use of ITNs by children under five years of age also increased significantly from 7 percent in 2005 to 35 percent in 2010. Decreases in two key impact indicators – severe anemia and malaria prevalence – were likely associated with malaria control interventions and were most pronounced among the poorest populations and in rural areas.

PMI'S CONTRIBUTIONS

Since PMI's inception 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 (see PMI Contributions at a Glance on page 7). In fiscal year (FY) 2013 alone, PMI:

- Protected more than 21 million residents by spraying more than 5 million houses with insecticides

- Procured more than 40 million long-lasting ITNs

- Procured more than 10 million sulfadoxine-pyrimethamine (SP) treatments for intermittent preventive treatment for pregnant women (IPTp)

- Trained more than 16,000 health workers in IPTp

- Procured more than 48 million treatments of artemisinin-based combination therapy (ACT) and more than 51 million malaria rapid diagnostic tests (RDTs)

PMI CONTRIBUTIONS AT A GLANCE

Indicator[1]	Year 1 (2006)	Year 2 (2007)	Year 3 (2008)	Year 4 (2009)	Year 5 (2010)	Year 6 (FY 2011)[2]	Year 7 (FY 2012)	Year 8 (FY 2013)	Cumulative
People protected by IRS (houses sprayed)	2,097,056 (414,456)	18,827,709 (4,353,747)	25,157,408 (6,101,271)	26,965,164 (6,656,524)	27,199,063 (6,693,218)	28,344,173 (7,004,903)	30,297,000 (7,127,040)	21,801,615 (5,553,556)	N/A[3]
ITNs procured	1,047,393	5,210,432	6,481,827	15,160,302	18,592,039	23,174,496	21,407,129	40,877,491	123,621,109 (81,942,473 distributed)
ITNs procured by other donors and distributed with PMI support	–	369,900	1,287,624	2,966,011	11,728,674	19,307,756	10,927,791	5,888,463	48,723,286
SP treatments procured	–	583,333	1,784,999	1,657,998	6,264,752	4,701,162	4,493,217	10,881,600	29,169,062 (17,966,280 distributed)
Health workers trained in IPTp	1,994	3,153	12,557	14,015	14,146	28,872	27,348	16,159	N/A[4]
RDTs procured	1,004,875	2,082,600	2,429,000	6,254,000	13,340,910	14,572,510	28,957,905	51,939,940	114,479,230 (67,039,333 distributed)
Health workers trained in malaria diagnosis (RDTs and/or microscopy)	–	1,370	1,663	2,856	17,335	34,740	28,210	26,232	N/A[4]
ACT treatments procured	1,229,550	8,851,820	22,354,139	21,833,155	41,048,295	38,588,220	72,345,860	48,433,634	237,602,123 (185,021,809 distributed)
ACT treatments procured by other donors and distributed with PMI support	–	8,709,140	112,330	8,855,401	3,536,554	6,993,809	950,239	1,466,959	29,559,232
Health workers trained in treatment with ACTs	8,344	20,864	35,397	41,273	36,458	42,183	39,797	61,554	N/A[4]

1 The data reported in this table are up-to-date as of September 30, 2013, and include all PMI focus countries and the Greater Mekong Subregion. In addition, during FY 2013, the U.S. Government provided support for malaria prevention and control activities in other countries. For data by country, see Appendix 2.
2 In Year 6, PMI transitioned from a calendar year to a fiscal year reporting schedule. The cumulative column takes into account the three-month overlap between Year 5 (covering the 2010 calendar year) and Year 6 (covering the 2011 fiscal year).
3 A cumulative count of people protected by IRS is not provided because most areas are sprayed on more than one occasion.
4 A cumulative count of individual health workers trained is not provided because some health workers have been trained on more than one occasion.

- Trained more than 61,000 health workers in treatment of malaria with ACTs and more than 26,000 health workers in laboratory diagnosis of malaria

In addition, in seven PMI focus countries (**Angola, Democratic Republic of the Congo [DRC], Guinea, Mali, Nigeria, Uganda,** and **Zimbabwe**) and in the **Greater Mekong Subregion**, PMI assisted with the distribution of more than 5 million long-lasting ITNs and more than 1 million ACTs that were procured by other donors, highlighting the well established and productive collaboration between PMI and its partners.

SCALING UP MALARIA CONTROL INTERVENTIONS

PMI's contributions, together with those of other partners, have led to dramatic improvements in the coverage of malaria control interventions in PMI focus countries. In 19 countries where at least two comparable nationwide household surveys have been conducted since PMI activities were launched:

- Household ownership of at least one ITN increased from a median* of 29 percent to 55 percent.
- Usage of an ITN the night before the survey increased from a median* of 20 percent to 43 percent for children under five years.
- Usage of an ITN the night before the survey more than doubled from a median* of 17 percent to 43 percent for pregnant women.

In all 17 countries where IPTp is national policy and where at least two comparable nationwide household surveys have been conducted since PMI activities were launched:

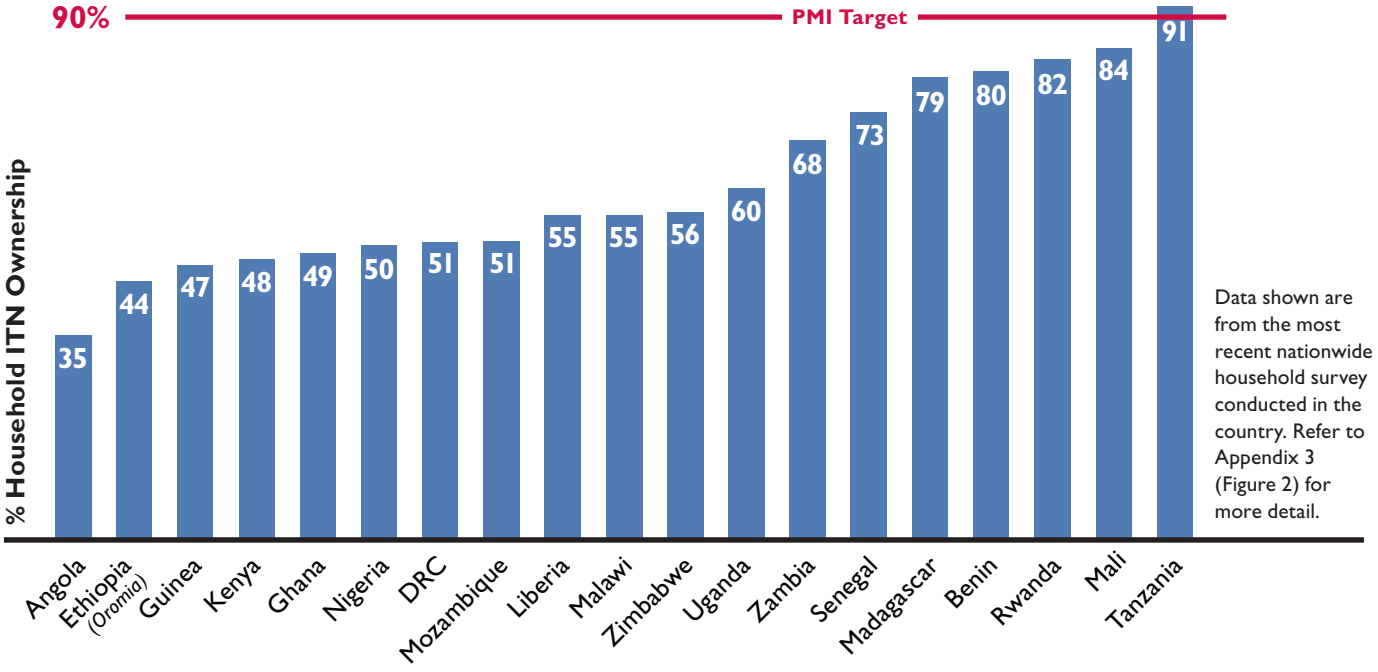
- The proportion of pregnant women who received two or more doses of IPTp (IPTp2) for the prevention of malaria increased from a median* of 13 percent to 25 percent.

In PMI focus countries overall, there has been enormous progress in ITN ownership and use. However, while some countries are nearing PMI targets for net ownership and use among children and pregnant women (e.g., **Benin, Madagascar, Mali, Rwanda,** and **Tanzania**), others still have further to go (see Figures 2 and 3). Progress has been slower for IPTp. While most PMI focus countries show low IPTp2 coverage, some countries, such as **Zambia** and **Zimbabwe**, have reached 70 and 75 percent coverage, respectively. To increase coverage, PMI intensified its support for the development and implementation of global malaria in pregnancy policies as well as training and supervision of health workers on IPTp guidance. PMI has also continued to support IRS activities; in FY 2013, more than 90

* The median is the middle value of a set of numbers ordered by rank.

FIGURE 2

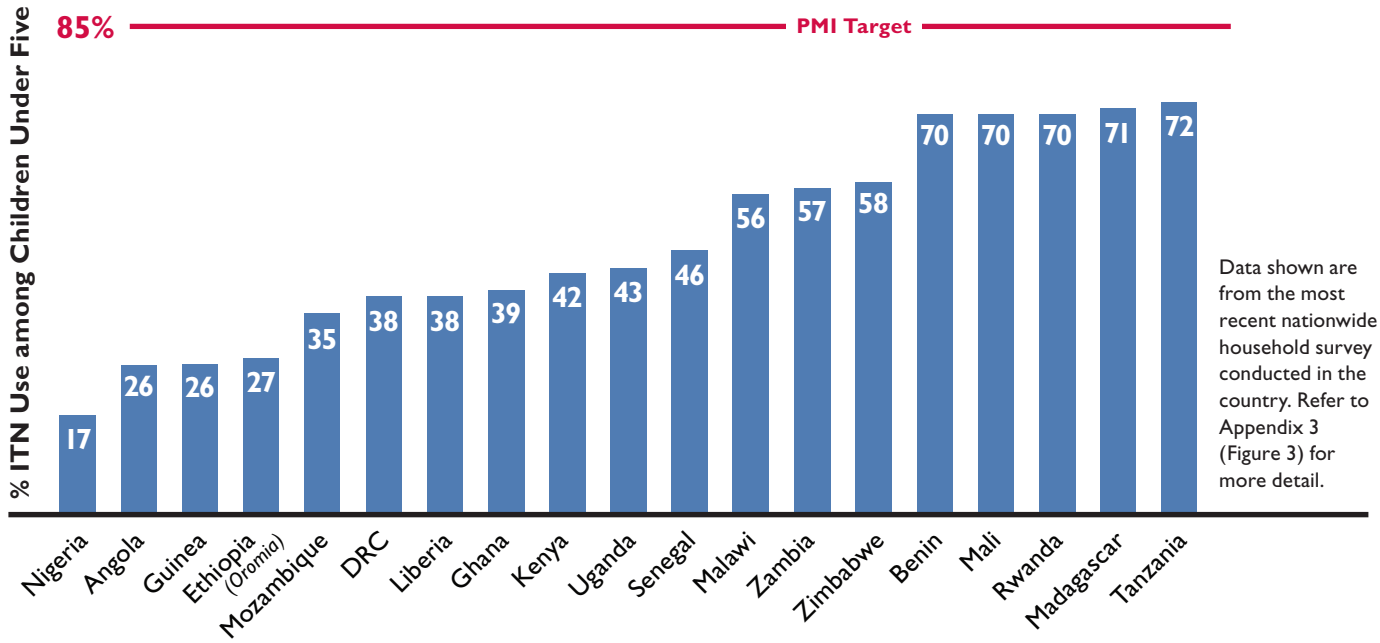
Household Ownership of at Least One ITN



Data shown are from the most recent nationwide household survey conducted in the country. Refer to Appendix 3 (Figure 2) for more detail.

FIGURE 3

ITN Use among Children Under Five



Data shown are from the most recent nationwide household survey conducted in the country. Refer to Appendix 3 (Figure 3) for more detail.

percent of houses targeted were successfully sprayed, protecting more than 21 million people in 15 countries.

PMI's scale-up of effective diagnosis and treatment of malaria in all 19 focus countries in sub-Saharan Africa is starting to show results. At health facilities and at the community level throughout PMI focus countries, RDTs and ACTs are now widely available, and health workers have been trained in their use. Where quality data are available, annual increases in the proportion of suspected malaria cases that are confirmed with laboratory tests and treated with a recommended antimalarial drug have been observed in nearly all focus countries. For example, more than 80 percent of malaria cases are now confirmed by a diagnostic test in **Ethiopia** and **Senegal** and close to 100 percent in **Rwanda** and **Zanzibar**. Furthermore, accurate diagnosis facilitates the detection and appropriate treatment of other causes of fever.

As a result of PMI's support for ITNs, IPTp, IRS, and appropriate diagnosis and treatment, a large proportion of at-risk populations in PMI focus countries are now benefiting from highly effective malaria control measures.

LEVERAGING PARTNERSHIPS

PMI is one of the major international financers of malaria control (15 percent of total aid for malaria since 2002) along with the Global Fund (76 percent), the World Bank Malaria Booster Program (8 percent), and the United Kingdom, which has recently substantially increased its effort.[1] Partnerships at the country and global levels are central to the success of PMI's malaria control efforts. PMI strategically targets its investments to support each focus country's malaria control strategy and plan and coordinates activities with a wide range of partner organizations. These include multilateral and bilateral institutions, such as WHO and the United Nations Children's Fund (UNICEF); private foundations, such as the Bill & Melinda Gates Foundation, Clinton Foundation, and UN Foundation; other U.S. Government programs; and numerous nonprofit and faith-based organizations. Examples of PMI partnerships in FY 2013 include:

PMI is exploring how new technologies can facilitate the collection and transmission of data. In Rwanda, a mobile phone is used to record data about storage conditions for IRS equipment.

Credit: Abt Associates

- PMI and DFID continued to collaborate closely in **Zambia**, where DFID has channeled funding to PMI for the procurement of antimalarial commodities. In FY 2013, using DFID funds, PMI procured more than 271,000 ITNs, 2 million RDTs, and 4.4 million ACTs for Zambia. The ongoing strong collaboration with DFID will make it possible to fill commodity gaps and improve access to commodities through 2015.

- PMI continued to be an active member of the Roll Back Malaria (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. During FY 2013, PMI supported an evaluation of RBM's subregional networks and worked closely with the RBM Secretariat to strengthen the overall support these networks provide to countries to improve their malaria control efforts.

- PMI's collaboration with UNICEF in introducing and scaling up integrated community case management in a number of countries has now expanded to include the rollout of seasonal malaria chemoprevention for children in **Mali** and **Senegal**.

- To extend the reach of malaria control interventions into communities, nearly 900 Peace Corps volunteers in 13 PMI focus countries assisted with malaria control activities, such as long-lasting ITN distribution campaigns and operations research.

- In FY 2013, PMI and the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) continued to work to strengthen and expand collaboration in the 13 countries where both programs are present. For example, in **Nigeria**, the collaboration included combined training, supervision, and quality assurance of laboratories for malaria, HIV, and tuberculosis testing.

- To date, PMI has supported malaria activities through more than 200 nonprofit organizations, approximately one-third of which are faith based. These groups often have strong and highly effective bases of operations in underserved rural areas where the burden of malaria is greatest.

SUPPORTING RESEARCH

Research to support malaria control efforts and reduce the burden of malaria has been a high priority of the U.S. Government for many years. 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).

While USAID does not directly conduct malaria research, it invested approximately $11 million in FY 2013 to support development of new antimalarial drugs and malaria vaccines. PMI complements the more upstream malaria vaccine and drug development work of other U.S. Government agencies by supporting operational research to help guide its program investments, make policy recommendations to national malaria control programs (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 funds operational research across all interventions to improve uptake and scale-up, preserve intervention effectiveness in the face of resistance, and assess how to incorporate new interventions and when to withdraw less effective interventions. To facilitate the identification and prioritization of operational research questions that are important for PMI, headquarters and field staff developed the

1. www.rollbackmalaria.org/financing/funding-tends.html

Spray operators receive training in Ethiopia, where community-based IRS utilizes female health extension workers who supervise local IRS teams.

Credit: Abt Associates

Strategic Guidance for Operational Research and a list of priority research activities. External review of this list confirmed that PMI's research priorities are consistent with the priorities of the global malaria research community. 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 2013 include:

- In **Benin** and **Ghana**, a study was conducted to evaluate progress and best practices for scaling up diagnostic testing, which included site visits to health facilities to observe patient consultations and laboratory practices. In both countries, health workers correctly interpreted the results of RDTs almost 100 percent of the time. The accuracy of malaria microscopy was 85 percent in Ghana but lower in Benin (70 percent). In Benin, more than 90 percent of patients with fever were referred for a diagnostic test, while less than 60 percent were referred in Ghana. PMI is working with counterparts in Ghana and Benin to refine and strengthen training, supervision, and quality assurance activities to address the noted deficiencies.
- In **Tanzania**, PMI supported a study to understand the impact of combining IRS and ITNs on malaria transmission. The findings demonstrated that IRS provided additional protection against malaria as compared with ITNs alone in this context, adding to the global knowledge base on combining vector control interventions.
- PMI conducted qualitative studies in **Benin, Malawi,** and **Mali** to understand the concerns of pregnant women around taking SP and the attitudes and practices of health care providers regarding the administration of IPTp. Study findings pointed to a need to retrain providers in the simplified dosing regimen recently approved by WHO. Practical obstacles to implementing directly observed administration of IPTp, such as lack of clean drinking water at health facilities and concerns among pregnant women about taking SP on an empty stomach, were also identified as barriers to IPTp scale-up.
- To address the growing issue of pyrethroid resistance, PMI is funding a study in **Mali** evaluating the effectiveness of second generation long-lasting ITNs that use a synergist to enhance insecticide activity, as well as a study on second generation non-pyrethroid durable wall liners in **Tanzania** to determine their potential as an effective alternative to IRS.

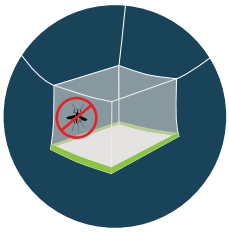
STRENGTHENING HEALTH SYSTEMS AND BUILDING NATIONAL CAPACITY

PMI supports the strengthening of the overall capacity of health systems, both

Fostering Innovation in Malaria Control

To improve the delivery of interventions, PMI continues to develop and advance innovations in malaria control. For example, in 12 focus countries, PMI is piloting an innovative mobile application using smartphones to conduct environmental compliance assessments for IRS programs. Results are uploaded to a central database, and it is anticipated that this will allow IRS programs to reduce errors, respond more quickly to correct issues, and improve overall supervision of environmental compliance activities. In **Benin, Ghana,** and **Liberia**, PMI's IRS program has devised an innovative way to dispose of used insecticide bottles by recycling them into pavement blocks. And, building on a similar accomplishment in **Mali**, PMI converted a shipping container into a working insectary in **Angola**. This "insectary-in-a-box" model can serve as a quickly implementable, cost-effective solution to carry out entomological monitoring that ultimately results in improved quality of IRS.

IN FY 2013, PMI:



Procured **+40M** long-lasting insecticide-treated nets

Sprayed **+5M** houses with insecticides

Procured **+10M** preventive treatments for pregnant women and trained **+16,000** health workers in their use

Procured **+48M** antimalarial treatments and **+51M** rapid diagnostic tests

directly and indirectly. In highly endemic countries, malaria typically accounts for 30 to 40 percent of outpatient visits and hospital admissions. Reducing malaria transmission levels in these countries unburdens the health system so health workers can concentrate on managing other important childhood illnesses and conditions, 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.[2] In addition to providing assistance to countries to roll out malaria-specific activities, PMI helps build national capacity in a variety of cross-cutting areas that benefit both malaria and other health programs. This support includes strengthening supply chain management, laboratory diagnosis, and monitoring and evaluation systems. In FY 2013, PMI efforts to strengthen health systems included:

- Building a cadre of ministry of health staff with technical skills in the collection, analysis, and interpretation of data for decision-making and epidemiologic investigations through support to the CDC's Field Epidemiology and Laboratory Training Program in 12 PMI focus countries in Africa (**Angola, DRC, Ethiopia, Ghana, Kenya, Mozambique, Nigeria, Rwanda, Tanzania, Uganda, Zambia,** and **Zimbabwe**) and in the **Greater Mekong Subregion (Burma)**, supporting approximately 70 trainees globally to date

- Supporting supervision and training of health workers at all levels of the health system, including in the community – more than 61,000 health workers were trained in the treatment of malaria with ACTs

- Providing technical assistance and programmatic support for forecasting 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 protect their quality and safety

- Collaborating with ministries of health and other partners to build quality assurance systems for laboratories that conduct malaria diagnosis and improve the overall quality of health care

- Supporting drug and insecticide-resistance monitoring systems

PMI also fosters country ownership by carrying 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. Furthermore, PMI's in-country teams worked with NMCPs during FY 2013 to help develop concept notes under the Global Fund's new funding model, thus increasing capacity to write successful malaria proposals.

LOOKING AHEAD

The decade of progress that we have witnessed in the fight against malaria is historic. However, technical challenges remain, including sustaining high ITN coverage over time, ensuring that more women receive IPTp2 during their pregnancies, managing antimalarial drug and insecticide resistance, and supporting the implementation of diagnostic testing for all suspected malaria cases together with appropriate treatment for confirmed malaria cases. Looking ahead, PMI and the global malaria community will need to address a number of challenges, including:

- *Antimalarial Drug and Insecticide Resistance:* While resistance to artemisinin drugs has thus far been confined to Southeast Asia, its spread to sub-Saharan Africa would result in a major setback for malaria control efforts on the continent. Resistance of the mosquito vector of malaria to the pyrethroid class of insecticides, which are widely used for IRS and are the only insecticides currently recommended for ITNs, has already been detected in multiple sites in Africa. PMI is therefore supporting NMCPs to conduct regular monitoring of both antimalarial drug and insecticide resistance. PMI is also supporting studies to assess the impact of emerging insecticide resistance on the effectiveness of ITNs and IRS. Furthermore, PMI is looking at other approaches, such as rotation of insecticides used for IRS, to delay the development of further resistance to pyrethroid insecticides and prolong their effectiveness on ITNs.

2. 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

The President's Malaria Initiative

PMI, launched in June 2005 by President George W. Bush, represented a major five-year, $1.265 billion expansion of U.S. Government resources for malaria control. The Initiative is led by USAID and implemented together with the CDC. Based on the 2008 Lantos-Hyde United States Leadership against HIV/AIDS, Tuberculosis, and Malaria Act, which authorized a further increase of up to $5 billion in PMI funding, PMI's goal was broadened to achieve Africa-wide impact by halving the burden of malaria in 70 percent of at-risk populations in sub-Saharan Africa, i.e., approximately 450 million people. PMI funds programs in 19 focus countries in Africa and 1 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).

PMI's efforts to reduce malaria mortality directly contribute to the goal to end preventable child deaths, as articulated by the 2012 Call to Action and implemented through A Promise Renewed, a joint global effort led by the Governments of Ethiopia, India, and the United States, in collaboration with UNICEF. Furthermore, reducing malaria transmission unburdens health systems, allowing health workers to address other important childhood illnesses and conditions, such as pneumonia, diarrhea, and malnutrition. Malaria is also an important economic burden in affected countries, with wide-ranging effects from reduced school attendance and worker productivity to out-of-pocket spending on malaria treatment by households. A recent study[3] estimated that annual costs of malaria are $38 million in Ghana, $109 million in Kenya, and $132 million in Tanzania, with average treatment costs per case ranging from $7 to $21. Combating malaria directly supports the achievement of broader development goals, such as the alleviation of extreme poverty.

- *Counterfeit and Substandard Drugs:* Counterfeit, falsified, and substandard medicines pose a considerable threat to public health. Substandard medical products increase the likelihood of drug resistance and harm to patients by preventing them from obtaining high quality medical products. Falsified medicines usually have no active ingredient or contain dangerous substances and can also cause serious harm to patients. Malaria medicines have been particularly vulnerable to these threats. As a major procurer of ACTs for public health programs in malaria-endemic Africa, PMI employs rigorous measures to ensure the integrity of the medicines it supplies. In recent years, PMI has increased its support to prevent the introduction of counterfeit drugs into supply chains, help national regulatory authorities improve drug quality, provide technical assistance on quality assurance testing, and strengthen capacity for monitoring and regulation in the public and private sectors.

- *Strengthening Surveillance and Data Systems:* As PMI has supported countries to successfully scale up malaria control interventions, malaria morbidity and mortality have declined. These decreases in malaria burden have often been uneven, with some parts of countries experiencing significant reductions in malaria cases and deaths, while other areas lag behind. Facing an increasingly complex pattern of malaria transmission in their countries, NMCPs will require more detailed and granular information on malaria burden and coverage of interventions, so their resources can be better targeted.

In the years ahead, tailoring PMI support for each country will take into consideration the existing capacity, malaria burden, and the availability and quality of malaria data, among other factors. PMI will support a range of activities, including strengthening malaria epidemic detection and response, community-based malaria surveillance, the use of mobile technology for malaria surveillance and commodity tracking, and the use of alternative data sources (such as school-based surveillance).

Through PMI, the U.S. Government remains steadfast in its commitment to fighting malaria and will continue to work together with other partners to overcome these and other challenges in program implementation. The tremendous expansion of financing and coverage of malaria control interventions has resulted in great successes in reducing the burden of malaria. PMI is recognized as a highly effective program that combines solid country-level support with global leadership on malaria prevention and control in close collaboration with other funding and technical partners. With an estimated 3 million malaria deaths averted among children under five years of age in Africa between 2001 and 2012, the Initiative remains dedicated to continuing to save lives, improving health systems, and building healthier, more productive communities.

3. Sicuri, E. et al. (2013). The Economic Costs of Malaria in Children in Three Sub-Saharan Countries: Ghana, Tanzania and Kenya. Malaria Journal, 12:307

CHAPTER 1 | Outcomes and Impact

Brant Stewart, RTI

The President's Malaria Initative (PMI) continues to support the scale-up and monitoring of key malaria interventions in 19 focus countries in sub-Saharan Africa. In all PMI-supported countries, there is evidence of impact on malaria-related illness and death. According to the World Health Organization's (WHO's) *2013 World Malaria Report*, the malaria mortality rates in children under five years of age in Africa were reduced by an estimated 54 percent between 2000 and 2012. The estimated number of malaria cases in all age groups in Africa has dropped from 174 million cases in 2000 to 165 million in 2012. Deaths from malaria in Africa have also decreased in all age groups from 802,000 in 2000 to 562,000 in 2012. PMI has played a significant role in these reductions.

To evaluate impact in PMI focus countries and guide programmatic decisions, PMI collects high quality data through national and subnational population surveys, disease surveillance systems, and national health management information systems (HMIS). PMI uses internationally-recognized indicators and methods recommended by Roll Back Malaria's (RBM's) Monitoring and Evaluation Reference Group (MERG) and coordinates its reporting with that of other agencies, so results can be compared over time and between countries. Among the indicators monitored are coverage rates for insecticide-treated mosquito nets (ITNs), indoor residual spraying (IRS), intermittent preventive treatment for pregnant women, and malaria case management, as well as the availability of malaria commodities in health facilities. Impact data, such as anemia and malaria prevalence, are collected at least every two to three years through household surveys. In countries where sufficient intervention time has elapsed, usually four to five years, PMI supports evaluations of impact on all-cause mortality in children under five years of age.

PMI PROGRESS TO DATE

In the original 15 PMI focus countries, all-cause mortality rates among children under five years of age have significantly decreased, ranging from a 16 percent decrease in Malawi to a 50 percent decrease in Rwanda (see Figure 1). Although declines in all-cause mortality are not exclusively due to malaria interventions, PMI, through its impact evaluations, has been able to correlate the reduction in all-cause mortality rates with the scale-up of malaria control interventions.

IMPACT EVALUATIONS

Since 2010, PMI, in collaboration with RBM and the Global Fund to Fight AIDS, Tuberculosis and Malaria, has supported in-depth evaluations of impact of malaria

HIGHLIGHTS

- All-cause mortality has declined in children under five years of age in all 15 original PMI focus countries from baseline, with reductions ranging from 16 percent (**Malawi**) to 50 percent (**Rwanda**).
- Impact evaluations conducted during FY 2013 in **Ethiopia, Rwanda,** and **Senegal** have demonstrated strong linkages between declines in all-cause mortality among children under five years of age and the rollout of malaria control interventions.

control, which assess whether the scale-up of malaria control interventions has contributed to the overall decline in all-cause mortality rates among children under five years of age (see page 14). These evaluations examine mortality reductions over the decade 2000–2010, whereas PMI calculates mortality reductions using baseline data corresponding to when countries joined PMI (see Figure 1). All PMI impact evaluations are carried out with national authorities and local scientists and researchers. Six impact evaluations have been completed or are nearing completion (**Angola, Ethiopia, Malawi, Rwanda, Senegal,** and **Tanzania**). The findings from the three impact evaluations conducted during FY 2013 (Ethiopia, Rwanda, and Senegal) are summarized below.

Ethiopia

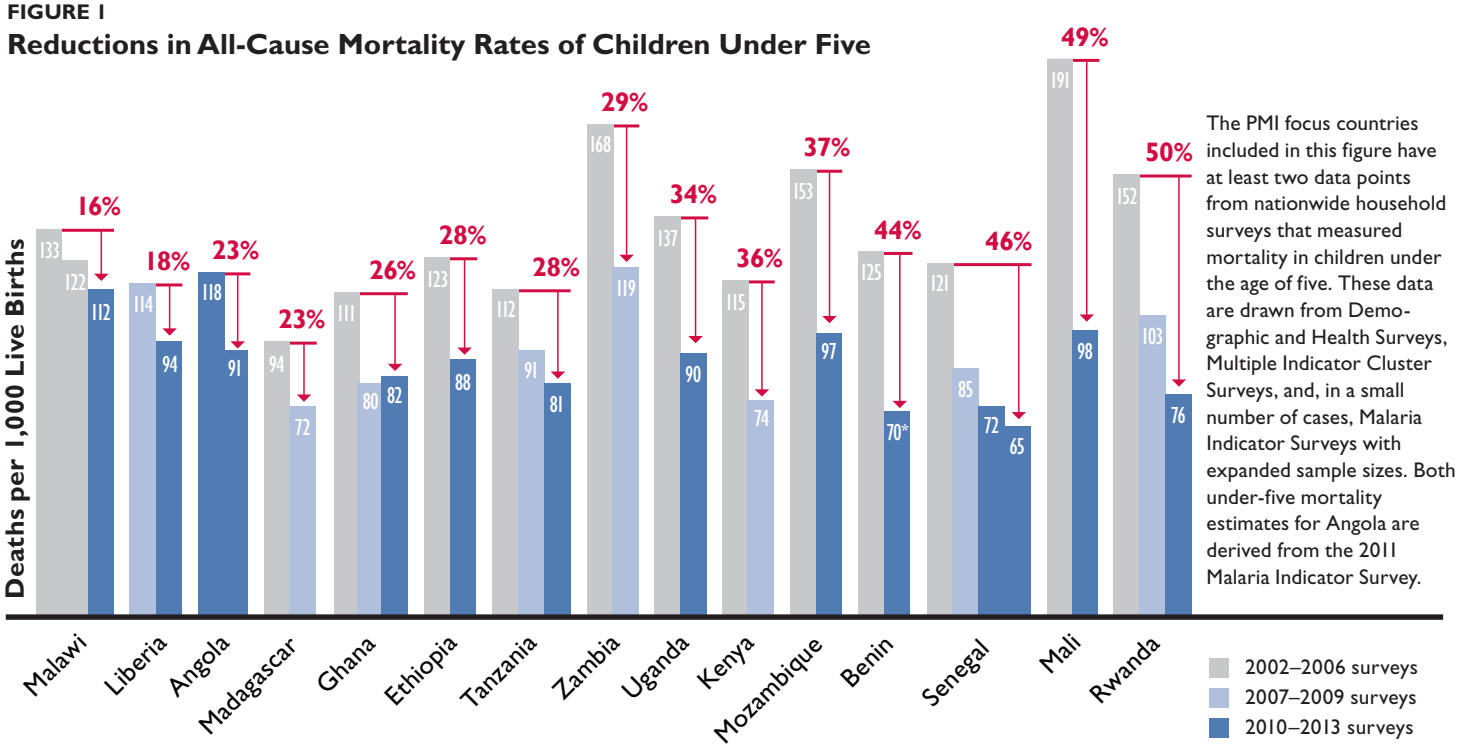
A recent impact evaluation showed a 47 percent reduction in all-cause mortality among children under five years of age in Ethiopia in the period 2000–2011. During the same time, access to health services and coverage of malaria control interventions increased: More than 35,000 health extension workers were trained to provide malaria case management services, ownership of ITNs increased tenfold from 5 percent in 2004 to 55 percent in 2011, households with at least one ITN or IRS in the last 12 months reached 71 percent in 2011 from 12 percent in 2005, and the proportion of malaria cases that were confirmed with a diagnostic test increased from less than 10 percent in 2000 to 83 percent in 2012. These improvements resulted in a very low malaria prevalence of 1 percent in 2007 and 1.3 percent in 2011. Widespread malaria epidemics historically associated with high mortality in Ethiopia have also been drastically reduced and nearly eliminated. As Ethiopia continues to consolidate the gains and reduce malaria transmission, improving disease surveillance to promptly identify and control malaria outbreaks and reaching difficult-to-access populations will become more critical to maintain its success.

Rwanda

Rwanda has achieved some of the highest coverage of malaria control interventions in all of sub-Saharan Africa: 82 percent of all households own an ITN, 70 percent of children under the age of five and 72 percent of pregnant women either sleep

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, Malaria Indicator Surveys with expanded sample sizes. Both under-five mortality estimates for Angola are derived from the 2011 Malaria Indicator Survey.

*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 underreporting of neonatal and child deaths by respondents.

Ethiopians have benefited from increased coverage of malaria control interventions; in 2011, malaria prevalence was only 1.3 percent.

Credit: Jessica Scranton, Abt Associates

under an ITN or sleep in a household that has been sprayed with an insecticide, and 99 percent of suspected malaria cases are confirmed by a diagnostic test. Malaria interventions have been equitably rolled out, with the poorest and the wealthiest benefiting equally from government efforts. Malaria prevalence in children under five years of age declined from 2.6 percent in 2007 to only 1.4 percent in 2010. All-cause under-five mortality decreased by 61 percent between 2000 and 2010. The Government of Rwanda has also instituted other child survival programs that have helped to reduce under-five mortality, but the evidence suggests that the contributions of malaria control interventions to this mortality decrease were substantial.

Senegal

Between 2005 and 2010, Senegal reduced its all-cause under-five mortality rate by 40 percent from 121 to 72 deaths per 1,000 live births. These results are a testament to Senegal's robust and well established malaria control program. Household ITN ownership increased from 20 percent in 2005 to 63 percent in 2010 – an increase of 43 percentage points. Use of ITNs by children under age five also increased significantly from 7 percent in 2005 to 35 percent in 2010. The greatest increases in ITN ownership and use were recorded in geographic areas with the greatest malaria risk and among the poorest populations. Decreases in two key impact indicators – severe anemia and malaria prevalence – were likely associated with malaria control interventions and were most pronounced among the poorest populations and in rural areas. Child survival gains in Senegal were greater during 2005–2010, the period in which malaria interventions were scaled up, than in the previous five-year period 2000–2005.

PMI'S EVOLVING APPROACH TO MONITORING AND EVALUATION OF MALARIA CONTROL

As PMI has supported countries to successfully scale up malaria control interventions, malaria morbidity and mortality have declined. These decreases in malaria burden have often been uneven, with some parts of countries experiencing significant reductions in malaria cases and deaths, while other areas lag behind. Facing an increasingly complex pattern of malaria transmission in their countries, national malaria control programs (NMCPs) will require more detailed and granular information on malaria burden and coverage of interventions, so their resources can be better targeted.

Progress and Impact Series

PMI supports the RBM Partnership in developing and producing the Progress and Impact Series. These country-specific publications, derived from PMI's impact evaluations, are summary documents published by the RBM Partnership for reporting and advocacy. To date, PMI has supported the production of five Progress and Impact Series reports for **Madagascar, Malawi, Senegal, Tanzania, and Zambia**. Reports for **Angola, Ethiopia, Rwanda,** and **Uganda** are in process and will be available in 2014. All reports are available on the RBM website (www.rbm.who.int/ProgressImpactSeries/).

Ghana's Innovative Health Information Management System Gains African Recognition

The Ghana Health Service (GHS) implemented an innovative district health information management system (DHIMS) that has led to significant improvements in data collection, reporting, and analysis and has strengthened the country's health systems. The system has enhanced access to timely health information for managers within the GHS, empowering them to assess the performance of the health system and respond to identified challenges in a timely fashion. In September 2013, the African Development Bank recognized Ghana's achievement with an e-health award for improving access to health information.

For years, Ghana relied on a paper-based vertical system to capture and report data on health service delivery and surveillance. Then, in 2012, PMI provided support to develop a more robust web-based system. The DHIMS 2 system enables health facilities to enter their summary reports directly into an electronic database. It also has the capacity to autogenerate reports, map data through a geographic information systems (GIS) interface, and aid managers and users to process raw facility-level data into graphs that can be easily interpreted. For the NMCP, the new system allows rapid access to malaria data at all levels of the health system and has facilitated the use of those data to plan and implement malaria interventions.

With the full implementation of the DHIMS 2 platform, gathering and interpreting data within the GHS has vastly improved, and managers and partners are beginning to see the full benefits of a robust data reporting system.

In the years ahead, tailoring PMI support for each country will take into consideration the existing capacity, malaria burden, and the availability and quality of malaria data, among other factors. Based on the available information from each country, PMI will support a range of activities, including strengthening malaria epidemic detection and response, community-based malaria surveillance, the use of mobile technology for malaria surveillance and commodity tracking, and the use of alternative data sources (such as school-based surveillance).

The increase in the quantity and quality of malaria data needs to be accompanied by better use of data for appropriate decision-making. PMI is already supporting activities to improve how data are analyzed and used at all levels of health system.

As malaria burden changes over time, the NMCP's ability to accurately monitor the disease and respond to changes appropriately and in a timely manner will influence the long-term success of malaria control efforts. PMI will continue to support activities to build capacity in malaria surveillance and monitoring and evaluation.

Roll Back Malaria Framework for Impact Evaluation

Evaluating the impact of malaria control on morbidity and mortality is very difficult. HMIS and civil registries in sub-Saharan Africa record only a small proportion of malaria cases and children's deaths. Moreover, when children die at home – unfortunately an all-too-often occurrence in sub-Saharan Africa – establishing the cause of death is particularly challenging. Due to the lack of malaria-specific mortality data in PMI focus countries and because malaria contributes to child mortality both directly and indirectly, PMI's impact evaluation uses all-cause child mortality to measure the impact of malaria interventions, in accordance with the recommendations of the RBM MERG. The MERG recommends that a "plausibility" argument 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 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 impact on all-cause mortality.
3. Establish that malaria control interventions have reached sufficient coverage to expect morbidity and mortality impact at population level.
4. Thoroughly investigate whether other child health interventions have also contributed to declines in all-cause mortality during the period under study.

According to the RBM MERG, 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.

Insecticide-Treated Mosquito Nets

Long-lasting insecticide-treated mosquito nets (ITNs) are the primary means for malaria prevention worldwide. High ownership and use of ITNs reduces the incidence of uncomplicated malaria episodes by 50 percent and all-cause child mortality by about 20 percent. When a community has a high level of ITN use – which is associated with greatly reduced numbers of mosquitoes that transmit malaria – malaria infections can be reduced even among those 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 long-lasting ITNs. PMI's policy is to contribute to and maintain universal coverage with long-lasting ITNs when adequate resources exist to achieve universal coverage. Universal coverage is commonly defined as one ITN for every two (or fewer) people residing in areas at risk of malaria transmission.

In 2013, PMI's ITN procurements reached an annual high of more than 40 million, which represents almost 30 percent of the 136 million ITNs that were delivered globally. This number is approaching the annual target of 150 million new nets needed each year to ensure all persons at risk have access to an ITN in their household.

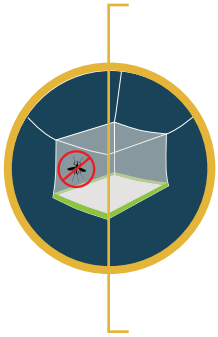
In PMI focus countries overall, there has been enormous progress in ITN ownership and use. Nonetheless, there is a range in advancement toward targets. While some countries are nearing PMI targets for net ownership and use (**Benin, Madagascar, Mali, Rwanda,** and **Tanzania**), others still have further to go (see Figures 1 and 2). Therefore, a tailored, targeted approach is required to continue to improve ITN ownership and use in PMI focus countries.

PMI supports ITN activities that strive to:

- Achieve high ownership with long-lasting ITNs
- Maintain high ownership during the coming years
- Ensure that ITNs are used consistently and correctly
- Monitor field durability and increase ITN longevity

ACHIEVING HIGH OWNERSHIP: MASS CAMPAIGNS

Mass distribution campaigns enable countries to quickly achieve equitable and univer-



HIGHLIGHTS

- Household ownership of at least one ITN has increased from a median* of 29 percent to 55 percent in 19 PMI focus countries during the past eight years.
- Use of ITNs among children under five has increased from a median* of 20 percent to 43 percent during the past eight years.
- To date, PMI has procured more than 123 million ITNs and has funded the distribution of more than 48 million ITNs procured by other donors.

*The median is the middle value of a set of numbers ordered by rank.

sal coverage with ITNs. Many PMI countries completed such national or subnational universal coverage campaigns between 2009 and 2013, moving them closer toward achieving universal coverage.

In fiscal year (FY) 2013, several PMI focus countries initiated a new round of mass campaigns. For example:

- In **Angola**, PMI is contributing to the country's universal coverage campaign by procuring 1.3 million long-lasting ITNs and funding the costs, in collaboration with the ExxonMobil Foundation, for distributing nearly 500,000 ITNs procured by the Government of Angola. In FY 2013, the campaign reached 4 of 18 provinces. The campaign will continue in 2014, with ongoing support from PMI.

- **Madagascar** launched a second round of universal coverage campaigns in 2012, to which PMI contributed 2.3 million ITNs to cover 19 out of 31 districts on the East Coast. In 2013, PMI provided 2.7 million ITNs to cover 28 of the 61 districts reached during this year's campaign. The Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund) and the United Nations Children's Fund provided 5 million ITNs for the 33 other districts during the same period. Overall, during the 2012/2013 campaign, PMI coordinated closely with partners to help distribute 10 million ITNs in 92 out of 111 districts.

- In **Nigeria**, PMI partnered with the Global Fund to distribute 2.5 million ITNs in Sokoto State, protecting 3.7 million people. PMI is procuring an additional 4 million ITNs for Kebbi, Bauchi, and Nasarawa States, which have a combined population of 9.8 million people.

- In **Uganda**, PMI supported the distribution of more than 3.5 million long-lasting ITNs to achieve universal coverage in 18 out of 36 districts of eastern Uganda and will continue to support delivery of an additional 18 million nets to complete the national campaign in 2014. This massive undertaking is being carried out in close collaboration between the National Malaria Control Program (NMCP), the Global Fund, and the U.K. Department for International Development (DFID).

In Mozambique, community members attend a malaria education session, where they learn about the importance of consistently sleeping under a mosquito net every night.

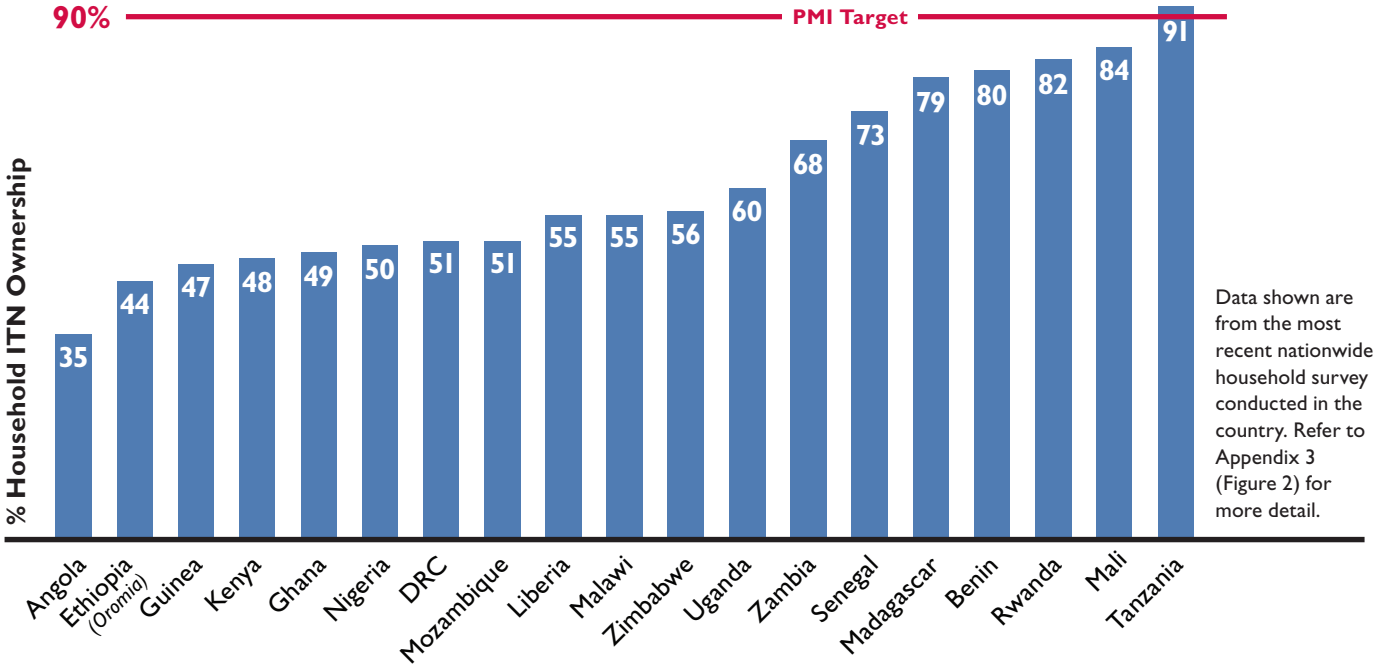
Credit: David Wood, C-Change

MAINTAINING HIGH OWNERSHIP: CONTINUOUS DISTRIBUTION

Although mass campaigns continue to be the major distribution channel, nets must be made available to the population continuously to maintain adequately high coverage over time. While the average life of an ITN depends upon local conditions, Roll Back Malaria (RBM) recommends that countries plan to replace long-lasting ITNs after three years of use. PMI encourages each country to assess its infrastructure, resources, and personal behaviors to determine the most appropriate combination of channels to maintain high coverage effectively. The most common channels are routine delivery to pregnant women through antenatal care (ANC) clinics and to children through vaccination clinics. However, even together, these targeted channels will not be sufficient to maintain high levels of universal coverage. Other channels, such as school- and community-based distributions, show promise, and PMI is investigating their

FIGURE 1

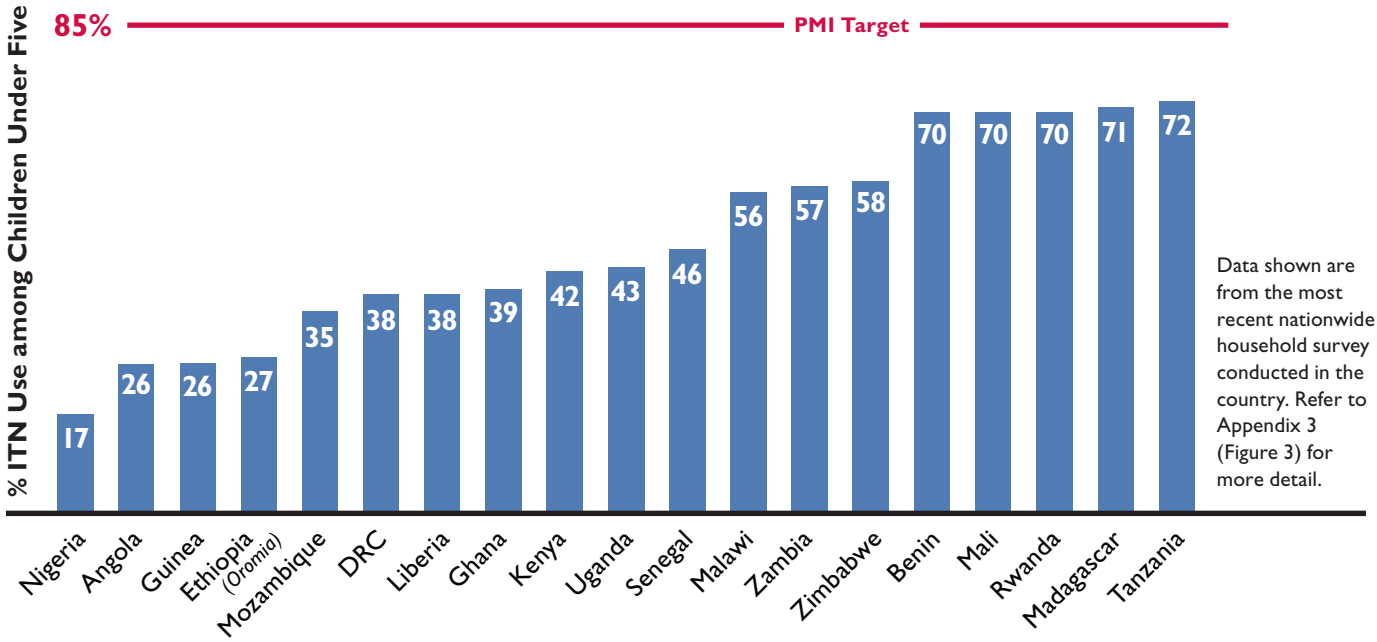
Household Ownership of at Least One ITN



Data shown are from the most recent nationwide household survey conducted in the country. 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. Refer to Appendix 3 (Figure 3) for more detail.

potential contribution toward maintaining high ownership levels.

In FY 2013, PMI focus countries used continuous distribution channels to maintain high ownership of ITNs and piloted innovative approaches to expand country alternatives to mass campaigns. Based on the pilot results, PMI plans to scale up those new strategies, depending on the country context:

- In **Mali**, PMI supported delivery of 800,000 ITNs nationwide through Expanded Program on Immunization and ANC clinics. In order to maintain high coverage in the coming year, PMI procured an additional 2.4 million ITNs to be distributed via routine channels (782,000) and a mass distribution campaign (1,618,000).
- A PMI-supported pilot program for continuous distribution of ITNs in **Senegal** employed various channels, including delivery through health facilities, schools, and community-based organizations (CBOs), to distribute more than 100,000 ITNs in two regions over a six-month period. The pilot demonstrated that CBOs could easily integrate distribution into their ongoing community activities. In addition

Migrant workers sit with an ITN they received while working at a rubber plantation in Cambodia.

Increasing Access to ITNs among Migrant Workers: Targeting Occupational Risk Groups in Cambodia

Since its emergence in the 1950s, drug-resistant malaria has been a serious problem in western Cambodia. The development of rubber plantations and large farms have exacerbated the issue by attracting migrant laborers who are more likely to contract malaria since they have low immunity to malaria and little knowledge of prevention. They are less likely to seek treatment and are often unfamiliar with government-run malaria treatment sites. They can carry the parasites back to their families and homes, perpetuating the cycle of malaria transmission. Mrs. Si Dara, a farm owner in Battambang Province, explains, "In late 2011 until early 2012, on average, 10 of my workers got malaria each month … I knew that they had malaria, but I didn't know how malaria occurred."

While Cambodia has stepped up its malaria control efforts, ITNs mostly have been distributed through health centers or during community campaigns – channels that often miss migrant workers. To increase access, PMI specifically targets their occupational settings, providing nets free of charge to farm owners, who distribute them to migrant workers. PMI-supported staff also educate farm owners and workers. In FY 2013, this model operated in 319 villages in 9 operational districts, distributing 97,955 ITNs to 8,741 farm owners and long-term mobile families.

Feedback from community leaders and farm owners has been positive. Mrs. Dara has noticed a significant decline in the number of malaria cases from mid- to end 2012, down to about one case per month. Innovative and creative solutions making ITNs accessible are needed to ensure that all who are at risk for malaria are protected.

to the pilot, 223,000 ITNs were distributed through health facilities nationwide (free to pregnant women and subsidized to other clients at health facilities).

- In **Tanzania**, the NMCP, PMI, and other partners supported a school-based pilot at 2,302 schools in the Southern Zone that successfully distributed more than 500,000 ITNs to students in seven classes between 1st and 11th grades. These students brought the ITNs home, where they protect students and others in the households.

PROMOTING REGULAR ITN USE THROUGH INCREASED OWNERSHIP

In PMI focus countries, household ownership of at least one ITN has increased from a median* of 29 percent at baseline to 55 percent as of the most recent survey (see Appendix 3). During this same period, use of ITNs among children under the age of five has more than doubled from a median* of 20 percent to 43 percent (see Appendix 3). This persistent gap between ITN ownership and use remains a major concern in the malaria community. In response, the global community committed to rapidly increase access to ITNs, which has contributed significantly to the documented increase in ITN use among children under the age of five. Studies from as early as 2009[1] demonstrate that the greatest determinant of ITN use is ownership. More recent studies supported by PMI confirm that the gap between ownership and use is frequently due to insufficient ITNs to cover all persons living in the household. However, individual choice not to use an available ITN continues to challenge malaria control programs.[2,3]

For example, an analysis of the 2010 **Nigeria** Malaria Indicator Survey data revealed that the relatively large national-level gap between ownership of at least one ITN (42 percent) and net use the previous night (24 percent)[4] masked regional differences. The study found distinct variations between the northern and the southern states.[2] In households with at least one ITN per two persons, net use was 89 percent in the North but only 64 percent in the South. This shows that in the northern states, low availability of nets may largely explain the use gap, and use will likely improve with an increase in availability. In the southern states, however, a gap between ownership and use may indicate that a sizable proportion of the population does not use ITNs even when they are available. In this region, a greater emphasis on behavior change along with increasing ITN availability may be needed to help improve net use rates.

MEASURING DURABILITY AND INCREASING ITN LONGEVITY

The current global recommendation is to replace ITNs every three years. However, some studies have shown that ITNs may physically deteriorate more rapidly in field conditions. In light of these findings, PMI has monitored durability and insecticide retention of WHO-approved net brands in nine countries since 2008. In most of these countries, PMI entomologists train local staff and provide critical equipment to build local capacity, which allow much of the testing to be conducted in-country. Through this monitoring, PMI found that one product in particular was less physically durable than others. Subsequent discussions with the manufacturer led to changes in the manufacturing process to make the fabric more durable. PMI-supported field tests are currently under way to confirm the improved longevity of this new netting material. PMI has noted a wide range of physical durability and insecticide retention metrics across and, in some cases, within countries. Improper handling of nets in the home, frequent net washing, bed type, and other factors can contribute to more rapid deterioration of ITNs.

PMI is coordinating with endemic countries and international partners to investigate

1. Eisele, T.P., et al. (2009). Assessment of Insecticide-Treated Bednet Use among Children and Pregnant Women Across 15 Countries Using Standardized National Surveys. American Journal of Tropical Medicine and Hygiene, 80:209-214.

2. Kilian, A., et al. (2013). Universal Coverage with Insecticide-Treated Nets: Applying the Revised Indicators for Ownership and Use to the Nigeria 2010 Malaria Indicator Survey Data. Malaria Journal, 12:314.

3. Koenker, H. and Kilian, A. Recalculating the Net Use Gap: A Multi-Country Comparison of ITN Use Versus ITN Access. In press.

4. Nigeria Malaria Indicator Survey 2010.

* The median is the middle value of a set of numbers ordered by rank.

One of Senegal's continuous ITN distribution channels is via community-based organizations. These organizations distribute coupons to people in need of a net, who can then redeem them for a net at specific locations, such as a boutique or tailor.

Credit: Diana Mrazikova, NetWorks

ways to extend the average life of ITNs, which would result in savings over time. PMI is supporting operations research in two countries to develop methods for improving mosquito net care and repair at the household level, and manufacturers continue to work on approaches to improve ITN durability (e.g., adding borders with stronger material on lower seams, testing new stitching patterns, and introducing polypropylene material).

CONTRIBUTIONS AT THE GLOBAL LEVEL

PMI remains a key contributor to global malaria ITN activities. In FY 2013, PMI continued to support the RBM Partnership through active participation and leadership in the Vector Control Working Group and the Alliance for Malaria Prevention, as well as WHO's Technical Expert Group on Malaria Vector Control and Vector Control Advisory Group. During FY 2013, PMI-supported research and advocacy led to the adoption by the RBM Monitoring and Evaluation Reference Group of two new indicators for ITN ownership and use.[5] PMI contributed significantly to addressing global concerns about ITN durability and field-tested new channels for continuous distribution.

OPERATIONS RESEARCH

PMI is currently supporting operations research to evaluate the contribution of alternative distribution channels to maintaining high, equitable coverage. This research focuses on school-based approaches in **Nigeria** and community-based distribution approaches in Nigeria and South Sudan. In South Sudan, the research study – a joint activity with DFID – demonstrated that community-based ITN distribution via volunteers in a postcampaign setting was effective. In this model, vouchers were given to household members who then redeemed them for a new net from a community volunteer. In one year, this program delivered an ITN to more than 70 percent of households with a total population of about 250,000. The endline survey found that access to an ITN within the household increased from 40 percent to 66 percent, and use of an ITN the previous night increased from 23 percent to 54 percent. Among those residing in households with a ratio of one ITN to two inhabitants, ITN use rose from 57 percent to 81 percent.[6]

All ITNs currently approved by WHO are treated by a pyrethroid insecticide, and recent studies in a number of African countries have documented pyrethroid resistance in the malaria vector. However, a PMI-funded study in **Malawi** showed continued protective efficacy of ITNs in children 6–59 months of age in an area with documented high levels of pyrethroid resistance. ITN use over a one-year period still correlated with a 30 percent reduction in the incidence of malaria infection. This shows that high levels of pyrethroid resistance do not necessarily lead to operational failure of ITNs.

5. Seventeenth Meeting of the RBM Partnership Monitoring and Evaluation Reference Group (MERG) 15-17th June 2011. http://www.rbm.who.int/partnership/wg/wg_monitoring/docs/17merg_meeting_report.pdf

6. Kilian, A., et al. (2013). Reaching and Sustaining High Levels of ITN Ownership and Use through a Community-Based, Demand-Driven Approach in Lainya County, South Sudan. ASTMH Annual Meeting Abstract

Indoor Residual Spraying

HIGHLIGHTS

- In FY 2013, PMI-supported IRS programs sprayed more than 5 million houses in 15 PMI focus countries, protecting almost 22 million residents.
- In an effort to promote sustainability and build local capacity to implement safe and effective IRS programs, more than 28,000 people were trained on IRS operations.
- All 19 PMI focus countries conducted regular entomological monitoring of malaria vectors to guide PMI vector control interventions; data were used to actively manage insecticide resistance by rotating the class of insecticide used for IRS when resistance was confirmed.

Indoor residual spraying (IRS) – the spraying of interior walls of houses with a residual insecticide that kills malaria mosquitoes – is a pillar of malaria prevention. There are four insecticide classes approved by the WHO's Pesticide Evaluation Scheme (WHOPES). When insecticide resistance to one class is detected, rotating to another class can mitigate resistance in vector populations, which is currently one of the greatest challenges to malaria prevention programs. PMI, since its inception, has been a global leader in building the capacity of countries to conduct comprehensive entomological testing, including insecticide resistance monitoring. This has provided robust data to PMI-supported IRS programs, enabling quality assessment of IRS operations, as well as informed decision-making as to where and with which insecticides to spray to maximize the impact of IRS.

Because the spread of insecticide resistance has required countries to switch to more costly alternatives, the overall number of households protected through PMI-supported IRS has decreased since 2012. In response to this changing landscape, PMI is using IRS monitoring data to help countries identify priority targets (where IRS will have the greatest impact) within older IRS zones, transitioning IRS to areas where ITN coverage is suboptimal and focusing on resistance mitigation.

A spray operator applies insecticide to the interior walls of a home during an IRS campaign in Rwanda.

Credit: Brant Stewart, RTI

ENTOMOLOGICAL MONITORING AND INSECTICIDE RESISTANCE MANAGEMENT

Over the past three years, PMI has significantly increased the number of sites at which insecticide resistance is monitored. In FY 2013, data on insecticide resistance were collected at more than 100 sites across all PMI focus countries. Through its support for monitoring efforts, PMI played a central role in mapping insecticide resistance to all classes of insecticide across all PMI focus countries. Resistance to the pyrethroid class of insecticides is of greatest interest since the current ITN strategy depends on pyrethroid susceptibility. Once resistance is detected in an IRS area, PMI engages the NMCP and other in-country stakeholders in a dialogue about switching classes of insecticide for IRS. PMI has been very successful in helping countries shift away from the pyrethroid class of insecticides for IRS in response to growing evidence of mosquito resistance. In 2012, most countries sprayed with either pyrethroids or a mix of two insecticides, including pyrethroids. However, in 2013, armed with new data and with guidance from technical experts at PMI, only three countries exclusively used pyrethroids for IRS, while the others shifted to carbamate or organophosphate class insecticides. In 2014, based on the insecticide resistance data that PMI collected in 2013, organophosphates will likely become the predominant insecticide class used in approximately half of PMI's IRS programs.

This transition is being made possible by the development of a new, longer-lasting organophosphate formulation, which was recently recommended by WHOPES. PMI conducted a field evaluation of the insecticide in **Ghana**, and results showed a residual

life of at least six months. Although the new product has higher initial costs and longer procurement lead times than pyrethroids, it is longer-lasting, has sufficient residual effect to provide protection to residents of countries with longer transmission seasons, and reduces the frequency of pyrethroid resistance in the vector population.

EPIDEMIOLOGICAL MONITORING

PMI is increasing its support for the collection of epidemiological data to improve IRS targeting capacity and better monitor IRS. By collecting malaria case data recorded in health facilities, PMI and NMCP partners are working to track changes in the epidemiology of malaria. This information, combined with entomological data, aims to provide countries with evidence to guide their decisions, such as where and for how long to spray.

As part of efforts to improve national malaria surveillance systems, PMI has supported routine epidemiological surveillance in IRS districts in **Angola, Ghana, Kenya, Mozambique,** and **Tanzania**. In Mozambique, for example, PMI is facilitating routine epidemiological data collection from health facilities in selected districts in Zambezia Province, where PMI currently implements IRS, as well as in districts from which PMI has recently withdrawn IRS. In 2013, the NMCP completed its rollout of a new malaria case reporting system in the selected districts that requires all health facilities to report confirmed malaria cases on a weekly basis. PMI provides technical and logistical assistance to support this system.

CAPACITY BUILDING FOR IRS

PMI has placed a strong emphasis on ensuring country ownership of IRS programs and making a concerted effort to build the capacity and infrastructure necessary to ensure sustainability over the long term. PMI has supported IRS capacity assessments in eight countries to evaluate the overall ability of focus countries at the national and district levels to carry out the technical, operational, and management functions of IRS programs. The NMCP and in-country partners implement these capacity assessments in conjunction with PMI and use them to develop an implementation plan to help prioritize and address identified capacity building needs. In **Ethiopia**, PMI, with the NMCP and local district authorities, is promoting capacity development and sustainability by piloting a community-based approach in 6 of PMI's 36 IRS districts. IRS activities in Ethiopia have traditionally been planned and implemented at the district-level health offices. Community-based IRS decentralizes IRS down to the village level, utilizing Ethiopia's successful Health Extension Program. In this model, female health extension workers serve as squad leaders for the IRS campaign in their villages, supervising a local IRS team, managing stocks, and handling data management responsibilities for their squad. The Government of Ethiopia has an extensive spray program (in approximately 500 out of the 700 districts where malaria is present) and is planning to expand community-based IRS nationwide; data from PMI's pilot will help inform this strategy as well as future PMI support.

In **Angola**, monitoring of IRS activities had been hampered by limited in-country experience in entomology and the lack of an insectary, a laboratory dedicated to rearing and studying live mosquito populations. In September 2013, the country celebrated the opening of the country's first insectary, established with PMI's support. Building on a similar accomplishment in **Mali** during FY 2012, a 40-foot shipping container was converted into a working insectary, and on-the-job entomological training was provided to Angolan entomology technicians. In countries that do not have an insectary, this "insectary-in-a-box" model can serve as a quickly implementable, cost-effective solution to carry out entomological monitoring that ultimately results in improved quality of IRS.

CONTRIBUTIONS AT THE GLOBAL LEVEL

PMI continues to support data-based decision-making on new tools at global forums, such as RBM's Vector Control Working Group and WHO's Technical Expert Group on Malaria Vector Control and Vector Control Advisory Group. Coordination and collaboration with other donors, such as the Global Fund, synergizes malaria control efforts in countries, such as **Ghana, Madagascar,** and **Zimbabwe**, where both PMI and the Global Fund support large IRS programs.

RESEARCH AND INNOVATION

In **Tanzania**, PMI supported a study to understand the impact of combining IRS and ITNs on malaria transmission. The study, which concluded in 2013, demonstrated that IRS provided additional protection against

A Rwandan spray operator carefully records her spray activities.

Rwandan Women Leading the Fight against Malaria

In most countries, IRS is often perceived as an activity implemented by men. In Rwanda, traditional gender roles are shifting as women are becoming more involved in IRS activities. Pelagie Niyongira and Therese Muhorakeye, both from Gisagara District, are among the nearly 1,500 female spray operators who worked in PMI-supported IRS campaigns in FY 2013. The promotion of women's involvement in community health programs by the Government of Rwanda has led to active participation of women in numerous activities previously seen as reserved for men. More and more women like Ms. Niyongira and Ms. Muhorakeye are actively engaging in IRS to play a major role in the fight against malaria in their communities.

"Using the money I am paid during the IRS campaign, I am able to pay school fees, medical insurance, and also buy food for my family," said Ms. Muhorakeye. As a woman and a mother, she is readily accepted and allowed to freely enter people's houses to conduct the spraying. Ms. Niyongira, who is a community health worker as well, enjoys participating in IRS not only because it provides income for her family, but also because it enables her to be directly involved in malaria control in her community. She said, "If we had kept on thinking that women are weak and should stay at home … we would not have made the gains we have achieved as a community in the fight against malaria."

With support from PMI, Rwanda's NMCP is implementing IRS as one of the key strategies for malaria control. During FY 2013, more than 990,000 residents were protected against malaria. Out of a total 1,925 spray operators who participated in the IRS campaigns in FY 2013, more than half were women.

malaria as compared with ITNs alone. This study has added to the global knowledge base on combining vector control interventions, potentially facilitating the targeting of interventions to locations where they are likely to have the most impact. However, since similar recent studies conducted by other groups have shown mixed results when combining IRS and ITNs, countries will need to consider local circumstances in planning locations of their vector control activities.

During FY 2013, PMI piloted an innovative mobile application using smart phones to conduct environmental compliance assessments for IRS programs in 12 countries. By using this tool to complete environmental compliance assessments at IRS operational sites and uploading results to a central database, it is anticipated that IRS programs will be able to reduce errors, respond more quickly to correct issues, and improve overall supervision of environmental compliance activities. This tool could further enhance program efforts that ensure that IRS is carried out in a manner that does not harm the environment or people living and working near operational sites. In addition to collecting data for the environmental compliance assessments, smartphones also are used to collect GPS coordinates and take photos of operational sites for supervisory purposes, further strengthening overall IRS program management and oversight.

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 43 percent over the past eight years. Progress has been slower for IPTp, with median* coverage increasing from 13 percent to 25 percent.
- Over the past year, more than 16,000 health workers were trained in IPTp with PMI's support.
- To fill commodity gaps, PMI procured more than 10 million SP treatments in FY 2013 and more than 29 million to date.
- PMI supported an IPTp guidelines review in five countries and is supporting these countries to revise policies and training to improve health worker adherence to IPTp guidance.

*The median is the middle value of a set of numbers ordered by rank.

In Africa, malaria infection in pregnancy is a major threat to the lives of mothers, fetuses, and infants. Approximately 125 million pregnant women are at risk annually, with severe malaria and maternal anemia resulting in up to 10,000 maternal deaths per year. Malaria-associated premature delivery and low birth weight in newborns cause up to 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 WHO guidelines, PMI supports a three-pronged approach to reducing malaria in pregnancy: (1) provision and promotion of use of ITNs, (2) administration of intermittent preventive treatment for pregnant women (IPTp), 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 the focused antenatal care (FANC) service delivery platform[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 not recommended. To ensure that pregnant women receive nets as early as possible in their pregnancy, PMI supports universal coverage of ITNs through mass campaigns, as well as supplemental distribution during antenatal care (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 43 percent (see Appendix 3). While some countries (**Benin, Mali, Rwanda**, and **Tanzania**) are approaching the 85 percent PMI target, ITN use remains relatively low in other countries (see Figure 1).

To date, progress in scaling up IPTp2 has been slow, with median* coverage increasing from 13 percent to 25 percent (see Appendix 3). Most PMI focus countries show low IPTp2 coverage, although **Zambia** and **Zimbabwe** have reached 70 and 75 percent coverage, respectively (see Figure

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

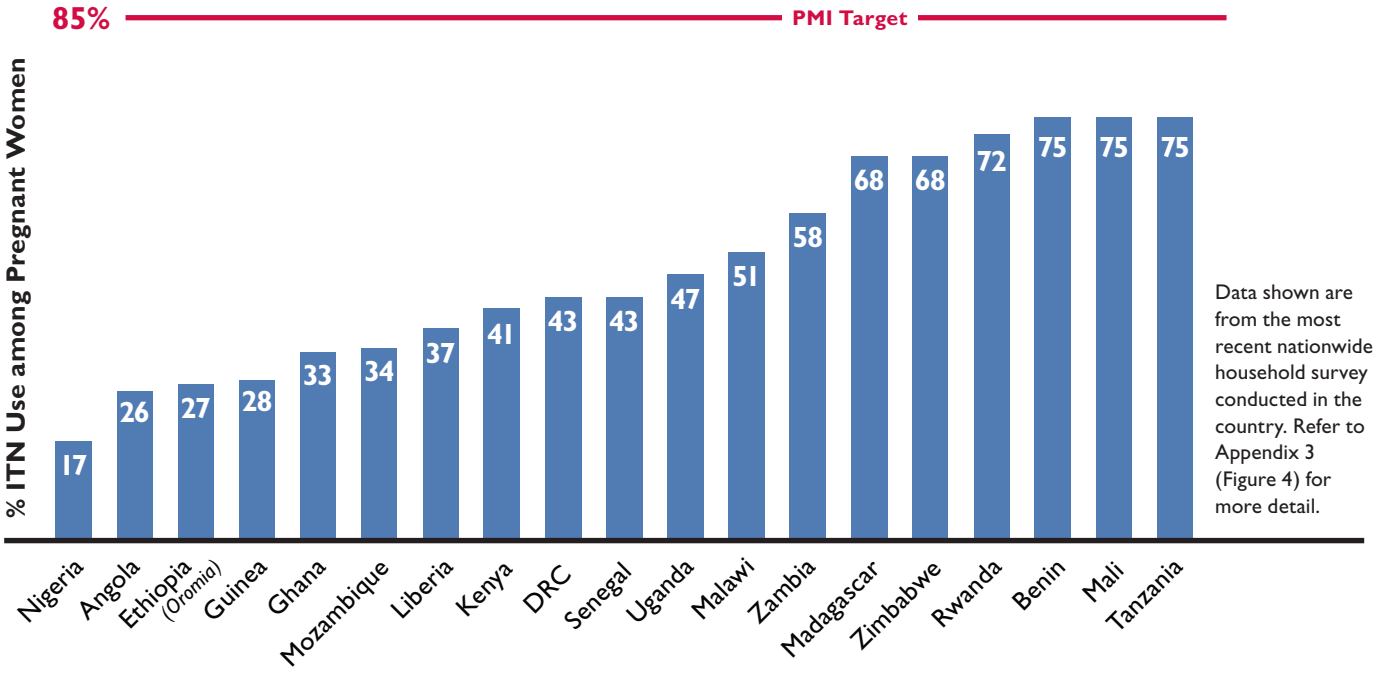
2. Eisele, T. P., Larsen, D. A., et al. (2012). Malaria Prevention in Pregnancy, Birthweight, and Neonatal Mortality; A Meta-Analysis of 32 National Cross-Sectional Datasets in Africa. The Lancet, 12 (12): 942-949

3. FANC, 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.

* The median is the middle value of a set of numbers ordered by rank.

FIGURE 1

ITN Use among Pregnant Women



2). Recognizing challenges in improving IPTp coverage, in 2012, WHO revised its guidelines for IPTp to recommend providing sulfadoxine-pyrimethamine (SP) at every scheduled ANC visit after the first trimester, with doses administered at least one month apart. This approach may increase the likelihood that women will receive at least three 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
- 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

PROVIDING IPTp DRUGS AND RELATED SUPPLIES

When gaps are identified, PMI funds the procurement and distribution of IPTp drugs to antenatal clinics. In FY 2013, PMI procured more than 10 million SP treatments for 10 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 countries reporting SP stockouts has decreased. PMI also works to identify and address other bottlenecks in the supply chain, including provision of clean water and drinking cups at health facilities to promote direct observation of IPTp administration.

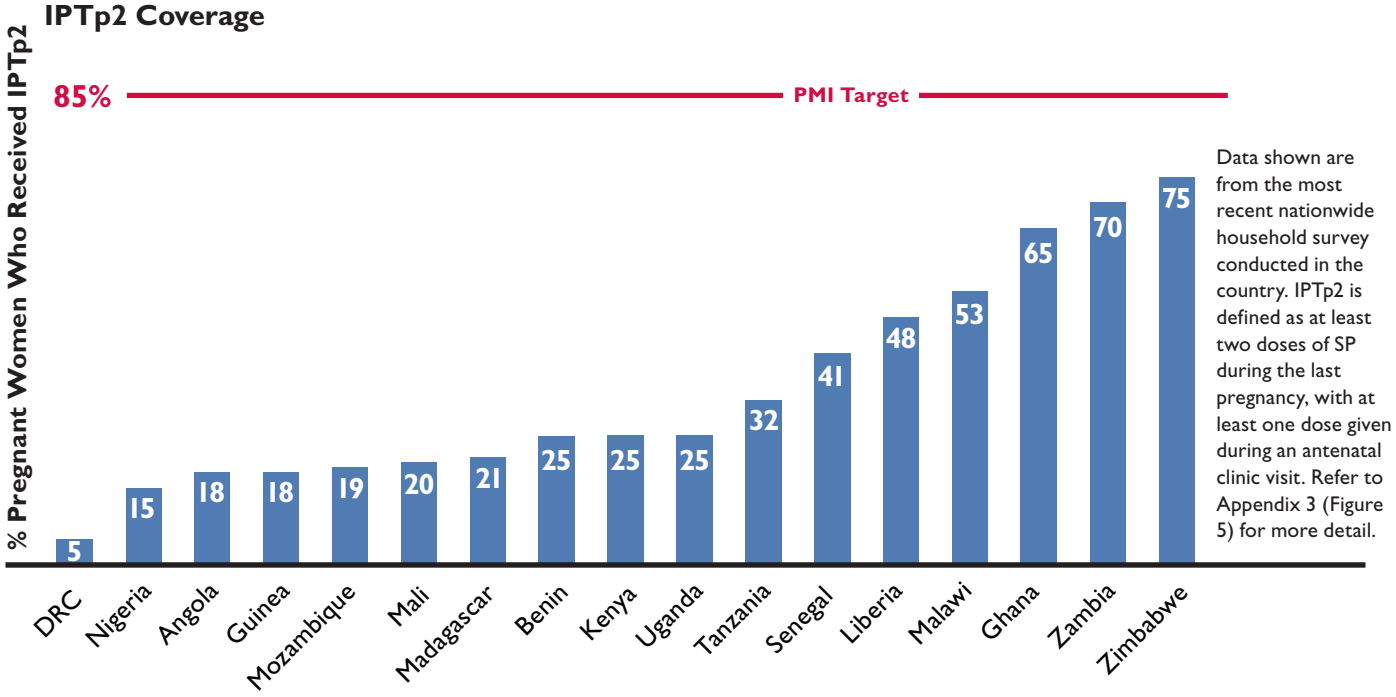
For example, to increase the proportion of pregnant women receiving at least two doses of IPTp in **Uganda**, PMI complemented ongoing nationwide public sector efforts of the Ministry of Health by increasing access to IPTp through the private sector (i.e., not-for-profit and employer-based private facilities). Furthermore, because lack of access to clean drinking water is an obstacle to the administration of directly-observed IPTp, PMI supplied 932 public health facilities (out of the 1,025 within the focus districts) with water purification tablets and water storage containers.

INTEGRATED TRAINING OF HEALTH WORKERS

PMI collaborates with national malaria control, reproductive health, and MCH programs within ministries to train health workers in prevention and treatment of malaria in pregnancy. Over the past year, more than 16,000 health workers were trained in IPTp with PMI's support. Examples of PMI-supported training activities during FY 2013 include the following:

- Despite availability of malaria in pregnancy interventions, coverage rates of IPTp in **Kenya** have remained low, with only 25 percent of women receiving at least two doses of IPTp (see Figure 2). Studies have found that increased IPTp coverage is associated with earlier ANC clinic attendance. Therefore, to increase IPTp coverage, Kenya has adopted a

FIGURE 2
IPTp2 Coverage



Data shown are from the most recent nationwide household survey conducted in the country. IPTp2 is defined as at least two doses of SP during the last pregnancy, with at least one dose given during an antenatal clinic visit. Refer to Appendix 3 (Figure 5) for more detail.

community strategy that aims to encourage pregnant women to start ANC early. In FY 2013, PMI supported the training of 5,523 health facility and community health workers (CHWs) (22 percent of health workers in the three malaria-endemic regions) on malaria in pregnancy interventions in Kenya. The CHWs identified pregnant women, registered them, and checked to see whether IPTp was provided as recommended. A 2013 study carried out in western Kenya by KEMRI/CDC showed 63 percent coverage of IPTp in areas where health facilities had received a memo reminding health workers of the new guidelines to provide IPTp at every ANC visit, and CHWs had been trained to encourage early ANC visits.

An expectant mother receives a dose of SP in Angola, where malaria poses a great risk to expectant mothers: It is one of the main causes of low birth weight, prematurity, and maternal and infant mortality.

Credit: Lilia Gerberg, PMI

- PMI supported in-service training and supervision of **Malian** health providers, in collaboration with the country's reproductive health program, the NMCP, and the Midwives Association to facilitate the implementation of malaria in pregnancy guidelines. Health providers were also trained in interpersonal communication, an area cited by the Ministry of Health's Center for Health Communication as needing improvement. In 2013, a total of 351 health workers were trained on the updated malaria in pregnancy strategy. PMI also supported refresher training and developed outreach materials for *relais* (community volunteers) that focus on communicating with men and key decisionmakers in households.

- In **Mozambique**, PMI supported training of 569 health workers in malaria in pregnancy during two regional trainings in the Northern and Central Regions.

PMI also assisted with health facility assessments, which covered the delivery of MCH services, including the provision of interventions to prevent malaria in pregnancy. For malaria in pregnancy, the assessments measured whether health facilities were providing IPTp, ITNs, and malaria treatment according to national guidelines. The assessments identified that health workers found it difficult to follow IPTp guidelines and that their job aids were not current. To assist health workers, PMI supported the development of job aids using WHO's updated IPTp guidelines.

SUPPORTING BEHAVIOR CHANGE THROUGH COMMUNICATION AND COMMUNITY OUTREACH

BCC for malaria in pregnancy is targeted at women of reproductive age, health care providers, and influential community members to promote early and regular ANC visits, acceptance of and demand for IPTp, and use of ITNs early in pregnancy. PMI-supported BCC activities during FY 2013 included the following:

- In October 2012, PMI leveraged U.S. Agency for International Development Maternal and Child Health and U.S. President's Emergency Plan for AIDS Relief (PEPFAR) funds to introduce a national integrated safe motherhood "Healthy

Pregnancy-Healthy Baby" campaign in **Tanzania**. The campaign uses mobile phones to send weekly text messages and reminders to pregnant women to encourage early ANC visits, testing for HIV and AIDS and prevention of mother-to-child transmission services, requests for ITN vouchers and IPTp, and development of an individual birth plan. Within a year, 251,444 people registered to receive the text messaging service.

- In FY 2013, PMI continued to support communication strategies about malaria in pregnancy in **Mali** through multiple channels, including a network of *relais* (community volunteers), who are trained and equipped with BCC materials and conduct household visits to identify and refer pregnant women to ensure early ANC attendance. In addition, PMI supported production of 192 radio spots to promote ITN use and IPTp uptake by pregnant women and 14 TV spots on malaria prevention, which were broadcast during the 2013 African Cup of Nations.

- In **Benin**, PMI support focuses on improving IPTp coverage through the provision of SP, supervision support at ANC clinics, and a vigorous BCC campaign targeting women of childbearing age. BCC included local outreach by CHWs, who canvassed their communities to encourage and recruit pregnant women to attend ANC clinics, along with nationwide radio and reality TV messages. Within two years of the project's initiation, IPTp use increased from 23 percent to 38 percent in 24 districts, according to 2013 routine health information system surveillance data.

CONTRIBUTIONS AT THE GLOBAL LEVEL

PMI contributes to the development and implementation of global malaria in pregnancy policies through partnerships with WHO and 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 *WHO Policy Brief for the Implementation of Intermittent Prevention Treatment of Malaria in Pregnancy using Sulfadoxine-Pyrimethamine* (April 2013). PMI also assisted in the development of the *Consensus Statement: Optimizing the Delivery of Malaria-in-Pregnancy Interventions* (October 2013), which was endorsed by WHO, the African Leaders Malaria Alliance, and several other malaria in pregnancy stakeholders. PMI continued its activities as a core member of the RBM Malaria in Pregnancy Working Group in FY 2013, 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.

To simplify and streamline national policies, PMI supported a five-country review of malaria in pregnancy guidelines, policies, supervisory tools, and in-service and pre-service training documents from both national malaria control and reproductive health programs. The review documented inconsistencies, which likely hinder health worker efforts. There were discrepancies between documents from national malaria control and reproductive health programs on the timing of IPTp, a lack of clear IPTp guidelines for HIV-positive women, and inaccuracies in the guidance for malaria case management during pregnancy and provision of nets at ANC. PMI is now working with these five countries to address inconsistencies and has expanded the review to include all 19 PMI focus countries in Africa. Furthermore, PMI has supported five countries to update national IPTp policies and is working with eight additional countries to do the same.

RESEARCH AND INNOVATION

Although data on antenatal care utilization patterns in PMI focus countries show that women attend ANC frequently enough to receive IPTp at least twice during their pregnancies, IPTp2 coverage remains suboptimal (see Figure 2). In FY 2013, PMI supported qualitative operations research studies in **Benin, Malawi,** and **Mali** to understand the concerns of pregnant women around taking SP and the attitudes and practices of health care providers regarding the administration of IPTp. PMI and its partners are currently working to address the findings of the studies that highlighted: (1) a need to retrain and support providers to follow the simplified dosing regimen described in WHO's revised guidelines; (2) the means to overcome obstacles to implementing directly-observed administration of IPTp such as a lack of clean drinking water at health facilities; and (3) concerns among some pregnant women about taking SP on an empty stomach.

Intermittent preventive treatment with sulfadoxine-pyrimethamine has been an effective approach to reducing the burden of malaria during pregnancy in Africa. Here, a woman holds one treatment, which consists of three tablets.

Increasing Uptake of IPTp: Success Seen in Malawi

In Malawi, a PMI-supported project integrates malaria in pregnancy activities with existing maternal, newborn, and child health interventions at the facility and community levels, with the goal of achieving universal access to malaria control interventions in Malawi by 2015. Activities to strengthen FANC in all health facilities led to an increase in IPTp2 from 16 percent in June 2012 to 64 percent in September 2013 in focus districts.

A key component of this success was the integration of IPTp training with other maternal and newborn interventions, including antenatal care, integrated management of childhood illnesses, and community case management. In the first two years of activities, 1,277 health workers were trained in malaria prevention and case management for pregnant women. During the same period, 1.2 million people were reached with messages promoting the use of ITNs, proper treatment of malaria, and access to IPTp during ANC visits. Furthermore, the project coordinated with the NMCP and other partners to ensure adequate supplies of SP and ITNs in intervention districts, providing transportation and logistical support.

CHAPTER 3 | Malaria Diagnosis and Treatment

Maggie Hallahan Photography

Effective case management remains one of the cornerstones of global efforts to reduce the intolerable burden of malaria. The President's Malaria Initiative (PMI) supports the World Health Organization (WHO) guidance that calls for universal diagnostic testing and rapid treatment with a recommended antimalarial drug only when a test is positive. In all focus countries, PMI is supporting the scale-up and strengthening of diagnostic testing for malaria to ensure that all patients with malaria are properly identified and receive a quality-assured artemisinin-based combination therapy (ACT) in health facilities and at the community level. This approach ensures that only confirmed malaria cases receive treatment for malaria and facilitates the detection and appropriate treatment of other causes of fever.

PMI works closely with ministries of health to scale up and improve malaria case management. Support from PMI is comprehensive and covers all of the components needed to ensure that patients are appropriately diagnosed and treated for malaria, including:

- Development of updated diagnosis and treatment policies, guidelines, training curricula, and supervision materials
- Procurement and distribution of essential commodities and equipment, including microscopes, and quality-assured rapid diagnostic tests (RDTs) and ACTs
- Support for strengthening management 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 antimalaria drug efficacy monitoring
- Development and implementation of behavior change communication (BCC) activities to support diagnostic and treatment guidelines
- Support of operations research to evaluate and improve implementation of diagnostic and treatment interventions

SCALING UP DIAGNOSTIC TESTING

PMI continues to provide leadership at both the global and country levels in supporting the scale-up of high quality diagnostic testing with microscopy and RDTs. In addition to procuring essential commodities (including quality-assured RDTs, microscopes, and other laboratory supplies), PMI's support to countries has included the revision and

HIGHLIGHTS

- To date, PMI has procured more than 237 million ACTs and more than114 million RDTs to support appropriate management of malaria cases in focus countries.
- In FY 2013, PMI supported training of more than 61,000 health workers in malaria case management and more than 26,000 health workers in diagnostic testing for malaria.
- PMI supported a review of Integrated Management of Childhood Illness (IMCI) training tools in 13 focus countries to assess their adherence to WHO guidelines.
- In Ghana and Benin, PMI supported a study to assess progress and best practices for scaling up diagnostic testing, which provided objective evidence that PMI's capacity building activities had improved the quality and use of diagnostic testing for malaria in those countries.
- In sub-Saharan Africa and the Greater Mekong Subregion, PMI funds contribute to a network of sites that monitors the efficacy of antimalarial drugs to ensure early detection of resistance in malaria parasites.

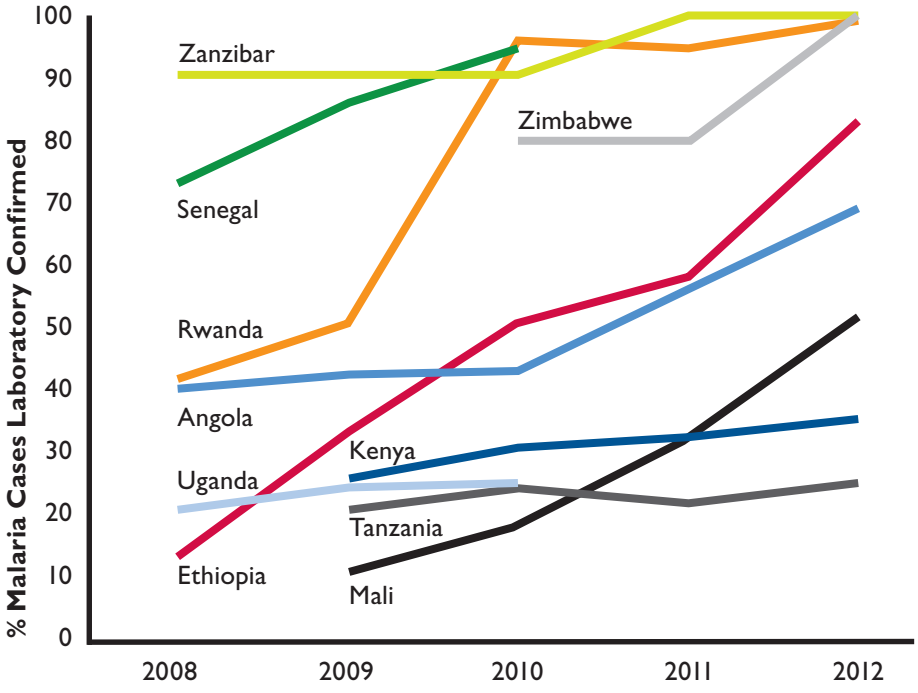
dissemination of national malaria diagnostic policies and tools, the strengthening of quality assurance programs, and the training and supervision of laboratory technicians and clinicians. In fiscal year (FY) 2013 alone, PMI supported training for more than 61,000 health workers in malaria case management and more than 26,000 health workers in diagnostic testing for malaria. Where quality data are available, annual increases in the proportion of suspected malaria cases that are confirmed with laboratory tests and treated with a recommended antimalarial drug combination have been observed in nearly all focus countries (see Figure 1).

Examples of PMI's work related to malaria diagnosis in FY 2013 include:

- In **Malawi**, microscopic diagnosis of malaria is available in approximately one-quarter of all health facilities. To improve availability of quality diagnostic services in the country, PMI supported the continued rollout and implementation of RDTs in FY 2013. A total of 5.2 million RDTs procured by PMI were distributed, and PMI provided assistance to the National Malaria Control Program (NMCP) in conducting routine Outreach Training and Support Supervision visits to public and faith-based health facilities. These visits were intended to improve the quality of diagnostic testing and encourage clinicians to provide treatment based on test results. To date, supervisors have completed 8 rounds of visits to more than 190 health facilities nationwide. Between Rounds 1 and 8, clinicians' adherence to test results (i.e., malaria treatment provided to those with a positive test and not to those with a negative test) improved from 45 to 85 percent. This more efficient use of antimalarial drugs can be attributed in large part to the supervisors who provided onsite training for clinicians during their visits.
- To support the nationwide scale-up of universal testing for malaria in **Mali**, PMI procured 3 million RDTs and provided support for in-service training of health workers during FY 2013. Data from end-use verification surveys of health facilities showed these efforts have contributed to an increase in the percentage of malaria cases confirmed with a diagnostic test

FIGURE 1

Proportion of Suspected Malaria Cases Confirmed with a Laboratory Diagnostic Test, 10 Countries



Source:CDC

Laboratory technicians participate in a malaria microscopy training in the DRC.

DRC Enhances Capacity of Laboratory Technicians to Perform Correct Malaria Diagnosis

Improving the quality of malaria diagnosis is a major challenge in the DRC. Through refresher training support in laboratory diagnosis of malaria that uses a practical hands-on approach to improving malaria microscopy, PMI has enhanced laboratory technicians' capacity to correctly perform malaria diagnostics.

In July 2013, 20 laboratory technicians from Orientale Province from reference laboratories at the province, university, and hospital levels participated in a five-day malaria microscopy refresher training course, focusing on important skills, such as parasite detection, species identification, and parasite quantification.

Remarkable improvements were noted in the knowledge and skills of the trainees after the course. Basic knowledge on malaria and diagnostic testing procedures more than doubled from an average precourse score of 31 percent to a postcourse average of 65 percent. The average ability to correctly detect parasites on test blood slides rose from 79 percent to 88 percent. The improvement in parasite species identification was even greater, with an increase from 28 percent to 62 percent. There was a fivefold improvement in technicians' ability to correctly count malaria parasites using the parasite per microliter method (from 11 percent to 55 percent). By the end of the course, seven participants were accredited as "expert level" microscopists by WHO standards; they have been selected to receive further training on diagnostics supervision and will form a core group of "expert supervisors" who will provide continuing onsite supervision to laboratory technicians throughout Orientale Province.

from 10 percent before the scale-up to 67 percent in the most recent survey.

EXPANDING ACCESS TO EFFECTIVE MALARIA CASE MANAGEMENT

To reach people with limited or no access to facility-based care, PMI supports the extension of public health services through integrated community case management (iCCM) and improved patient referral. Integrated community case management provides a platform to deliver diagnosis, treatment, and referral for malaria, pneumonia, and diarrhea by trained community health workers (CHWs) using standardized treatment algorithms. PMI's iCCM efforts are fully integrated and coordinated with the U.S. Agency for International Development's (USAID's) maternal and child health (MCH) programs, as well as other key partners, such as the United Nations Children's Fund. Examples of progress in this area in FY 2013 include:

- In the **Democratic Republic of the Congo (DRC)**, PMI helped support the expansion of malaria services and the delivery of commodities to 68 additional health zones in FY 2013. More than 4.3 million ACTs and more than 1.7 million RDTs procured by PMI were distributed to health facilities and communities, which is estimated to have provided access to malaria diagnosis and treatment to an additional 500,000 children under five.

- Volunteer home care providers (known as *dispensateurs de soins à domicile* or DSDOM) are key to **Senegal's** fight against malaria and contribute to reducing severe disease and deaths by facilitating prompt care-seeking behavior. Based on the success of the DSDOM intervention, PMI, in collaboration with USAID's MCH program, is supporting a pilot to train these volunteers to treat pneumonia and diarrhea in addition to malaria. During six months in 2013, DSDOM volunteers treated 3,177 children under five years of age nationwide, of which 413 were treated for malaria, 985 for pneumonia, and 922 for diarrhea.

- In **Burma**, PMI provided support to bring malaria treatment services to endemic communities in the remote, forested areas of Tanintharyi, Kayin, and Rakhine Regions. In 2013, PMI procured 400,000 RDTs and 36,480 ACTs, training 594 village malaria workers and 641 health facility workers on their proper use. Forty-four mobile outreach workers were trained to reach hilly, forested areas. To prevent migrant workers from importing malaria to their home villages, malaria screening posts were set up at transit points between regions and major townships, offering free malaria screening and treatment. In FY 2013, these mobile outreach workers tested 65,859 people for malaria, and the 5,277 (8 percent) whose tests were found positive received treatment according to national treatment guidelines.

- In **Zimbabwe**, PMI supported the NMCP to train 1,851 village health workers nationwide to appropriately manage malaria cases at the community level and record case data in the health management information system. PMI supported development of a training curriculum for village health workers, which has been adopted nationwide, as well as a quality performance checklist and an innovative peer-to-peer supervisory program. PMI also procures RDTs and ACTs to supply village health workers with the commodities they need to provide care at the community level. Thanks to these efforts, more people are being treated by village health workers. For example, trained village health workers in the catchment area of Muchadziya Clinic in Manicaland Province started testing and treating malaria cases in their communities in December 2012. In the two months that followed, more than a quarter of all the cases reported by the health facility had received treatment from village health workers.

STRENGTHENING PHARMACEUTICAL AND SUPPLY CHAIN MANAGEMENT

Malaria control measures cannot be implemented without predictable supplies of diagnostic tests and recommended antimalarial drugs, as well as insecticide-treated mosquito nets, insecticides, and other supplies for indoor residual spraying. PMI therefore helps to strengthen procurement and supply chain management systems to ensure products are available when and where they are needed and to protect their quality and safety. In all PMI focus countries, PMI conducts quarterly end-use verification surveys in a sample of health facilities to verify whether RDTs and ACTs

are in stock for patients. To date, PMI has procured more than 114 million RDTs and more than 237 million ACTs. During FY 2013, PMI provided supply chain management assistance in all 19 PMI focus countries, including:

- In **Kenya**, PMI supported the scale-up of case management activities by purchasing more than 6.5 million RDTs and more than 4 million ACTs. To ensure that all PMI-procured commodities reach beneficiaries, PMI supports monitoring of the availability of antimalarial commodities, improved reporting from health facilities, and quantification of drug needs. A quality of care survey conducted in 2013 showed that RDTs were available in 70 percent of all facilities, up from only 8 percent in 2010.

- In **Liberia**, where until 2010 there had been no drug authority to regulate the quality of medicines, PMI supported the creation of a new regulatory authority: the Liberia Medicines and Health Products Regulatory Authority (LMHRA). Subsequently, the LMHRA established a National Quality Control Laboratory to collect and test the quality of medicines sampled from the private sector. (PMI-procured drugs for the public sector are all quality-tested before distribution.) In its first round of testing, the LMHRA found that 60 percent of tested antimalarial medicines available on the private market were counterfeit or substandard. To date, the LMHRA has recalled an estimated $50,000 worth of substandard antimalarial drugs from the market and is currently strengthening drug registration processes. PMI supports the LMHRA in its efforts to expand the medicines tested, establish priority medicines regulations, improve its regulatory functions, and strengthen the quality control of antimalarial and antiretroviral medicines. In addition to PMI's contributions, the Government of Liberia is now using its own resources to support the LMHRA.

- In **Nigeria**, PMI is strengthening the direct delivery logistics system to peripheral health facilities in order to improve availability of malaria commodities at service delivery points. A November 2013 end-use verification survey showed a decline in stockouts since June 2013, with drops in sulfadoxine-pyrimethamine stockouts from 54 percent to 19 percent and RDT stockouts from 17 percent to 14 percent.

In Zambia, a trained community health worker uses RDTs to test a mother and her child for malaria.

Credit: Laura Newman, PATH

COUNTERING THEFT OF MALARIA DRUGS

In 2013, *The Wall Street Journal* reported on the theft and illegal diversion of medicines intended to cure malaria in the most vulnerable populations in sub-Saharan Africa: pregnant women and children under five years of age. In recent years, there have been other reports of theft involving drugs and other malaria commodities given to host governments by donors.

The U.S. Government takes aggressive steps to combat theft and diversion of antimalarials. PMI routinely works through ministries of health to build local capacity in supply chain management to help prevent theft. When problems do occur, PMI works with host governments to strengthen national-level oversight by establishing tighter controls, heightened vigilance, and a robust review of standard operating procedures. PMI refers information of theft or diversion to law enforcement officials. If there is repeated evidence of theft, corruption or fraud, PMI has withdrawn PMI-funded commodities from national government-controlled supply systems and channeled them through a non-governmental parallel system. At the same time, PMI continues to strengthen national supply chain management systems, so malaria commodities can be returned to the national system.

PMI continues to work with recipient country stakeholders at all levels to improve the accountability, transparency, and performance of supply chains to ensure that the integrity of programs is maintained and the intended beneficiaries are served. This includes working closely with national governments, medical stores, and local institutions to strengthen oversight and safe delivery of drugs and other commodities to the end user. In addition, PMI collects samples from the market place to determine whether diversion is taking place and works with host governments to strengthen regulatory and enforcement, as well as implement measures to improve central-level stock tracking, periodic physical inventories, and rapid facility-based surveys to monitor the presence of U.S. Government-financed malaria commodities. These steps have improved transparency in these systems and detected loss and diversion of commodities.

MONITORING FOR AND RESPONDING TO ARTEMISININ RESISTANCE

Resistance in malaria parasites emerges and spreads in response to selection pressure from the use and misuse of antimalarial drugs. The emergence and expansion of antimalarial drug resistance has complicated previous malaria control efforts, and therefore it continues to be a vital concern. Because ACTs have been essential to the recent gains in malaria control, monitoring for malaria parasite resistance to ACTs remains a central component of case management. PMI supports WHO guidance to conduct

PMI supports the scale-up of high quality diagnostic testing with RDTs and microscopy. This includes procuring essential commodities (such as these RDTs), strengthening quality assurance programs, and training laboratory technicians and clinicians.

Credit: Laura Newman, PATH

therapeutic efficacy studies of first-line drugs and potential alternatives, as appropriate, every two years. Data from these studies are reviewed regularly in each PMI focus country to inform national malaria treatment guidelines.

In the Greater Mekong Subregion, PMI supports a regional network of therapeutic efficacy monitoring at 36 sites in 6 countries. Monitoring conducted by this network first heralded the emergence of ACT failures and triggered further research to characterize and confirm artemisinin resistance and help guide the programmatic response to slow its spread. The regional network continues to provide early warning information on the extent of resistance in the region, including along Cambodia-Thailand and Burma-Thailand border areas, as well as southern Vietnam.

In addition to monitoring the therapeutic efficacy of antimalarial drugs, PMI supports a multipronged approach to managing drug resistance in border areas of the Greater Mekong Subregion by:

- Funding intensified malaria prevention and case management activities to reduce transmission and ultimately eliminate *P. falciparum* malaria
- Scaling up and improving the quality of diagnostic testing
- Improving patient treatment seeking and adherence to treatment through BCC activities
- Monitoring for substandard and counterfeit drugs in markets

If artemisinin resistance should spread from Southeast Asia to Africa, it would have a catastrophic impact on malaria control in the region and threaten the global progress achieved to date. PMI, therefore, is supporting therapeutic efficacy monitoring for current first-line malaria treatments in 17 of the 19 PMI focus countries in Africa (in DRC and Guinea, studies are implemented using other funding sources).

CONTRIBUTIONS AT THE GLOBAL LEVEL

PMI remains a key contributor to global malaria case management activities. In FY 2013, PMI continued to support the Roll Back Malaria Partnership by co-chairing the Case Management Working Group and leading its Diagnosis Work Stream, which developed and published lessons learned and best practices for scaling up diagnostic testing in the public sector and shared early results from pilot studies assessing introduction of RDTs in the private sector. PMI is also represented on WHO's Technical Expert Group on Antimalarial Drug Resistance and Containment.

In addition, PMI, in partnership with USAID's MCH program, continued to host the Secretariat for the Global iCCM Task Force, which coordinates all major partners involved in the implementation of iCCM globally.

PMI also supported a review of IMCI training tools in 13 PMI focus countries to assess their adherence to WHO guidelines. The assessment showed that most countries had guidance that correctly defined fever and use of an ACT for treatment, but only two-thirds of the countries recommended diagnostic testing for all febrile patients, and only one-third provided specific instructions for performing an RDT. The findings were disseminated to the respective countries, and PMI in-country staff members are now working with their ministry of health counterparts to update IMCI training curricula to align them with WHO guidance.

RESEARCH AND INNOVATION

PMI supports operations research to improve the effectiveness of case management activities. A study completed in FY 2013 evaluated the progress and best practices for scaling up diagnostic testing in **Ghana** and **Benin**. The study consisted of a desk review of existing data and site visits to health facilities to observe patient consultations and laboratory practices. In Ghana, the accuracy of RDT and microscopy readings were 100 percent and 85 percent, respectively, but clinicians referred patients with fever for a laboratory test less than 60 percent of the time. In Benin, the accuracy of RDT readings also were high (98 percent), but the accuracy of microscopy was lower (70 percent). Clinicians in Benin, though, referred a higher percentage of their febrile patients for testing, but nearly half of patients with a negative test result were still treated for malaria. PMI is disseminating lessons learned from this study and working with counterparts in Ghana and Benin to refine and strengthen training, supervision, and quality assurance activities to address the noted deficiencies.

Bita Rodrigues, USAID

CHAPTER 4 | Global and U.S. Government Partnerships for Ensuring Success

Partnerships at the national and international levels are key to the success of the President's Malaria Initiative's (PMI's) malaria control efforts. PMI's investments are strategically targeted to support each focus country's malaria control strategy and plan while coordinating with and leveraging the support of other partners, including:

- 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 and the Global Fund are committed to coordinating investments for malaria control to maximize impact on malaria burden in each focus country. All PMI focus countries receive substantial malaria financing from the Global Fund. Because the Global Fund has no in-country personnel, the PMI in-country team plays an important role working with national malaria control programs (NMCPs) to implement Global Fund malaria grants. PMI in-country teams facilitate access to technical assistance for grant implementation, as well as help address implementation bottlenecks. PMI teams also communicate regularly with Global Fund Secretariat staff to review implementation progress and troubleshoot implementation challenges. Under the new funding model, PMI staff participate actively in the country dialogue and development of the concept note. The U.S. Government is the Global Fund's largest contributor, and PMI represents malaria on the U.S. delegation to the Global Fund Board.
- *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 Procurement and Supply Management Working Group, the Malaria in Pregnancy Working Group, and the Monitoring and Evaluation Reference Group. During fiscal year (FY) 2013, PMI supported an evaluation of RBM's subregional networks and worked closely with the RBM Secretariat to strengthen the overall support that these networks provide to countries to improve their malaria control efforts. PMI also assumed a leadership role in support of the Harmonization Working Group's efforts to coordinate technical assistance

HIGHLIGHTS

- In seven PMI focus countries (**Angola, Democratic Republic of the Congo, Guinea, Mali, Nigeria, Uganda,** and **Zimbabwe**) and in the **Greater Mekong Subregion**, PMI assisted with the distribution of more than 5.8 million ITNs and more than 1.4 million ACTs during FY 2013 that were procured by other donors or the host government.
- During FY 2013, PMI's collaboration with UNICEF expanded to include the rollout of seasonal malaria chemoprevention (SMC) for children in **Mali** and **Senegal**.
- To extend the reach of malaria control interventions into communities, nearly 900 Peace Corps volunteers in 13 PMI focus countries assisted with malaria control activities, such as long-lasting ITN distribution campaigns and operations research.
- In FY 2013, PMI and PEPFAR continued to strengthen and expand collaboration in the 13 countries where both programs are present.
- To date, PMI has supported malaria activities through more than 200 nonprofit organizations, approximately one-third of which are faith based.

to PMI focus countries around Global Fund grants, which has particularly intensified this year with the rollout of the new funding model.

- *U.K. Department for International Development (DFID):* PMI and DFID collaborate at both the global and country levels. During FY 2013, PMI and DFID continued to collaborate closely in **Zambia**, where DFID has channeled funds to PMI for the procurement of commodities since 2010. In FY 2013, using DFID funds, PMI procured more than 271,000 insecticide-treated mosquito nets (ITNs), 2 million rapid diagnostic tests, and 4.4 million artemisinin-based combination therapies (ACTs) for Zambia. The ongoing, strong collaboration with DFID will make it possible to fill commodity gaps and improve access to commodities through 2015.

- *United Nations Children's Fund (UNICEF):* PMI works closely with UNICEF on integrated community case management (iCCM) and seasonal malaria chemoprevention (SMC) activities.

  - *iCCM:* At a global level, PMI and UNICEF worked together alongside the World Health Organization (WHO) and multiple non-governmental organization (NGO) and academic partners on the iCCM Global Task Force. The Task Force brings together all key stakeholders to promote integrated community-level management of childhood illness in targeted countries. In FY 2013, the Global Task Force supported a process to prioritize a research agenda for iCCM and supported UNICEF in planning an iCCM Evidence Review Summit, which was held in March 2014. The UNICEF-PMI partnership has also included joint country-level activities around iCCM. Fourteen PMI focus countries currently implement iCCM. PMI has supported **Senegal** and the **Democratic Republic of the Congo (DRC)** to document best practices and bottlenecks to the implementation of iCCM and funded iCCM expansion efforts in **Mali**. During FY 2013, PMI supported research on the feasibility of different types of iCCM programs in **Nigeria** and scale-up plans for iCCM in **Zambia**.

  - *SMC:* During FY 2013, PMI's engagement with UNICEF expanded to include the rollout of SMC in **Mali** and **Senegal**. SMC is defined as the intermittent administration of full treatment courses of an antimalarial medicine to children during the malaria season in areas with highly seasonal transmission. In Mali, where SMC is now part of the NMCP's implementation strategy for malaria, PMI supported the development of SMC tools and funded health worker training and supervision activities during the July-November 2013 SMC campaign. The joint efforts of PMI, UNICEF, and Médecins sans Frontières (MSF) supported the NMCP to protect more than 372,000 children during the 2013 high transmission season. Similarly, in Senegal, PMI and UNICEF worked with the Ministry of Health to plan and implement the first SMC campaign, which was carried out in four southern health districts with high malaria transmission. PMI supported the development of the SMC strategy and tools and procured drugs, while UNICEF funded on-the-ground operations during the campaign. MSF/Mali stepped up to provide a small but critical loan of drugs to help cover a shortfall due to shipping delays.

- *World Bank:* The World Bank is a major funder of malaria activities in several PMI focus countries, such as the **DRC** and **Nigeria**. PMI and the World Bank work closely together to help overcome bottlenecks in donor funding and malaria control activities in those countries and collaborate at the global level through RBM technical working groups.

- *World Health Organization:* PMI provides financing to the WHO Global Malaria Programme to support activities related to antimalarial drug resistance surveil-

lance, vector control, and monitoring and evaluation. PMI supports the salaries of WHO national and international program officers in selected PMI focus countries and a U.S. Centers for Disease Control and Prevention (CDC) epidemiologist seconded to the Global Malaria Programme at WHO headquarters. PMI also provides funding to strengthen a regional antimalarial drug surveillance network in the **Greater Mekong Subregion** and non-PMI countries in the Horn of Africa. In addition, the U.S. Agency for International Development (USAID) continues 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) through a Disease Control and Reproductive Health Grant managed by USAID's Africa Bureau. Through this grant, PMI supports activities related to capacity building in malaria diagnostics, assisting countries to report on malaria drug efficacy, developing country reports on malaria in pregnancy, and assisting countries to develop budgeted surveillance and monitoring and evaluation plans. The financing directly supports the salaries of key AFRO staff located in Brazzaville, as well as in Intercountry Support offices, including an epidemiologist, a data management officer, a social scientist, and a medical officer for case management.

OTHER U.S. GOVERNMENT-SUPPORTED HEALTH PROGRAMS

PMI integrates its activities with other U.S. Government-funded global health programs to maximize health sector investments and reduce duplication. Furthermore, PMI's activities, particularly appropriate diagnosis and treatment of child fevers, fully support USAID's commitment to ending preventable child and maternal deaths. During FY 2013, PMI partnered with other U.S. Government-supported global health programs, including:

- *Peace Corps:* During FY 2013, almost 900 Peace Corps volunteers in 13 PMI focus countries (**Benin, Ethiopia, Ghana, Guinea, Kenya, Madagascar, Malawi, Mozambique, Rwanda, Senegal, Tanzania, Uganda, and Zambia**) worked on joint malaria prevention activities with NMCPs, implementing partners, and PMI in-country teams. Volunteers helped to extend the reach of malaria control interventions into communities through their assistance with ITN distribution campaigns, innovative communication activities, and health worker trainings. PMI staff, both at headquarters and in-country, oriented and provided technical guidance, training, and mentoring for new Peace Corps volunteers. During FY 2013, PMI staff provided technical support for three malaria Boot Camps, which trained approximately 100 people, including Peace Corps volunteers, Peace Corps staff, and host country counterparts. In Senegal, Malaria Volunteers worked with PMI to pilot active case detection, and preliminary results are promising (see page 36). In Zambia, PMI-supported Malaria Volunteers assisted with community surveys to measure long-lasting ITN ownership and use and with data collection for PMI's operational research study on the longevity of long-lasting ITNs.
- *U.S. President's Emergency Plan for AIDS Relief (PEPFAR):* In FY 2013, PMI and PEPFAR continued to work to strengthen and expand collaboration in the 13 countries where both programs are present. In two countries, **Nigeria** and **Zambia**, the interagency teams identified additional opportunities where PEPFAR resources will be requested to increase the reach of malaria prevention and control interventions to populations at risk for both diseases. These may include combining training, supervision, and quality assurance of laboratories; strengthening supply chain management for malaria, HIV, and tuberculosis commodities; and expanding sulfadoxine-pyrimethamine and long-lasting ITN distributions to pregnant women at antenatal and prevention-of-mother-to-child-transmission clinics, as well distributing nets through couples HIV and AIDS counseling and testing activities. Plans are under way to strengthen such collaboration in all countries where PMI and PEPFAR are present.
- *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, and through secondment of an Army medical officer who serves as an advisor on the PMI Mekong Team based in Bangkok, **Thailand**. In addition, PMI regularly engages with the Armed Forces

Rwanda is one of 13 countries where PMI and Peace Corps are working collaboratively to fight malaria.

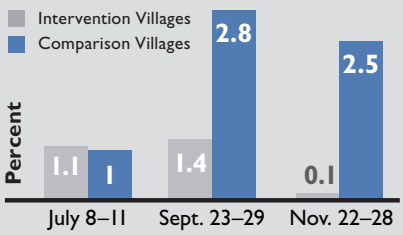
Credit: Claire Brosnihan, Peace Corps Rwanda

PECADOM Plus – Peace Corps Volunteers in Senegal Extend Malaria Case Management to the Community

Peace Corps volunteers are partnering with Senegal's NMCP and PMI to study a new approach to malaria testing and treatment for rural populations with limited access to health care. The aim of the project is to actively detect and treat all malaria cases, thus diminishing the reservoir of malaria parasites in humans. The approach is to train health workers and residents on active surveillance, testing, and treatment. Using Senegal's existing PECADOM (*Prise en charge à domicile*) model, volunteer health care workers were trained on home-based management of malaria and paid a small wage (approximately $5 per week) to conduct weekly door-to-door visits in their village to detect and treat all suspected malaria cases. One woman from each household was also trained to recognize symptoms to assist health workers to locate possible malaria cases, ensuring everyone in the village was monitored for malaria and all symptomatic people received free testing and treatment.

After a promising pilot conducted in one village during 2012, this model was expanded to 15 villages in the Saraya Health District during the 2013 malaria transmission season (July–November). Fifteen comparison villages were chosen among villages benefiting from the original passive PECADOM model. Active case detection surveys were conducted in both the intervention and comparison villages to estimate symptomatic malaria prevalence at baseline, midline, and endline. At baseline, both sets of villages showed a similar prevalence at just around 1 percent. In the end, the prevalence in comparison villages was much higher than in the intervention villages, where only 6 cases of symptomatic malaria were found, showing great promise for this model.

Proportion of the Total Population with Confirmed Symptomatic Malaria: *July–November 2013*



Pest Management Board regarding current entomological monitoring and vector control issues. In several PMI countries, PMI works closely with the Walter Reed Army Institute of Research (WRAIR). In **Kenya**, for example, WRAIR supports the Malaria Control Unit to improve malaria laboratory diagnostic capacity. Using PMI funds, WRAIR has trained quality assurance officers and, in FY 2013, workshops on quality assurance and quality control were conducted for over 100 laboratory personnel.

PRIVATE SECTOR PARTNERSHIPS

PMI works with private sector partners to help leverage their capabilities and resources and ensure that their efforts are well coordinated with government strategies and plans. Historically, this has primarily involved partnering with companies from the mining and sugar cane industries to implement IRS activities in **Ghana, Liberia, Malawi,** and **Zambia**. During FY 2013, examples of private sector partnerships included:

- In **Tanzania**, PMI partnered with Geita Gold Mine to spray houses in two districts of Geita Region. The mining company provided funds to the local government to cover the operational costs of spraying, while PMI provided insecticide and the technical expertise for microplanning, environmental compliance, data management and reporting, and disposal of chemical waste at the end of spraying.

- In **Angola**, PMI partnered with the ExxonMobil Foundation to support a universal ITN coverage campaign in Uige Province, which experienced an upsurge of malaria. The activity is part of a broader multiyear partnership between PMI and the ExxonMobil Foundation to support malaria control and prevention at the provincial level.

FOUNDATIONS

PMI works closely with Malaria No More and foundations, such as the Bill & Melinda Gates Foundation, the Clinton Foundation, and the UN Foundation to advance the global malaria control agenda through the RBM Partnership. In addition, PMI has coordinated with the Clinton Foundation's Health Access Initiative on pilot studies to examine how to scale up diagnostic testing for malaria in private retail drug outlets (e.g., in **Tanzania**) and on forecasting global commodity requirements. PMI leverages the Bill & Melinda Gates Foundation's considerable financing for development of new malaria treatments, diagnostics, and insecticides in its support of these activities.

COMMUNITY-BASED ORGANIZATIONS

NGOs and faith-based organizations have strong bases of operations in underserved, rural areas where malaria is a major public health problem and formal health services may be limited. Through support to these groups, 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 malaria activities through more than 200 local and international nonprofit organizations in all PMI focus countries, approximately one-third of which are faith based.

Appendix 1: PMI Funding FY 2006–FY 2013 (in USD)

	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]	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	**190,697,000**
	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	**307,188,000**
	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	**211,644,775**
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	**158,221,000**
	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	**190,061,000**
	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	**127,706,000**
	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	**150,512,000**
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	**107,527,000**
	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	**207,491,000**
	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	**165,027,000**
	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	**198,192,000**
	Liberia			2,500,000	12,399,000	11,800,000	18,000,000	13,273,000	12,000,000	12,372,000	**82,344,000**
	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	**156,399,000**
	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	**144,222,000**
	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	**145,987,000**
Round 4	DRC						18,000,000	34,930,000	38,000,000	41,870,000	**132,800,000**
	Nigeria						18,000,000	43,588,000	60,100,000	73,271,000	**194,959,000**
	Guinea							9,980,000	10,000,000	12,370,000	**32,350,000**
	Zimbabwe							11,977,000	14,000,000	15,035,000	**41,012,000**
	Mekong[8]							11,976,000	14,000,000	3,521,000	**29,497,000**
	Burma									6,566,000	**6,566,000**
	Cambodia									3,997,000	**3,997,000**
	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	**204,696,500**
	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**	**3,070,471,500**
	Jump-Start Total	**4,250,775**	**35,554,000**	**42,820,000**	**0**	**0**	**36,000,000**	**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**	**3,189,096,275**

(1) This table does not include other U.S. Government funding for malaria activities from USAID, CDC, NIH, or DOD. (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.

Appendix 2: PMI Contributions Summary

The reporting timeframe for this PMI annual report is the 2013 fiscal year (October 1, 2012 to September 30, 2013). PMI counts commodities (ITNs, SP tablets, ACT treatments, and 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.

1. INDOOR RESIDUAL SPRAYING

PEOPLE 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)
Round 1	Angola	590,398	612,776	992,856	485,974	650,782	650,782	689,668	676,090
	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
	Uganda	488,502	1,865,956	2,211,388	2,262,578	2,794,839	2,839,173	2,543,983	2,581,839
Round 2	Malawi	_	126,126	106,450	299,744	364,349	364,349	321,919	0
	Mozambique	_	2,593,949	1,457,142	2,263,409	2,945,721	2,945,721	2,825,648	2,716,176
	Rwanda	_	720,764	885,957	1,329,340	1,365,949	1,571,625	1,025,181	990,380
	Senegal	_	678,971	645,346	661,814	959,727	887,315	1,095,093	690,029
Round 3	Benin	_	_	521,738	512,491	636,448	426,232	652,777	694,729
	Ethiopia	_	3,890,000	5,921,906	6,484,297	2,064,389	2,920,469	1,506,273	1,629,958
	Ghana	_	_	601,973	708,103	849,620	926,699	941,240	534,060
	Kenya	_	3,459,207	3,061,967	1,435,272	1,892,725	1,832,090	2,435,836	0[4]
	Liberia	_	_	_	163,149	420,532	827,404	876,974	367,930
	Madagascar	_	_	2,561,034	1,274,809	2,895,058	2,895,058	2,585,672	1,781,981
	Mali	_	_	420,580	497,122	440,815	697,512	762,146	850,104
	Zambia	_	3,600,000	4,200,000	6,500,000	4,056,930	4,056,930	4,581,465	2,347,545
Round 4	Nigeria	_	_	_	_	_	_	346,115	346,798
	Zimbabwe	_	_	_	_	_	_	_	1,164,586
	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**

(1) A cumulative count of the number of people protected is not provided because many areas were sprayed on more than one occasion. (2) Angola, Madagascar, Malawi, Mozambique, and Zambia implemented spray rounds during the first quarter of FY 2011; 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.

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

(1) A cumulative count of the number of houses sprayed is not provided because many areas were sprayed on more than one occasion. (2) Angola, Madagascar, Malawi, Mozambique, and Zambia implemented spray rounds during the first quarter of FY 2011; 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.

	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)**
Round 1	Angola	350	582	2,104	585	834	834	0	691
	Tanzania	536	734	688	2,806	5,890	4,397	10,756	10,046
	Uganda	450	4,062	4,945	4,412	5,171	1,771	541	3,881
Round 2	Malawi	_	300	309	462	929	929	885	765
	Mozambique	_	1,190	1,282	1,343	1,996	1,996	1,121	1,128
	Rwanda	_	655	2,091	2,276	2,088	2,357	1,986	1,925
	Senegal	_	275	706	570	1,024	911	1,097	933
Round 3	Benin	_	_	335	347	459	617	825	804
	Ethiopia	_	_	1,198	3,017	4,049	3,855	2,260	2,684
	Ghana	_	_	468	577	572	636	992	669
	Kenya	_	4,697	1,452	1,719	2,496	2,118	5,921	0[4]
	Liberia	_	_	_	340	480	793	802	292
	Madagascar	_	_	1,673	851	1,612	1,612	4,634	2,894
	Mali	_	_	413	424	549	816	872	853
	Zambia	_	1,300	1,413	1,935	2,396	2,396	929	926
Round 4	Nigeria	_	_	_	_	_	_	351	381
	Zimbabwe	_	_	_	_	_	_	158	0
	TOTAL	**1,336**	**13,795**	**19,077**	**21,664**	**30,545**	**26,038**	**34,130**	**28,872**

(1) A cumulative count of the number of people trained is not provided because many areas were 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; 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.

2. INSECTICIDE-TREATED MOSQUITO NETS

INSECTICIDE-TREATED MOSQUITO 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)	Cumulative[3]
Round 1	Angola	540,949	294,200	734,198	395,748	1,353,298	1,011,800	727,700	1,265,000	5,311,093
		540,949	0	339,440	446,348	294,169	630,000	207,000	798,000	3,255,906
	Tanzania	130,000	0	143,560	1,468,966	623,441	0	697,201	1,245,097	4,308,265
		130,000	0	113,560	1,498,966	623,441	0	697,201	1,245,097	4,308,265
	Uganda	376,444	1,132,532	480,000	765,940	1,009,000	709,000	1,200,000	5,000,000	9,963,916
		305,305	683,777	999,894	651,203	294,139	221,325	225,890	956,571	4,334,927
Round 2	Malawi	_	1,039,400	849,578	1,791,506	850,000	1,659,700	1,261,285	521,864	7,973,333
		_	211,995	849,578	851,436	457,822	1,142,938	1,768,951	1,011,915	6,126,365
	Mozambique	_	786,000	720,000	1,450,000	500,000	1,200,000	1,200,000	1,200,000	7,056,000
		_	565,000	842,802	930,000	500,000	1,494,277	850,000	1,328,379	6,403,295
	Rwanda	_	0	550,000	912,400	100,000	310,000	1,000,500	0	2,872,900
		_	0	0	500,000	962,400	0	806,100	604,400	2,872,900
	Senegal	_	200,000	790,000	408,000	1,025,000	2,880,000	500,000	1,362,550	7,165,550
		_	196,872	792,951	380,000	28,000	1,546,617	1,614,563	540,980	5,099,983
Round 3	Benin	_	221,000	385,697	875,000	634,000	905,000	510,000	1,420,000	4,950,697
		_	215,627	45,840	879,415	315,799	699,300	360,000	429,000	2,944,981
	Ethiopia	_	102,145	22,284	1,559,500	1,845,200	1,845,200	2,540,000	5,700,000	11,769,129
		_	102,145	22,284	559,500	1,000,000	1,845,200	2,510,746	3,600,000	9,639,875
	Ghana	_	60,023	350,000	955,000	2,304,000	1,994,000	1,600,000	2,600,000	8,389,023
		_	60,023	0	350,000	955,000	2,313,546	1,616,400	1,654,200	6,587,069
	Kenya	_	_	60,000	1,240,000	455,000	2,212,500	1,299,195	1,740,000	7,006,695
		_	_	60,000	550,000	690,000	2,589,180	35,090	1,298,259	4,901,729
	Liberia	_	197,000	0	430,000	830,000	650,000	0	0	1,757,000
		_	0	184,000	430,000	480,000	350,000	300,000	0	1,744,000
	Madagascar	_	_	351,900	1,875,007	1,715,000	0	2,112,000	2,729,750	8,783,657
		_	_	351,900	1,005,007	2,579,720	2,217,074	0	2,085,671	6,022,298
	Mali	_	369,800	858,060	600,000	2,110,000	3,037,150	600,000	3,076,850	9,111,860
		_	369,800	258,060	600,000	0	2,040,964	1,510,000	800,000	5,578,824
	Zambia	_	808,332	186,550	433,235	1,800,000	1,760,146	833,000	2,728,980	7,150,243[4]
		_	550,017	444,865	433,235	400,000	1,760,146	833,000	0	4,421,263
Round 4	DRC	_	_	_	_	824,100	2,000,000	455,000	3,950,000	7,229,100
		_	_	_	_	589,553	314,111	2,113,864	142,306	3,110,869
	Mekong	_	_	_	_	_	_	298,573	658,000	956,573
		_	_	_	_	_	_	0	118,059	118,059
	Nigeria	_	_	_	_	614,000	1,000,000	3,315,675	4,200,000	9,129,675
		_	_	_	_	0	614,000	204,635	2,496,730	3,315,365
	Guinea	_	_	_	_	_	_	800,000	779,900	1,579,900
		_	_	_	_	_	_	0	0	0
	Zimbabwe	_	_	_	_	_	_	457,000	699,500	1,156,500
		_	_	_	_	_	_	457,000	699,500	1,156,500
	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**	**123,621,109**
		976,254	**2,955,256**	**5,305,174**	**10,065,110**	**10,170,043**	**19,778,678**	**16,110,440**	**19,809,067**	**81,942,473**

(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 three-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 million ITNs were procured in FY 2011, and 271,945 ITNs were procured in FY 2013 for Zambia with a donation from DFID.

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)	Cumulative[2]
Round 1	Angola	_	0	109,624	17,089	540,851	0	0	484,577	1,152,141
	Tanzania	_	0	350,000	117,400	871,680	615,010	1,077,840	0	3,031,930
	Uganda	_	369,900	0	0	2,431,815	125,017	0	3,503,651	6,314,383
Round 2	Malawi	_	_	0	10,700	9,600	20,000	0	0	40,300
	Mozambique	_	_	78,000	179,730	0	0	0	0	257,730
	Senegal	_	_	0	1,875,456	621,481	385,427	0	0	2,882,364
Round 3	Ethiopia	_	_	_	475,000	0	0	0	0	475,000
	Ghana	_	_	750,000	0	82,600	0	6,788,328	0	7,620,928
	Madagascar	_	_	_	290,636	3,204,647	2,772,824	0	0	3,495,283
	Mali	_	_	_	_	_	_	258,000	800,000	1,058,000
Round 4	DRC	_	_	_	_	3,966,000	0	0	2,700	3,968,700
	Mekong	_	_	_	_	_	_	951,019	348,502	1,299,521
	Nigeria	_	_	_	_	0	15,389,478	1,852,604	749,033	17,127,006
	TOTAL	_	**369,900**	**1,287,624**	**2,966,011**	**11,728,674**	**19,307,756**	**10,927,791**	**5,888,463**	**48,723,286**

(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 three-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 SUPPORT[1]

		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)**	**Cumulative[5]**
Round 1	Uganda	0	0	18,333	72,666	39,367	26,666	26,667	0	171,033
		0	0	2,556	45,780	40,063	26,666	0	0	107,270
Round 2	Rwanda	_	583,333	0	0	0	0	0	0	583,333
		_	583,333	0	0	0	0	0	0	583,333
Round 3	Benin	_	0	766,666	0	0	405,863	227,550	900,000	2,300,079
		_	0	0	307,121	150,000	309,546	227,550	227,550	1,121,767
	Ghana	_	_	0	0	25,000	0	0	900,000	925,000
		_	_	0	0	0	25,000	0	900,000	925,000
	Kenya	_	_	0	840,000	0	0	0	0	840,000
		_	_	0	840,000	0	0	0	0	840,000
	Liberia	_	_	0	78,666	85,333	85,333	79,667	331,667	575,333
		_	_	0	78,666	0	71,333	7,667	79,667	237,333
	Malawi	_	_	_	_	_	_	_	2,070,333	2,070,333
		_	_	_	_	_	_	_	0	0
	Mali	_	_	1,000,000	0	0	0	531,000	633,333	2,164,333
		_	_	0	1,000,000	0	0	531,000	333,333	1,864,333
	Mozambique	_	_	0	0	3,645,052[6]	0	2,000,000	577,000	6,222,052
		_	_	0	0	0	3,645,052	0	1,485,900	5,130,952
	Zambia	_	_	0	666,666	0	3,083,300[7]	0	0	3,749,966
		_	_	0	0	666,666	3,083,300	0	0	3,749,966
Round 4	DRC	_	_	_	_	2,470,000[8]	1,100,000	300,000	1,000,000	3,770,000
		_	_	_	_	1,370,000	0	223,683	563,786	2,157,469
	Nigeria	_	_	_	_	_	_	1,000,000	4,000,000	5,000,000
		_	_	_	_	_	_	0	498,200	498,200
	Guinea	_	_	_	_	_	_	108,333	280,000	388,333
		_	_	_	_	_	_	108,057	233,333	341,390
	Zimbabwe	_	_	_	_	_	_	220,000	189,267	409,267
		_	_	_	_	_	_	220,000	189,267	409,267
	TOTAL	_	**583,333**	**1,784,999**	**1,657,998**	**6,264,752**	**4,701,162**	**4,493,217**	**10,881,600**	**29,169,062**
		_	**583,333**	**2,556**	**2,271,567**	**2,226,729**	**7,160,897**	**1,317,957**	**4,511,036**	**17,966,280**

(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 South Sudan. (5) The cumulative column takes into account the three-month overlap between Year 5 (covering the 2010 calendar year) and Year 6 (covering the 2011 fiscal year). (6) All treatments were procured with non-malaria U.S. Government funds. (7) 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. (8) Of this total, 1,370,000 treatments were procured with non-malaria U.S. Government funds.

	HEALTH WORKERS TRAINED IN IPTp 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)**
Round 1	Angola	1,450	290	1,481	2,554	2,695	1,488	1,308	686
	Tanzania	376	1,158	2,532	2,288	2,157	4,634	1,210	162
	Uganda	168	807	649	724	870	5,341	5,651	874
Round 2	Malawi	_	_	2,747	348	181	0	31	134
	Mozambique	_	_	_	_	_	_	776	569
	Rwanda[3]	_	250	436	0	964	225	0	0
	Senegal	_	43	2,422	865	1,025	1,563	672	512
Round 3	Benin	_	605	1,267	146	80	0	0	805
	Ghana	_	_	464	1,170	2,797	7,577	2,665	1,087
	Kenya	_	_	0	5,107	93	1,844	4,950	5,523
	Liberia	_	_	417	750	535	404	289	289
	Madagascar	_	_	0	0	1,576	3,370	3,808	0
	Mali	_	_	142	0	1,173	1,983	270	351
	Zambia	_	_	_	63	0	0	387	350
Round 4	DRC	_	_	_	_	0	443	1,347	3,265
	Nigeria	_	_	_	_	0	0	3,456	1,466
	Guinea	_	_	_	_	_	_	313	0
	Zimbabwe	_	_	_	_	_	_	215	86
	TOTAL	**1,994**	**3,153**	**12,557**	**14,015**	**14,146**	**28,872**	**27,348**	**16,159**

(1) A cumulative count of individual health workers trained is not provided because some health workers were 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 were 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)	Cumulative[3]
Round 1	Angola	129,875	375,000	375,000	600,000	832,000	1,637,000	862,150	2,930,000	7,291,025
		0	101,000	380,875	975,000	282,000	1,637,500	1,762,150	900,000	6,038,525
	Tanzania	875,000	550,200	1,075,000	950,000	292,000	117,000	212,500	364,500	4,436,200
		250,000	1,025,200	425,000	989,500	661,900	194,574	212,500[4]	202,000	3,896,174
	Uganda	0	0	0	0	1,309,000	1,346,650	2,061,000	525,000	3,916,650
		0	0	0	0	34,000	296,985	0	500,000	795,055
Round 2	Malawi	_	0	0	0	0	0	2,966,675	9,227,000	12,193,675
		_	0	0	0	0	0	2,966,675	5,227,825	8,194,500
	Mozambique	_	0	0	0	0	5,000,000	1,000,000	9,956,375	15,956,375
		_	0	0	0	0	3,452,550	1,000,000	2,485,753	6,938,303
	Rwanda	_	0	0	0	200,010	200,010	500,010	500,010	1,200,030
		_	0	0	0	0	109,991	349,219[5]	240,000	699,210
	Senegal	_	0	0	0	0	0	700,000	300,000	1,000,000
		_	0	0	0	0	0	700,000[6]	300,000	1,000,000
Round 3	Benin	_	178,400	0	0	600,000	600,000	980,000	1,000,000	2,758,400
		_	73,815	104,585	0	0	600,000	490,000	1,190,000	2,458,400
	Ethiopia	_	_	0	1,680,000	1,560,000	0	0	0	3,240,000
		_	_	0	820,000	2,420,000	0	0	0	3,240,000
	Ghana	_	_	0	74,000	725,600	725,600	3,048,000	0	3,847,600
		_	_	0	0	0	725,600	1,000,000	0[7]	1,725,600
	Kenya	_	_	0	0	547,800	547,800	1,745,120	6,547,680	8,840,600
		_	_	0	0	0	292,040	667,960	3,298,320	4,258,320
	Liberia	_	_	0	850,000	1,200,000	0	1,900,000	2,500,000	6,450,000
		_	_	0	850,000	1,116,275	83,725	0	1,506,450	3,556,450
	Madagascar	_	_	0	0	270,000	1,500,000	778,000	1,000,000	3,548,000
		_	_	0	0	202,031	248,329	1,491,589	0	1,832,469
	Mali	_	_	0	30,000	500,000	500,000	1,000,000	3,000,000	5,030,000
		_	_	0	0	530,000	500,000	600,000	1,253,800	2,883,800
	Zambia	_	979,000	1,639,000	2,070,000	4,804,500	2,337,450[5]	3,056,250	3,530,000	16,162,100[8]
		_	0	979,000	1,250,000	2,550,400	2,337,450	999,975	5,586,250	11,448,975
Round 4	DRC	_	_	_	_	500,000	0	3,500,000	4,000,000	8,000,000
		_	_	_	_	0	400,425	428,175	1,710,676	2,539,276
	Mekong	_	_	_	_	_	61,000	248,500	424,000	733,500
		_	_	_	_	_	61,000	5,250	120,126	186,376
	Nigeria	_	_	_	_	_	0	2,700,000	4,000,000	6,700,000
		_	_	_	_	_	0	428,400	1,084,425	1,512,825
	Guinea	_	_	_	_	_	_	100,000	1,000,000	1,100,000
		_	_	_	_	_	_	100,000	1,000,000	1,100,000
	Zimbabwe	_	_	_	_	_	_	1,599,700	1,135,375	2,735,075
			_	_	_	_	_	1,599,700	1,135,375	2,735,075
	TOTAL	**1,004,875**	**2,082,600**	**2,429,000**	**6,254,000**	**13,340,910**	**14,572,510**	**28,957,905**	**51,939,940**	**114,479,230**
		250,000	**1,200,015**	**1,889,460**	**4,884,500**	**7,796,606**	**10,940,169**	**14,801,593**	**27,741,000**	**67,039,333**

(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 three-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, 1,350,000 RDTs were procured in FY 2011, and 2,000,000 RDTs were procured in FY 2013 for Zambia with a donation from DFID.

	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)**
Round 1	Angola	_	374	1,356	691	1,022	1,028	225	487
	Tanzania	_	0	0	247	388	338	83	159
	Uganda	_	0	100	1,115	941	1,651	427	1,281
Round 2	Malawi	_	_	0	0	307	549	1,039	579
	Mozambique	_	391	0	136	0	0	0	8
	Rwanda	_	_	0	0	29	0	172	556
	Senegal	_	_	90	19	4,158	2,920	1,239	2,212
Round 3	Benin	_	605	0	24	583	232	884	967
	Ethiopia	_	_	0	0	0	7,666	9,068	563
	Ghana	_	_	0	46	4,511	8,680	2,540	1,292
	Kenya	_	_	77	0	485	210	408	3,257
	Liberia	_	_	0	22	906	39	0	0
	Madagascar	_	_	0	108	2,701	8,932	535	4,620
	Mali	_	_	40	412	1,276	1,957	1,292	375
	Zambia	_	_	0	36	0	37	2,017	719
Round 4	DRC	_	_	_	_	28	499	1,762	5,157
	Mekong	_	_	_	_	0	0	63	1,975
	Nigeria	_	_	_	_	0	2	3,555	1,919
	Guinea	_	_	_	_	_	_	835	20
	Zimbabwe	_	_	_	_	_	_	2,066	86
	TOTAL	_	**1,370**	**1,663**	**2,856**	**17,335**	**34,740**	**28,210**	**26,232**

(1) A cumulative count of individual health workers trained is not provided because some health workers were 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 THERAPY (ACT) TREATMENTS PROCURED AND DISTRIBUTED WITH PMI SUPPORT

		ACTs Procured / ACTs Distributed								
	Country	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)	Cumulative[4]
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	23,964,940
		0	1,689,321	3,109,089	1,947,188	3,567,360	3,770,010	3,600,000	3,829,800	21,512,768
	Tanzania	380,160	694,050	146,730	4,001,760	8,751,150	7,608,900	8,201,910	6,278,820	32,491,920
		380,160	494,050	346,730	544,017	4,873,207	8,819,640	8,663,280	1,593,300	23,406,994
	Uganda	261,870	0	1,140,480	0	2,085,120	2,085,120	1,169,820	799,800	5,457,090
		227,827	0	0	1,140,480	0	545,310	52,501	1,054,490	3,020,608
Round 2	Malawi	_	4,695,450	8,449,920	1,169,280	1,634,520	214,500	7,691,970	6,520,260	30,161,400
		_	4,694,013	3,579,278	3,693,510	2,198,460	215,100	6,536,307	3,908,910	24,610,478
	Mozambique	_	218,880	4,988,160	0	5,331,840	7,064,040	8,731,950	7,469,790	30,999,540
		_	218,880	1,440,000	2,210,320	1,553,430	4,920,990	2,830,380	11,643,402	23,838,982
	Rwanda	_	714,240	0	0	0	0	0	300,150	1,014,390
		_	0	714,240	0	0	0	0	300,150	1,014,390
	Senegal	_	0	0	443,520	670,080	659,790	355,000	346,110	2,416,420
		_	0	0	0	443,520	455,756	468,776	210,378	1,578,430
Round 3	Benin	_	_	1,073,490	215,040	1,002,240	509,100	1,841,190	132,000	4,773,060
		_	_	326,544	812,232	1,002,600	470,749	1,181,091	396,716	4,182,886
	Ethiopia	_	_	600,000	1,081,000	2,268,000	0	1,365,000	3,610,000	8,924,000
		_	_	0	1,681,000	648,000	1,620,000	1,365,000	1,821,000	7,135,000
	Ghana	_	_	1,142,759	0	0	0	2,090,130	849,460	4,082,349
		_	_	0	1,028,000	114,759	0	2,090,130	849,460	4,082,349
	Kenya	_	_	1,281,720	7,804,800	6,997,080	6,960,390	9,578,970	4,168,414	34,160,974
		_	_	1,281,720	6,015,360	7,667,310	3,268,260	2,410,810	10,422,328	30,598,308
	Liberia	_	496,000	0	1,303,175	1,631,625	4,444,875	2,375,525	2,703,000	12,382,600
		_	0	496,000	1,303,175	1,631,625	1,623,781	2,375,525	1,865,775	9,295,881
	Madagascar	_	_	0	0	0	100,025	400,000	0	500,025
		_	_	0	0	0	0	84,948	387,035	471,983
	Mali	_	_	0	241,720	739,200	1,289,190	2,400,030	2,289,720	6,220,660
		_	_	0	241,720	0	1,289,190	900,000	2,274,682	4,705,592
	Zambia	_	_	495,360	0	2,390,400	1,688,160	2,721,060	3,379,830	10,037,850[5]
		_	_	80,640	173,160	2,257,920	1,688,160	2,721,060	3,080,970	9,364,950
Round 4	DRC	_	_	_	_	3,780,000	0	7,000,000	2,378,400	13,158,400
		_	_	_	_	639,075	855,948	1,007,387	4,344,124	6,750,395
	Mekong	_	_	_	_	0	0	68,070	102,060	170,130
		_	_	_	_	0	0	0	17,415	17,415
	Nigeria	_	_	_	_	0	0	7,201,535	3,584,060	10,785,595
		_	_	_	_	1,043,352[6]	0	1,241,363	3,184,730	5,469,445
	Guinea	_	_	_	_	_	1,450,000	754,750	1,401,300	3,606,050
		_	_	_	_	_	0	915,500	754,725	1,670,225
	Zimbabwe	_	_	_	_	_	744,120	969,150	581,460	2,294,730
		_	_	_	_	_	520,884	1,192,386	581,460	2,294,730
	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**	**237,602,123**
		607,987	**7,096,264**	**11,374,241**	**20,790,162**	**27,640,618**	**30,063,778**	**39,636,444**	**52,520,850**	**185,021,809**

(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 three-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, and 4,432,140 ACTs were procured in FY 2013. (6) These ACTs were distributed in 2010 with U.S. Government funds but were procured before Nigeria became a PMI focus country.

ACT TREATMENTS 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)	Cumulative[1]
Round 1	Uganda	_	8,709,140	112,330	4,459,918	0	0	0	0	13,281,388
Round 2	Malawi	_	_	0	2,056,170	0	5,015,490	0	0	6,779,580
	Mozambique	_	_	0	1,423,350	2,857,590	1,428,630	0	0	4,951,070
	Rwanda	_	_	_	396,625	282,494	114,471	966	0	794,556
	Senegal	_	_	_	0	0	0	275,000	0	275,000
Round 3	Madagascar	_	_	_	519,338	396,470	124,118	674,273	0	1,699,579
	Mali	_	_	_	_	_	_	_	184,319	184,319
Round 4	Nigeria	_	_	_	_	_	311,100	0	0	311,100
	Guinea	_	_	_	_	_	_	_	938,480	938,480
	Zimbabwe	_	_	_	_	_	_	_	344,160	344,160
	TOTAL	_	**8,709,140**	**112,330**	**8,855,401**	**3,536,554**	**6,993,809**	**950,239**	**1,466,959**	**29,559,232**

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

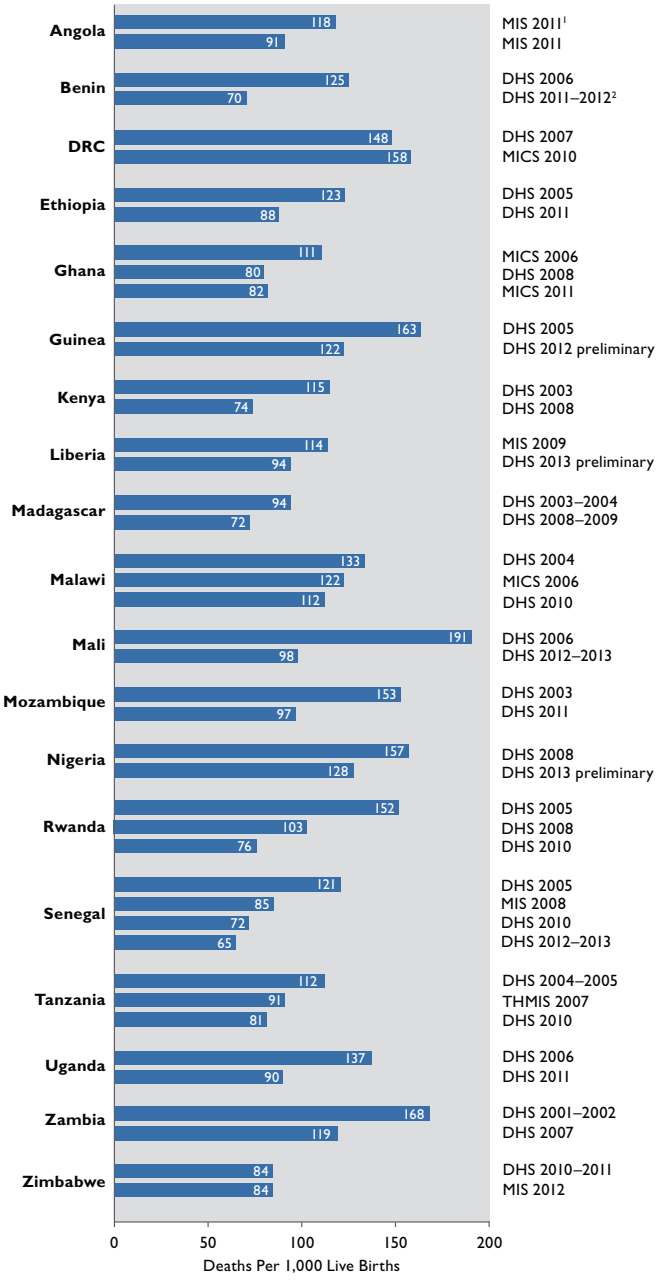
HEALTH WORKERS TRAINED IN TREATMENT WITH ACTS WITH PMI SUPPORT[1]

	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)
Round 1	Angola	1,283	290	1,357	2,784	2,868	238	1,489	2,492
	Tanzania	4,217	1,011	1,767	1,018	1,162	1,520	2,218	162
	Uganda	2,844	12,637	9,159	1,356	0	485	5,651	767
Round 2	Malawi	_	0	5,315	809	1,813	378	204	540
	Mozambique	_	174	422	16,768	219	0	2,383	1,190
	Rwanda	_	5,127	8,565	7,672	7,180	8,911	3,098	1,707
	Senegal	_	1,020	4,776	1,162	4,158	2,375	1,196	2,124
Round 3	Benin	_	605	_	762	1,178	1,207	678	907
	Ethiopia	_	_	2,786	0	1,740	7,666	8,694	4,560
	Ghana	_	_	368	1,144	2,952	7,954	1,318	10,278
	Kenya	_	_	_	4,747	390	0	0	0
	Liberia	_	_	595	746	1,008	498	289	60
	Madagascar	_	_	_	1,696	4,575	8,039	580	4,582
	Mali	_	_	101	412	1,283	1,957	1,260	328
	Zambia	_	_	186	197	0	493	542	655
Round 4	DRC	_	_	_	_	874	462	1,525	5,097
	Mekong	_	_	_	_	0	0	291	1,804
	Nigeria	_	_	_	_	5,058	0	5,608	24,195
	Guinea	_	_	_	_	_	_	707	20
	Zimbabwe	_	_	_	_	_	_	2,066	86
	TOTAL	**8,344**	**20,864**	**35,397**	**41,273**	**36,458**	**42,183**	**39,797**	**61,554**

(1) A cumulative count of individual health workers trained is not provided because some health workers were 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

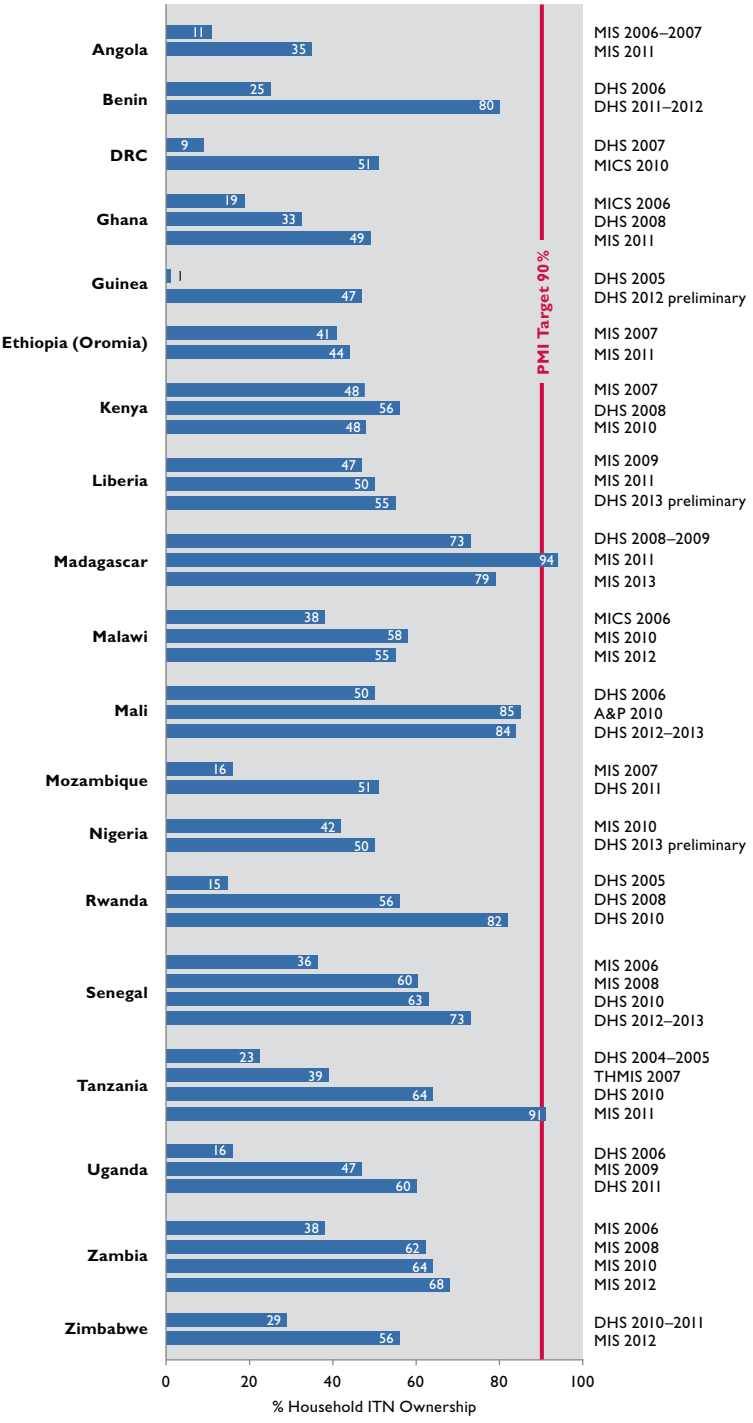
Figure 1: All-Cause Mortality Rates among Children Under Five in PMI Focus Countries



1. Both under-five mortality estimates for Angola are derived from the MIS 2011.
2. The final DHS 2011–2012 report notes that, while mortality among children under five years of age in Benin has declined, there may have been significant underreporting of neonatal and child deaths by respondents.

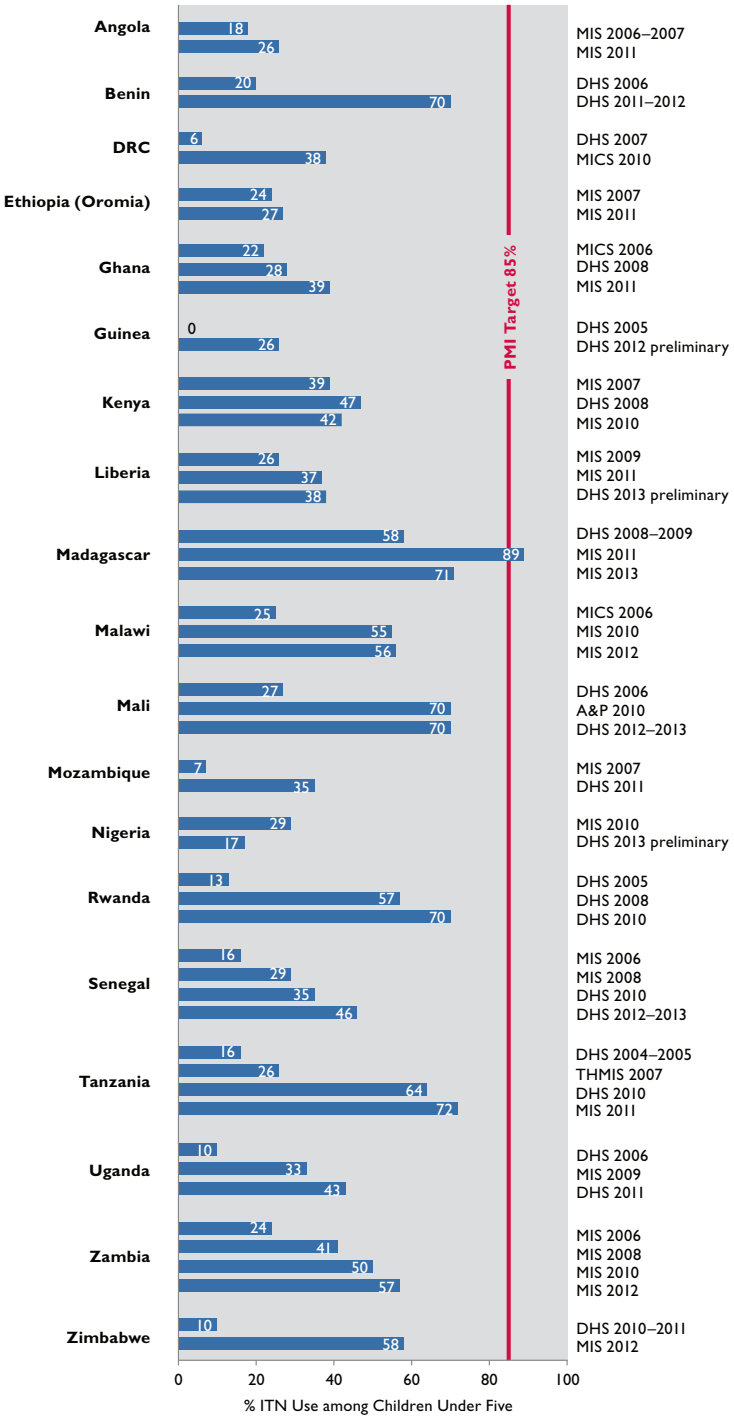
Note: The PMI focus countries included in this figure have at least two data points from nationwide household surveys that measured all-cause mortality among children under five years of age.

Figure 2: ITN Ownership in PMI Focus Countries



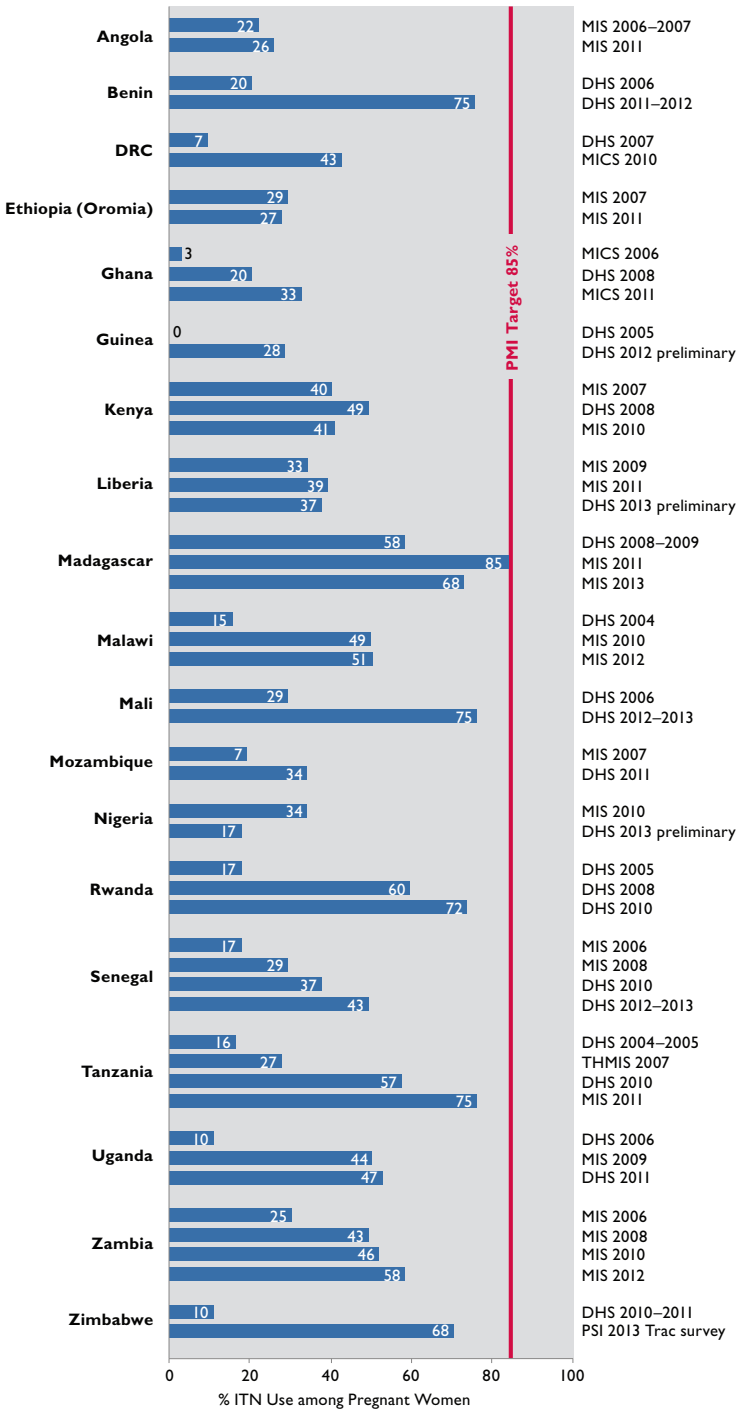
Note: The PMI focus countries included in this figure have at least two data points from nationwide household surveys that measured ITN ownership, defined as the percentage of households that own at least one ITN.

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



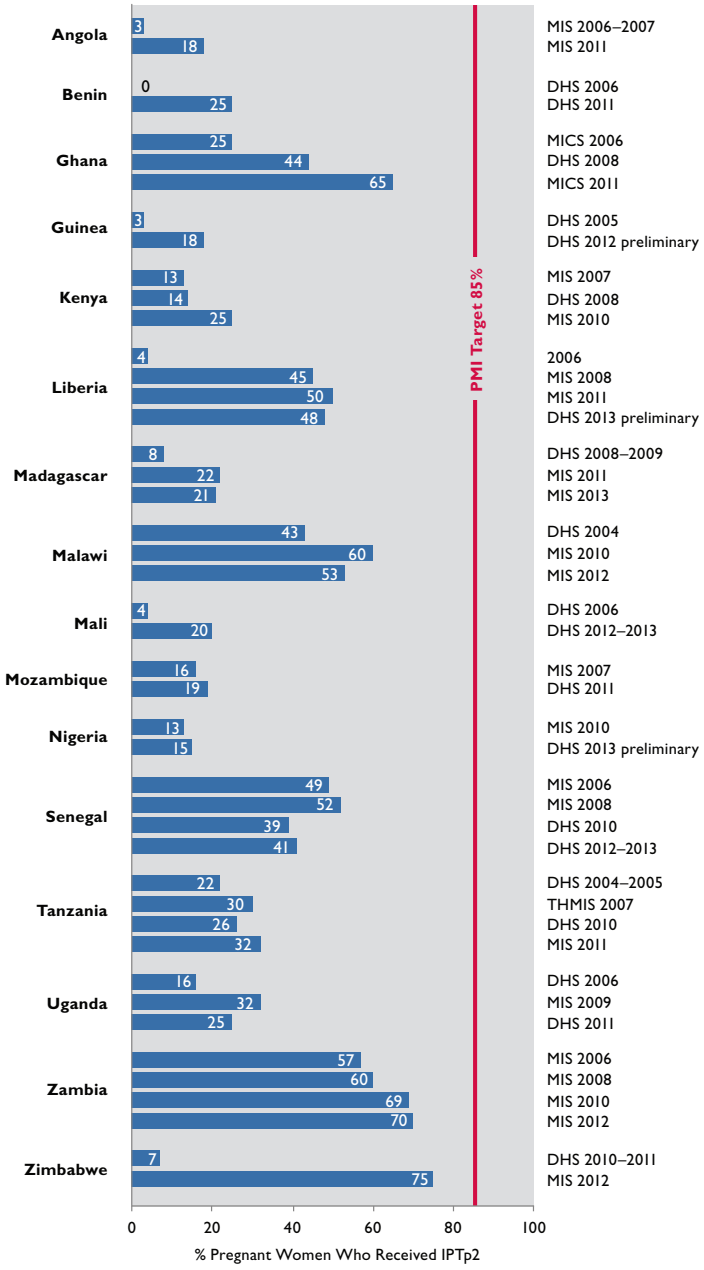
Note: The PMI focus countries included in this figure have at least two data points from nationwide household surveys that measured ITN use among children under five, defined as the percentage of children under five who slept under an ITN the night before the survey.

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 IPTp2 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 Eighth 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

All photos credited to Maggie Hallahan Photography except:
First row, third photo: Karie Atkinson, USAID
Second row and third row, first photo: Brant Stewart, RTI
Third row, second photo: Jessica Scranton, Abt Associates

USAID
FROM THE AMERICAN PEOPLE

PRESIDENT'S MALARIA INITIATIVE

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

U.S. Agency for International Development
1300 Pennsylvania Avenue, NW
Washington, DC 20523
Tel: (202) 712-0000
Fax: (202) 216-3524
www.usaid.gov