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The President's Malaria Initiative

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Executive Summary



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MALARIA'S TOLL

Malaria remains a fact of life for billions of people living in tropical areas. Each year, malaria kills an estimated 429,000 people worldwide.¹ In sub-Saharan Africa, infection with malaria parasites also makes young children more likely to die of pneumonia and diarrhea. Because malaria is one of the main reasons that children miss school and adults miss work, it is a disease that further hampers educational achievement, contributes to food insecurity, and entrenches poverty.

U.S. GOVERNMENT CONTRIBUTIONS TO HISTORIC PROGRESS AGAINST MALARIA

While malaria can be deadly, it is also a preventable and curable disease. Global progress in the fight against malaria since 2000 has been truly historic, and the U.S. Government has played a key role in this achievement. The World Health Organization (WHO) estimates that more than 6.8 million malaria deaths were averted worldwide between 2001 and 2015, primarily among children under five years of age in sub-Saharan Africa.² The greatest progress occurred after 2005, when U.S. President's Malaria Initiative (PMI) programs were operational and making contributions alongside partner countries and other donors to malaria control efforts. The Millennium Development Goal target of halting and reversing malaria

¹ World Health Organization, 2016 World Malaria Report.

² World Health Organization, 2016 World Malaria Report.

incidence by 2015 was attained and surpassed. As a result of these unprecedented successes, the global malaria community has embraced a long-term goal of malaria eradication.³ PMI's Strategy for 2015–2020 supports this global vision of a world without malaria (see Box, page 3).

The U.S. Government has shown unwavering commitment to ending the scourge of malaria, especially since the launch of PMI in 2005. The Initiative operates in 19 of the highest burden countries across sub-Saharan Africa, as well as 2 countries and a regional program in the Greater Mekong Subregion (GMS). In FY 2016, PMI reached more than 480 million people at risk of malaria across sub-Saharan Africa. The Initiative, led by the U.S. Agency for International Development (USAID) and implemented together with the U.S. Centers for Disease Control and Prevention (CDC), has contributed to substantial reductions in malaria deaths and illness in partner countries. According to the 2015 World Malaria Report, between 2000 and 2015, global malaria mortality has declined by an estimated 48 percent and malaria incidence by 37 percent.

Furthermore, across the 19 PMI focus countries in sub-Saharan Africa, between 2010 and 2015:

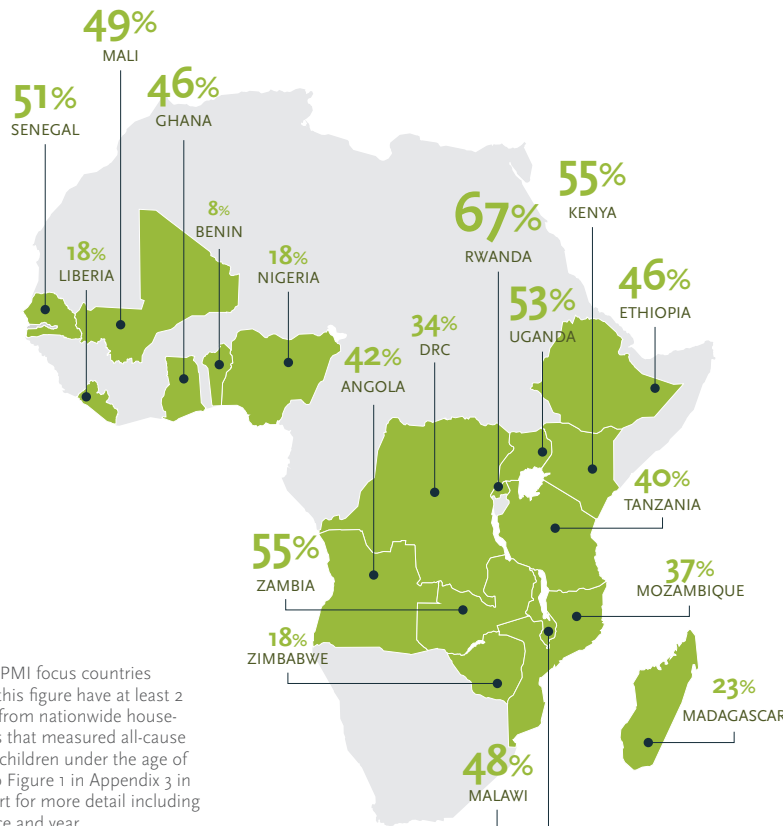
- Malaria mortality rates decreased by 29 percent with 10 PMI focus countries achieving 20 percent to 40 percent reductions, and
- Malaria incidence decreased by 19 percent with 9 PMI focus countries achieving 20 percent to 40 percent reductions.

These reductions, which have been achieved on top of the recorded progress in PMI focus countries since the start of the Initiative, have contributed to the reported declines in all-cause child mortality. To date, 18 of the 19 PMI focus countries in Africa have data from paired nationwide surveys that were conducted since PMI activities began. All 18 countries have documented declines in all-cause mortality rates among children under five (see Figure 1, page 2).⁴ The large-scale rollout of malaria prevention and treatment measures across sub-Saharan Africa during the past decade has been an important factor in these child survival improvements.

In addition to the reductions in malaria mortality, a number of PMI focus countries also have documented significant decreases in reported malaria cases. In some countries, the

⁴ While reductions in all-cause child mortality may be the result of both malaria and non-malaria related child health interventions, PMI relies on this indicator to measure the impact of malaria control interventions in accordance with the recommendations of the Roll Back Malaria Monitoring and Evaluation Reference Group. All-cause child mortality captures both the direct and indirect effects of malaria.

Figure 1. Reductions in All-Cause Mortality Rates of Children Under Five Years of Age in PMI Focus Countries



Note: All 18 PMI focus countries included in this figure have at least 2 data points from nationwide household surveys that measured all-cause mortality in children under the age of five. Refer to Figure 1 in Appendix 3 in the full report for more detail including survey source and year.

drop in malaria cases has been large enough that these countries now have set their sights on eliminating malaria in the next 30 years. The leaders of all six countries in the GMS have committed to eliminating malaria by 2030. To date, eight PMI focus

countries (**Burma, Cambodia, Ethiopia, Madagascar, Senegal, Thailand, Zambia, and Zimbabwe**) and Zanzibar in the Republic of **Tanzania** have both adopted national strategies that include an elimination goal and allocated resources in support of that goal.

After documenting significant decreases in malaria burden, a few PMI focus countries in sub-Saharan Africa have seen increases in reported malaria cases in the last few years, which are likely due to multiple factors including increased care seeking, improved case reporting, and in some cases, actual increases in malaria transmission. PMI is working with national governments and partners to verify these increases in reported cases, investigate the potential causes, and respond appropriately in those instances where increases in malaria burden are identified.

Nevertheless, the 2016 WHO World Malaria Report estimates that overall malaria incidence decreased by 21 percent globally between 2010 and 2015, and the proportion of the population at risk in sub-Saharan Africa who are infected with malaria parasites is estimated to have declined to 13 percent in 2015.

ACHIEVING AND SUSTAINING SCALE OF PROVEN INTERVENTIONS

Under the national leadership of PMI focus countries and in close collaboration with other donors, PMI's direct contributions to the scale-up of proven and effective malaria prevention and control tools have been substantive. These tools currently include insecticide-treated mosquito nets (ITNs), indoor residual spraying (IRS), intermittent preventive treatment for pregnant women (IPTp), seasonal malaria chemoprevention (SMC), and diagnosis by malaria microscopy or rapid diagnostic test (RDT), together with effective treatment for confirmed malaria cases with artemisinin-based combination therapies (ACTs).

As a result of PMI's support, millions of people have benefited from protective measures against

THE PRESIDENT'S MALARIA INITIATIVE STRATEGY FOR 2015–2020

The PMI Strategy for 2015–2020 takes into account the progress over the past decade and the new challenges that have arisen, setting forth a vision, goal, objectives, and strategic approach for PMI through 2020, while reaffirming the longer-term goal of a world without malaria. Malaria prevention and control remains a major U.S. foreign assistance objective, and this strategy fully aligns with the U.S. Government's vision of ending preventable child and maternal deaths and ending extreme poverty.

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

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

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

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

This strategic approach is informed by PMI's experiences to date. It builds on the successes that countries have achieved, incorporates the lessons learned from implementation thus far, and addresses the challenges that could hamper further progress toward malaria control and elimination.

malaria, and millions more have been diagnosed and treated for malaria. Furthermore, tens of thousands of people have been trained on case management, malaria diagnosis, preventive treatment for pregnant women, and IRS operations (see Appendix 2 in the full report for more details). Close collaboration and synergies with other partners engaged in malaria control efforts have also been a hallmark of PMI from the outset of the Initiative (see Box, page 8).

Since the Initiative began, nationwide household surveys in the 19 focus countries have documented significant improvements in the coverage of malaria control interventions such as:

- Household ownership of at least one ITN increased from a median of 36 percent to 68 percent.
- Usage of an ITN the night before the survey increased from a median of 22 percent to 52 percent among children under five years of age.

- Usage of an ITN the night before the survey increased from a median of 20 percent to 50 percent among pregnant women.

And, in all 17 focus countries where IPTp is national policy:

- The proportion of pregnant women who received 2 or more doses of IPTp for the prevention of malaria increased from a median of 14 percent to 37 percent.

In addition to supporting the rollout of ITNs and IPTp, PMI has been a global leader in supporting countries to implement IRS activities. The number of people protected through PMI-supported IRS was more than 16 million across 12 PMI focus countries in FY 2016.

Timely, accurate, and effective case management is also critical to effective malaria control. In all focus countries, PMI supports universal diagnostic testing to accurately identify patients with malaria and immediate treatment with an appropriate, quality-assured ACT for those who test positive. As a result of these efforts, the proportion of suspected malaria cases that are confirmed with laboratory tests and treated with a recommended antimalarial drug combination continues to increase in nearly all focus countries. Fifteen countries have reached more than 60 percent confirmation of malaria cases by diagnostic test, 10 of which exceed 80 percent confirmation.

ADAPTING TO CHANGING MALARIA EPIDEMIOLOGY AND INCORPORATING NEW TOOLS

With the scale-up of malaria control interventions and subsequent reductions in malaria mortality and morbidity, some PMI focus countries have adopted more targeted approaches to malaria control with strategies that focus control activities at the subnational level or target specific population groups. PMI is supporting countries as they roll out such targeted interventions and, where appropriate, supporting activities that aim to move countries closer to malaria elimination. PMI also is investing in testing the effectiveness and feasibility of new tools and approaches and supporting operational research to improve intervention scale-up and impact. For example, during FY 2016, PMI supported:

- Enhanced case finding and investigation activities in **Cambodia, Senegal, and Zanzibar**. As these countries move toward elimination, identifying, tracking, and following up every malaria case becomes an important tool to interrupt malaria transmission and identifying residual foci of transmission.
- Operational research to complement U.S. Government investments in upstream malaria research, which is carried out by CDC, USAID, the National Institutes of Health, and the Department of Defense. In line with PMI's Strategy for 2015–2020, PMI-funded operational research addresses bottlenecks in achieving and maintaining coverage of proven interventions, while also informing malaria control efforts as malaria epidemiology changes, risks and challenges arise or intensify, and new tools are introduced to combat them. PMI resources support those research questions that are important and relevant to achieving PMI's objectives. To date, PMI has funded 102 operational research studies and contributed to more than 200 peer-reviewed publications. In FY 2016, for example, PMI-supported operational research studies included:
 - A study investigating the acceptability of insecticide-treated clothing among rubber tappers in **Burma**, a group that is at high risk of malaria infection
 - A qualitative study assessing barriers to net use in **Madagascar**, which is informing the country's new social and behavior change communication strategy

IMPROVING COUNTRY CAPACITY TO COLLECT AND USE INFORMATION

PMI has prioritized collecting data to monitor confirmed malaria cases as well as the coverage and impact of key malaria interventions and supporting countries to use these data to guide program planning and implementation as well as to inform malaria-related policies. PMI provides support for a broad set of malaria data collection efforts across PMI focus countries. These include support for nationwide household surveys, routine health management systems, entomological monitoring, therapeutic efficacy monitoring, and supply chain related surveys of malaria commodities. For example:

- PMI is working closely with partner countries to support deployment of online platforms such as the District Health Information System-2 (DHIS-2) to improve data quality and improve the efficiency of data collection, analysis, and reporting from health management information systems (HMIS). To date, 16 of the 19 PMI focus countries in Africa have fully transitioned their HMIS system to the DHIS-2 platform or are in the process of transitioning.
- Since PMI's launch in 2005, 80 nationally representative household surveys have been conducted with PMI's support across the 19 focus countries in Africa. These surveys have provided essential information on the coverage of key interventions and all-cause child mortality.
- The capacity of countries to monitor entomological indicators has substantially improved with PMI's support, and all 19 PMI focus countries in Africa currently conduct regular entomological monitor-

ing. In seven countries, PMI has supported the rollout of entomological monitoring databases to compile entomology data to drive decision-making around vector control interventions.

- To monitor the availability of malaria commodities at health facilities and address stockouts, PMI has conducted more than 221 end-use verification surveys with government counterparts in a total of 16 PMI focus countries.

MITIGATING RISK AGAINST THE CURRENT MALARIA CONTROL GAINS

ITNs and IRS both rely on a limited number of WHO-recommended insecticides from only four insecticide classes, and only one class – pyrethroids – is currently available for use in ITNs. When countries expand their ITN and IRS programs, this places increased insecticide selection pressure on mosquito populations, which can accelerate the selection and spread of vector resistance to insecticides. It is, therefore, im-

perative that national malaria control programs (NMCPs) continue to conduct entomological monitoring, including testing for the presence of insecticide resistance. Across PMI focus countries, insecticide resistance is being measured at approximately 190 sites. Mosquito resistance to pyrethroids has now been detected in all 19 PMI focus countries in Africa, while resistance to carbamate insecticides has been found in 16 PMI focus countries. This has prompted changes in the insecticides used for IRS in the 12 PMI focus

IN FY 2016, PMI



Procured **+30M** long-lasting insecticide-treated nets



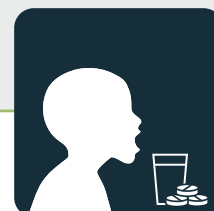
Sprayed **+4M** houses with insecticides, protecting **+16M** people

Trained **+25,000** people to implement IRS



Procured **+7M** intermittent preventive treatments for pregnant women

Trained **+38,000** health workers in IPTp delivery



Procured **+10M** seasonal malaria chemoprevention treatments for children, and helped protect **+1.2M** children from malaria



Procured **+44M** antimalarial treatments and **+77M** rapid diagnostic tests

Trained **+51,000** health workers in malaria case management and **+43,000** clinicians and laboratory technicians in procedures for quality diagnostic testing for malaria



countries that maintain spray programs. For example, in FY 2016, all PMI-supported IRS activities were conducted using a long-lasting organophosphate insecticide.

Despite the emergence of resistance to pyrethroids, ITNs continue to remain effective. The current global recommendation is to replace ITNs every 3 years. However, studies conducted by PMI have shown that ITNs may physically deteriorate more quickly under certain field conditions and that ITN longevity is strongly dependent on behavioral and environmental conditions. PMI has developed a standardized methodology for monitoring ITN durability. In FY 2016, PMI expanded durability monitoring activities to 14 countries, and additional countries are preparing for implementation in the coming year.

Although there is currently no evidence of artemisinin resistance outside of the GMS, carefully monitoring the efficacy of antimalarial drugs in sub-Saharan Africa is now even more critical to ensure prompt detection of and response to the emergence of artemisinin resistance in Africa, should it occur. During FY 2016, PMI continued to support a network of 41 therapeutic efficacy surveillance (TES) sites in the GMS to monitor first-line antimalarial drugs and potential alternatives. PMI has also incorporated monitoring for K13 mutations, a genetic marker for artemisinin resistance, and other molecular markers associated with resistance to partner drugs. In FY 2016, PMI has supported monitoring of K13 mutations in seven countries in Africa, none of which have exhibited markers associated with artemisinin resistance.

Fake and substandard malaria medicines continue to be a major global threat to effective malaria case management and are likely to contribute significantly to malaria deaths. As a major procurer of ACTs, PMI employs a stringent quality assurance and quality control strategy to monitor the quality of drugs procured by PMI. To help reduce the availability of counterfeit drugs in private sector outlets and marketplaces, PMI is collaborating with USAID's Office of Inspector General and teaming up with local police, customs agents, national medicines regulatory authorities, and drug sellers to identify fake and substandard medicines and remove them from the market. In addition, PMI partners with national medicines regulatory authorities in PMI focus countries to help strengthen local capacity to sample and test drugs found in shops and strengthen national drug quality laboratories to test the quality of drug samples collected from public and private outlets.

BUILDING CAPACITY AND HEALTH SYSTEMS

The gains achieved to date in malaria control can only be sustained if endemic countries have strong health systems. In addition to providing assistance to countries to roll out malaria-specific activities, PMI also helps build national capacity in a variety of cross-cutting areas that benefit both malaria and other health programs. PMI efforts to strengthen health systems have included:

- Support for the training of tens of thousands of health workers in malaria case management, diagnostic testing for malaria, and the prevention of malaria during pregnancy, including the use of IPTp, as well as training people to implement IRS activities.

- Providing technical assistance and programmatic support to strengthen systems to quantify malaria commodity requirements, strengthen stock management systems, and build health worker capacity in logistics management. Between 2011 and 2016, the percent of PMI focus countries with adequate stocks of ACTs and RDTs at the central level increased from 15 percent to 67 percent for ACTs and 10 percent to 67 percent for RDTs. PMI also serves as a flexible procurement source when other sources of malaria commodities are insufficient or delayed; in FY 2016, PMI filled eight emergency orders.
- Through support to the CDC's Field Epidemiology and Laboratory Training Program, PMI helped to build a cadre of ministry of health staff with technical skills in the collection, analysis, and interpretation of data for decision-making, as well as policy formulation and epidemiologic investigations. To date, PMI has supported more than 100 trainees in 11 PMI focus countries in Africa and 1 PMI program in the GMS.
- Contributing to key elements of global health security by working in synergy with the Global Health Security Agenda (GHSA), which includes countering antimicrobial resistance, strengthening national laboratory systems, supporting real-time surveillance, and investing in workforce development. PMI-supported community level programs provide the first point-of-care and referral for epidemic diseases as well as a platform for response to public health emergencies.

EXAMPLES OF PMI'S GLOBAL AND U.S. GOVERNMENT PARTNERSHIPS

From its very inception and launch 12 years ago, the U.S. President's Malaria Initiative (PMI) was created with the recognition that achieving its ambitious goals would not be possible alone and thus partnerships were recognized as central to PMI's malaria control efforts. PMI continues to maintain robust partnerships at the country, regional, and international levels to support NMCPs to expand the impact of malaria control activities. PMI works closely with the government of each focus country and with local and international partners to ensure that investments are strategically aligned with the country's overall malaria control plan, while leveraging financial and technical support from other partners. PMI's key multilateral and bilateral partners include:

- *Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund)*: PMI works closely with the Global Fund at the country and global level to coordinate investments for malaria control to maximize impact and harmonize activities to ensure that these complement each other. The U.S. Government is the Global Fund's largest financial contributor, and PMI leadership is represented on the U.S. delegation to the Global Fund Board.
- *Roll Back Malaria (RBM) Partnership*: PMI is an active member of the RBM Partnership, providing financial and technical support for numerous RBM activities and participating in many of its technical and coordination working groups.
- *World Health Organization (WHO)*: PMI provides targeted financial support to WHO headquarters in Geneva as well as to WHO regional offices in Africa, South East Asia, and the Americas. At the central level, PMI provides support to the WHO Global Malaria Program for defined activities that will help PMI achieve our objectives including activities related to vector control, malaria diagnosis policy development, antimalarial drug resistance surveillance, and monitoring and evaluation.

PMI leverages support from the private and commercial sectors to ensure that these resources are being invested into appropriate and effective interventions and support coordination with government strategies and plans. Historically, this has primarily involved partnering with large companies who wish to protect their workforce through vector control as part of their corporate social responsibility portfolio.

To advance the global malaria control agenda, PMI also partners with foundations, including the Bill & Melinda Gates Foundation and the United Nations Foundation, as well as non-governmental organizations, whose primary function is advocacy such as Malaria No More.

PMI has long-standing relationships with non-governmental organizations and faith-based community organizations, which often have the ability to reach remote, marginalized, and underserved populations in PMI focus countries. Through support to community-based organizations, and in close coordination with NMCPs and local health authorities, PMI is improving community-level access to critical malaria prevention and treatment services while also building local capacity and ensuring program sustainability. To date, PMI has supported more than 200 local and international nonprofit organizations to deliver critical malaria services in all PMI focus countries.

Furthermore, PMI works closely with other U.S. Government programs, both on the ground in focus countries and at the headquarters level to synchronize PMI's work with other U.S. Government investments in global health and maximize the combined impact and avoid duplication. This collaboration includes, for example, the Peace Corps and the Global Health Security Agenda.

REAPING THE ECONOMIC BENEFITS OF MALARIA CONTROL

Global health programs such as PMI do more than save lives and protect people most vulnerable to disease. Our efforts promote the stability of communities and nations, while advancing American prosperity and security. Leading health economists consider malaria among the most cost-effective public health investments. A 50 percent reduction in global malaria incidence could produce \$36 in economic benefits for every \$1 invested globally, with an even greater estimated return on investment of 60:1 in sub-Saharan Africa.⁵

Reducing malaria transmission also promises to alleviate the burden that the disease places on already overstretched health systems in affected countries. In highly endemic countries, malaria typically accounts for up to 40 percent of outpatient visits and hospital admissions. Reducing malaria transmission levels in these countries has a positive effect on the rest of the health system by allowing health workers to focus on managing other important childhood ailments, 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 tenfold.⁶ Reports from other PMI focus countries indicate dramatic reductions in child hospitalizations.

⁵ Roll Back Malaria Partnership. Action and Investment to Defeat Malaria 2016–2030 (AIM) – For a Malaria-Free World.

⁶ 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. *Am. J. Trop. Med. Hyg.*, 90: 20-32.

Malaria's damaging effects ripple well beyond the public health sector. The disease cripples economies by disrupting children's attendance at school, increasing absenteeism of the adult workforce, and causing out-of-pocket health expenditures for families. It is estimated that achieving malaria eradication will produce an estimated \$2 trillion in economic benefits and save an additional 11 million lives over the period 2015–2040.⁷ In the WHO African Region, malaria mortality reductions over the period 2000–2015 have increased life expectancy by 1.2 years; this has been valued at \$1.8 trillion.⁸

ENDING MALARIA FOR GOOD

Despite remarkable gains against malaria in sub-Saharan Africa over the past decade, the disease remains one of the most common infectious diseases and a significant public health problem. The 2016 WHO World Malaria Report points out that, although global access to key anti-malarial interventions has continued to improve, critical gaps in coverage and funding are jeopardizing the attainment of global targets set forth by the Global Technical Strategy for Malaria 2016–2030. Sub-Saharan Africa continues to bear a disproportionately high share of the global malaria burden. In 2015, the region was home to 9 out of every 10 malaria cases and malaria deaths. Almost 400,000 people still die from malaria each year in sub-Saharan Africa, and children under five years of age remain particularly vulnerable, accounting for an estimated 70 percent of all malaria deaths. More than 830 children still die from malaria every day.

⁷ Roll Back Malaria Partnership. Action and Investment to Defeat Malaria 2016–2030 (AIM) – For a Malaria-Free World.

⁸ World Health Organization, 2016 World Malaria Report.

We are confronted with serious challenges, including resistance to artemisinin drugs and key insecticides; widespread availability of substandard and counterfeit malaria treatments; inadequate disease surveillance systems; waning country and donor attention as malaria burden drops; and unexpected crises. Progress has not been uniform throughout Africa, and in some countries, malaria control interventions will need to be scaled up further before substantial reductions in malaria burden can be expected. In contrast, other countries have progressed to a point where malaria is no longer a leading public health problem. The lives of millions of people have been transformed; their prospects for a healthy life greatly improved; and the future of their communities and countries enhanced by economic development unimpaired by malaria – moving ever closer to breaking the vicious cycle that keeps communities and countries impoverished.

Fighting malaria is a “best buy” in global health, creating opportunity and fostering growth and security, especially among the poor. In addition to the Goal 3 (Good Health) target of ending malaria by 2030, there are a number of examples of synergies between advances in malaria control and progress toward the 17 Sustainable Development Goals. In particular, malaria control directly contributes to the achievement of Goals 1 (No Poverty), 10 (Reduced Inequalities), and 16 (Peace and Justice).⁹ The U.S. Government, through PMI, is a key partner in the global fight against malaria, working together with host country governments and the broader malaria partnership to maintain the momentum for malaria elimination and the achievement of the bold vision of a world without malaria.

⁹ Roll Back Malaria Partnership. Action and Investment to Defeat Malaria 2016–2030 (AIM) – For a Malaria-Free World.

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