ROLL BACK MALARIA

Malaria Funding & Resource Utilization: The First Decade of Roll Back Malaria

unicef ·|· World Health Organization ·|· PATH

ROLL BACK
MALARIA

CONTENTS

ABBREVIATIONS

ACT   *Artemisinin-based combination therapy*

AFRO   *WHO Regional Office for Africa*

AMRO   *WHO Regional Office for the Americas*

CQ   *Chloroquine*

DAC   *Development Assistance Committee (http://www.oecd.org/dac)*

DHS   *Demographic and Health Survey*

EFR   *Enhanced Financial Report—a Global Fund financial reporting system*

EMRO   *WHO Regional Office for the Eastern Mediterranean*

EURO   *WHO Regional Office for Europe*

GAVI   *Global Alliance for Vaccines and Immunisation*

GFATM   *The Global Fund to Fight AIDS, Tuberculosis and Malaria*

GMP   *Global Malaria Programme*

HIV   *Human Immunodeficiency Virus*

IDA   *International Development Association (World Bank Group)*

IHME   *International Health Metrics and Evaluation, University of Washington*

IPT   *Intermittent preventive treatment*

IPTp   *IPT for pregnant women*

IPTi   *IPT for infants*

IRS   *Indoor residual spraying (with insecticides)*

ITN   *Insecticide-treated mosquito net*

LLIN   *Long-lasting insecticide-treated mosquito net*

MDGs   *Millennium Development Goals*

MERG   *Monitoring and Evaluation Reference Group*

MICS   *Multiple Indicator Cluster Survey*

MIS   *Malaria Indicator Survey*

NMCP   *National Malaria Control Programme*

OECD   *Organisation for Economic Cooperation and Development*

PAHO	Pan American Health Organization
PPR	Per-person-at-risk
RBM	Roll Back Malaria
RDT	Rapid diagnostic test
SEARO	WHO Regional Office for South East Asia
SP	Sulfadoxine-pyrimethamine
SPR	Slide positivity rate
SUFI	Scale Up for Impact
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
US-PMI	United States President's Malaria Initiative
WHO	World Health Organization
WPRO	WHO Regional Office for the Western Pacific

ACKNOWLEDGEMENTS

FOREWORD

The launch of the Roll Back Malaria (RBM) Partnership just over a decade ago began a new phase in the fight against malaria—one in which collective coordinated action was chosen over fragmentation and duplication—transforming the global malaria landscape.

Countries implementing evidence-based plans to rapidly scale up malaria control interventions are saving lives. The recent WHO *World Malaria Report 2009* noted the high impact of control interventions on malaria cases and deaths in an ever-growing list of countries in Africa, Asia and Latin America. UNICEF also reported a steady decline in child mortality over the last decade, highlighting the important contribution of malaria control to advancing the Millennium Development Goals.

Today, in 2010—the international deadline for providing universal access to malaria prevention, diagnosis and treatment and for reducing malaria deaths by half—we have grounds for optimism. This year we must show just how far we have come and how far we still have to go to make good on the pledges of the African Heads of State, expressed in the Abuja Declaration of 2000 and reinforced by the UN Secretary General's call for universal coverage.

Malaria Funding and Resource Utilization is the first report to be released as part of the 2010–2011 RBM Progress and Impact series. This report charts the increase in external funding for malaria control over the last ten years in twelve African countries and clearly shows that reliable and sustained funding is key to saving lives.

Such investment by the Global Fund for AIDS, Tuberculosis and Malaria, the U.S. President's Malaria Initiative, the World Bank Booster Program, and others has resulted not only in a dramatic decrease in malaria deaths and illness, but also in a vastly improved understanding of what it takes to control malaria. The RBM Partnership applauds these funding commitments and the countries that have used these resources wisely, responsibly, and rapidly.

As we continue benchmarking progress, country by country, towards ending malaria, it is crucial that global financing bodies do not decrease their commitment to malaria control in response to a job well done. Current global funding is less than one third of the amount required to realize the full potential of malaria control. In a turbulent economic environment with new global priorities, there are many claims on available resources. To maximize the return on investment in malaria and sustain the global health gains made to date, we need to increase, not decrease, support. We can achieve the Millennium Development Goals by 2015 if we continue on this track.

The Global Malaria Action Plan, developed by the RBM Partnership in 2008, is guiding investments through a continuum from scaling up for impact to sustained control and elimination, ultimately aiming to eradicate malaria. By bridging the current funding gap and helping countries implement their plans, we can, together, make malaria a problem of the past.

Professor Awa Marie Coll-Seck
RBM Partnership Executive Director

EXECUTIVE SUMMARY

At the end of the first decade of the Roll Back Malaria Partnership, the global burden of malaria remains high, and disproportionately impacts young children and pregnant women living in sub-Saharan Africa. However, major progress is being made in many malaria-endemic countries. Investment in highly effective interventions including prevention (insecticide-treated mosquito nets [ITNs], indoor residual spraying [IRS] of insecticides, and intermittent preventive treatment in pregnancy [IPTp]); diagnosis (expanded use of microscopy and rapid diagnostic tests [RDTs]); and treatment with highly effective antimalarial regimens, particularly artemisinin-based combination therapy (ACT), is leading to demonstrable progress in a number of countries.

Roll Back Malaria (RBM) has set the goal of halving the burden of malaria between 2000 and 2010, and as countries work toward achieving this target, the global community is also focused on the impact of reducing the malaria burden as a key component for achieving several of the Millennium Development Goals: Goals 1 (poverty reduction), 4 (child mortality reduction), and 6 (specific disease reduction, including malaria). The Global Malaria Action Plan (GMAP, approved in 2008) further clarified RBM goals and objectives and quantified the required investment to achieve those goals; programme support costs were estimated at approximately $5–6 billion per year for the next decade with some decline thereafter.

Global development assistance for health has quadrupled in real terms in the last two decades with dramatic increases in support for malaria between 2003 through 2009. Publicly financed health aid on average accounted for two thirds of total health assistance during this time. New public-

private initiatives, including The Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund), have been responsible for a large and growing share of health assistance. With the recognition of the great potential of effective malaria interventions to markedly improve maternal and child health and survival, added major malaria support has been garnered under the World Bank Malaria Booster Program and the US President's Malaria Initiative (US-PMI).

Between 2003 and 2009, 81 of the 108 malaria-endemic nations have spent their own government resources and have received financial support from the global community for their malaria-control work. While more than 40 countries and more than 10 foundations, companies, and organizations provide this external financial support, the vast majority of malaria-control funding is channeled through just three sources: the Global Fund (based on contributions from numerous nations, foundations, and private organizations), the World Bank, and the US-PMI.

External funding commitments for malaria have been unprecedented—approximately $4.6 billion between 2003–2009—and annual commitments have recently stabilized for the 2008–2010 interval at approximately $1.6 billion per year. Depending on the funding source, commitments may be for annual amounts (e.g., US-PMI funding is approved annually), or for periods of up to five years (e.g., typical Global Fund grants cover five years of funding). Thus, current commitments or approved requests include some money that will be available through 2014.

The disbursements and expenditures of the malaria-control funds have been timely and responsive to needs. There is a typical time interval (approximately 1 to 1.5 years) for discussion of needs, application procedures, negotiations, commitments/approvals, and dispersals. Recent experience in countries generally shows that once funding is received, there is timely use with procurement of needed supplies typically starting immediately and distribution of the supplies occurring soon after receipt. In Africa, most of the funding support goes to a balance of prevention (42%) and treatment (38%), with the remaining approximately 20% of funding supporting programme management and systems strengthening. Outside of Africa, the prevention and treatment balance is often maintained but at lower proportions, and more external investment is made in programme management and systems strengthening.

There is high year-to-year variability in the current investments with regard to per-population-at-risk expenditures. This makes it difficult for countries to establish the effective planning and implementation cycles required to sustain and grow their wide-scale malaria-control efforts over time.

The investment to date has shown dramatic impact. An in-depth analysis of 12 African nations for which there exists both recent and earlier "baseline" population-based information on intervention coverage and burden shows that countries with even modest per-person spending amounts were able to make substantial progress in scale-up of intervention coverage and coincident reduction in morbidity and mortality.

Unfortunately, those countries spending less on malaria-control commodities, not surprisingly, also achieved less. We estimate that just in the 12 countries, approximately 384 000 child lives were saved between 2000 and 2009 through scaling up malaria-prevention measures (ITNs and IPTp). These data also suggest that if these 12 countries were to achieve 80% prevention coverage in 2010, they could save an additional 217 000 lives in the following one year. In summary, the malaria investment saves lives, reduces illness, particularly for women and young children, and leads to healthier and more productive populations. While this is emerging information, there is substantial consistency of the findings of benefit across multiple countries and settings, suggesting that the application of the full package of malaria interventions is achieving the expected benefit through national programmes.

The following critical issues remain:

- *While the current funding is working, it is less than 25% of estimated need.*

- *The recent growth in funding levels now needs to be followed with the establishment of mechanisms to ensure stable funding to provide a firm foundation for country planning leading to the completion of programme scale-up and sustained programme actions.*

- *The funding support must respond to the variations in need between:*

  a. *Countries with historical high burden (many are in Africa) and their actions to respond to malaria illness and death (much of which is in Africa), and*

  b. *Countries with lower burden (most are outside of Africa) and their actions to respond to remaining malaria transmission with a view toward elimination.*

Key Points

1. Malaria is a major contributor to morbidity and mortality among children and mothers and has been clearly identified as a disease of poverty; malaria has its greatest impact on the poorest populations in endemic countries and malaria contributes directly to poverty.

2. Global financing needs for malaria control were quantified and characterized in the Global Malaria Action Plan (GMAP) in 2008 and in the near term are estimated at $5–6 billion per year for programme implementation costs.

3. Globally available funding for malaria control has increased substantially since 2003. Global Fund commitments and disbursements to malaria-endemic countries began in 2003, and both the World Bank Malaria Booster Program for Malaria Control in Africa and the US-PMI were launched in 2006. In the six years from 2003–2009, approximately $4.6 billion of external financial assistance was committed to malaria control; global funding commitments for malaria control appear to be peaking at about $1.6 billion per year (approximately 25% of the estimated need).

4. Most of the external financial resources for malaria control are from the Global Fund (70% of commitments in the 2003–2009 interval), US-PMI (15% of commitments), and World Bank (8% of commitments). A remaining 7% of funding commitments have come from approximately 18 countries and several agencies as bilateral funding. Undoubtedly, some additional external financing to the health sector supports systems that facilitate malaria control (just as some malaria-control financing helps strengthen health systems) but is not specifically designated as malaria funding. Malaria-endemic countries are heavily reliant on the external support from Global Fund, US-PMI, and World Bank.*

5. External financing for malaria control is being used well and in a timely fashion and leading to results:

   a. Approximately 85% of external financing goes to the Africa region, which accounts for nearly 90% of global deaths from malaria.

   b. The funding supports a reasonable balance of actions in the areas of prevention, treatment, systems strengthening and programme support.

   c. Countries are able to spend external financing for malaria control effectively and relatively quickly— on average more than 80% of funds are spent within the year that they become available.

6. An analysis of data from 12 African countries supports the assertion that external financing is effectively used and further demonstrates that:

   a. The causal linkages between approval of external financing for malaria control and intervention coverage are well demonstrated (approval ⇨ commitment ⇨ disbursement ⇨ country expenditure ⇨ increased intervention coverage). For example, ITN expenditures were followed rapidly by ITN distribution to households, where coverage increased.

   b. Donor commitments and disbursements and country expenditures on ITNs and ACTs still

have high year-to-year variability, and this variability presents a challenge to systematic programme planning.

c. Many lives have been saved. For the 12 African countries (described in detail in this report) with recent documentation of progress we estimate that between 2000–2009, approximately 384 000 child lives have been saved through the scale-up of prevention interventions (ITN and IPTp). If the RBM community can fully scale up in these 12 countries to 80% prevention coverage in 2010, an additional estimated 217 000 lives can be saved in the following one year.

7. Despite recent increases in malaria funding, the current financing available is well short of the need, and it appears that the amount available may be peaking at this insufficient level.

8. Where progress has been made, the dramatic efforts by the RBM community to scale up prevention and treatment coverage, with particular emphasis on mothers and children in Africa, have led to substantial reductions in morbidity and mortality. This progress has occurred in countries that have attracted substantial funding. With continued growth in malaria funding and investments in the high-burden countries, we have a clear opportunity to help countries achieve several of the Millennium Development Goals—for Goal I (poverty), Goal III (gender equality and empowerment of women), Goal IV (child mortality reduction), Goal V (improved maternal health), and Goal VI (reduced disease including malaria); without this support, we will fail, particularly in Africa.

9. Given the substantial documented benefits and continued importance of sustaining and increasing the progress in malaria control, the RBM partners must urgently assure that global external financing commitment to malaria does not decrease in response to a job well done, but increases to help address the outstanding needs and realize the full potential of malaria control. For this most recent decade, malaria prevention and control have been among the best investments in global health.

* Of note, families and national governments also spend substantial sums on malaria prevention and treatment; however, information on this spending is not complete, so this report focuses on trends in external financial assistance for malaria control programmes.

INTRODUCTION

Malaria has been clearly identified as a disease of poverty, whereby malaria has its greatest effects on the poorest populations in endemic countries, and it contributes directly to poverty. This was highlighted nearly two decades ago[1] and again brought to the forefront one decade ago in policy papers[2] and scientific publications[3-4] and more recently with growing attention to the Millennium Development Goals.[5] Effective malaria interventions have been identified, refined, and examined in economic terms and shown to be relatively inexpensive and highly cost-effective.[6,7]

Global development assistance for health has quadrupled in real terms between 1990 and 2007 with initial gradual increases through 2001 and then dramatic increases from 2002 through 2008.[8-11] Publicly financed health aid on average accounted for two-thirds of total health assistance during this time, and new public-private initiatives, including the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) and the Global Alliance for Vaccines and Immunization (GAVI) have been responsible for a large and growing share of the assistance in health since 2002.[8,9]

Development assistance for malaria has also increased substantially, principally since 2002 to the present. The impetus for this began with the start of the Global Fund (2002) and substantial additions from the World Bank and the US President's Malaria Initiative (US-PMI), with both essentially starting in 2006.

These changes in global financing for health and malaria nearly coincided with the development of the Roll Back Malaria (RBM) initiative in late 1998.[12] That is, while the RBM initiative began before the rapid funding increases starting in 2002, this early period in the RBM Partnership focused on building partnerships and a common vision for effective national malaria-control strategies, which supported programmes to better focus their spending on effective activities once increased resources became available. Indeed, by the early- to mid-2000s, when international funding toward malaria control began increasing, there was reasonable consensus for strategies in malaria-endemic countries, particularly those in Africa with the greatest malaria burdens. This package of interventions addressed prevention (insecticide-treated mosquito nets [ITNs], indoor residual spraying of insecticides [IRS], and intermittent preventive treatment in pregnancy [IPTp]) and case

management with diagnosis (expanded use of microscopy and rapid diagnostic tests [RDTs]) and treatment with highly effective antimalarial regimens, particularly artemisinin-based combination therapy (ACT).

In malaria-endemic countries, national government spending and individual or household spending on malaria prevention and treatment have always been in place, although to different degrees. That is, where the disease is transmitted and where illness presents, the country and its people have no choice but to spend resources on malaria. This spending for national governments reaches all aspects of preventive and curative care, but is also difficult to quantify as malaria-specific; for example, financing of staff, facilities, training, etc., is seldom designated as disease-specific funding. Similarly, within households, families spend money to prevent malaria (buying ITNs, sprays; repellants; and window, door, and eave screens; etc.) and to treat illness (paying for travel to heath centers, costs of care and medicines, costs associated with lost work time, etc.), but these expenditures are not systematically recorded except in special studies. With recent efforts in nationwide scale-up of malaria-control interventions, it is clear that the additional financing being provided through external donor assistance is filling a substantial gap between what is needed and what is available from poor households and national governments in these endemic countries. Thus, the external financing is both a high proportion of needed resources and is helping shift the financing burden from poor families and nations to a shared burden across the global community.

Increasingly, it is apparent that as external assistance grows and is applied systematically in malaria-endemic countries, the benefits of the interventions can be seen in households (less infection, illness, and death) and in the health systems serving them (lower numbers of malaria cases and complications, fewer hospital admissions, and fewer deaths)—all leading to lower malaria-specific household and health care costs. With the understanding that the less-quantifiable costs in countries and households will be reduced through good malaria-control programme work, and that much of the recent change has been due to dramatic increases in external financing, here we focus on tracking progress in external assistance for malaria control.

With the advent of the GFATM and the first malaria grants approved in 2002 and disbursed in 2003,[13] an invigorated sense of opportunity was established. Twelve countries—Benin, China, Honduras, Indonesia, the Lao People's Democratic Republic, Madagascar, Mali, Senegal, Sri Lanka, the United Republic of Tanzania (both the mainland and Zanzibar, with each receiving grants individually), Zambia, and Zimbabwe—were recipients of Round 1-approved five-year malaria grants[*] totalling nearly $200 million in approved requests. In Round 2 (January 2003), an additional 28 malaria grant requests were approved totalling ~$500 million. Through 2009, Global Fund-approved malaria grants included an estimated lifetime funding of $8.1 billion[**] until approximately 2015. Enthusiasm for progress was palpable, and the global commitment expanded with the World Bank Malaria Booster Program[14]

launch in 2005. The US-PMI was announced in 2005 and launched in 2006.[15] With Phase 2 of the World Bank Booster Program, funding opportunities from the World Bank reached ~$1.1 billion. US-PMI funding has steadily increased from $30 million in fiscal year (FY) 2006, reaching $135 million in FY 2007 and $300 million in FY 2008 and FY 2009. Its funding for FY 2010 is expected to reach $500 million.

The global community has rapidly moved support from hundreds of thousands of dollars to millions and now billions of dollars invested in halting the health disaster of malaria. This report chronicles the external donor assistance funding in terms of commitments, disbursements, and in-country expenditures and the timing of achievement of intervention coverage and health impact. The report follows the framework outlined in Box 1.

Most, but not all grants were for five years.

** This substantial sum represents maximum amounts of approved funding for the life of all current approved grants through Round 9 and includes Rolling Continuation Channels, National Strategy Applications, and multi-country grants; these are not current "committed" funds and this total is contingent on available money in the Global Fund.

Box 1: Framework for Malaria Control Financing

A comprehensive view of malaria-control funding requires a systematic approach to assessing funding needs, availability, utilization, and achievements and a continuous reappraisal process that ensures durable and appropriate-to-need resourcing over time. These components are further considered in this document and are outlined here:

1. Establish the funding needs for malaria control.

With the Global Malaria Action Plan (GMAP) there is an assessment of external financing for the global control of malaria. While this does not go into great detail, it provides a blueprint for our current expected needs.

2. Analyze the sources and amounts of funding available from the different sources.

The funding for malaria control comes from three major sources: household expenditures, national expenditures (including government and other in-country expenditures such as businesses providing health services to employees and families), and external donor assistance. As a disease of poverty, malaria has its greatest impact on poor families—they experience the highest frequency of infection and illness and they spend a higher proportion of available money on the disease.[*] Thus, an overarching principle for malaria control is the reduction of the excessive burden on poor families, and this includes having wealthier countries assist in paying some of the costs of malaria control. Today, information on household, government, and private institution spending on malaria is insufficiently complete to allow a comprehensive analysis of trends. Of note,

in the *World Malaria Report 2009*, an assessment of 31 countries shows government expenditures have remained constant or slightly increased between 2004 and 2008.[**] Thus, this current report focuses on trends in external financial assistance.

3. Ensure proper and timely management and utilization of the funding.

The funding must be used well and in a timely fashion to achieve the required benefits. Both the financing agents and the recipients need to establish proper administrative and accounting mechanisms to ensure that funds are directed to the needs and achieve the required outcomes. This implies a partnering relationship between funders and recipients that is based on integrity and is impact oriented.

4. Document the impact of the funding in health and economic terms.

To justify existing and potential future funding, donors and recipients must systematically document the impact of the funding. Regular financial and health-impact reporting must remain critical components of malaria-control financing.

5. Monitor and address gaps between financing needs, availability, and flow over time—to sustain financing based on need and continued progress.

As countries scale up intervention coverage and reduce malaria burden and transmission, their priority actions and funding needs may change dramatically. Some actions may continue, some may be stopped, and others may be added. Continued funding should be contingent on updated needs and on documented appropriate use of existing funds and achievements.

* Ettling M, McFarland DA, Schultz LJ, Chitsulo L. Economic impact of malaria in Malawian households. Trop Med Parasitol. *1994 Mar;45(1):74-9.*

** WHO. World Malaria Report 2009*, p. 59, Figure 6.3.*

Box 2: Sources of Information and Methods of Analysis

The Technical Notes (Annex 1) provide detailed information on data sources, methods, and interpretation for financial data presented in this report. This box provides an overview of these information sources and the analytic approach used in this report.

Funding toward malaria control is generally derived from three main sources: external assistance from donors, national government spending, and household or private spending ("out of pocket"). This report largely focuses on the first category (external assistance from donors), which, according to the RBM Global Malaria Action Plan, accounted for an estimated half of total global spending on malaria in 2007.[16]

Different types of financial information are available from donors, including pledge/approval, commitment/obligation, disbursement, and expenditure. These definitions are detailed in the box below:

Types of financial information:

Pledge/approval: A non-binding announcement of intent to contribute a certain funding amount.

Commitment/obligation: A firm obligation, expressed in writing and backed by the availability of the necessary funds for a particular project, programme, or sector.

Disbursement: Placement of resources at the disposal of a government or implementing agency.

Expenditure: Use of funds to pay for commodities, buildings, equipment, services, or salaries.

Information for this report on donor funding commitments, disbursements, and expenditures was derived from a variety of sources to assess malaria funding over time by recipient countries and by donor countries, as well as by programme activity area. Data sources reviewed include:

- *Organization for Economic Cooperation and Development – Development Assistance Committee (OECD-DAC)* maintains a public-access database on aid and other resource flows to developing countries based on reporting from bilateral (22 DAC member countries), multilateral, and other international organizations. As of November 2009, information on resource flows (commitments and disbursements) toward malaria control from donors and to recipient countries was available for the time period 2003–2008.

- *International Health Metrics and Evaluation (IHME) recently published a report,* Global Financing for Health 2009, which also includes a comprehensive database of global funding for health projects, including disbursements toward malaria control.

- *Individual funding agencies: The Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund), the World Bank Malaria Global Strategy and Booster Program (World Bank), and the US President's Malaria Initiative (US-PMI)* provided data on funding commitments, disbursements, and expenditures (including by programme activity area) based on information regularly maintained to monitor their programmes.

However, different organizations may define or report this financial information in different terms, and details on such variations (including methods for harmonizing these data for this report) are discussed in Annex 1. In the 12-country assessment, expenditure data for the period 2005–2008 were used to analyze how much was spent on malaria control programme activities using funds from Global Fund, World Bank, and US-PMI. However, expenditure data, in particular, are often collected and reported differently across different organizations, which leads to challenges in harmonizing data to report on combined expenditures toward key malaria-control activities. For purposes of this report, and in order to harmonize these data to the extent possible, expenditure data refer only to spending on commodity procurement and related shipping and other fees, unless otherwise noted. See Annex 1 for more information.

Based on these data, this report analyzed the following issues: (1) trends in international financing for malaria and their relation to estimated resource requirements, (2) how malaria funding has been allocated to different geographical regions, countries, and programmes, (3) timeliness between committed, disbursed, and expended funds for malaria control, (4) the relationship between external financing, programme results, and disease trends for a subset of 12 African countries. The time period for analysis is generally 2003–2009, given that major increases in external assistance toward malaria began around this time, and funding commitments data are not generally available for earlier periods. Data on disbursements and expenditures are available for shorter periods (e.g., expenditures data are generally available for 2005–2008, and disbursement data are generally available for 2003–2008), however estimates for 2009 can be made with a combination of available data sources and reasonable assumptions where data is incomplete.

FUNDING NEEDS FOR MALARIA CONTROL

Following a detailed consultative effort in 2007–2008, the Global Malaria Action Plan (GMAP)[16] estimated the annual financing needs for intervention scale-up, for sustained control, and for elimination.

These summary data are presented in the following figures, which show an estimated initial financing requirement of approximately $5 billion per year over the next 10 years, with a peak funding need of ~$6.2 billion in 2010 (see Figure 2.1). The component breakdown of expected needs is shown in Figure 2.2 for ITNs and IRS (Part a); for infrastructure support, training, community work, and monitoring and evaluation (Part b); and for diagnosis and treatment (Part c). These

estimates can be used for comparisons with existing available funding overall and for the components. These cost estimates from the GMAP suggest that the needs during the coming decade 2010–2020 for prevention with LLINs and IRS remain relatively stable at ~$4 billion per year. Costs for programme support and monitoring and evaluation are relatively stable at ~$0.8 billion; costs for diagnosis and treatment are initially ~$1.4 billion but then may decline in subsequent years.*

* The GMAP costing model estimated a declining need for diagnosis; however, fever illness requiring assessment with RDTs or microscopy may continue longer than described here, and as some programmes move to active infection detection and treatment, the use of diagnostics may actually be higher than estimated here. However, for the purposes of this report, we focus on the near-term costs in 2010–2012, which are the peak level shown here.

Figure 2.1.

Summary estimates of financial needs for rapid scale up of global malaria-control programming and research from 2010 to 2040.

The Global Malaria Action Plan's estimates of financial needs for the next 35 years for malaria control programmes suggest that annual needs will peak in 2010 at $6.2 billion and will be relatively stable at approximately $5 billion per year over the next 10 years.

Global research & development costs (~ $750M – $900M / year)
Early research and information needs
New vaccines, drugs, vector control and diagnostics

Global implementation costs (~ $5B / yr for next 10 yrs)
Prevention: LLINs, IRS and IPTp
Case management: Drugs, diagnostics, and management of severe cases
Country programme costs: infrastructure / institutional strengthening, M&E, operational research, training and community health workers

Source: GMAP costing model

Figure 2.2.

Summary estimates of financial needs for 2010–2020:

a. **For global vector-control programming.** *The funding needs for long-lasting insecticide-treated mosquito nets (LLINs), indoor residual spraying (IRS), and intermittent preventive treatment in pregnancy (IPTp) are estimated to be stable at ~$4 billion each year for the next decade.*

US$ billions

Peak costs ~US$ 4 billion

IPTp
LLINs
IRS

2010

2015

Source: GMAP costing model.

2020
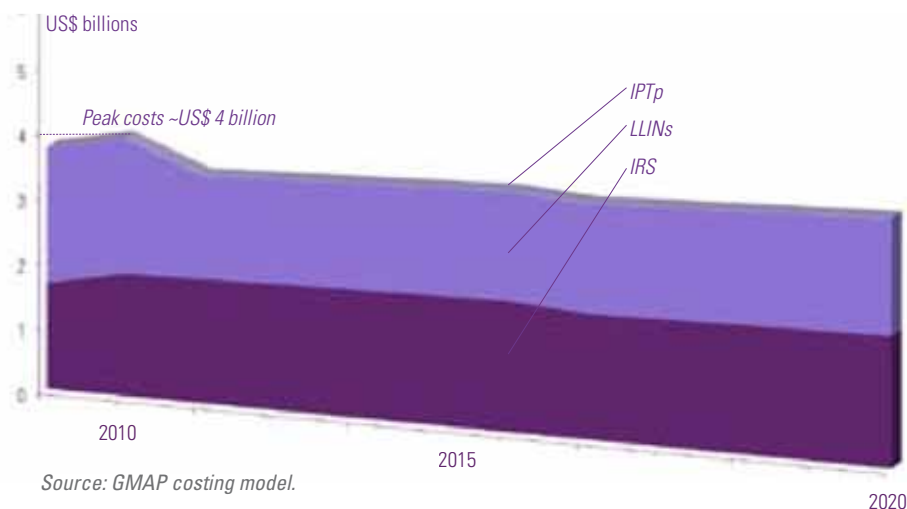
b. **For global malaria management, training, and monitoring and evaluation.** *The funding needs for malaria-control programme work and the required systems and training are estimated to be stable at ~$0.8 billion each year for the next decade.*

US$ billions

Peak costs US$ 0.8 billion

Community health workers

Training

Monitoring & Evaluation and Operational Research

Infrastructure / institutional strengthening

2010

2015

Source: GMAP costing model.

2020
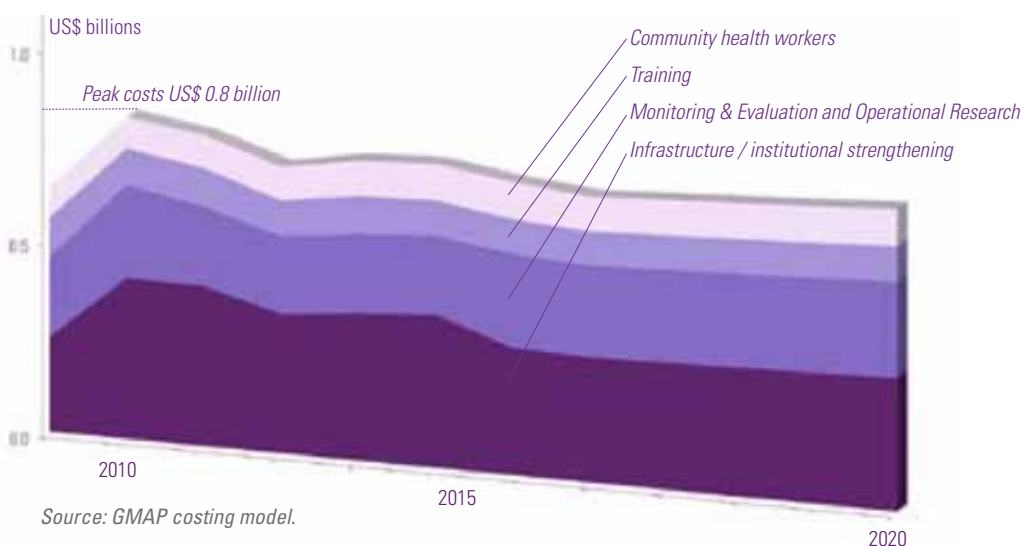
c. **For malaria diagnosis and treatment.** *The funding needs for diagnosis and treatment were estimated to peak in 2010–2011 at $1.4 billion and then decline (of note, updated assessments suggest that requirements for diagnosis may remain stable at 2010 levels for some years as requirements for diagnostic assessment of fever illness will persist).*

US$ billions

Peak costs ~US$ 1.4 billion

Management of severe cases

Chloroquine and primaquine

ACTs (paed.)

ACTs (adult)

RDTs

2010

2015

2020

Source: GMAP costing model.
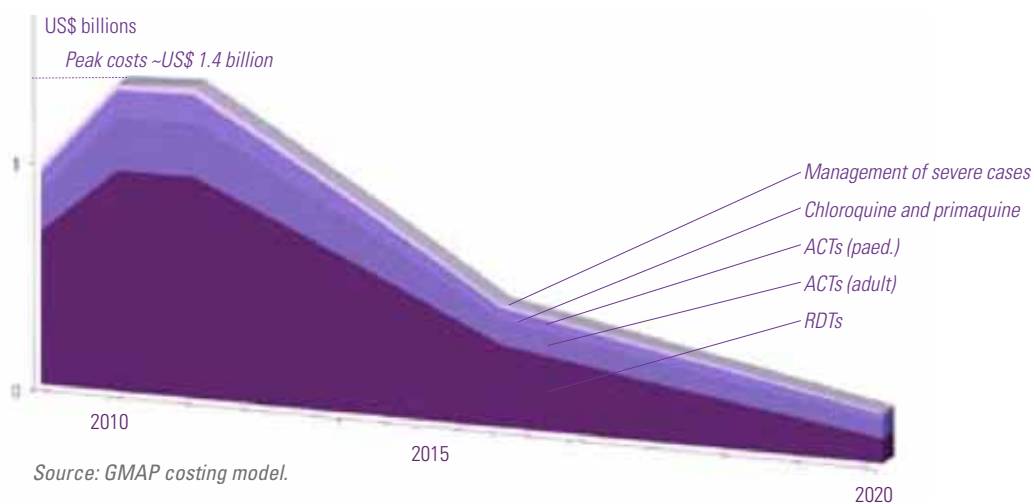
FUNDING SOURCES AND ALLOCATIONS FOR MALARIA CONTROL

In the first decade of RBM, there has been an unprecedented increase in global financing for malaria control, particularly for sub-Saharan Africa.

The Global Fund and the large group of countries and individual or organizational donors to the Global Fund can be credited with beginning this process in 2002 and growing the resources over time. The addition of World Bank and US-PMI funds in 2006 generated more broad-based support. This financing commitment and its growth over time are shown in Figure 3.1.

Figure 3.1.

Annual funding commitments of the Global Fund, World Bank, US-PMI, and countries and multilaterals participating in the Development Assistance Community (DAC).

Malaria-control funding commitments have increased steadily each year from 2003 (~$100 million) through 2009 (~$1.6 billion).
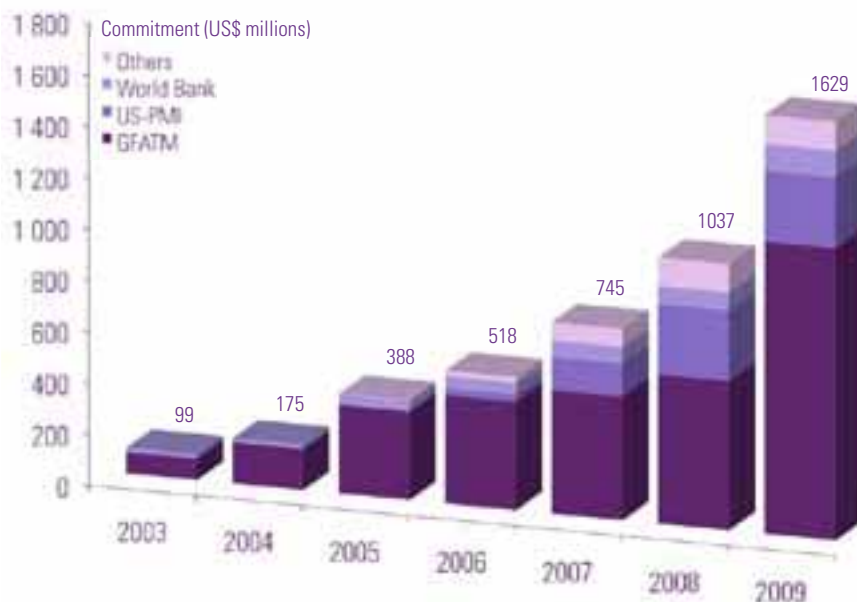
Source: The Global Fund, World Bank, and US-PMI.

Notes: Annual commitments of World Bank-funded projects were calculated from the planned disbursements described in project appraisal documents, or if these were not available, by assuming a constant flow of funds throughout the life of a project with funding commencing six months after board approval. Commitments of US-PMI were allocated to calendar years proportionally according to the number of months of a financial year falling in each calendar year. Annual commitments of the Global Fund were recorded from Global Fund databases and committed funds were assigned to a calendar year assuming a constant flow of funds throughout the grant period.

While commitments are critical, it is the disbursements for malaria to endemic countries that determine progress (Figure 3.2). These disbursements increased from approximately $35 million in 2000 to ~$1.5 billion in 2009, a ~40-fold increase. The Global Fund accounted for ~$2.8 billion, or more than 60% of all external malaria-control funds disbursed to malaria-endemic countries between 2003 and 2009. USAID (including US-PMI) was second to the Global Fund as a source of funds from 2003 to 2009, increasing its malaria-funding disbursements to more than $300 million in 2008 (figures are not yet complete for 2009); the World Bank disbursed $54.2 million, and the combined bilateral donor countries (not including the United States) and other multilateral donors disbursed ~$120 million.

Figure 3.2.

International donor disbursements to malaria endemic countries, 2000–2009.

International financial disbursements to malaria endemic countries have increased from approximately $100 million in 2003 to nearly $1.5 billion in 2009.
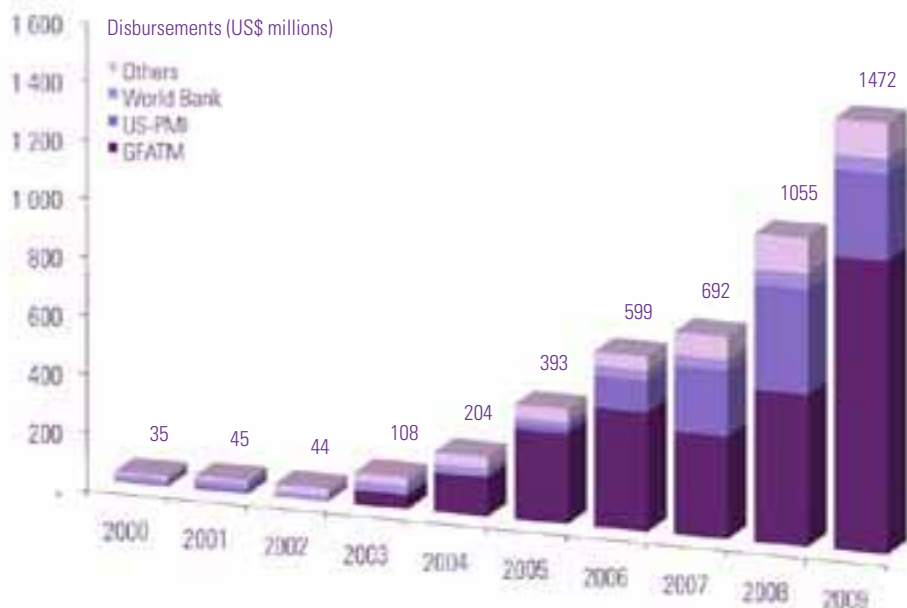
Source: The Global Fund, World Bank, US-PMI, OECD database (for 2008); IHME database (for 2000–2007 and 2009).

Notes: PMI disbursements are for the first three quarters of 2009, disbursements of WB and other agencies assumed to be equal to 2008.

Figure 3.3.

Cumulative approved, committed, and disbursed funds from the Global Fund across all malaria grants between 2003 and 2008.

Global Fund lag-times between funding approvals and commitments is ~1 year, and lag-times between commitments and initial disbursements are shorter (typically 1–2 months).
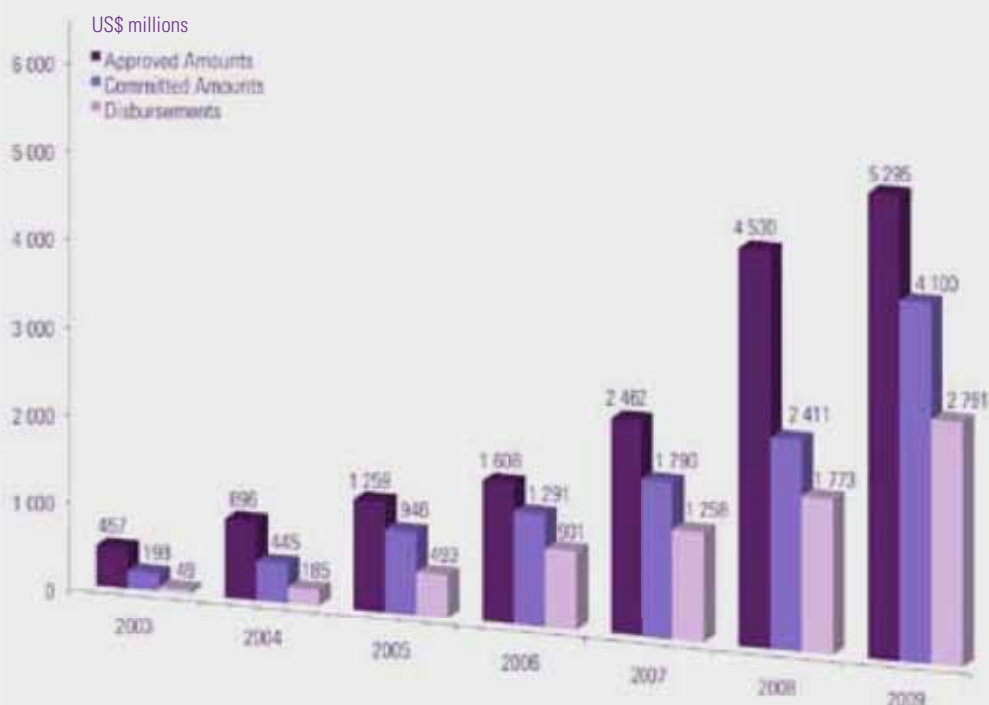
Source: The Global Fund.

Notes: The approved amount in 2003 is nearly equivalent to the committed amount in 2004, which is similar to the disbursed amount in 2005. The wide discrepancy in 2008 between approved and committed amounts is due to a large approved award for malaria in Round 8 grants that were not signed until late 2009. While Round 9 malaria grants were reviewed and approved by the Global Fund Board in November 2009, no signed grants (commitments) or disbursements had been made by the time of this report.

The link between commitments and disbursements is most clearly seen over the six full years of information from the Global Fund. The initial approval of a Global Fund grant is followed by a signed commitment; this is typically signed as a five-year agreement with a Phase 1 (two-year) initial commitment and a Phase 2 (three-year) commitment that is contingent on documented performance from Phase 1 and not considered a "commitment" until that time. Thus, as time progresses and new grants are introduced (there have now been nine Rounds of Global Fund grants), there is a growing approval amount, a slightly lesser amount committed via signed grants, and a now somewhat stable rate of disbursement against commitments (see Figure 3.3).

Funding Sources

The three principal sources (Global Fund, World Bank, and US-PMI) and the fourth source (countries participating in the DAC network) of funding for the approximate $4.6 billion funding commitments from 2003 through 2009 are shown proportionally in Figure 3.4, where the Global Fund provides approximately 70%, the US-PMI provides about 15%, the World Bank about 8%, and other bilateral donors approximately 7%.

Figure 3.4.

Commitments of Global Fund, World Bank, US-PMI, and other countries participating in the DAC network support for malaria control between 2003 and 2009.

International malaria funding is channeled largely through three sources: the Global Fund (70%), the US-PMI (15%), and the World Bank (8%). Of note, more than 40 countries and more than 10 foundations or private organizations support the Global Fund channel; 18 countries or other multilaterals in the DAC network provide bilateral support for malaria. Commitments 2003–2009: total ~$4.6 billion over seven years.
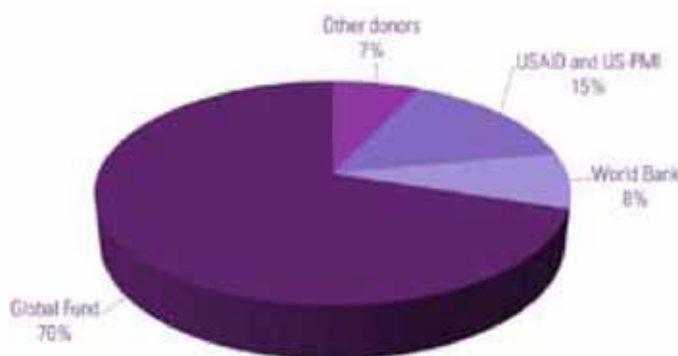
Source: OECD data (January 2010) and summaries from World Bank, USAID, US-PMI, and the Global Fund.
Notes: The World Bank Malaria Booster Program began in 2005 and the US-PMI began in 2006, thus their cumulative commitments are lower proportionally over the 2003-2009 time period than they are in more recent years. Commitments are not fully available for the other donor countries for 2009 and are estimated to be similar to 2008.

There is a broad base of malaria funding overall when considering that 18 countries have contributed direct bilateral support to malaria control and more than 40 countries and more than 10 foundations or private organizations contributed via the Global Fund. Having said that, there remains a heavy reliance on the three main channels of funding (Global Fund, World Bank, and US-PMI) and, in particular, approximately two thirds of disbursements and commitments between 2003–2009 have come via the Global Fund. Contributions from the international community to the Global Fund began in 2002 and increased dramatically (doubled) between 2005 and 2008 and appear to have stabilized in 2009.

Figure 3.5.

Annual contributions to the Global Fund from all sources 2002–2009.

Contributions to the Global Fund began in 2002, increased dramatically (doubled) between 2005 and 2008, and appear to have stabilized in 2008 and 2009.

US$ millions
■ Annual Contributions - all sources

Total amount contributed over 8 years = US$ 15.7 billion
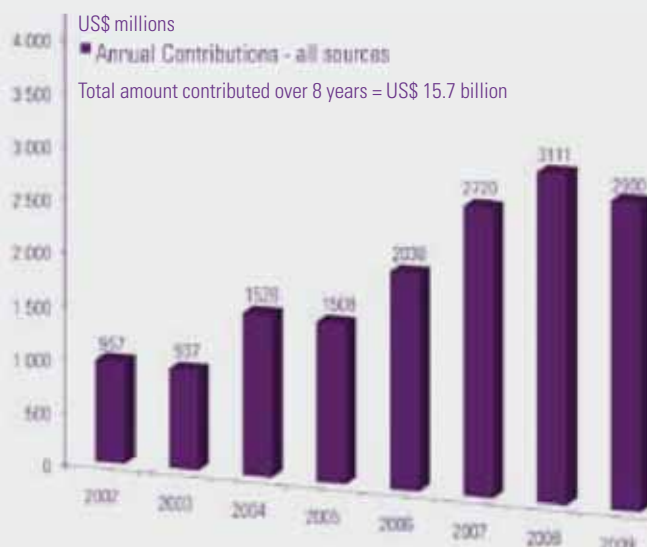
Source: The Global Fund.
Notes: This $15.7 billion amount has been allocated across the three diseases of HIV/AIDS, tuberculosis, and malaria, with malaria receiving approximately one-quarter of the funding.

While Figure 3.5 shows the total contribution to the Global Fund from donors, Figure 3.6 shows the total amount disbursed by disease. Historically 24% of all Global Fund grants have been allocated to malaria, but as noted above, this 24% makes up more than two thirds of international financing for malaria. The Global Fund contributions to total funding for HIV/AIDS and tuberculosis are proportionately less because of the many other sources for HIV/AIDS and the higher proportion of national funding available for tuberculosis. Thus, any changes in Global Fund support will have an important impact on overall funding for malaria control.

Figure 3.6.

Global Fund disbursements to malaria, HIV/AIDS, and tuberculosis by year.

Over the nine Rounds of funding, malaria has received approximately one quarter of Global Fund disbursements.

US$ millions
Tuberculosis
Malaria
HIV/AIDS
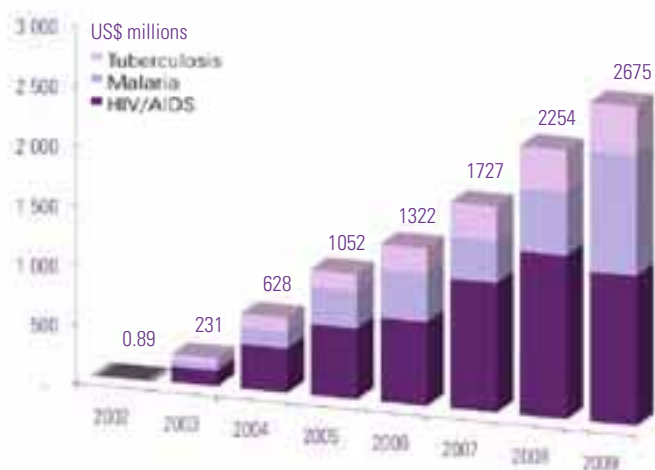
Source: Global Fund.

Malaria Funding Allocation

Among the 108 malaria endemic countries (WHO: *World Malaria Report 2009*), 9 are in a phase of ensuring no reintroduction as they seek elimination certification, and 18 are considered to be in the pre-elimination or elimination phase; approximately 81 countries have received external donor financing assistance during the past decade. Table 3.1 shows summary information on financing commitments by region for malaria funding and the relative per-capita funding.

Table 3.1.

Malaria-endemic countries, donor funding from 2003–2009, and population-at-risk.

External donor assistance is currently supporting ~81 malaria-endemic countries with a 2.5 billion population-at-risk. From 2003 through 2009, this funding commitment was greatest in total money and per-population-at risk for the African Region (where the malaria burden is highest); globally, the per-person-at-risk funding during these seven years was $1.64 or approximately $0.25 per year.

Region * (per WHO)	Malaria-endemic countries	Received external donor funding**	% receiving external funding	Malaria risk in countries receiving funding	Population-at-risk in donor-supported countries (millions)	Total funding commitment 2003–2009 ($ millions)	Total funding per person at risk 2003–2009
AFRO	43	40	93%	High-moderate	656.5	$3 470.3	$5.29
AMRO	23	11	48%	High-low	88.8	$74.1	$0.83
EMRO	13	7	54%	High-low-elimination	239.8	$248.2	$1.04
EURO	9	6	67%	Low-elimination	22.0	$18.4	$0.84
SEARO	10	9	90%	Moderate-low	1 429.2	$224.5	$0.16
WPRO	10	8	80%	High-low-elimination	190.1	$269.8	$1.42
Total	108	81	75%		2 626.4	$4 305.3	$1.64

*Notes: *WHO Regional Offices include Africa (AFRO), Americas (AMRO), Eastern Mediterranean (EMRO), European (EURO), South East Asia (SEARO) and the Western Pacific (WPRO).*

**Among 27 malaria-endemic countries not receiving external funding, 17 (63%) are considered to be in pre-elimination, elimination, or prevention-of-reintroduction phases of their malaria control; thus, only 10 countries in the "control phase" are not reported to be receiving external financial assistance. Several countries are receiving funding through multi-country regional grants and may not be included in the 81 countries identified here.

The funding commitment amount differs slightly from amounts noted in Figure 3.3 because some Global Fund grants are for multi-country work and are not included in this table.

Map 3.1.

The 81 malaria-endemic countries receiving external financial assistance directed for malaria control, 2003-2009.
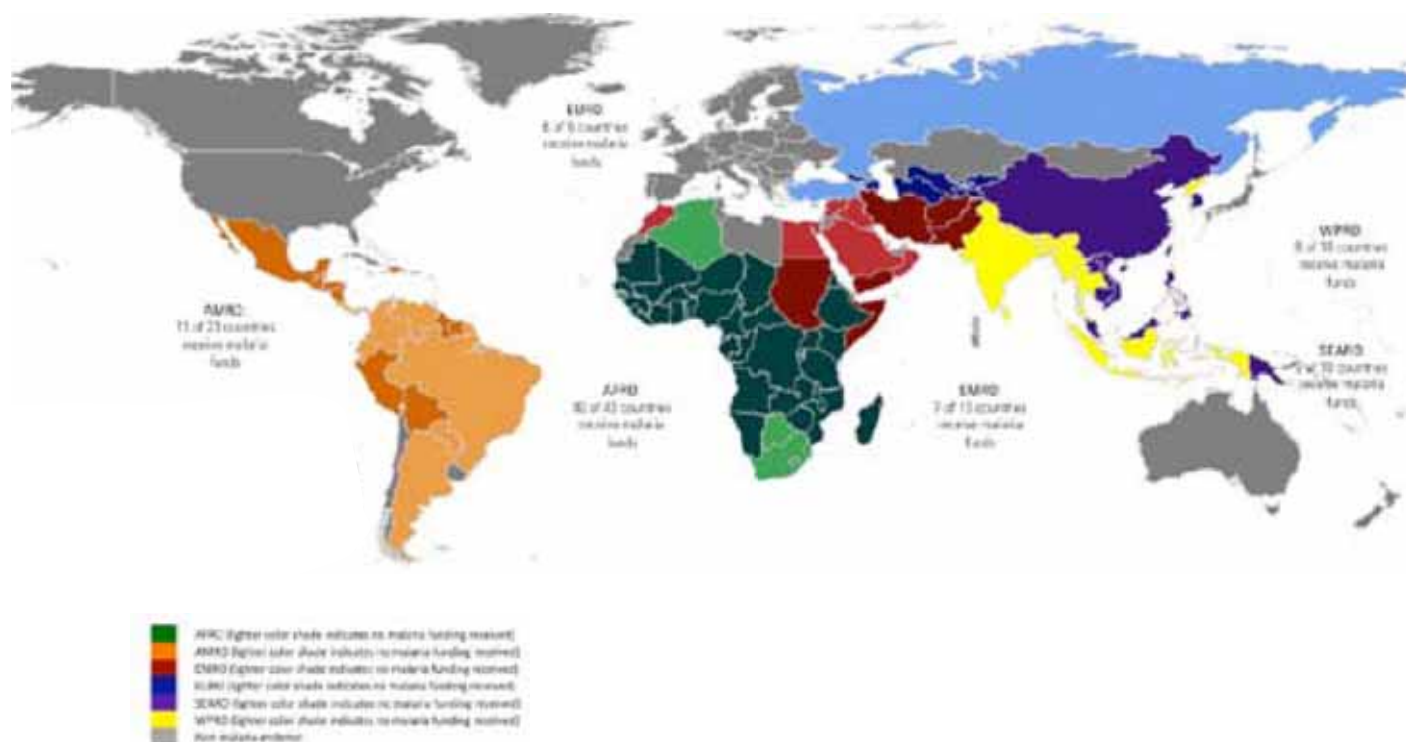
Notes: Countries considered malaria-endemic but not receiving external malaria funding include: African Region = Algeria, Botswana, South Africa; American Region = Argentina, Bahamas, Belize, Colombia, Costa Rica, Ecuador, French Guiana, Jamaica; Eastern Mediterranean Region = Egypt, Iraq, Morocco, Oman, Saudi Arabia, Syrian Arab Republic; European Region = Armenia, Russian Federation, Turkey; South East Asian Region = Democratic People's Republic of Korea; Western Pacific Region = Malaysia.

Some countries have received funding through indirect or regional grants and these are not represented in the darker colour in this map. These include South Africa, Colombia, Ecuador, Peru, Venezuela, Brazil and DPR Korea.

The appropriate allocation of funding to recipient countries is an important consideration because malaria infection, illness, and death are not homogeneous and are widely known to affect sub-Saharan African countries to a much greater extent than those outside of Africa. Figure 3.7 shows that while funding levels in 2003 were both low and only slightly disproportionately going to support African programmes, the substantial growth in funding has been largely seen in Africa.

Figure 3.7.

Cumulative malaria funding commitments from the Global Fund, World Bank, and US-PMI 2003–2009 for countries in and outside of sub-Saharan Africa.

As funding has increased, the proportion going outside of sub-Saharan Africa has decreased from 27% to 15%; this is consistent with estimates that sub-Saharan Africa accounts for ~85% of the global malaria burden.
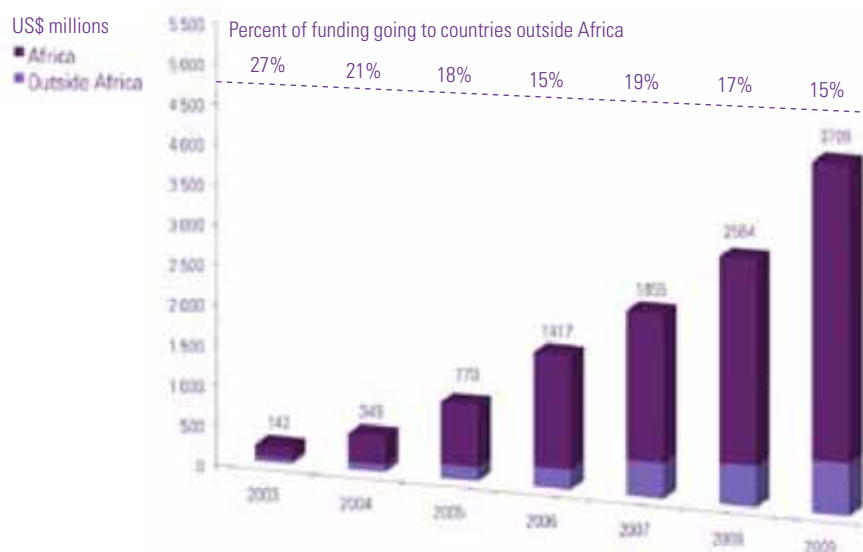
Source: Global Fund, World Bank and US-PMI.

The emphasis on funding in Africa also means that the available funding per-population-at-risk differs among regions. Similarly, because countries are still relatively early in their experience with identifying and budgeting needs, the per-capita-at-risk funding varies between countries within a region. The wide inter-country variation in Africa is shown in Map 3.2, where the cumulative funding commitments from all external sources from 2003 through 2009 per-person-at-risk (ppr) of malaria is presented. There is more than an 90-fold difference in funding ppr between the countries with the highest

and lowest external funding commitments: $0.57 in Côte d'Ivoire and $50.93 in Sao Tome and Principe. The countries receiving the highest ppr funding rates are generally very small countries (Sao Tome and Principe, Equatorial Guinea, Rwanda, and Swaziland each received more than $20.00 ppr), where a modest grant is supporting work for a relatively small population. Of note, given that these life-of-grant commitments are over the seven-year interval from 2003 through 2009, 24 of these countries have less than $1.00 ppr per year, and ten countries have less than $0.50 ppr per year.

Map 3.2.

Cumulative funding commitments for the life of the grants from all external sources for 2003–2009 per person at risk (ppr) of malaria.

There is an approximate 90-fold difference between ppr funding levels in sub-Saharan Africa: Côte d'Ivoire received $0.57 ppr and Sao Tome and Principe received $50.93 ppr over the seven years from 2003–2009.

Total funding commitment 2003-2009
per population at risk of malaria

- > US$ 20.00/person
- US$ 10.00 – 19.99/person
- US$ 5.00 – 9.99/person
- US$ 2.00 – 4.99/person
- <US$ 2.00/person
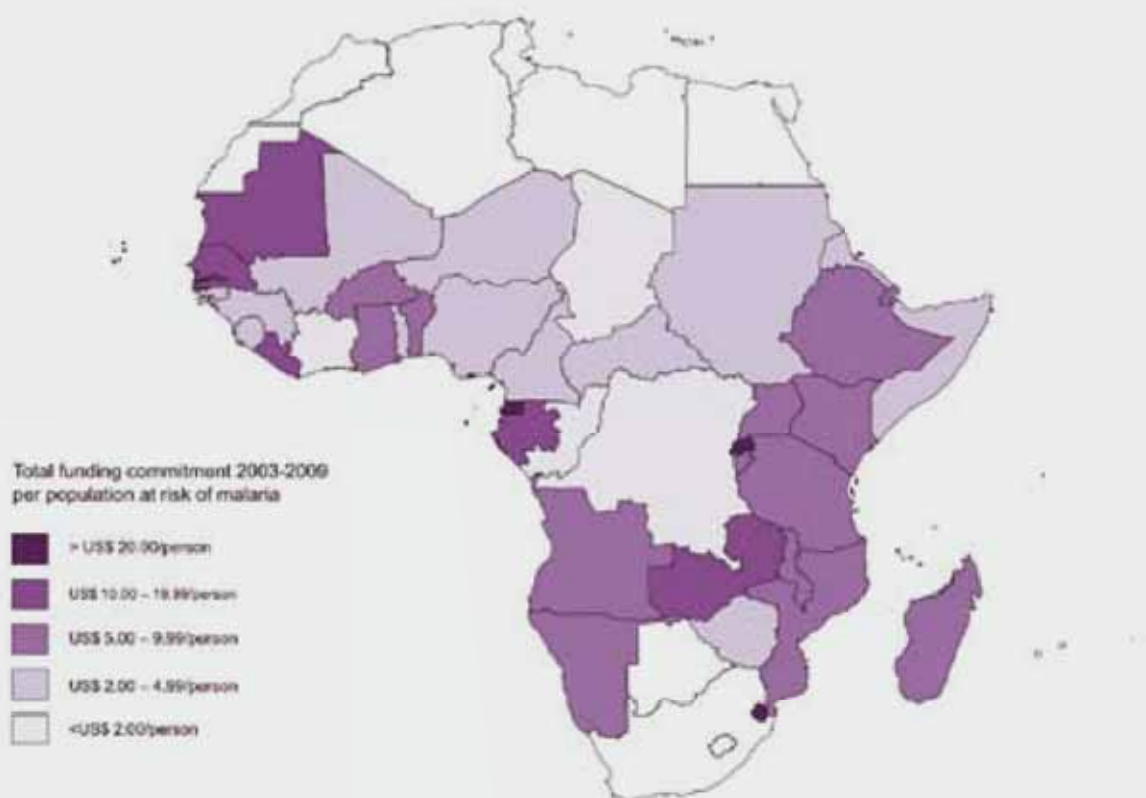
Source: Data from the Global Fund, World Bank, US-PMI, OECD, (as of December 2009).

Notes: Over the current life of all country malaria grants, the country per person commitments ranged from $50.93 (Sao Tome and Principe) to $0.57 (Côte d'Ivoire); no external grants were reported for Botswana, Cape Verde, or South Africa.

Annual disbursements of donor funding are also not homogeneous between countries and between years within countries. For a few countries annual funding disbursements were stable (typically found in countries with few funds); while in other countries, annual fluctuations in disbursements varied by 4–5-fold (see Chapter V. Making the money work). During the phase of rapid scale-up of interventions, it is understandable that certain countries may have dramatic swings in their financial needs to procure and then distribute commodities such as LLINs or IRS. As national intervention scale-up is achieved, one would hope that current swings in annual disbursements will evolve to more stable funding that can facilitate effective annual planning for malaria control.

MANAGEMENT AND USE OF FUNDING FOR MALARIA CONTROL

Following donor funding commitments and disbursements, countries are using the money relatively rapidly, as evidenced by timely expenditures.

For US-PMI, the annual approved budget for the countries is moved into contracts that are country-focused and have a limited time frame (within the allocated year) for expenditure by the contractors. For the World Bank, grants and loans have been developed such that once the disbursement is made, the expenditure (especially for commodity procurement) moves quite quickly. For the Global Fund, extensive data are available to examine the time frame between grant approval, grant signing (commitment), disbursements to the principal recipients, and expenditures. Using data from the Rounds-based grants and from the more recently developed Enhanced Financial Reporting (EFR) system at the Global Fund, grant use can be tracked over time. There is a substantial time interval between grant approval by

the Global Fund Board and the actual signature of the grant (commitment). For malaria grants, despite the key performance indicator of 8 months (243 days), for Round 6, the average was 11 months (335 days), and for Round 7 the average was 11.2 months (340 days). Once a Global Fund grant is signed, initial Phase 1 disbursements usually follow within the next 1–2 months. Table 4.1 shows the majority of the money from Rounds 1–4 had been disbursed, consistent with the proportional time elapsed on these grants. And, while there is incomplete disbursement at this time for Rounds 5–8 (and Round 9 was just approved in November 2009), their disbursement rate is in line with the proportion of time elapsed on the grants.

Table 4.1.

Global Fund malaria grants: dollar amounts committed and disbursed in proportion to the grant time elapsed for Rounds 1–8.

The rate of grant disbursement has closely matched the elapsed time of the grant.

Round of funding	Approvals total ($ millions)	Grant agreements total ($ millions)	Disbursements total ($ millions)	Mean percent disbursed	Mean %time elapsed in the grant	Disbursement/ time elapsed
Round 1	196.3	196.3	181.5	93%	94%	99%
Round 2	517.5	448.7	402.7	91%	97%	94%
Round 3	382.3	303.2	288.4	96%	98%	98%
Round 4	890.4	865.2	618.2	85%	91%	93%
Round 5	381.7	381.7	292.7	79%	70%	113%
Round 6	285.9	238.7	166.5	72%	84%	86%
Round 7	469.7	469.7	290.2	60%	60%	100%
Round 8	1 394.6	1 196.7	552.3	39%	11%	
Total	4518.4	4 100.2	2 792.5	74%	72%	103%

Source: Global Fund Secretariat.

Notes: The mean percent disbursed is the mean of the percent disbursed for individual grants from the Round or the total. While Round 9 grants have been approved, no grant signing has yet occurred to establish the formal commitment.

Table 4.2.

Regional Global Fund malaria disbursements and country expenditures accounted for through the EFR through 2008.

Overall, 81% of Global Fund disbursed money was spent within the calendar year; this high proportion is consistent across most regions.

Global Fund Regions	Budget $ millions	Expenditure $ millions	Expenditures within the year as a percentage of budget
East Africa	541.4	444.6	82%
Southern Africa	193.7	151.2	78%
West & Central Africa	329.8	263.6	80%
North Africa & Middle East	100.4	89.5	89%
East Europe & Central Asia	8.5	7.8	93%
South & West Asia	107.9	67.6	63%
East Asia & Pacific	162.1	137.0	84%
Latin America & the Caribbean	65.8	56.4	86%
All Regions	1 509.6	1 217.7	81%

Source: The Global Fund Enhanced Financial Reporting (EFR) database.

The EFR accounting system allows for detailed tracking of annual budgets and the categories of spending. In Table 4.2, the country expenditure against the budget available is shown. Countries on average spent 81% of their year's budget by the end of the year, and this was consistent across regions.

Figure 4.1.

Average country Global Fund malaria cumulative expenditures through 2008 by category.

Overall in 2008, countries spent Global Fund grant money on prevention (42%), treatment (31%), health systems strengthening (14%), and programme supportive environment (13%).
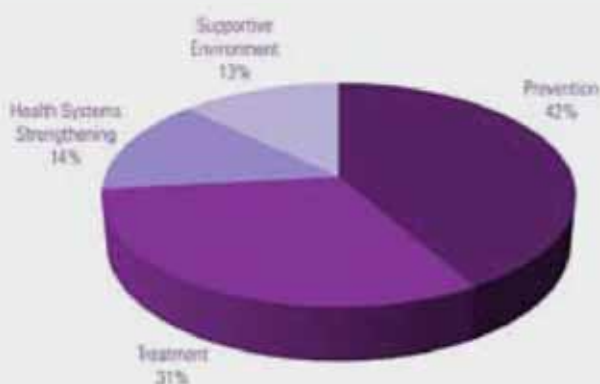
Source: Global Fund Enhanced Financial Reporting System. Represents ~$1.2 billion expended in 2008.
Notes: Not all countries have completed reporting, but general compliance with reporting is good and 93% of expected reports were received by the end of December in 2009.

In summary, the Global Fund-approved grants typically become available for disbursement almost one year after approval, but following grant signature, timely disbursements and timely expenditures are seen across the vast majority of the grants. This would argue that concerns about "country absorptive capacity for the funds" are currently being addressed by the systems in place between the Global Fund and their country partners.

The expenditures in the EFR are also reported by service delivery area (using standard Global Fund categories) and can then be considered in the four categories of prevention, treatment, health systems strengthening, and programme supportive environment.

Overall, across all of the regions, expenditures in 2008 for malaria control were allocated as prevention (42%), treatment (31%), systems strengthening (14%), and programme management support (13%) (see Figure 4.1). This allocation did vary by region, with expenditures on prevention dominating in all regions (except Latin America and the Caribbean), and allocation to treatment, systems strengthening, and programme management support varying across the regions. In general, where lower funding levels were provided and where risk is lower outside of Africa, a higher proportion of money was spent on systems strengthening and programme management support (see Map 4.1).

Map 4.1.

Proportional expenditure from the Global Fund for malaria-endemic countries in 2008 as distributed by prevention, treatment, health systems strengthening, and programme supportive environment among the eight regions.

All regions spend a substantial proportion on malaria prevention; spending on malaria treatment varies by region (highest in Africa, particularly in East, West, and Central Africa); proportional spending on health systems and programme support is highest outside Africa.
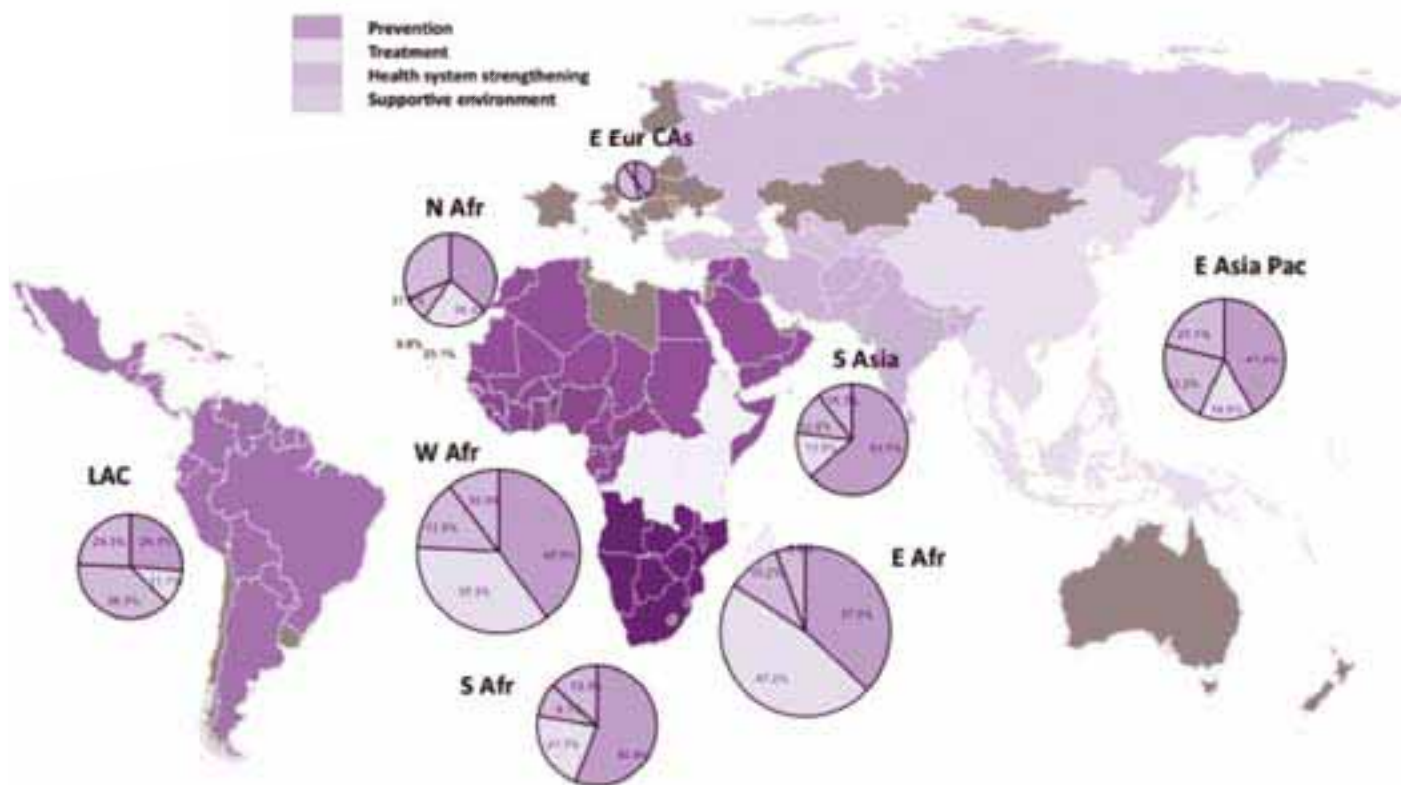
Notes: The size of the pie charts approximates the relative proportion of the Global Fund expenditures by region: East Africa ($380.6 million); Southern Africa ($141.6 million); West and Central Africa ($230.7 million); North Africa and the Middle East ($89.5 million); East Asia and the Pacific ($136.9 million); Eastern Europe and Central Asia ($7.8 million); South and West Asia ($67.6 million); and Latin America and the Caribbean ($56.4 million).

Comparisons of expenditure patterns in Africa (see Figure 4.2) and outside of Africa (see Figure 4.3) are shown for each of the main malaria service-delivery areas. In Africa, expenditures on ITNs and malaria drugs for treatment make up two-thirds of all expenditures; of note, expenditures on diagnostics have been quite low (only ~2% of treatment costs) in relationship to expenditures on drugs. In countries outside of Africa, the spending on prevention is still substantial, but spending on drugs for treatment is proportionally lower (likely due to the lower number of cases overall), and the relative expenditure on programme management and administration and on areas of health systems strengthening is greater. This would suggest that as countries improve their malaria control and have fewer infections, cases, and severe morbidity and mortality, they both need less external funding and they demonstrate a changing pattern of spending toward health systems strengthening.

Figure 4.2.

African Region country expenditures in 2008 by Global Fund Service Delivery Area.

African country expenditure is greatest for prevention (~42%; particularly for ITNs) and treatment (38%; most spent on drugs, only ~2% was spent on diagnostics).
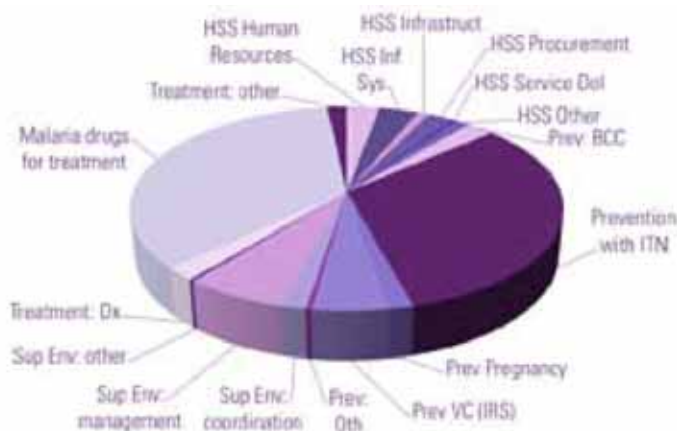
Source: Global Fund Enhanced Financial Report for 2008 expenditures; represents $752.8 million in 2008 expenditures from East, Southern, West, and Central Africa (but not the Global Fund Northern Africa and Middle East Region).

Notes: Health Systems strengthening (HSS) = 11.1%, Prevention = 41.5% of which 32.3% is ITNs; Supportive Environment = 8.5% and Treatment = 38.3% of which diagnosis is only 2.1%.

Figure 4.3.

Outside-Africa Region country expenditures in 2008 by Global Fund Service Delivery Area.

Compared to African expenditures, country malaria expenditures outside Africa were lower in overall amounts and are greatest for prevention (~42%; particularly for ITNs, and are similar to the within-Africa spending proportion). They are lower for treatment (~16%; most spent on drugs, only ~3% was spent on diagnostics) but greater for health systems strengthening (~20%) and programme support (22%).
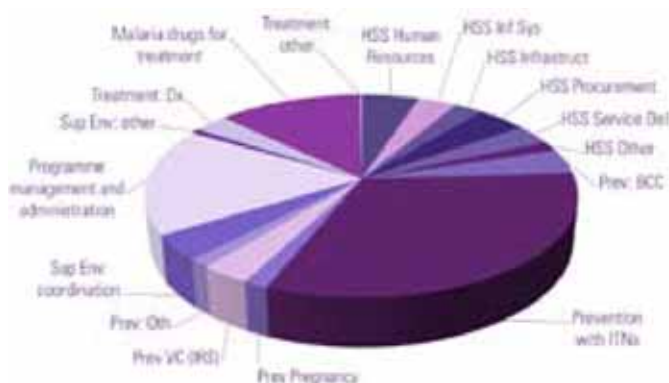
Source: Global Fund Enhanced Financial Report for 2008 expenditure; represents $358.3 million in 2008 expenditures, which includes the expenditures from the Global Fund Northern Africa and Middle East Region.

Notes: Health Systems strengthening (HSS) = 20%, Prevention = 42% of which 32% is ITNs; Supportive Environment = 22% and Treatment = 16% of which diagnosis is only 3%.

MAKING THE MONEY WORK: 12-COUNTRY ASSESSMENT (AFRICA)

The purpose of this chapter is to assess the links between global funding for malaria-control programmes, intervention coverage and health impact to provide an overall indication of the relationship between global funding toward malaria control with programme results.

This assessment focuses on the 12 malaria-endemic African countries with recent (between 2007–2009) and past (2000–2005) population estimates of malaria intervention coverage. This analysis examined changes in country expenditures on key malaria-control commodities using resources from the Global Fund, World Bank, and US-PMI since 2005, and changes in coverage of key interventions purchased with these funds, including ITNs, IRS, antimalarial medicines and diagnostics, and intermittent preventive treatment during pregnancy (IPTp). The final section provides an indication of how these programme results affected malaria-associated morbidity and mortality in these 12 countries.

Twelve countries— an overview

Twelve malaria-endemic African countries were identified based on the availability of data from national-level population-based household surveys for this assessment. Countries were included in this analysis if they had recently conducted a Demographic and Health Survey (DHS), a Multiple Indicator Cluster Survey (MICS), or a Malaria Indicator Survey (MIS) in 2007–2009 and had comparable survey data during an earlier period (2000–2005) to allow for an evaluation of changes in malaria-control intervention coverage during this relevant time period. The countries included in this assessment are Democratic Republic of the Congo, Ethiopia, Ghana, Kenya, Mauritania, Mozambique, Nigeria, Rwanda, Senegal, Sierra Leone, United Republic of Tanzania, and Zambia (Map 5.1).

Map 5.1.

Mapping the 12 countries.

In 2008, these 12 countries accounted for more than 400 million people at risk of malaria transmission (or nearly two-thirds of the African at-risk population) and nearly 3 million total deaths among children under five (or more than two-thirds of total African under-five deaths).

Since these 12 countries were selected based on data available for this assessment (Table 5.1), they may differ in other important aspects. These countries vary greatly in demographic characteristics– and include populous countries, such as Nigeria, Ethiopia, and Democratic Republic of the Congo, and much less populous countries, including Mauritania and Sierra Leone. Overall, these countries constitute approximately 60 percent of both the total and under-five populations living in Africa.

Across the assessment countries, more than 400 million people are at risk of malaria transmission, accounting for nearly two thirds of the at-risk African population. Yet, these countries may have significantly different proportions of their populations living in areas of malaria transmission. In 8 of the 12 countries, more than 90 percent of all people live in areas of stable malaria transmission, while in the other countries (Ethiopia, Kenya, Mauritania, and Rwanda) malaria is a sub-national problem, and a large proportion of the population live in areas with low or no transmission. Finally, these 12 countries were home to nearly 3 million total deaths among children in 2008, accounting for more than two thirds of total African under-five deaths (Table 5.2).

Table 5.1.

Selection of the 12 countries – overview of data availability.

Household survey activity (DHS, MICS, and MIS) 1998–2009, 12 countries.

Country	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Congo, Dem Rep				MICS						DHS		
Ethiopia			DHS					DHS		MIS		
Ghana	DHS					DHS			MICS		DHS	
Kenya	DHS		MICS			DHS				MIS		DHS
Mauritania				DHS			DHS (Nat'l)			MICS		
Mozambique						DHS				MIS	MICS	
Nigeria		DHS				DHS			MICS	DHS		
Rwanda			MICS; DHS					DHS		DHS		
Senegal			MICS					DHS	MIS			MIS
Sierra Leone			MICS					MICS			DHS	
Tanzania		DHS						DHS			MIS	
Zambia		MICS			DHS				MIS	DHS	MIS	

Table 5.2.

Twelve countries – demographic characteristics

Country	Total population	Total under-five population	Proportion of population living in areas of malaria transmission			Under-five mortality rate	Total under-five deaths	Under-five deaths due to malaria
			Risk-free	Unstable	Stable			
	2008	2008	2007	2007	2007	2008	2008	2004
	(thousands)	*(thousands)*	*%*	*%*	*%*	*(per 1 000 live births)*	*(thousands)*	*%*
Congo Dem Rep	64 257	11 829	6	0	94	199	554	17
Ethiopia	80 713	13 323	37	2	61	109	321	7
Ghana	23 351	3 319	0	0	100	76	55	25
Kenya	38 765	6 540	29	0	70	128	189	13
Mauritania	3 215	475	5	29	66	118	12	11
Mozambique	22 383	3 820	0	0	100	130	110	16
Nigeria	151 212	25 020	0	0	100	186	1 077	20
Rwanda	9 721	1 646	43	0	57	112	41	6
Senegal	12 211	2 046	0	0	100	108	49	15
Sierra Leone	5 560	947	0	0	100	194	43	13
Tanzania	42 484	7 566	4	0	96	104	175	19
Zambia	12 620	2 282	0	0	100	148	77	17

Sources: Data columns 1–2: UN Population Division, World Population Prospects: 2008 Revision, New York: UNPD; 2009; Data columns 3–5: Malaria Atlas Project estimates of populations at risk under different levels of Plasmodium falciparum *malaria intensity. Available at: http://www.map.ox.ac.uk/. Data columns 6–7: Interagency Mortality Estimation Group as reported in* The State of the World's Children 2010, *New York: UNICEF; 2009; Data column 8: WHO Global Burden of Disease estimates as reported in* WHO World Health Statistics 2009*, Geneva: WHO; 2009.*

Table 5.3 highlights the countries where Global Fund, US-PMI, and World Bank are active and the time line for these activities. For example, while Global Fund has funded various malaria grants in each of these 12 countries starting in 6 countries in 2003, US-PMI and World Bank are currently active in only 8 and 10 of the 12 countries, respectively, and generally for a much shorter time period. There are six countries where all three organizations are financing malaria-control activities, and six additional countries where two of the three organizations are funding programmes. In some countries, these activities started only recently (e.g., 2008) and therefore programmes may not yet have expended these funds on key malaria-control interventions, but will do so in the coming months and years.

Table 5.3.

Global Fund, World Bank, and US-PMI funding activities in the 12 countries.

Global Fund, World Bank, and US-PMI activities in the 12 countries from programme/funding approval date through length of programme period, 2003–2008. Global Fund grants began in 2003–2005; World Bank financing began 2005–2007; and US-PMI funding began 2006–2008.

Country	2003	2004	2005	2006	2007	2008
Congo, Dem Rep			GFATM (2005-present, Rounds 3 and 8)			
			WB (2005-present)			
Ethiopia	GFATM (2003-present, Rounds 2, 5 and 8)					
				WB (2006-present)		
						PMI (2008-present)
Ghana	GFATM (2003-present, Rounds 2, 4 and 8)					
					WB (2007-present)	
						PMI (2008-present)
Kenya	GFATM (2003-present, Rounds 2 and 4)					
					WB (2007-present)	
						PMI (2008-present)
Mauritania		GFATM (2004-present, Rounds 2 and 6)				
				WB (2006-present)		
Mozambique			GFATM (2005-present, Rounds 2 and 6)			
				PMI (2007-present)		
Nigeria		GFATM (2004-present, Rounds 2, 4 and 8)				
				WB (2006-present)		
Rwanda		GFATM (2004-present, Rounds 3, 5 and 8)				
				PMI (2007-present)		
Senegal	GFATM (2003-present, Rounds 1, 4 and 7)					
				WB (2006-present)		
				PMI (2007-present)		
Sierra Leone			GFATM (2005-present, Rounds 4 and 7)			
					WB (2007-present)	
Tanzania	GFATM (2003-present, Rounds 1, 4, 7 and 8)					
					WB (2007-present)	
				PMI (2006-present)		
Zambia	GFATM (2003-present, Rounds 1, 3 and 7)					
			WB (2005-present)			
						PMI (2008-present)

More than $2 billion has been committed to these 12 countries by the Global Fund, US-PMI and World Bank as of the end of 2009 (Figure 5.1), and there has been a sharp increase in funding available for malaria control from these three organizations between 2003 and 2009, particularly since 2006 when US-PMI and World Bank increased their activities in countries (Figure 5.2). But significant differences exist across these countries in the funding committed by these three organizations, and significant year-to-year variability in global funding toward malaria control exists for most of these 12 countries. Moreover, some countries – such as Nigeria – may receive large overall malaria funding commitments, but these sums are quite small when compared to their at-risk populations (Map 5.2, Table 5.4 and Figure 5.3).

Figure 5.1.

Cumulative commitments by Global Fund, World Bank, and US-PMI, 12 African countries, 2003–2009.

More than $2.2 billion was committed to 12 countries by the three main external donors by 2009.
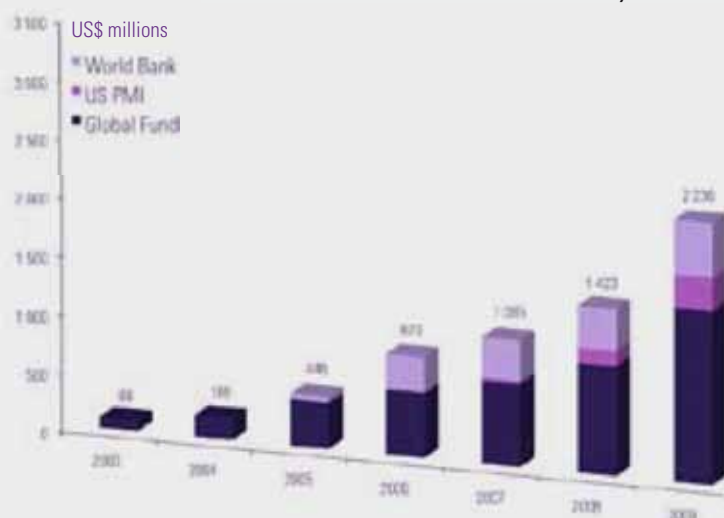
Source: See Annex 1. for detailed source information.

Figure 5.2.

Annual commitments from Global Fund, World Bank, and US-PMI during 2003–2009 apportioned over the estimated grant or loan period through 2010, 12 countries.

Funding available for malaria control across 12 countries estimated over the committed grant or loan period, simulated based on Global Fund, World Bank, and US-PMI annual commitments for 2003–2009; substantial increases occurred in 2005, 2006, and 2009.
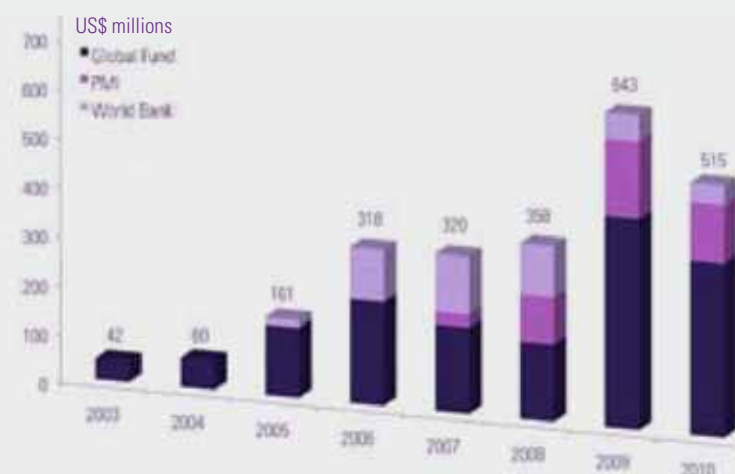
Source: See Annex 1 for detailed source information.

Notes: Estimates of GFATM, World Bank, and US-PMI funding commitments as applied over the lifetime of the grant or loan period. Note that GFATM grants were simulated from grant approval (Phase 1 grant approvals spread over two years and Phase 2 grant approvals over three years); World Bank funding simulated from loan approval and spread over three years; US-PMI commitments are for one-year periods. Commitments reported by fiscal year were converted to calendar-year estimates by splitting the total commitment amount proportionally over the year or months of the grant or loan period and applying the result to the different calendar years. Commitment information is available for the years 2003–2009, and this figure represents the funding available across the life of the grant or loan committed by the year 2009. It is expected that commitments for 2010 and beyond will increase the funding available in future years, and an illustrative estimate based on available information for 2010 is provided here.

Map 5.2.

Cumulative funding commitments for malaria control (total and per-person-at-risk [ppr]), 12 countries, 2003–2009.

Some countries receive large total malaria funding amounts, but these amounts are modest when considered against the number of persons at risk.

Cumulative malaria commitments (2003–2009) from Global Fund, US-PMI and World Bank (US$)

Cumulative commitments ppr (2003–2009) from Global Fund, US-PMI and World Bank (US$)

Table 5.4.

Cumulative commitments per-person-at-risk by GFATM, World Bank, and US-PMI, 12 countries, current US$, 2003–2009.

Large differences exist between the 12 countries in funding per-person-at-risk commitments by the Global Fund, World Bank, and US-PMI.

Country	2003	2004	2005	2006	2007	2008	2009
Rwanda*	$0.00	$2.37	$2.37	$8.33	$9.10	$18.08	$30.74
Zambia	$1.42	$1.42	$4.81	$5.05	$6.83	$10.34	$11.52
Tanzania, Un. Rep.	$0.31	$0.44	$1.69	$2.64	$3.09	$6.26	$9.56
Senegal	$0.35	$0.35	$2.25	$3.49	$3.82	$7.94	$9.33
Kenya	$0.38	$0.38	$3.36	$3.98	$4.20	$4.38	$8.03
Ethiopia	$0.74	$0.74	$0.74	$3.02	$3.26	$3.36	$7.94
Ghana	$0.20	$0.20	$1.17	$1.17	$2.47	$2.65	$6.37
Mauritania*	$0.00	$0.27	$0.27	$4.72	$6.13	$6.13	$6.13
Mozambique	$0.00	$0.55	$0.55	$0.55	$2.59	$3.39	$4.89
Sierra Leone	$0.00	$0.00	$1.60	$1.60	$1.60	$3.40	$3.40
Nigeria	$0.00	$0.27	$0.27	$1.46	$1.82	$1.82	$2.62
Congo, Dem. Rep.	$0.00	$0.41	$0.91	$1.03	$1.24	$1.61	$1.61

Source: See Annex 1 for detailed source information on funding data and population at risk estimates.

*Notes: *Population-at-risk estimates are based on Malaria Atlas Project estimates applied to UN Population Division total population figures for 2008. However, WHO estimates of populations-at-risk (as published in the WHO World Malaria Report 2009) differ significantly from these estimates for Rwanda and Mauritania. If WHO estimates for these two countries were used in the table above, the 2009 figures for Rwanda and Mauritania would be $17.40 and $8.35, respectively. As funding is over seven years, the annual funding per-person-at-risk varied from $0.23 (DR Congo) to $4.40 (Rwanda, see above). And, as seen in Figure 5.3, the large funding increase in Rwanda occurred very recently—in 2008 and 2009.*

Figure 5.3.

Annual funding commitments per-person-at-risk by Global Fund, World Bank, and US-PMI, 12 countries, current US$, 2003–2009.

Major year-to-year variability exists in funding committed to malaria control across these 12 countries

Source: See Annex 1 for detailed source information on funding data and population-at-risk estimates.

*Notes: **Population-at-risk estimates are based on Malaria Atlas Project estimates applied to UN Population Division total population figures for 2008. However, WHO estimates of populations-at-risk (as published in the WHO World Malaria Report 2009) differ significantly from these estimates for Rwanda and Mauritania, which results in much lower annual funding commitments per-person-at-risk when using those estimates.*

Figure 5.4.

Distribution of total country Global Fund grant expenditures by programme area activity, 12 countries, 2008.

Global Fund grant expenditures for prevention (39%) and treatment (37%) predominated in 2008 and were similar across the 12 countries.
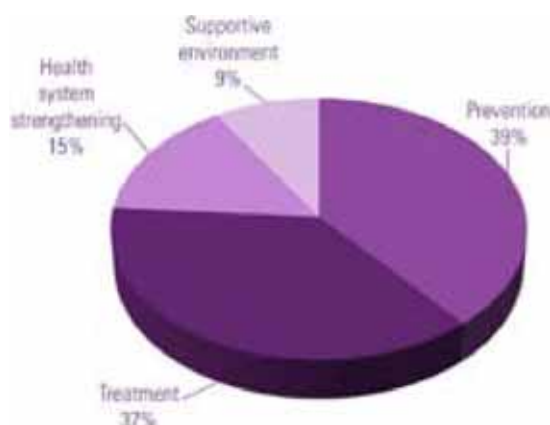
More than three-quarters of prevention spending was on insecticide-treated nets in 2008.
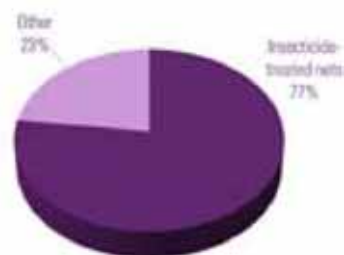
In treatment spending in 2008, there was a 90%–10% split between medicines and diagnostics.
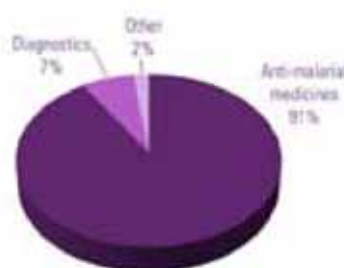
Source: GFATM Enhanced Financial Reporting (EFR) database, 2009

Notes: Supportive environment includes programme management, partnership development, monitoring drug and insecticide resistance and other relevant activities. Health systems strengthening includes human resources, procurement and supply chain management, community systems, information systems, monitoring and evaluation, or other relevant activities. Treatment includes antimalarial medicines for treatment, diagnostics, and other relevant activities. Prevention includes ITNs, other vector control, prevention during pregnancy, behaviour change communication, and other relevant activities.

Twelve countries—
Funding, coverage and impact assessment

This section assesses the links between changes in expenditures to procure key malaria-control commodities using resources from Global Fund, World Bank, and US-PMI from 2005 through 2008 with changes in coverage of interventions purchased with these funds and an estimated impact on the malaria burden based on these programme results. Specifically, the following analysis focuses on funding for the four RBM-recommended prevention and treatment interventions: ITNs, IRS, antimalarial medicines and diagnostics, and IPTp.

Data for this assessment were made available by each of these funding organizations based on expenditure information maintained in their databases, which have generally been reported to them by countries or implementing agencies. Importantly, such data are often collected and reported differently across different organizations, which leads to challenges in pooling data to report on combined funding expenditures toward key malaria-control interventions. For example, organizations may define categories of expenditures differently and/or include different costs in each of these categories. There are also often expenditures that support the scale-up of multiple interventions, such as broader health systems strengthening initiatives or monitoring and evaluation activities, and these funds may be apportioned to expenditure categories differently or may be consolidated into an "other" category that is not easily disaggregated by programme activity area. These issues are further detailed in the Technical Notes at the end of this report (Annex 1).

To harmonize these data to the extent possible for this report, expenditures data refer only to spending on commodity procurement (such as ITNs, antimalarial medicines, diagnostics, etc.) and related shipping and other fees, unless otherwise noted (Box 3). These expenditures do not typically include costs associated with scaling up intervention coverage, such as spending on in-country distribution, technical assistance, programme administration, behaviour change and communication programmes, monitoring and evaluation activities, or other activities. Therefore, expenditure data presented here do not reflect the total intervention expenditures by these organizations for the given year and country; however, the categories are consistent across the countries for each of the funding organizations.

Finally, and as mentioned in the previous section, this report includes expenditures during the period 2005 through 2008 using resources from Global Fund, US-PMI, and World Bank. While Global Fund has financed malaria-control activities in these 12 countries since 2003 (although for different funding amounts and for different periods of time), US-PMI and World Bank have become active in many of these countries only recently. For example, US-PMI began its activities in Ethiopia, Ghana, Kenya, and Zambia in 2008 and Mozambique, Rwanda, and Senegal in 2007. Similarly, World Bank began its programmes in Ghana, Kenya, Sierra Leone, and the United Republic of Tanzania in 2007. Given the time lag between funding commitments, disbursements, and expenditures, funding available from these organizations may not have been spent by end-2008, and would therefore not be included in this assessment.

Prevention

Insecticide-Treated Mosquito Nets

A close link was observed between disbursements and expenditures to purchase ITNs, distribution of these nets and resulting coverage gains. Among the 12 countries, 11 countries (with the exception of Mozambique) had ITN expenditure data from Global Fund, World Bank, or US-PMI for the period 2005–2008. These countries were analyzed in groups according to their coverage gains between a baseline survey (generally 2003–2005) and a more recent survey (2007–2009), and were categorized as follows:

- **high-performers** *with at least a 40 percentage point gain between the two surveys;*
- **middle-performers** *with a 14–32 percentage point gain; and*
- **low-performers** *with less than an 11 percentage point gain.*

Based on this definition, there were five high-performing countries (Ethiopia, Kenya, Rwanda, Senegal, and Zambia), three middle-performing countries (Ghana, the United Republic of Tanzania, and Sierra Leone), and three low-performers (Democratic Republic of Congo, Mauritania, and Nigeria).

Figure 5.5 shows the patterns of ITN procurement for each of these countries. This spending was not steady over this period from 2005–2008 but, as expected, generally spiked prior to planned mass national distribution campaigns. Household ownership of ITNs subsequently increased after these activities. Importantly, these figures show that in each country there has been a very short time lag between the purchase, distribution, and use of nets by the population – often occurring within one year. For example, in Ethiopia, spending on ITN procurement jumped from $0.19 per person at malaria risk in 2005 to $1.13 in 2006 prior to its planned major distribution campaigns in 2006–2007. Survey data from 2007 then showed that as a direct result of these efforts more than half of households owned at least one ITN at the national level – rising to 66 percent of households in at-risk areas. A similar pattern may be seen among the high-performing countries, and to some extent among the middle-performers.

Furthermore, among high-performing countries, total expenditures on ITN procurement between the baseline and follow-up surveys was between $1.22 and $1.94 per person at risk of malaria.[*] Middle-performing countries spent between $0.45 and $0.69 per person at malaria risk on ITN procurement, while low-performing countries spent between $0.05 and $0.13 (Table 5.5). Indeed, these results confirm the close relationship between ITN procurement spending and coverage gains (Figure 5.6). Based on this observed relationship, it is further estimated that most countries would have needed to spend between $2 and $3 per person at risk on ITN procurement in order to initially achieve the target of 80 percent coverage of households with at least one ITN (Table 5.6).

*Rwanda is an exception as it had higher spending levels than the other countries; however the majority of this spending occurred in the most recent two years and the benefits of that may not have been seen from the existing surveys.

Box 3: Defining expenditure categories

Below is a brief description of the expenditure categories used in this report. Data are reported in US dollars and by calendar year. Further information on these categories, data sources, and other methodological issues is available in Annex 1.

ITNs. Includes only spending to procure long-lasting insecticidal nets for US-PMI and World Bank along with shipping fees and other related charges. Global Fund, however, reports expenditures data for the broader category of "health products and equipment," which includes spending to procure ITNs, diagnostics, and IRS materials. Prior to 2008, it was not possible to further disaggregate this category. However, 2008 data for these 12 countries show that most spending among these "health products" went to ITNs (in 2008, more than three quarters of prevention spending was for ITNs with the remainder split among other prevention measures, such as IRS materials). In addition, given the major ITN distribution campaigns that took place in many of the 12 countries around 2006–2007, it is expected that at least the same or an even greater proportion of prevention spending had been used to purchase ITNs in previous years. We have therefore included expenditures data for "health products and equipment" in this ITN category without adjustments.

IRS. Includes data from 2006–2008 for US-PMI for expenditures related to the total cost of IRS programmes including materials, spray operations, local labor costs, in-country administration, and technical assistance. World Bank and Global Fund data are for the year 2008 only and include only IRS commodity procurement costs.

Antimalarial medicines. Includes only spending to procure ACT for US-PMI and World Bank, along with shipping fees and other related costs. Global Fund does not disaggregate their "pharmaceutical" category by drug type, although the vast majority of such spending is also to purchase ACT.

Diagnostics. Includes spending on RDTs and lab equipment (such as microscopes) procurement for Global Fund and US-PMI, and only RDT procurement for World Bank (along with shipping fees and other related costs). Global Fund data are only for the year 2008.

IPT. Includes only spending to procure *sulfadoxine-pyrimethamine (SP)* tablets and related costs for US-PMI, World Bank, and Global Fund. Global Fund data on SP tablet procurement are only available for the year 2008.

MALARIA FUNDING AND RESOURCE UTILIZATION: THE FIRST DECADE OF ROLL BACK MALARIA | RBM PROGRESS & IMPACT SERIES

Figure 5.5

Annual expenditures per-capita-at-risk on ITN procurement using GFATM, US-PMI and World Bank funds, 11 countries, current US$, 2005–2008; proportion of households owing at least one ITN.

Close timing links existed between increasing funding availability, ITN procurement spending, ITN distribution campaigns and ITN coverage increases.

■ Household ITN availability

— Annual ITN procurement expenditures per person at risk (current US$)

⇩ Indicates known ITN distribution campaigns

1. High-performing countries

Ethiopia

Kenya

Rwanda*

Senegal

Zambia
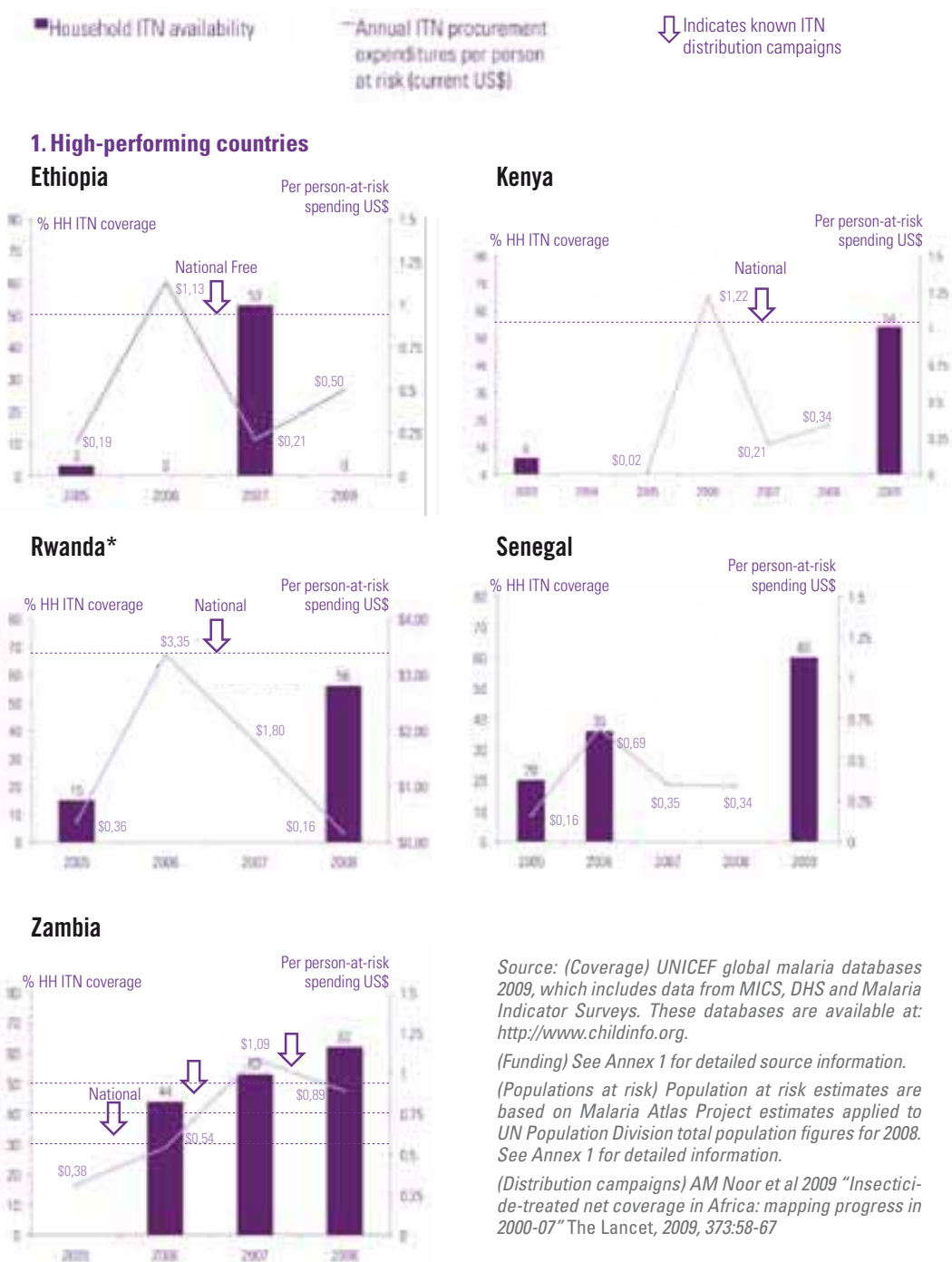
Source: (Coverage) UNICEF global malaria databases 2009, which includes data from MICS, DHS and Malaria Indicator Surveys. These databases are available at: http://www.childinfo.org.

(Funding) See Annex 1 for detailed source information.

(Populations at risk) Population at risk estimates are based on Malaria Atlas Project estimates applied to UN Population Division total population figures for 2008. See Annex 1 for detailed information.

(Distribution campaigns) AM Noor et al 2009 "Insecticide-treated net coverage in Africa: mapping progress in 2000-07" The Lancet*, 2009, 373:58-67*

2. Middle-performing countries
Ghana

Sierra Leone

United Republic of Tanzania

3. Low-performing countries
Democratic Republic of the Congo
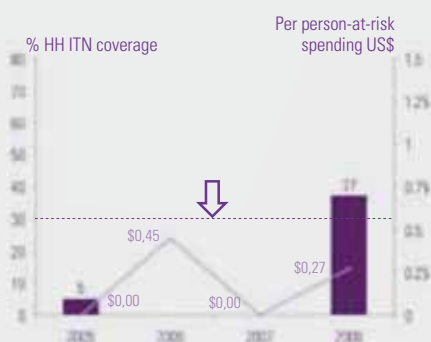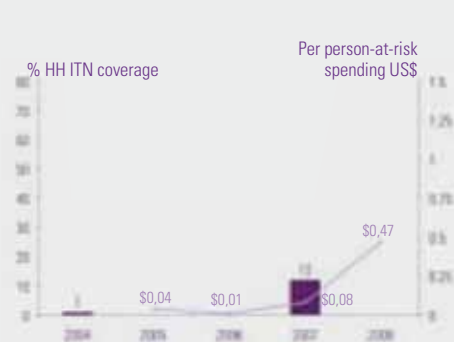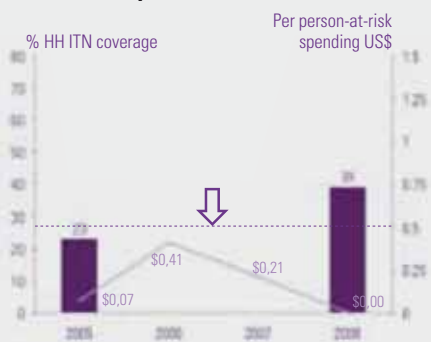
Mauritania*

Nigeria

⬇ Indicates known ITN distribution campaigns

■ Household ITN availability

— Annual ITN procurement expenditures per person at risk (current US$)
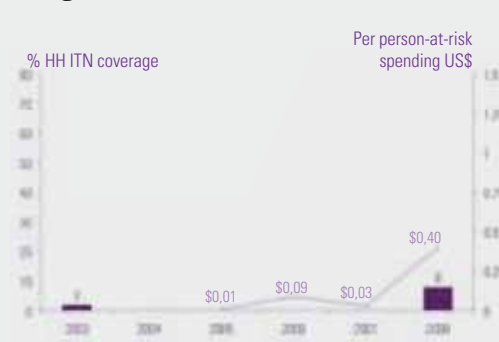
Notes: Expenditures data for 2005 are based on Global Fund estimates of cumulative expenditures for 2003–2005, which was split evenly across the period to derive an annual estimate for the year 2005.

ITN expenditures data for Mozambique was not available, and this country is therefore not included in this analysis.

See Annex 1 for detailed definition of ITN expenditures category. These data generally include only expenditures on commodity procurement, fees for shipment to port and other insurance and related charges. Spending on other related activities needed to increase ITN coverage, such as in-country distribution and health systems strengthening activities, are not included in these estimates. Expenditures data presented here, therefore, do not reflect total expenditures by these organizations for the given year and country. Global Fund ITN expenditures are estimated based on the reported category of "health equipment and products" which includes spending on ITNs, other vector control methods and diagnostics. However, the vast majority of spending for this category is on ITNs.

*Population at risk estimates is based on Malaria Atlas Project estimates applied to UN Population Division total population figures for 2008. However, WHO estimates of populations-at-risk (as published in the WHO World Malaria Report 2009) differ significantly from these estimates for Rwanda and Mauritania. If WHO estimates for these two countries were used in the figures above, Rwanda's ITN spending for 2005–2008 would be $0.21, $1.90, $1.02 and $0.09, respectively, and Mauritania's ITN spending for 2005-2008 would be $0.05, $0.02, $0.11 and $0.64, respectively.

Table 5.5.

Total ITN procurement expenditures per-person-at-risk between baseline and follow-up surveys, 11 countries, 2005–2008.

Countries spent different amounts on ITN procurement and achieved different coverage gains; spending was highly correlated with coverage gains.

Country	% households owning at least one ITN (baseline survey)	% households owning at least one ITN (follow-up survey)	Percentage point change	Total spending on ITN procurement per-person-at-risk between baseline and follow-up surveys (current US$)
High-performing countries				
Ethiopia	3 *(2005)*	53 *(2007)*	50	$1.32 *(2005–2006)*
Kenya	6 *(2003)*	54 *(2008–2009)*	48	$1.79 *(2005–2008)*
Zambia	14 *(2001–2002)*	62 *(2008)*	48	$1.94 *(2005–2007)*
Rwanda*	15 *(2005)*	56 *(2007–2008)*	41	$5.51 *(2005–2007)*
Senegal	20 *(2005)*	60 *(2008–2009)*	40	$1.22 *(2005–2008)*
Middle-performing countries				
Sierra Leone	5 *(2005)*	37 *(2008)*	32	$0.45 *(2005–2007)*
Tanzania, Un. Rep.	23 *(2004–2005)*	39 *(2007–2008)*	16	$0.69 *(2005–2007)*
Ghana	19 *(2006)*	33 *(2008)*	14	$0.64 *(2006–2007)*
Low-performing countries				
Mauritania*	1 *(2004)*	12 *(2007)*	11	$0.05 *(2005–2006)*
Congo, Dem. Rep.	2 *(2001 estimate)*	9 *(2007)*	7	$0.10 *(2005–2006)*
Nigeria	2 *(2003)*	8 *(2008)*	6	$0.13 *(2005–2007)*

Source: See detailed source information for funding data and population-at-risk estimates.

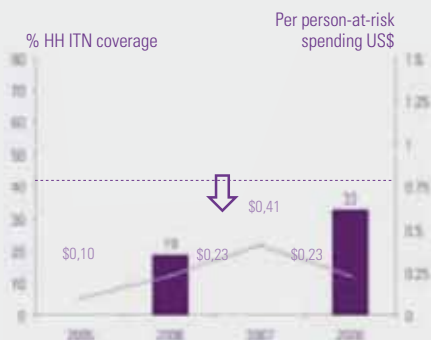*Notes: *Population-at-risk estimates are based on Malaria Atlas Project estimates applied to UN Population Division total population figures for 2008. However, WHO estimates of populations-at-risk (as published in the WHO World Malaria Report 2009) differ significantly from these estimates for Rwanda and Mauritania. If WHO estimates for these two countries were used in the table above, the total expenditures figure for Rwanda and Mauritania would be $3.13 and $0.07, respectively. Mozambique was not included in this assessment since ITN procurement expenditures data were not available.*

Figure 5.6.

Total ITN procurement expenditures per-person-at-risk between baseline and follow-up surveys and percentage point gain in coverage between these surveys, 9 countries.

A close relationship exists between procurement spending for ITNs and coverage gains for ITNs.
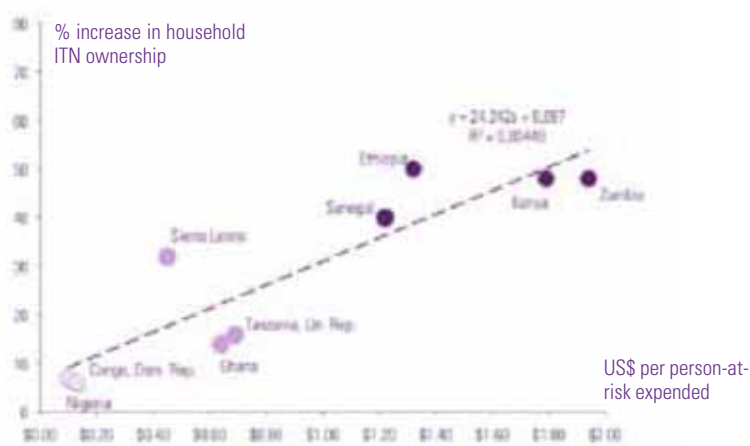
Notes: Rwanda and Mauritania were not included in regression analysis due to variability in estimates of population-at-risk and its impact on ITN procurement spending per-capita-at-risk.

Table 5.6.

Estimated additional ITN procurement expenditures per-person-at-risk needed to achieve 80 percent coverage, nine countries.

Countries need to spend between approximately $1.80 to $2.60 per-capita-at-risk to achieve 80% household coverage of at least one ITN per household from their baseline coverage. Additional total spending required for each of the countries to reach 80 percent coverage depends on current coverage (Zambia needs to spend $0.47 per-person-at-risk; Nigeria needs to spend $2.69 per-person-at-risk).*

Country	% households owning at least one ITN (baseline survey)	% house-holds owning at least one ITN (follow up survey)	% point change	Total expenditures on ITN procurement per person at risk between baseline and follow-up surveys (current US$)	RBM target	% point change needed to reach RBM target	Additional spending on ITN procurement per person at risk needed to achieve 80% coverage	Total spending on ITN procurement per person at risk needed from baseline survey to reach 80% coverage
High performing countries								
Ethiopia	3 (2005)	53 (2007)	50	$1.32 (2005-2006)	80	27	$0.84	$2.16
Kenya	6 (2003)	54 (2008-09)	48	$1.79 (2005-2008)	80	26	$0.80	$2.59
Zambia	14 (2001-02)	62 (2008)	48	$1.94 (2005-2007)	80	18	$0.47	$2.41
Rwanda**	15 (2005)	56 (2007-08)	41	$5.51 (2005-2007)	80	24	-	-
Senegal	20 (2005)	60 (2008-09)	40	$1.22 (2005-2008)	80	20	$0.55	$1.77
Middle performing countries								
Sierra Leone	5 (2005)	37 (2008)	32	$0.45 (2005-2007)	80	43	$1.50	$1.95
Tanzania, Un. Rep.	23 (2004-05)	39 (2007-08)	16	$0.69 (2005-2007)	80	41	$1.42	$2.11
Ghana	19 (2006)	33 (2008)	14	$0.64 (2006-2007)	80	47	$1.66	$2.30
Low performing countries								
Mauritania**	1 (2004)	12 (2007)	11	$0.05 (2005-2006)	80	68	-	-
Congo, Dem. Rep.	2 (2001 estimate)	9 (2007)	7	$0.10 (2005-2006)	80	71	$2.65	$2.75
Nigeria	2 (2003)	8 (2008)	6	$0.13 (2005-2007)	80	72	$2.69	$2.82

Notes: Estimates of additional spending needed to achieve 80% coverage are predicted based on a linear regression model of the observed relationship between ITN procurement spending per capita at risk between the baseline and follow-up surveys and the resulting percentage point coverage gains in households owning at least one ITN (see Figure 5.6).

* Note that the estimates of additional spending required to reach 80% coverage are estimates for that initial coverage achievement and ongoing costs to maintain that coverage are not included here. In addition, this should be considered a first step in coverage as malaria programmes are strongly encouraged to seek ITN ownership and use for all persons sleeping in houses.

**Rwanda and Mauritania are not included in regression analysis due to variability in estimates of population-at-risk and the resulting impact on ITN procurement spending per person at risk.

Indoor Residual Spraying

National programme records provide the most useful data for monitoring IRS coverage since this intervention is often targeted to sub-national areas. Table 5.7 summarizes the IRS activities between 2006 and 2008 in eight countries that received US-PMI funding support for this intervention; more than 3.7 million houses were sprayed and more than 35 million person-years of protection were provided during 2006-2008. US-PMI support for IRS activities in 8 of the 12 assessment countries (Ethiopia, Ghana, Kenya, Mozambique, Rwanda, Senegal, United Republic of Tanzania [mainland and Zanzibar] and Zambia) totalled more than $40 million during 2006–2008.

The World Bank has supported IRS programmes in three of these countries (Ethiopia, Nigeria, and Zambia) with expenditures on IRS activities totalling $7 million during this same time period. In 2008, the Global Fund grants supported IRS in 3 of the 12 countries (Mauritania, Mozambique, and Zambia), totalling $3.5 million. Overall, 10 of the 12 countries received support for their IRS programmes, and in some countries (e.g., Ethiopia; see *World Malaria Report 2009*, WHO) the composite support from multiple sources provided protection to a substantial portion of the at risk population.

Table 5.7.

Total number of houses sprayed and people protected by IRS programmes supported by the US-PMI, 8 countries, 2006–2008.

More than 35 million person-years of protection were provided by IRS programmes in 2006–2008 through one support mechanism. Additional funding from the World Bank, the Global Fund and other resources provided additional household coverage and protection.

Country	Number of structures sprayed (thousands) 2006	Number of people protected (thousands) 2006	Number of structures sprayed (thousands) 2007	Number of people protected (thousands) 2007	Number of structures sprayed (thousands) 2008	Number of people protected (thousands) 2008	Number of structures sprayed (thousands) 2006-2008	Number of person-years protected (thousands) 2006-2008
Ethiopia	-	-	-	3 890	317	5 922	317	9 812
Ghana	-	-	-	-	254	602	254	602
Kenya	-	-	-	3 459	207	3 062	207	6 521
Mozambique	-	-	587	2 594	413	1 457	999	4 051
Rwanda	-	-	162	721	190	886	352	1 607
Senegal	-	-	76	679	154	645	230	1 324
Tanzania (Mainland)	-	1 018	35	160	126	449	161	1 626
Tanzania (Zanzibar)	204	-	204	1 120	201	1 120	609	2 241
Zambia	-	-	-	3 600	605	4 200	605	7 800
Total (in thousands)	204	1 018	1 064	16 223	2 467	18 343	3 734	35 584
Total funding (2006-2008):				$40.5 million				
Total funding per person protected (2006-2008):				$1.14 per person protected				

Source: US-PMI Annual Report 2009.

Case Management of Malaria

Diagnostics

Wide-scale implementation of diagnostics can support the rational use of antimalarial medicines, and is a critical aspect of treatment programmes. However, to date, survey data are largely unavailable to monitor the use of diagnostics to better target treatment to only those febrile patients with a positive malaria test. Questions on the use of diagnostics for malaria testing have been developed for inclusion in future surveys, and new information will become available in the coming years. At present national survey data have only been collected in one survey (Zambia Malaria Indicator Survey 2008), indicating that 11 percent of Zambian children with reported fever received a finger or heel prick for malaria testing.

Strengthened efforts to purchase, distribute, and train for the use of diagnostics in malaria-endemic countries are now under way in response to global recommendations for parasite confirmation of suspected malaria cases.[17] In 2008 alone, $3.4 million was spent by GFATM, US-PMI, and World Bank to purchase diagnostics across these 12 countries. Much greater spending on diagnostics based on committed funds from these organizations is expected in the coming years.

Treatment

In recent years, Africa has gone through a major transition in terms of malaria treatment activities. Since 2003, countries have rapidly shifted their national drug policies to promote ACT, which is a more effective—but more expensive—treatment course. At the same time, global procurement of these medicines has sharply increased

since 2005. And even more recently, countries have started investing in diagnostics in order to better target malaria treatment to those with a positive malaria diagnosis. These actions taken together, along with strengthening distribution systems, suggest that many countries will improve coverage with prompt and effective treatment in the coming years.

At present, only 3 of the 12 countries included in this assessment (Ghana, the United Republic of Tanzania, and Zambia) have survey data that show trends in coverage with ACT, which is their first-line treatment for uncomplicated malaria and is the treatment course now largely procured with funding received from GFATM, US-PMI, and World Bank.

Figure 5.7 shows that Ghana and the United Republic of Tanzania made major gains in effective treatment coverage with ACT and in a short period of time. Zambia data shows higher ACT coverage rates early, but these have been stable more recently; this may reflect increasing use of diagnostics such that fewer febrile children are treated with ACT because many do not have malaria, but the rate is judged against febrile children. During this time, treatment with less effective medicines (e.g., chloroquine [CQ]) has declined or remained at low levels in these countries. It is expected that other African countries that have recently invested in expanding ACT coverage will show similar results in their next surveys, although interpreting trends in treatment coverage is challenging and will become more difficult in the future as countries expand the use of malaria diagnostics (see Annex 1 for more detailed discussion).

Figure 5.7.

Proportion of febrile children under five years of age receiving antimalarial medicines by type (ACT or CQ) in the previous two weeks; and average annual expenditures per capita at risk on antimalarial procurement using funds from GFATM, US-PMI, and World Bank (current US$); Ghana, the United Republic of Tanzania, and Zambia, 2005–2008.

Although data show progress in ACT coverage in Ghana, the United Republic of Tanzania, and Zambia, spending to procure these drugs is still too low and too variable from year to year.

Ghana

United Republic of Tanzania
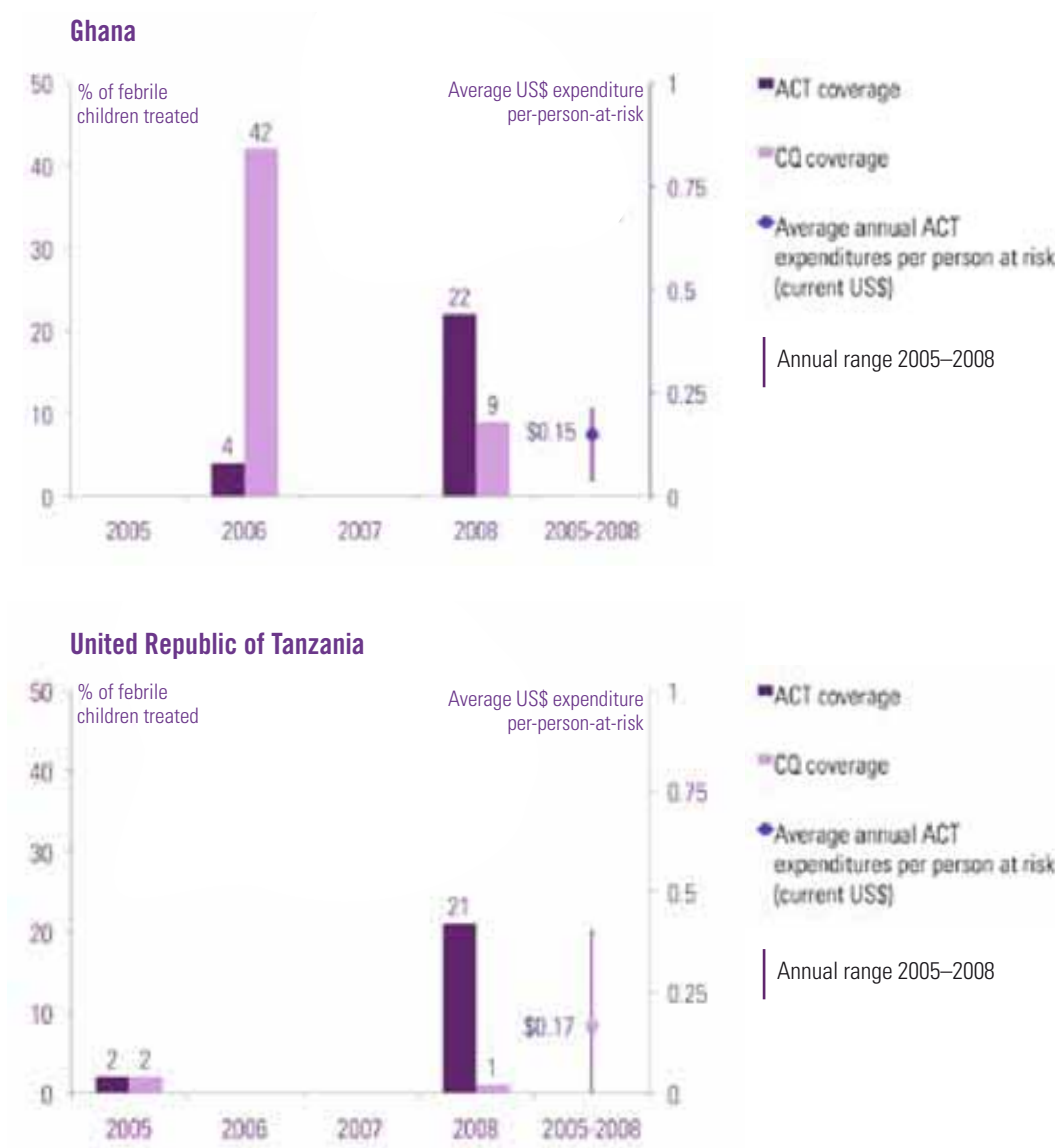
Zambia
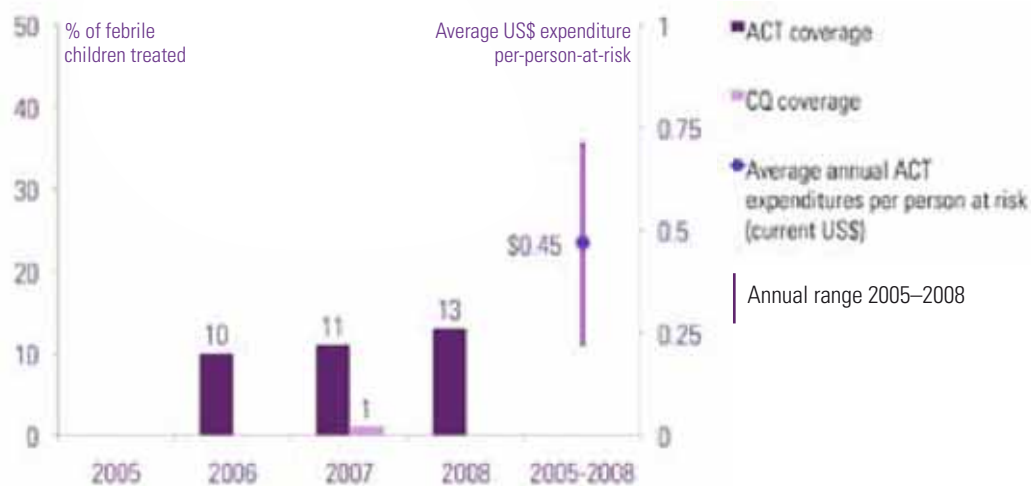
Source: (Coverage) UNICEF global malaria databases 2009, which include data from MICS, DHS, and Malaria Indicator Surveys. These databases are available at: http://www.childinfo.org; (Funding) See Technical Annex for detailed source information.

(Populations at risk) Population at risk estimates are based on Malaria Atlas Project estimates applied to UN Population Division total population figures for 2008. See Technical Annex for detailed information.

Notes: Expenditures data for 2005 are based on Global Fund estimates of cumulative expenditures for 2003–2005, which was split evenly across the period to derive an annual estimate for the year 2005. See Annex 1. for a detailed explanation of the antimalarial expenditures category. These data generally include only expenditures on commodity procurement, fees for shipment to port, and other insurance and related charges. Spending on other related activities needed to increase antimalarial treatment coverage, such as in-country distribution and health systems strengthening activities, are not included in these estimates. Expenditures data presented here, therefore, do not reflect total expenditures by these organizations for the given year and country.

Figure 5.8 shows that across the 12 countries spending on ACT procurement is often too low and too variable from year to year in many of these countries. For example, the United Republic of Tanzania, a country that made some major progress in ACT coverage between 2005 and 2008, showed highly variable spending on ACTs during this time period—jumping from $0.07 per person at risk of malaria in 2005 to $0.40 in 2006, declining to $0.22 in 2007 and $0.00 in 2008. While ACT coverage increased from 2 percent in 2005 to 21 percent in 2008, it is not clear based on funding data the extent to which these gains may be sustained in the coming years. Similar treatment spending patterns but lower levels of spending are occurring across many of the other countries included in this assessment; however, the trends in coverage data were not available from the national survey reports.

Table 5.8.

Annual ACT procurement expenditures per person at risk using Global Fund, US-PMI, and World Bank resources, 12 countries, 2005–2008.

ACT procurement spending is often too low and too variable from year to year.

Country	Annual expenditures on ACT procurement per person at risk using funds from GFATM. US-PMI and World Bank				Average spending on ACT procurement
	2005	2006	2007	2008	2005-2008
Rwanda *	$0.08	$1.23	$0.77	$0.12	$0.55
Zambia	$0.21	$0.44	$0.47	$0.67	$0.45
Kenya	$0.00	$0.57	$0.06	$0.33	$0.24
Tanzania, Un. Rep.	$0.07	$0.40	$0.21	$0.00	$0.17
Ghana	$0.04	$0.16	$0.21	$0.17	$0.15
Ethiopia	$0.07	$0.34	$0.09	$0.05	$0.14
Mauritania *	$0.01	$0.00	$0.01	$0.30	$0.08
Senegal	$0.13	$0.20	$0.00	$0.00	$0.08
Sierra Leone	$0.00	$0.18	$0.00	$0.15	$0.08
Mozambique	$0.00	$0.00	$0.00	$0.26	$0.07
Nigeria	$0.01	$0.06	$0.02	$0.04	$0.03
Congo, Dem. Rep.	$0.01	$0.01	$0.01	$0.05	$0.02

Source: See detailed source information for Figure 5.7.

*Notes: *Expenditures data for 2005 are based on Global Fund estimates of cumulative expenditures for 2003–2005, which were split evenly across the period to derive an annual estimate for the year 2005. Population-at-risk estimates are based on Malaria Atlas Project estimates applied to UN Population Division total population figures for 2008. However, WHO estimates of populations-at-risk (as published in the WHO World Malaria Report 2009) differ significantly from these estimates for Rwanda and Mauritania. If WHO estimates for these two countries were used in the figure above, average annual spending on ACT procurement for Rwanda and Mauritania would be $0.31 and $0.11, respectively.*

Figure 5.8.

Proportion of last births where the mother received IPTp (two or more doses of SP) through antenatal care during pregnancy, 10 of 12 assessment countries with data, 2003–2009.

Some countries showing major gains in IPTp coverage.
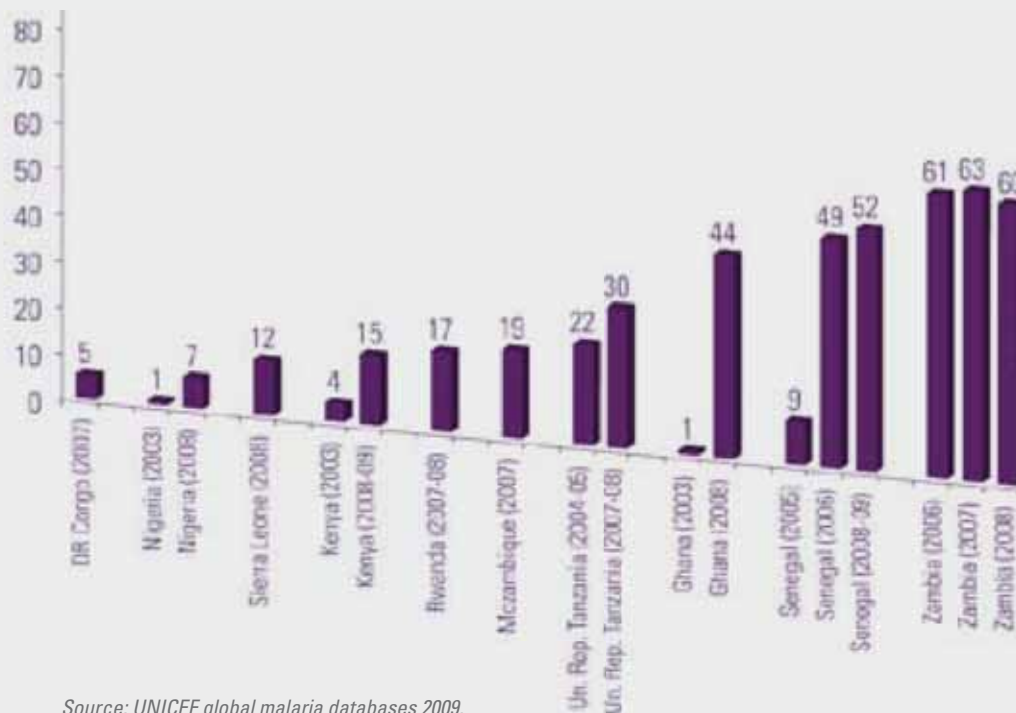
Source: UNICEF global malaria databases 2009.

Malaria During Pregnancy

Intermittent preventive treatment during pregnancy (IPTp) is a critical measure to prevent malaria among pregnant women in endemic areas, and should be coupled with regular use of ITNs throughout the pregnancy. The treatment consists of at least two doses of sulfadoxine-pyrimethamine (SP) during the second and third trimesters of pregnancy received through routine antenatal care visits.

IPTp is a relatively inexpensive activity given the low cost of purchasing SP tablets, and the ability to nest this intervention within ongoing routine care provided during antenatal care visits. In 2008 alone, $1.4 million was spent on these activities in 3 of these 12 countries (Ghana, Mauritania, and Zambia) using Global Fund resources. No spending was reported for 2008 in other countries receiving Global Fund resources, or in countries supported by US-PMI and World Bank programmes.

Survey data to monitor coverage of IPTp activities are available for 10 of the 12 assessment countries. These data show that IPTp coverage is low in most countries, with less than 40 percent coverage in 7 of the 10 countries with data. Notably, Ghana and Zambia—two of the countries showing higher coverage (44 percent and 60 percent in 2008, respectively)—also reported spending on malaria during pregnancy activities in 2008 (Figure 5.8).

Impact of Funding and Coverage Gains

*Note that the estimates of additional spending required to reach 80% coverage are estimates for that initial coverage achievement and ongoing costs to maintain that coverage are not included here. In addition, this should be considered a first step in coverage as malaria programmes are strongly encouraged to seek ITN ownership and use for all persons sleeping in houses.

Significant challenges exist in measuring the impact of malaria-control programmes in many malaria-endemic countries that have weak disease surveillance systems. While further investments are needed to strengthen health information and vital registration systems in these countries, data derived from these sources do suggest major declines in the malaria burden in a number of areas.

Model-based estimates provide a crude indication of the number of potential deaths averted at the national level, and may be used alongside other data sources to provide an overall indication of the mortality impact of programmes. This model, known as the Lives Saved Tool (LiST model), links coverage of key child survival interventions with empirical evidence of the effect of these interventions on preventing deaths in children under age five.[18,19] The model also incorporates current demographic projections and country-specific cause of death profiles for children under age five into its predictions.

These estimates suggest that scaling up ITN and IPTp interventions between 2000 and 2009 in these 12 countries may have potentially averted more than 380,000 malaria deaths among children—with more than three-quarters of these deaths averted in the last four years (Table 5.9 and Figure 5.9). These results coincide with increases in global commitments toward malaria control —with more than 80 percent of funding committed between 2003 and 2009 made available in just the past four years (Figure 5.10).

Modeled estimates further suggest that if these 12 countries scaled up malaria prevention coverage to 80 percent by end-2010, ~217 000 additional malaria deaths among children could potentially be averted in the following year alone (Table 5.10). As highlighted in Table 5.6, most countries would need to spend between $2 and $3 per person at risk on ITN procurement in order to achieve this target*. And despite the major increases in ITN coverage in recent years, most countries (even high-performing ones) are not spending this amount and are currently falling short of achieving this coverage target.

Table 5.9.

Estimated number of malaria deaths averted in children under age five due to changes in ITN and IPT coverage during 2000–2009, 12 countries.

In these 12 countries, an estimated ~384 000 malaria deaths were averted by scaling up ITNs and IPT since 2000; an estimated ~92 000 deaths were averted in 2009 alone.

Country		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total 2000-2009	Uncertainty Lower bound	Upper bound
Congo Dem. Rep.	ITN	0	311	958	1 646	2 412	3 161	3 936	4 730	5 543	6 386	29 083	21 302	38 878
	IPTp	0	0	13	31	47	82	106	112	137	161	689	438	962
Ethiopia	ITN	0	87	176	255	349	448	3 806	7 279	8 475	9 694	30 569	22 497	42 406
	IPTp													
Ghana	ITN	0	139	269	416	1 107	1 809	2 544	3 536	4 573	5 458	19 851	14 619	26 658
	IPTp	0	0	2	3	29	60	93	126	156	184	653	384	924
Kenya	ITN	0	312	629	1 005	2 344	3 787	5 304	6 885	8 587	10 340	39 193	28 746	52 598
	IPTp	0	5	11	45	79	112	173	236	301	361	1 323	785	1 909
Mauritania	ITN	0	2	6	9	33	58	84	110	137	165	604	446	814
	IPTp													
Mozambique	ITN	0	1 428	2 039	2 674	3 992	5 345	6 701	8 095	9 334	10 616	50 224	37 023	67 350
	IPTp	0	0	0	0	66	140	213	288	366	441	1 514	892	2 126
Nigeria	ITN	0	1 367	2 607	4 060	6 145	8 497	10 741	13 235	15 617	18 010	80 279	59 118	107 922
	IPTp	0	8	25	39	95	194	293	391	475	551	2 071	1 111	2 939
Rwanda	ITN	0	21	44	68	95	121	386	667	784	903	3 089	2 262	4 174
	IPTp	0	0	0	0	0	0	10	21	34	48	113	67	161
Senegal	ITN	0	243	501	767	1 057	1 349	2 566	3 522	4 521	5 186	19 712	14 480	26 508
	IPTp	0	7	15	24	33	43	165	183	205	232	907	538	1 281
Sierra Leone	ITN	0	32	67	98	137	176	747	1 345	1 993	2 303	6 898	5 072	9 245
	IPTp	0	2	4	7	9	12	32	55	86	103	310	184	436
Tanzania Un. Rep.	ITN	0	1 197	2 433	3 728	5 150	6 720	8 399	10 144	11 939	13 839	63 549	46 821	85 344
	IPTp	0	33	73	117	160	203	247	290	342	398	1 863	1 099	2 646
Zambia	ITN	0	523	1 055	1 685	2 326	2 995	3 681	4 519	5 814	6 646	29 244	21 541	39 245
	IPTp	0	19	41	114	194	279	374	408	415	471	2 315	1 354	3 289
12 Countries	ITN	0	5 662	10 784	16 411	25 147	34 466	48 895	64 067	77 317	89 546	372 295	273 927	501 142
	IPTp	0	74	184	380	712	1 125	1 706	2 110	2 517	2 950	11 758	6 852	16 673
Total deaths averted		0	5 736	10 968	16 791	25 859	35 591	50 601	66 177	79 834	92 496	384 053	280 779	517 815

Source: Eisele TP, Larsen D, Steketee RW. Protective efficacy of interventions for preventing malaria mortality in children in Plasmodium falciparum *endemic areas.* Int J Epidemiol. *In press 2010.*

Table 5.10.

Estimated number of malaria deaths in children under five that could be averted in 12 countries if the RBM target of 80 percent or 100 percent ITN and IPTp coverage is achieved by end-2010.

By the end of 2010, nearly 217 000 additional malaria deaths could be averted in these 12 countries if 80 percent coverage for ITNs and IPTp is achieved; this could expand to nearly 300 000 malaria deaths averted with 100 percent coverage.

Country		Estimated number of malaria deaths averted among children under five due to changes in ITN and IPTp coverage, 2000-2009			…Additional malaria deaths that could be averted if 80 per cent coverage is achieved by end-2010			…And if 100% coverage is achieved by end-2010		
		Total	Uncertainty		Total	Uncertainty		Total	Uncertainty	
		2000-2009	Lower bound	Upper bound	2009-2010	Lower bound	Upper bound	2009-2010	Lower bound	Upper bound
Congo Dem. Rep.	ITN	29 083	21 302	38 878	36 926	29 538	45 598	47 759	38 353	58 757
	IPTp	689	438	962	1 394	910	1 805	1 768	1 157	2 283
Ethiopia	ITN	30 569	22 497	42 406	1 794	667	3 375	4 667	3 016	6 885
	IPTp	-	-	-	-	-	-	-	-	-
Ghana	ITN	19 851	14 619	26 658	6 114	4 555	8 137	9 020	6 927	11 700
	IPTp	653	384	924	92	50	138	153	90	216
Kenya	ITN	39 193	28 746	52 598	2 123	890	3 847	5 232	3 436	7 638
	IPTp	1 323	785	1 909	34	14	82	149	63	183
Mauritania	ITN	604	446	814	594	471	747	784	627	980
	IPTp	-	-	-	-	-	-	-	-	-
Mozambique	ITN	50 224	37 023	67 350	7 665	5 472	10 699	12 282	9 203	16 229
	IPTp	1 514	892	2 126	977	559	1 420	1 435	715	1 804
Nigeria	ITN	80 279	59 118	107 922	141 569	114 455	174 907	181 316	147 010	223 394
	IPTp	2 071	1 111	2 939	3 573	2 347	4 596	4 509	2 966	5 972
Rwanda	ITN	3 089	2 262	4 174	161	52	464	445	284	662
	IPTp	113	67	161	62	38	85	87	55	117
Senegal	ITN	19 712	14 480	26 508	1 100	464	1 998	2 717	1 783	3 979
	IPTp	907	538	1 281	80	40	128	148	85	215
Sierra Leone	ITN	6 898	5 072	9 245	2 347	1 729	3 151	3 527	2 696	4 588
	IPTp	310	184	436	418	272	542	536	351	657
Tanzania, Un. Rep.	ITN	63 549	46 821	85 344	9 355	6 489	13 155	15 249	11 317	20 347
	IPTp	1 863	1 099	2 646	359	218	542	515	324	664
Zambia	ITN	29 244	21 541	39 245	518	0	1 451	2 326	1 357	3 658
	IPTp	2 315	1 354	3 289	88	32	161	202	106	309
Total	ITN	372 295	273 927	501 142	210 266	164 782	267 226	285 324	226 009	358 817
	IPTp	11 758	6 852	16 673	7 077	4 480	9 499	9 502	5 912	12 420

Figure 5.9.

Estimated number of malaria deaths averted in children under age five due to changes in ITN and IPT coverage during 2000–2009, 12 countries.

Three quarters of these estimated malaria deaths were averted since 2006.
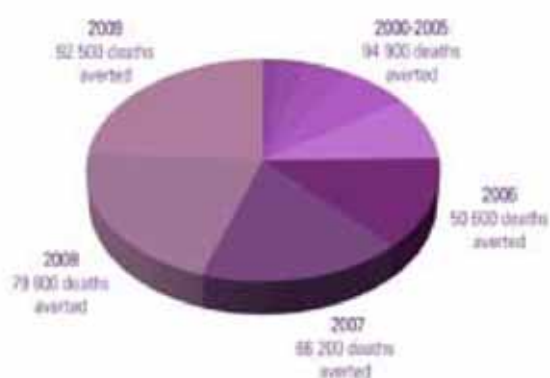
Information from other data sources further substantiates these model predictions. Across the 12 countries included in this assessment, five have conducted and published an in-depth analysis of the impact of their malaria-control programmes on malaria-associated morbidity and mortality based on data from health facilities, household surveys and other sources. These countries are Ethiopia, Ghana, Rwanda, the United Republic of Tanzania (Zanzibar) and Zambia (see Global Fund Five-Year Evaluation[18]).

Table 5.11.

Summary of impact of malaria-control programmes on malaria-associated morbidity and mortality in Ethiopia, Ghana, Rwanda, the United Republic of Tanzania (Zanzibar), and Zambia.

Substantial mortality reductions and a range of morbidity reductions associated with malaria have been recently documented in five countries in the assessment.

Countries	Zanzibar	Rwanda	Ethiopia	Ghana	Zambia
Time period	2000–02 vs. 2005	2001–06 vs. 2007	2001–05 vs. 2007	1999–2003 vs. 2004–08	Surveys in 2001–02, 2006, 2007, 2008
Morbidity					
Out-patient malaria visits in children under 5	⇩73%	⇩58%	⇩85%		⇩33%
Fever rates					
Hospital malaria admissions in children under 5	⇩75%	⇩55%	⇩73%		⇩55%
Blood transfusions	⇩95%				
Parasite prevalence in children under 5	⇩97%		To <1% in all age groups		⇩54%
Child anaemia prevalence (Hb<8gm/dl)	⇩87%		No change		⇩69%
Splenomegaly					
Mortality					
Malaria-specific mortality (not all microscopy confirmed)	⇩71%	⇩67%			⇩66%
All-cause mortality					
Under-5	⇩52%	⇩33%		⇩28%	⇩29%
Infant (0–11mos)	⇩33%	⇩28%		⇩22%	⇩26%
Child (1–4yr)	⇩71%	⇩41%		⇩38%	⇩36%
Case fatality					
Comments					
	Introduced IRS, ACTs in 2004, ITNs in 2006 all to high coverage rates	ITN and ACT scaled up in late 2006	Scaled up ITN distribution in all malarious areas in 2006-2007	Scaled up ITN cover-age with emphasis on rural areas	Scaled up ITNs, IRS, IPTp, and case management

Source: Impact of national malaria-control scale-up programmes in Africa: magnitude and attribution of effects. Report for the Malaria Control and Evaluation Partnership in Africa (MACEPA)/PATH, Seattle, USA citing the following articles: (Zambia): Chizema-Kawesha E, Mukonka V, Mwanza M, Kaliki C, Phiri M, Miller J, Komatsu R, Aregawi M, Masaninga F, Kitikiti S, Babaniyi O, Otten M. Evidence of substantial nationwide reduction of malaria cases and deaths due to scale-up of malaria control activities in Zambia 2001-2008. Impact Evaluation Mission Report, World Health Organization, 19-23 January 2009; (Zanzibar): Bhattarai A, Ali AS, Kachur SP, et al. Impact of artemisinin-based combination therapy and insecticide-treated nets on malaria burden in Zanzibar. PLoS Med 2007; 4: e309; (Rwanda and Ethiopia): Otten M, Aregawi M, Were W, Karema C, Medin A, Bekele W, et al. Initial evidence of reduction of malaria cases and deaths in Rwanda and Ethiopia due to rapid scale-up of malaria prevention and treatment. Malar J 2009; 8: e14.

Table 5.11 summarizes these impressive results, and indicates their association with scaling up key malaria-control interventions in these countries based on increases in recent malaria-control funding. For example, in Zambia, during the period of scaling up multiple malaria-control interventions, malaria-specific mortality declined by 66 percent and all-cause under-five mortality by 29 percent between 2001–2002 and 2008. At the same time, parasite prevalence among children under five was down by 54 percent, and hospital malaria admissions by 55 percent. Similarly in Zanzibar (United Republic of Tanzania), malaria-specific mortality declined by 71 percent and all-cause under-five mortality by 52 percent between 2000–2002 and 2005.

CONCLUSIONS AND FUTURE ISSUES

There has been substantial progress during the last decade with global funding in support of malaria control in endemic countries. The funding need was evident early in the decade but was better defined with the development of the Global Malaria Action Plan (approved in 2008 and describing an annual need of $5–6 billion).

The amount of external funding available has clearly increased dramatically, reaching approximately $1.6 billion in commitments in 2009. These available funds have actually come from many countries and organizations but have largely been channeled through three main sources: the Global Fund, World Bank, and US-PMI. The timely use of this funding is evident as shown in the 12-country assessment in this report. That is, as countries have attracted funding, they have been reasonably efficient and timely in using the resources to provide prevention and treatment commodities and services for their at-risk populations. And, the intervention coverage and best estimates of impact suggest that the funding and subsequent actions are saving a substantial number of lives and reducing the burden of malaria dramatically.

The funding available has not matched the estimated funding need (Figure 6.1 shows a visual demonstration of this gap over the next few years; see also Annex 4). As a consequence, countries that have not been able to attract substantial funding have not achieved serious progress. In the 12-country assessment in this report, several of the countries have not been well funded, and there is clear lack of progress in those situations. That is sobering during a time of recent global financial crises and recent experience with the Global Fund where approved Phase 1 grants (requested for Round 8 and Round 9 HIV, Tuberculosis and Malaria grants) have all had to find 10% reductions in their budgets.

The malaria community is at an important juncture. We are currently looking forward to 2010 and the RBM partners' commitment to supporting scale-up to reach RBM targets of greater than 80% coverage for all the interventions. We have progressed remarkably from a time when the request for resources to support malaria control was made solely on the basis of need—approximately 850 000 deaths a year and 250 million cases each year. The justification today for continued support is based on the proven effective interventions that have been shown to reduce illness and death when delivered through national programmes. For this most recent decade, malaria prevention and control have been among the best investments in global health.

Figure 6.1.

Estimated annual global resource requirements for malaria control and current global malaria commitments from Global Fund, World Bank, and US-PMI.

The Global Malaria Action Plan estimated that between $5.0–$6.2 billion is required per year between 2010 and 2015 to scale up and sustain control and progress toward malaria elimination globally. While there have been substantial increases in funding for malaria control, they continue to fall short of the needs to achieve the global goals.
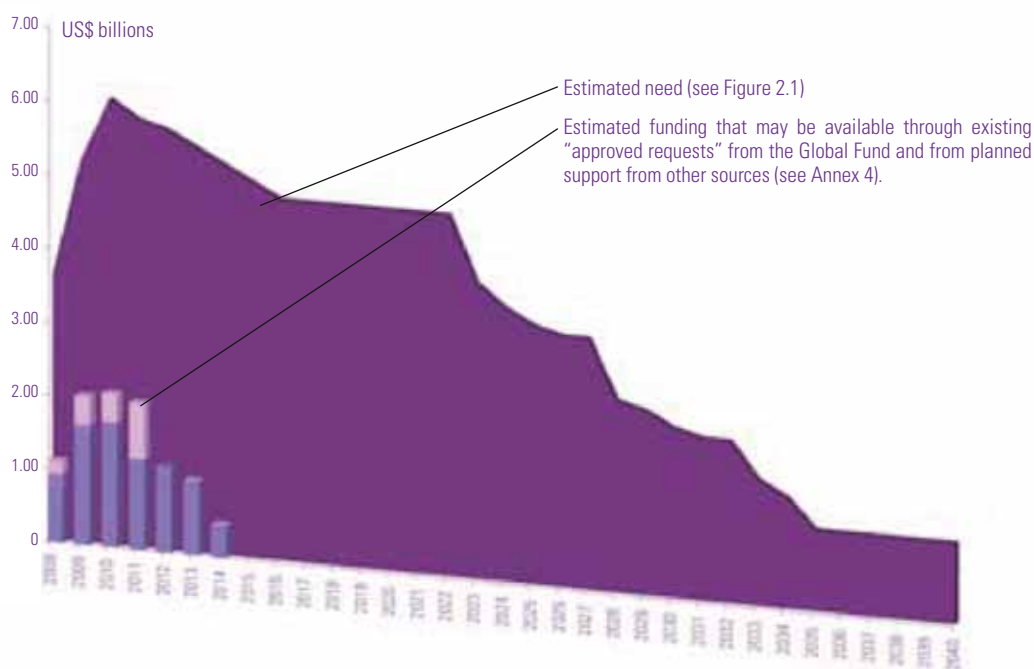
Source: Global Malaria Action Plan (RBM, 2008), Global Fund, World Bank, and US-PMI.

Notes: Current estimated commitments represent approved Global Fund grant requests (not all approved requests are committed funds) and estimates from the US-PMI and World Bank; see Annex 4.

REFERENCES

1. Shepard D, Etling M, Brinkmann U, Sauerborn R. The economic cost of malaria in Africa. *Annals of Tropical Medicine and Parasitology.* 1991;42:199–203.

2. McCarthy FD, Wolf H, Wu Y. Malaria and Growth. Policy Research Working Paper 2303. Washington, DC: World Bank; 2000.

3. Gallup JL, Sachs JD. The economic burden of malaria. *American Journal of Tropical Medicine and Hygiene.* 2001;64(Suppl 1,2):85–96.

4. Sachs J, Malaney P. The economic and social burden of malaria. *Nature.* 2002;415:680–685.

5. Sachs JD. Achieving the Millennium Development Goals—the case of malaria. *New England Journal of Medicine.* 2005;352:115–117.

6. Goodman C, Coleman P, Mills A. *Economic Analysis of Malaria Control in Sub-Saharan Africa.* Geneva: Global Forum for Health Research/World Health Organization (WHO); 2000.

7. Hanson K, Goodman C, Lines J, et al. *The Economics of Malaria Control Interventions.* Geneva: Global Forum for Health Research/WHO; 2004.

8. Ravishankar N, Gubbins P, Cooley RJ, et al. Financing of global health: tracking development assistance for health from 1990 to 2007. *The Lancet.* 2009;373:2113–2124.

9. Institute for Health Metrics and Evaluation (IHME), University of Washington. *Financing Global Health 2009: Tracking Development Assistance for Health.* Seattle; IHME: 2009. Available at: http://www.healthmetricsand-evaluation.org/resources/policyreports/2009/financing_global_health_0709.html.

10. Snow RW, Guerra CA, Mutheu JJ, Hay SI. International funding for malaria control in relation to populations at risk of stable *Plasmodium falciparum* transmission. *PLoS Medicine.* 2008;5(7):e142. doi: 10.1371/journal.pmed.0050142.

11. WHO. *World Malaria Report 2009.* Geneva: WHO; 2009: 57–65. Available at: http://www.who.int/malaria/world_malaria_report_2009/en/index.html.

12. Nabarro D. Roll Back Malaria. *Parassitologia.* 1999;41:501–504.

13. Nahlen BL, Low-Beer D. Building to collective impact: the Global Fund support for measuring reduction in the burden of malaria. *American Journal of Tropical Medicine and Hygiene.* 2007;77(6 Suppl):321–327.

14. The World Bank. *Rolling Back Malaria: The World Bank Global Strategy and Booster Program.* Washington, DC: The World Bank; 2005.

15. Statement by USAID Administrator Andrew Natsios on the President's Initiative on Malaria. Available at: http://www.usaid.gov/press/releases/2005/pr050630.html.

16. Roll Back Malaria. *Global Malaria Action Plan.* Geneva: Roll Back Malaria; 2008. Available at: http://www.rollbackmalaria.org/gmap.

17. Malaria Diagnosis and Treatment page. WHO website. Available at: http://www.who.int/malaria/diagnosis_treatment/en/. Accessed February 3, 2010.

18. MACRO International, Inc. *Global Fund Five-Year Evaluation: Study Area 3; The Impact of Collective Efforts on the Reduction of the Disease Burden of AIDS, Tuberculosis, and Malaria.* Geneva: The Global Fund; 2009: pp. 7-27–7-30. Available at: http://www.theglobal-fund.org/documents/terg/TERG_SA3.pdf.

19. Eisele TP, Larsen D, Steketee RW. Protective efficacy of interventions for preventing malaria mortality in children in *Plasmodium falciparum* endemic areas. *International Journal of Epidemiology.* In press.

Additional relevant background information for this report includes:

Roll Back Malaria (RBM). *The Abuja Declaration and the Plan of Action.* (An extract from The African Summit on Roll Back Malaria.) WHO/CDS/RBM/2003.46. Abuja, Nigeria: World Health Organization/RBM; 2000.

RBM. *Framework for Monitoring Progress and Evaluating Outcomes and Impact.* Geneva: RBM Cabinet Project/World Health Organization; 2000.

RBM. *Roll Back Malaria Global Strategic Plan, 2005–2015.* Geneva: RBM Partnership Secretariat; 2005.

RBM, WHO, UNICEF. *World Malaria Report 2005.* WHO/HTM/MAL/2005.1102. Geneva: WHO; 2005.

The Global Fund to Fight AIDS, Tuberculosis and Malaria (The Global Fund). *Updated Demand Estimate 2008–2010. Mid-Term Review of the Second Voluntary Replenishment 2008–2010.* Caceres, Spain; 30 March – 1 April 2009.

The Global Fund. *Resource Needs: Funding the Global Fight Against HIV/AIDS, Tuberculosis and Malaria. Resource Needs for the Global Fund 2008–2010.* Geneva: The Global Fund; 2007.

UNICEF, RBM, The Global Fund. *Malaria and Children: Progress in Intervention Coverage.* New York: UNICEF; 2009.

UNICEF, RBM. *Malaria and Children: Progress in Intervention Coverage.* New York: UNICEF; 2007.

World Health Organization (WHO). *World Malaria Report 2008.* WHO/HTM/GMP/2008.1. Geneva: WHO; 2008.

WHO. *World Malaria Report 2009.* Geneva: WHO; 2009.

WHO. *The Global Burden of Disease: 2004 Update.* Geneva: WHO; 2008.

WHO, UNICEF. *Africa Malaria Report 2003.* WHO/CDS/MAL 2003.1093. Geneva: WHO; 2003.

Bhattarai A, Ali AS, Kachur SP, et al. Impact of artemisinin-based combination therapy and insecticide-treated nets on malaria burden in Zanzibar. *PLoS Medicine.* 2007;4:e309.

Chizema-Kawesha E, Mukonka V, Mwanza M, et al. Evidence of substantial nationwide reduction of malaria cases and deaths due to scale-up of malaria control activities in Zambia 2001–2008. Impact Evaluation Mission Report, WHO; January 2009.

Ettling M, McFarland DA, Schultz LJ, Chitsulo L. Economic impact of malaria in Malawian households. *Annals of Tropical Medicine and Parasitology.* 1994;45(1):74–79.

Guerra CA, Gikandi PW, Tatem AJ, et al. The limits and intensity of *Plasmodium falciparum* transmission: implications for malaria control and elimination worldwide. *PLoS Medicine.* 2008;5(2):e38.

Hay SI, Guerra CA, Gething PW, et al. A world malaria map: *Plasmodium falciparum* endemicity in 2007. *PLoS Medicine.* 2009;6(3):e1000048. doi:10.1371/ journal.pmed.1000048.

Hay SI, Smith DL, Snow RW. Measuring malaria endemicity from intense to interrupted transmission. *Lancet Infectious Diseases.* 2008;8(6):369–378.

Lengeler C. Insecticide-treated bet nets and curtains for preventing malaria. *Cochrane Database of Systematic Reviews.* 2004;Issue 2:CD000363.

Noor AM, Mutheu JJ, Tatem AJ, Hay SI, Snow RW. Insecticide-treated net coverage in Africa: mapping progress in 2000–07. *The Lancet.* 2009;373:58–67.

Otten M, Aregawi M, Were W, et al. Initial evidence of reduction of malaria cases and deaths in Rwanda and Ethiopia due to rapid scale-up of malaria prevention and treatment. *Malaria Journal.* 2009;8:e14.

Tatem AJ, Noor AM, von Hagen C, di Gregorio A, Hay SI. High resolution population maps for low income nations: combining land cover and census in East Africa. *PLoS One.* 2007;2(12):e1298.

ANNEX I. TECHNICAL NOTES

Data in this report were derived from a range of sources summarized below:

1. Financial data

Funding toward malaria control is generally derived from three main sources: external assistance from donors, national government spending, and household or private spending ("out of pocket"). This report focuses on the first category (external assistance from donors), which, according to the RBM Global Malaria Action Plan accounted for an estimated half of total global spending on malaria in 2007 (RBM 2008).

1a. Financial data—sources of information

Data from the following organizations were reviewed and incorporated in the analyses of this report:

- *OECD DAC databases—The Organization for Economic Cooperation and Development—Development Assistance Committee (OECD-DAC) maintains a series of public-access databases on aid and other resource flows to developing countries based on reporting from bilateral (22 DAC member countries), multilateral, and other international organizations. As of November 2009, information on resource flows toward malaria control from donors and to recipient countries is available for the time period 2003–2008; of note, data prior to 2007 may be incomplete so additional information sources have been sought from the IHME databases (noted below). Data for gross disbursements toward malaria control from all donors and to all recipient countries (in constant prices, 2007 US dollars) for the years 2003–2008 were downloaded using the Query Wizard for International Development Statistics (QWIDS) in November 2009. More information is available at: http://www.oecd.org/document/31/0,3343,en_264 9_34447_41798751_1_1_1_1,00.html.*

- *IHME databases—The Institute for Health Metrics and Evaluation recently published a report, Global Financing for Health 2009, that provides a comprehensive tracking of global funding for health projects, including toward malaria control. More information on this report, as well as data included in its statistical tables, is available at:*

http://www.healthmetricsandevaluation.org/ resources/policyreports/2009/financing_global_ health_0709.html.

- *World Bank Malaria Global Strategy and Booster Program provided data on funding commitments, disbursements, and expenditures for this report based on information regularly maintained to monitor its programmes. World Bank financing for malaria is typically through an IDA credit which is an interest free loan with repayments commencing after 10 years and the loan maturing at 35 or 40 years; an annual service charge of 0.75% applies. More information on World Bank Booster countries and project financing data are available at: http://web.worldbank.org/WBSITE/EXTERNAL/ COUNTRIES/AFRICAEXT/EXTAFRBOOPRO/0,,men uPK:2128629~pagePK:64168427~piPK:64168435~t heSitePK:2128617,00.html.*

- *US-PMI provided data on funding commitments and expenditures for this report based on information regularly maintained to monitor its programmes. More information about US-PMI countries, Malaria Operational Plans, and programme-funding commitments is available at: http://www.fightingmalaria.gov/countries/mops/ index.html.*

- *Global Fund provided data on funding commit-ments, disbursements and expenditures based on information regularly maintained to monitor its programmes. More information on Global Fund supported programmes, including funds commit-ted and disbursed is available at: http://www.theglobalfund.org/en/.*

Major funding sources for external assistance toward malaria control

International funding for malaria control has increased dramatically over the recent decade. Key donor organizations are highlighted here. Of note, malaria-specific funding is identified here; however, there is much funding for general health services that benefits malaria control but that is not shown here, as it is not malaria-specific.

The Global Fund

The Global Fund was created in 2002 to dramatically increase funding to support integrated approaches to prevention and treatment of AIDS, tuberculosis, and malaria. The Global Fund is a partnership among governments, multilateral and bilateral organizations, the private sector, and communities. Between 2002 and 2009, the Global Fund has committed through nine Rounds of grants almost $3.7 billion for malaria programmes in more than 80 recipient countries. More information is available at http://www.theglobalfund.org.

The World Bank's Malaria Control Booster Program

The World Bank Booster Program identified an initial five-year intensive effort to help bring malaria under control across Africa and globally; it began in 2005. During the first phase (2005–2008), projects in 18 countries, including one major cross-border region, were approved by the World Bank's board of directors. Together they reflect an eight-fold increase in World Bank funding for malaria control in Africa since 2005, with total commitments of the Booster Program of approximately $469 million. The second phase (2008–2015) has recently been designed. More information is available at http://www.worldbank.org/afr/malaria.

The US-PMI

This initiative was established in 2005 with the goal of helping to reduce the malaria mortality by 50 percent in 15 target countries in sub-Saharan Africa. It was established initially as a $1.2 billion five-year initiative (2005–2010) coordinated with national malaria control programmes and other international donors and programme support agencies. More information is available at http://www.fightingmalaria.gov.

Of note, the Global Fund now has approved malaria grants in all malaria-endemic countries in sub-Saharan Africa except Botswana. The World Bank has financial support available in 18 sub-Saharan African countries, with most projects supported through International Development Assistance (IDA) mechanisms; Kenya and Mozambique are supported

in "pipeline projects," and Northern and Southern Sudan are supported as a multi-donor trust fund. The US-PMI supports 15 countries in sub-Saharan Africa. The African map shows countries with World Bank and/or US-PMI support.

Map A1.1

African countries with malaria financing support from

World Bank and US-PMI country support in malaria

- Both World Bank and US-PMI country support
- World Bank country support*
- US-PMI country support

the World Bank and/or the US-PMI through 2009.

Source: Information provided by the World Bank and US-PMI.

*Notes: *For the World Bank, support to Kenya and Mozambique are provided through a "pipeline project"; support to Sudan represents a multi-donor trust fund.*

The bilateral and multilateral agencies and private companies and foundations:

Many nations have contributed health funding, including support for malaria programmes, either directly to countries or through the Global Fund or World Bank or other multilateral organizations (e.g., UNITAID, WHO, UNICEF). Similarly,

private companies, institutions, and foundations have worked to improve health, reduce poverty, and support research in developing countries. Of note, in 2008 the Bill & Melinda Gates Foundation (http://www.gatesfoundation.org) convened many partners to discuss prospects for much-improved malaria control and the ultimate goal of seeking elimination and eradication. They support research on new tools for malaria vaccines, drugs and diagnostics, vector control, and expanded access to malaria control through direct grants and contributions to the Global Fund.

1b. Financial data—definition of terms

Different types of financial information are available from donors, including pledge/approvals, commitments/obligations, disbursements, and expenditures. The types of financial information reported by donors include commitments, disbursements, and expenditures. Different organizations may define or report this financial information in different terms. Below are specific descriptions of the financial information reported by Global Fund, US-PMI, and World Bank for use in this report.

Commitments

Global Fund commitments reflect amounts backed by a signed grant agreement between the organization and the principal grant recipient of the country. Funds can only flow to a country once such an agreement is in place. These grants are generally for multi-year periods–typically 5 years. However, the signed agreement leads to a commitment for Phase 1 (the first 2 years of the grant) and the remaining 3 years of the grant (Phase 2) can be considered an "approved request" but not a commitment until Phase 1 has been completed and Phase 2 has been signed.

US-PMI commitments reflect planned obligations to a country based on annual Congressional appropriations. Annual funding commitments are reported for the US Government fiscal year period (October 1–September 30). Commitment amounts were converted to the calendar year by splitting the total amount across the duration of the fiscal year period proportionally by the days/months across the different calendar years.

World Bank commitments reflect the approval date for the loan amount the country has committed to for the project. These loans are generally for multi-year periods and are reported for the World Bank fiscal year period (July 1–June 30). Commitment amounts were converted to the calendar year by splitting the total amount across the duration of the fiscal year period proportionally by the days/months across the different calendar years.

Disbursements

Global Fund disbursements reflect periodic remittances to the country, which are performance-based (recipients report on progress on targets and goals) except for the first one of a new grant agreement. Only committed amounts can be disbursed.

US-PMI disbursements reflect fund transfers to the implementing agency based on planned obligations to a country, with amounts recorded along with the date of disbursement.

World Bank disbursements reflect approved funds that are set aside for use by the country, with amounts recorded along with the date of disbursement.

Expenditures

Since 2008, Global Fund expenditures data are based on monthly country reporting on use of funds through the EFR system, which also disaggregates expenditures by line category, service delivery area, and implementing entity. Prior to this time, expenditures information was reported through Progress Update Reports provided by the principal recipient as part of the disbursement cycle. Expenditures data from this source may be disaggregated according to the following relevant categories: health products and equipment, medicines and pharmaceutical products, and other (including human resources, technical assistance, training, infrastructure, communication material, monitoring and evaluation, planning and administration, and overhead costs). Expenditures data are reported per disbursement period and were annualized to calendar year by splitting the total amount across the duration of the disbursement period proportionally by the days/months across the different calendar years. Cumulative expenditure for the period 2003–2005 is estimated based on cumulative expenditures reported through Progress Update Reports in the first period of 2006.

US-PMI expenditures data are based on implementing agencies' reporting on the use of funds for country programmes. For purposes of this report, expenditures data were made available on the procurement of commodities along with shipping and other relevant fees (including LLINs, ACT, diagnostics, SP tablets for malaria during pregnancy, and IRS activities), as well as for costs related to technical assistance for in-country distribution of total commodities. Therefore, expenditures data used in this report do not reflect total expenditures by US-PMI for a given country and year, since they do not include spending on associated activities needed

to support malaria-control programmes, such as monitoring and evaluation, health systems strengthening, behaviour change and communication activities, among others.

World Bank expenditures data are based on country reporting on the use of disbursed funds. For purposes of this report, expenditures data were made available on the procurement of commodities along with shipping and other relevant fees (including LLINs, ACT, diagnostics, SP tablets for malaria during pregnancy, and IRS activities). Therefore, expenditures data used in this report do not reflect total expenditures by World Bank for a given country and year, since they do not include spending on associated activities needed to support malaria-control programmes, such as monitoring and evaluation, health systems strengthening, behaviour change and communication activities, among others.

Expenditures by programme activity areas

This report uses expenditures data to analyze how much was spent on malaria-control programme activities using funds from these three organizations, notably in the 12-country assessment. It is generally preferable to use expenditures information for this purpose since these data provide the most accurate and timely picture of the extent to which funding has been used on specific activities, and the extent to which recipients have benefited. Committed and disbursed funds, for example, may not always translate into programme expenditures. These funds may be re-programmed for uses other than those originally planned, or there may be delays between committing and disbursing funds and their use in programme implementation.

However, expenditures data are often collected and reported differently across different organizations, which leads to challenges in harmonizing data to report on combined expenditures toward key malaria-control activities. For example, organizations may define categories of expenditures differently and/or include different costs in each of these categories. There are also often expenditures that support the scale-up of multiple interventions, such as broader health systems strengthening initiatives

or monitoring and evaluation activities, and these funds may be apportioned to expenditure categories differently or may be consolidated into an "other" category that is not easily disaggregated by programme activity area.

For purposes of this report, and in order to harmonize these data to the extent possible, expenditures data generally refer only to spending on commodity procurement (including ITNs, antimalarial medicines, diagnostics, SP tablets for intermittent preventive treatment, and IRS) and related shipping and other fees, unless otherwise noted (Table 1). These expenditures do not generally include associated costs needed to scale up intervention coverage, such as spending on in-country distribution, technical assistance, programme administration, behaviour change and communication programmes, or monitoring and evaluation activities, among others. Expenditures data presented here, therefore, do not reflect the total expenditures by these organization for the given year and country.

1c. Financial data—methodologies and interpretation issues

Use of current US dollars for financial data. In order to harmonize with donors' publicly reported financial information, the financial data used in the report are presented as originally provided by the funding agencies in current US dollars. While a current US dollar series does not account for inflation, the data are used to provide an overall indication of general trends in funds committed toward malaria control by these organizations and the cost to procure specific malaria commodities (e.g., ITNs), which have not increased significantly in price during the period of analysis for the 12-country assessment (2005–2008).

Conversion to annual calendar years is needed when a funding commitment or disbursement is for a multi-year period, or is reported for an organization's fiscal year. For this report, such data were converted to annual calendar year periods by splitting the amount of the total commitment across the duration of the grant and proportionally by the days/months across the different calendar years.

Description of costs included in expenditure categories

	Global Fund	US-PMI	World Bank
Insecticide-treated nets	Commodity procurement (including shipment to port and insurance fees) and supply management costs for "health products and equipment" category reported by principal grant recipients in Progress Update Reports. This category reflects combined procurement of malaria "health equipment" including ITNs, diagnostics, and IRS materials. However, 2008 data show that ITNs constituted the vast majority of prevention spending in Global Fund grants across the 12 assessment countries. It is also likely that ITN spending was at least the same or greater in previous years given the number of major ITN distribution campaigns occurring in 2006–2007.	Commodity procurement (including shipment to port and insurance fees) for LLINs. Based on expenditures data provided by implementing agencies. LLIN spending occurred in the years 2007–2008.	Commodity procurement (including shipment to port and insurance fees) for LLINs. Based on expenditures data provided by countries. LLIN spending occurred in the years 2007–2008.
Indoor residual spraying	Commodity procurement (including shipment to port and insurance fees) for IRS materials reported by principal grant recipients through the Enhanced Financial Reporting system. These data are only available for the year 2008.	Total IRS programme costs including spray operations, materials, local labor costs, in-country administration, and technical assistance. Based on expenditures data provided by implementing agencies. IRS spending occurred in the years 2006–2008.	Commodity procurement (including shipment to port and insurance fees) for IRS programmes. Based on expenditures data provided by countries. IRS spending occurred in the years 2007–2008.
Anti-malarial medicines	Commodity procurement (including shipment to port and insurance fees) for "medicines and pharmaceutical products" category reported by principal grant recipients in Progress Update Reports. This category reports on antimalarial expenditure, which is largely directed toward the purchase of ACTs.	Commodity procurement (including shipment to port and insurance fees) for anti-malarial medicines, and reflects ACT spending occurring in the years 2007–2008. Based on expenditures data provided by implementing agencies.	Commodity procurement (including shipment to port and insurance fees) for anti-malarial medicines, and reflects ACT spending occurring in the year 2008. Based on expenditures data provided by countries.
Diagnostics	Commodity procurement (including shipment to port and insurance fees) for diagnostics (RDT and lab equipment) by principal grant recipients through the Enhanced Financial Reporting system. These data are only available for the year 2008.	Commodity procurement (including shipment to port and insurance fees) for diagnostics (RDT and lab equipment). Based on expenditures data provided by implementing agencies for spending on diagnostics in 2007–2008.	Commodity procurement (including shipment to port and insurance fees) for diagnostics (RDT only). Based on expenditures data provided by countries for spending on diagnostics in 2007.
Malaria during pregnancy	Commodity procurement (including shipment to port and insurance fees) for malaria during pregnancy activities by principal grant recipients through the Enhanced Financial Reporting system. These data are only available for the year 2008.	US-PMI funds were not reported as spent on SP tablets for IPTp during the period of analysis (2005–2008).	World Bank funds were not reported as spent on SP tablets for IPTp during the period of analysis (2005–2008).

Estimating funds available over the life of the grant or loan period is based on funding commitments from Global Fund, US-PMI, and World Bank between 2003 and 2009, and was simulated by applying the total commitment over the full funding period. Funds available for Global Fund grants were estimated by spreading Phase 1 grant approval amounts evenly over a two-year period and Phase 2 grant approval amounts over a three-year period starting from the grant approval date. Funds available for World Bank loans were spread evenly over a three-year period from the approval date. US-PMI commitments are for one-year periods, and were converted from fiscal to calendar using the method described in this section.

2. Coverage data

Data on prevention and treatment interventions were derived from national-level household surveys, notably the Demographic and Health Surveys (DHS), Multiple Indicator Cluster Surveys (MICS), and the Malaria Indicator Surveys (MIS). Further information on these surveys is available at MICS (http://www.childinfo.org), DHS (http://www.measuredhs.com), and MIS (http://www.measuredhs.com/aboutsurveys/mis/start.cfm).

Data from the surveys are compiled for all countries by UNICEF headquarters and made available in a series of public-access databases found at http://www.childinfo.org. These databases have been published in various reports, including UNICEF *The State of the World's Children* report, as well as various RBM partner reports, including UNICEF/RBM/Global Fund *Malaria and Children: Progress in Intervention Coverage* as well as the WHO *World Malaria Reports*.

3. Demographics and mortality estimates

Populations at risk estimates are based on the work of the Malaria Atlas Project (MAP). More information on their methodology is available at http://www.map.ox.ac.uk/. MAP estimates of the share of the total population living in areas of malaria transmission (stable and unstable) were applied to United Nations Population Division total population figures for the year 2008 in order to derive the total population living in areas of malaria transmission within endemic countries for that year.

Demographic and mortality estimates are based on estimates produced by the United Nations Population Division in the *World Population Prospects: 2008 Edition* (total population and total under-five population) and the Interagency Group for Mortality Estimation (under-five mortality). More information is available at http://esa.un.org/unpd/wpp2008/index.htm and http://childmortality.org/.

4. Lives saved estimates

Estimates of the number of lives saved are derived from model-based predictions using the Lives Saved Tool (LiST)[18,19]. A consortium of academic and international organizations, led by the International Programs at the Johns Hopkins Bloomberg School, developed this model to estimate the impact on child mortality of scaling up maternal, newborn, and child health interventions.

The model derives its estimates of trends in cause-specific under-five mortality based on the methods outlined in Jones and others (2003), which were incorporated into the Spectrum Demographic Software. This model estimates the potential number of deaths averted in children under age five by cause through changes in child survival intervention coverage (including those for malaria) with empirical evidence of the effect of these interventions on preventing deaths in children under age five. Estimates of the impact of ITNs on all-cause under-five mortality are based on the work of Lengeler (2004). The model's predictions also take into account current demographic projections and country-specific cause of death profiles for children under age five (developed in collaboration with the WHO Global Burden of Disease, http://www.who.int/healthinfo/global_burden_disease/en/). More information on this model is available at http://www.jhsph.edu/dept/IH/IIP/index.html.

ANNEX 2. GLOBAL BURDEN OF MALARIA

Malaria is an acute mosquito-transmitted infectious disease caused by the Plasmodium *parasite that infects red blood cells and causes acute fever illness, progressive anemia, and potentially evolves rapidly to severe disease with convulsions, coma, and death. Malaria flourishes in warm, humid tropical climates where Anophelene mosquitoes come into regular contact with humans, particularly in rural and poor settings. While there are four different human malarias,* Plasmodium falciparum *is widespread and by far the most deadly;* Plasmodium vivax *is common, particularly outside of Africa, and causes much illness, but little death; the other two human species (*Plasmodium malariae *and* Plasmodium ovale*) are much less common.*

The toll from malaria is staggering with approximately 250 million episodes in 2008 and more than 850,000 deaths—with approximately 90% of the deaths occurring in Africa and with most of these deaths in children less than five years of age (WHO, World Malaria Report 2009). Malaria is one of the leading killers of children globally and particularly in Africa, and malaria also contributes "indirectly" to other major illnesses and health conditions including anemia, low birth weight, malnutrition, and in enhancing the severity of other co-infections, such as AIDS, pneumonia, and diarrhea.

Approximately 50 million pregnant women are at risk of exposure to malaria with 60% of these in Africa where exposure is high. These women may suffer acute illness or they may be asymptomatic but have maternal anemia and infection in their placental blood contributing to stillbirths, premature, and low birth weight babies – with consequent increased risk of early death. Thus, malaria kills children in three ways: 1) by acute febrile illness leading to cerebral malaria, respiratory distress, hypoglycemia, and progressive organ failure; 2) by chronic (untreated or inadequately treated) and repeated infection leading to malnutrition, severe anemia, and risk of additional bacterial or viral infections that jointly cause death; and 3) by contributing to premature delivery and low birth weight newborns through maternal infection in pregnancy. And, malaria interacts with HIV infection, particularly in sub-Saharan Africa, where each infection potentially worsens the course and consequences of the other infection.

While sub-Saharan Africa and its young children and reproductive-aged women are most affected by malaria, malaria remains an important issue outside of Africa. With large populations in South Asia, Southeast Asia, the Western Pacific, and some parts of the Americas still exposed to malaria, many cases occur and, evolving parasite resistance to treatment potentially allows for resurgence of malaria in these areas. Map A2.1 and Map A2.2 show the wide geographic coverage of malaria and the wide variation in transmission intensity and risk.

Map A2.1.

Plasmodium falciparum malaria global endemicity in children aged 2–10.
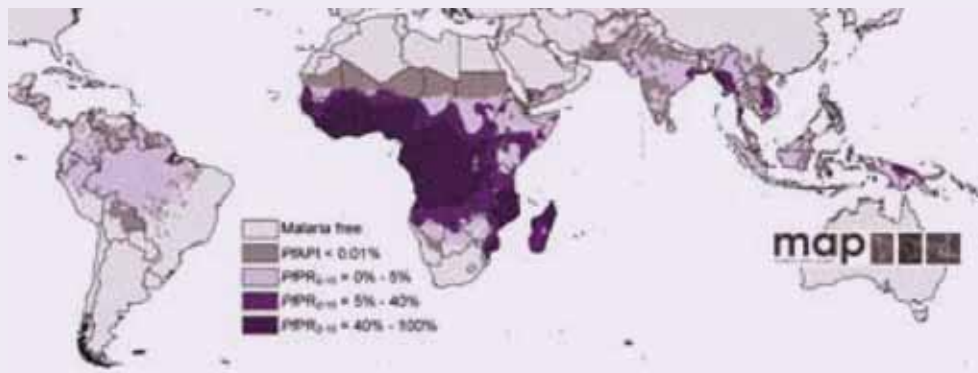

Source: Malaria Atlas Project.
Notes: light purple shows low risk/intensity and darker purple shows high risk/intensity.

Map A2.2.

Plasmodium falciparum malaria global endemicity by risk category

Source: Malaria Atlas Project.

Notes: Risk is categorized as low where Plasmodium falciparum *prevalence ratio in children aged two to ten years (Pf PR$_{2-10}$) is ≤ 5%; intermediate risk Pf PR$_{2-10}$ > 5% to < 40%; and high risk Pf PR$_{2-10}$ ≥ 40%. Other areas were defined as unstable risk, where* Pf *annual parasite index was less than 0.1 per 1,000 person or no risk.*

These maps show that over 70% of the 2.4 billion people at some risk of infection with *Plasmodium falciparum* live in areas of unstable or low endemic risk, where the technical obstacles to malaria control are relatively small. The maps also show that almost all populations at medium and high levels of risk live in sub-Saharan Africa, where the disease, death, and disability burdens from *P. falciparum* malaria remain high. This is further shown in Figure A2.1, where the size of the pies represents the population, and the colour shows the risk or intensity of transmission. While a larger population outside of Africa is at risk of malaria, their risk is much lower.

Figure A2.1.

Relative risk of *Plasmodium falciparum* by region and endemicity intensity.

While many malaria infections occur in the large population in Asia (Central, South, and East), the transmission intensity and disease burden are far greater in the somewhat smaller sub-Saharan African population.

Americas   Africa   CSE Asia   World

■ Unstable   ■ ≤ 5%   ■ > 5%–<40%   ■ ≥ 40%
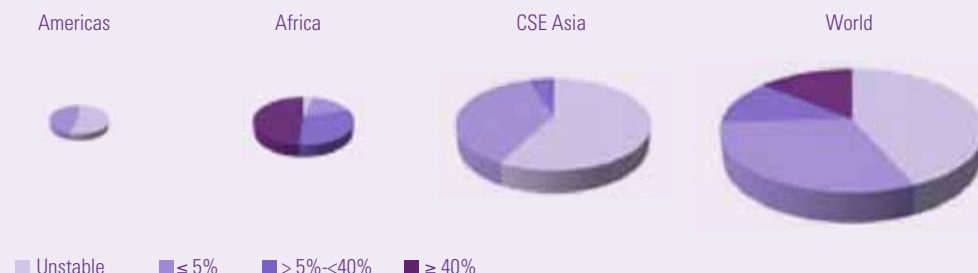
Source: The Malaria Atlas Project.

Notes: The charts show the proportion of the population living in each predicted Pf *PR$_{2-10}$ endemicity class for the Americas, Africa, Central South & East Asia regions, and worldwide. The charts are scaled proportionally to the total population at risk in each region.*

*The maps can be found in the publication: Hay SI, Guerra CA, Gething PW, Patil AP, Tatem AJ, Noor AM, Kabaria CW, Manh BH, Elyazar IRF, Brooker SJ, Smith DL, Moyeed RA, Snow RW. (2009). A world malaria map: Plasmodium falciparum *endemicity in 2007. PLoS Medicine, 6(3): e1000048.*

ANNEX 3. INTERVENTIONS TO CONTROL MALARIA

The malaria community currently has a number of highly effective interventions available for broad use in malaria-endemic settings. The control of malaria is based on both the prevention of the infection, or if the infection does occur, by the prompt effective treatment of the infection and illness. Clearly, excellent prevention is a priority as this would both limit disease and limit the extent of the need for treatment. However, historically and particularly in Africa, the intensity of transmission has been such that people were getting bitten by an infected mosquito nearly every night, leading to 300 or more "infections" each year. That would mean that the preventive measures would need to accomplish a 100-fold reduction in transmission intensity to bring the frequency to one infective bite every three to four months (which would still seem horrific to people living in non-malarious areas). Fortunately, it appears that our prevention tools are capable of such transmission reduction and much progress is being made, even in malaria-intense settings.

Prevention is largely based on addressing the habits of mosquitoes and their interaction with humans. The female mosquito needs a blood meal to provide protein and energy to lay her eggs, and she seeks this blood meal regularly, typically needing a blood meal every three days. When she is able to bite a human, she fills her abdomen with blood and, because she is many times her usual body weight, she typically needs to fly to a nearby resting place to digest her meal before moving on. Anophelene mosquitoes particularly like vertical surfaces in a warm, dark, humid, protected setting—such as a wall or curtain inside the house. Once her blood meal is digested, she will seek a nearby body of water that is suitable to lay her eggs. Once she has taken a blood meal with parasites, the parasites must develop over about ten days in the mosquito to a new stage before the mosquito can infect another human. If prevention measures can shorten her lifespan such that she does not survive the ten days, then she will not infect anyone.

Prevention—Insecticide-Treated Mosquito Nets (ITNs):

Most ITNs are now long-lasting ITNs or LLINs). LLINs are one of most effective ways to prevent malaria transmission. By sleeping under an insecticide-impregnated net, a person draws the mosquito to the net where it lands on the net and comes into contact with the insecticide and is killed soon thereafter. If the mosquito somehow avoids the net during its blood meal seeking, she may get her meal but then land on the mosquito net to rest, thus still coming into contact with the insecticide and subsequently dying. Scientific controlled trials in a variety of settings of different transmission risk (from low to very high risk) have shown the great benefit in mosquito killing, marked transmission reduction, and markedly improved child survival. And, when a good proportion of the population is using LLINs, they have been shown to have a protective effect for non-users in the community who live near the households with nets—probably because the extensive killing of female mosquitoes is such that few live long enough to transmit malaria. Critical issues for the efficacy and effectiveness of LLINs is that they have an effective insecticide on their surface and that they are used regularly. LLINs must be hung and slept under by at least one person in the household—while it may be good if that person is the young child or the pregnant woman, it is most critical that there is someone in the house to "bait the LLIN" each night.

Prevention—Indoor Residual Spraying (IRS):

IRS involves applying a long-lasting insecticide to the inside walls of houses and other structures where people are sleeping to kill mosquitoes when they rest on the walls. IRS is a highly effective malaria prevention method in settings where it is epidemiologically and logistically appropriate. That is, IRS must be applied prior to the transmission season (either each year or twice a year if there is continuous or multiple seasons of transmission) and

is typically done by a trained cadre of workers who move through a community spraying all appropriate structures. This is easiest if houses are close together as is found in urban or peri-urban settings. The type of insecticide sprayed on the wall depends on the make-up of the wall—brick or plaster may be sprayed with one type of insecticide while a mud or thatch wall might be best sprayed with a different insecticide. And, as a means of limiting the spread of insecticide-resistant mosquitoes, IRS programmes may evolve to rotating different insecticides with the different spray cycles.

Prompt and Effective Malaria Treatment:

Prompt treatment (preferably within 24 hours of fever onset) with an effective antimalarial agent (ACT is widely recommended for *Plasmodium falciparum*; whereas chloroquine remains highly effective for most cases of Plasmodium vivax) is necessary to prevent life-threatening complications. Several challenges for this intervention exist. First, many malaria cases do not present promptly and many may seek care outside of the formal health structures. This means that programmes must examine opportunities to reach malaria cases in the variety of places where they present. Second, many countries have viewed fever in children as equivalent to malaria, but as malaria prevention is improved and malaria infection rates are lower, this may no longer be the case. Thus, malaria diagnosis with microscopy or rapid diagnostic tests (RDTs) is increasingly important—a growing requirement—in order to know who does have a malaria infection and needs an antimalarial, who does not have malaria and needs an alternative treatment, and where the malaria infections are occurring in the communities and the nation. Finally, the efficacy of the drug is critical, and malaria parasites have long had the ability to develop resistance to antimalarial drugs, posing a threat to the intervention effectiveness. Programmes must use diagnostics to limit and focus drug use to those in need, and they must monitor the efficacy of their drugs over time in order to ensure that they are using the most effective drugs available.

Intermittent Preventive Treatment during Pregnancy (IPTp):

Together with regular use of LLINs, IPTp is key to preventing malaria in pregnant women in malaria-endemic settings. The treatment consists of at least two doses of an effective antimalarial drug during the second and third trimesters of pregnancy. The intervention is highly effective in reducing the proportion of women with anemia, placental malaria, and delivering babies prematurely and with low birthweight. Currently, sulfadoxine-pyrimethamine (SP) is considered a safe and appropriate drug for IPTp in malaria-endemic settings.

Surveillance, case-finding, infection-finding, and infection-containment as emerging interventions:

As certain countries progress in their malaria prevention and control, they may be able to markedly reduce malaria transmission such that fewer and fewer true malaria cases exist. In that context, the active identification of the remaining malaria infections (not just cases, but also asymptomatic infections) will likely be an effective and required means of further containing malaria transmission. This approach was used effectively during the Global Malaria Eradication Programme and is relevant to countries progressing toward malaria elimination, but should be developed earlier in the programme in order to be fully in place when needed.

Although other malaria interventions exist, they are not widely recommended for national programme adoption. For example, mosquito repellants used by individuals may reduce the frequency of mosquito bites, but this is largely seen as an intervention to be taken up by the individual. Application of larvicidal chemicals in mosquito breeding sites can be effective in reducing the emergence of new mosquitoes; however, the required frequent application and associated human and financial cost, and the challenges of reaching the many, many mosquito breeding sites means that this approach may be relevant only in a few and focal settings.

ANNEX 4. ANTICIPATING FUTURE FUNDING

Historically, external funding assistance in health has been provided on a short-term basis with most commitments for only a year or two. For each of the main three funders for malaria, there are different mechanisms of how the funding is provided and the duration of commitment.

The Global Fund has established a system of funding rounds where a typical 5-year funding application can receive Global Fund Board approval and begin with a Phase 1 (for the first two years) commitment. Based on good productivity and accounting under Phase 1, a subsequent Phase 2 (for the remaining three years) commitment can be signed.

The US-PMI funding support is provided under standard USAID procedures and the funding is allocated each year according to US Congressional approval. Thus, commitments are made on an annual basis and once the available funding level is known, plans can be made for disbursement and expenditure for that fiscal year. US-PMI commitments made for a given fiscal year are typically available for disbursement towards the end of that fiscal year.

The World Bank typically provides funding through International Development Assistance (IDA) loans or grants. While the loans have a long interval before re-payment must be made, the interval during which the loan is active is typically about five years. However, because these are loans, the actual amounts disbursed and expended are determined between the World Bank and the national Ministry of Finance and a malaria loan may be subject to additional considerations such as other development assistance in other national sectors in the country.

As a consequence, it is quite challenging to determine malaria-control funding availability for future years. To address this partially, we examined Global Fund grants and considered the Board-approved total grant request over five years. For the first 4–5 Rounds, most countries have received commitments (signed Phase 1 and Phase 2 grant components) and these can be assessed for the disbursements across the five-year life of the grant (with some grants being extended beyond the 5 years). For the more recent funding rounds, we considered the total grant request for Board-approved applications (even though only Phase 1 might have been committed) and allocated that request across the expected five years of the grant. In Figure A4.1 we present these estimates of possible Global Fund resources for the full life of the approved Rounds-based funding requests. As can be seen, through the first 9 Rounds of approved grants, we anticipate that some funding may be available through 2015. To maintain existing funding levels or to increase them to meet expected funding needs, the international donor community will need to assure funds through the Global Fund to support existing approvals and will need to support future funding to provide continued resource base that is so critical to appropriate planning at the country level.

Figure A4.1.

Global Fund "approved requests" for malaria control support over the life of the existing nine Rounds of funding.

With the current nine Rounds of approved grant requests, Global Fund resources will peak in 2010 at ~$1.3 billion. Additional funding will be required from Global Fund, US-PMI, World Bank and other existing and potential international donors (and from domestic sources in malaria-endemic countries) in order to stabilize or grow financial resources for malaria control in future years.
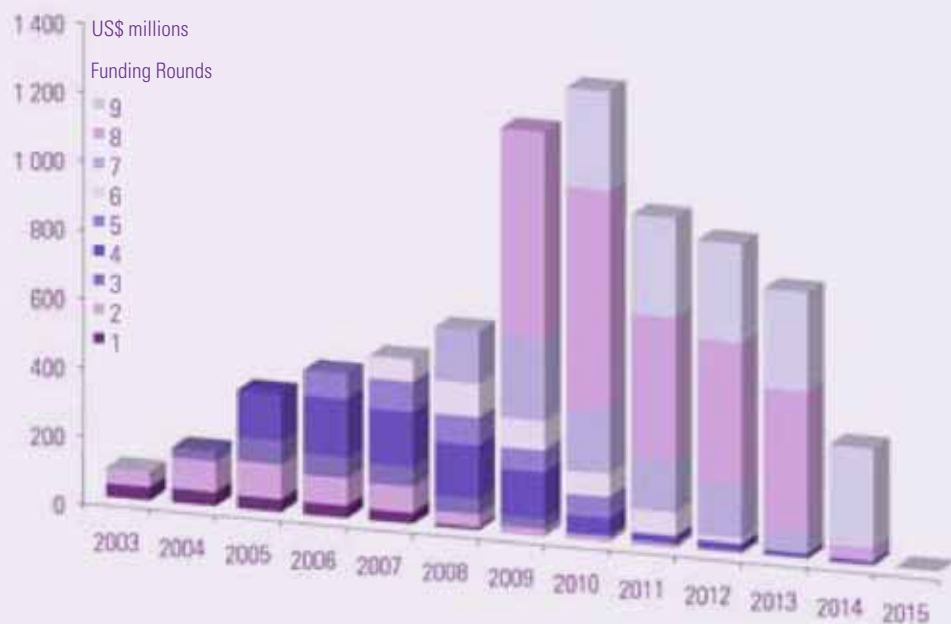
Source: the Global Fund.

Notes: Existing funding commitments for Phase 1 and Phase 2 of the grants are allocated according to data from the Global Fund; these are mostly complete for the first 5 rounds of funding. Known commitments for subsequent rounds were allocated according to year of expenditure and additional approved requests were apportioned equally across the remaining years. For example, for Round 9 funding approvals where no grant signings have yet occurred, these approved total requests were allocated equally across the next 5 years from 2010 through 2014.

ROLL BACK
MALARIA