Focus on Malawi
CONTENTS

Abbreviations............................................................................................................................................................. 5
Acknowledgements.................................................................................................................................................. 7
Foreword .................................................................................................................................................................... 9
Executive summary................................................................................................................................................. 11
   Box 1: The extent of malaria in Malawi....................................................................................................... 14
I. The early years..................................................................................................................................................... 17
   Box 2: Interview with Professor Jack Wirima, Chairman of the Malaria Advisory Board ................. 20
II. Rolling out malaria control interventions and rolling back malaria, 2000–2012 ....................................... 25
   a. Management and planning................................................................................................................ 25
   Box 3: The strength of operational research in Malawi............................................................................. 30
   b. Securing appropriate funding ........................................................................................................... 32
   Box 4: Private sector contributions to malaria control in Malawi .......................................................... 35
   c. Reaching Malawians with life-saving interventions......................................................................... 37
   Box 5: Intermittent preventive treatment in pregnant women in Malawi.............................................. 47
   d. Supporting interventions through communication activities....................................................... 51
   Box 6: Integrated community case management in Malawi .................................................................. 52
   e. Saving lives and measuring impact ................................................................................................. 54
III. Preparing for the future ................................................................................................................................... 69
IV. Conclusion.......................................................................................................................................................... 73
Annex A: List of National Malaria Control Programme Partners................................................................. 74
Annex B: Information related to major child health programme coverage that may have contributed to reductions in all-cause child mortality between DHS 2000 and DHS 2010 ................................................. 76
Annex C: Equity of malaria control interventions in Malawi by residence, wealth, and mother’s/pregnant woman’s level of education ........................................................................................................ 78
Table of figures

1. Prevalence of Plasmodium falciparum infection among children under five years of age, Malawi, 2009–2010 ............................................. 15
2. NMCP’s Malaria Strategic Plan 2011–2015 Goal and Targets ........................................................................................................ 28
3. Malaria control funding commitments by source and by year for the period 2006–2010, Malawi ........................................................................................................ 33
5. Increases in malaria control commodities distributed and structures sprayed with IRS, Malawi, 2004–2010 ...................................................................... 38
6. Progress in malaria control intervention coverage, Malawi, 2000–2012 .......................................................................................... 39
7. ITN use among children under five years of age, pregnant women, and the general population, Malawi, 2000–2012 ........................................ 42
8. ITN ownership by residence and wealth, Malawi, 2004–2012 ........................................................................................................ 43
9. IPTp in women of childbearing age with live birth 0-2 years before survey, Malawi, 2000–2012 .......................................................... 45
10. IPTp coverage by residence, wealth, and level of education, Malawi, 2000–2012 ........................................................................ 46
11. Treatment-seeking for children under five years of age with fever, Malawi, 2000–2012 .......................................................... 50
12. Trends in severe anaemia among children under five years of age by residence and age, Malawi, 2004–2012 ........................................ 56
16. All-cause under-five mortality in rural and urban areas, Malawi, 2000–2010 ........................................................................ 60
17. All-cause under-five mortality in high, medium, and low malaria risk areas, Malawi, 2000–2010 .......................................................... 61
18. Trends in malaria control interventions, infant and under-five mortality, Malawi, 2000–2010 ........................................................................ 63
19. Deaths prevented by malaria prevention for children under five years of age, Malawi, 2000–2010 .......................................................... 65
20. Projections of the impact of various NMCP activity scenarios between 2011 and 2015, Malawi .......................................................... 66

C1. ITN use among children under five years of age and pregnant women by residence, wealth, and mother’s/pregnant woman’s level of education, Malawi, 2000–2012 ........................................................................ 78
C2. Treatment-seeking for children under five years of age with fever by residence, wealth, and mother’s level of education, Malawi, 2000–2012 ........................................................................ 79
C3. Severe anaemia among children under five years of age by residence, wealth, and mother’s level of education, Malawi, 2004–2012 .... 80
## ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACT</td>
<td>Artemisinin-based combination therapy</td>
</tr>
<tr>
<td>AL</td>
<td>Artemether-lumefantrine</td>
</tr>
<tr>
<td>ANC</td>
<td>Antenatal care</td>
</tr>
<tr>
<td>ARI</td>
<td>Acute respiratory infection</td>
</tr>
<tr>
<td>BCC</td>
<td>Behaviour change communication</td>
</tr>
<tr>
<td>CDC</td>
<td>(United States) Centers for Disease Control and Prevention</td>
</tr>
<tr>
<td>DDT</td>
<td>Dichlorodiphenyltrichloroethane</td>
</tr>
<tr>
<td>DHS</td>
<td>Demographic and Health Survey</td>
</tr>
<tr>
<td>EPI</td>
<td>Expanded Programme on Immunization</td>
</tr>
<tr>
<td>Global Fund</td>
<td>Global Fund to Fight AIDS, Tuberculosis, and Malaria</td>
</tr>
<tr>
<td>HMIS</td>
<td>Health Management Information System</td>
</tr>
<tr>
<td>HSA</td>
<td>Health surveillance assistant</td>
</tr>
<tr>
<td>iCCM</td>
<td>Integrated community case management</td>
</tr>
<tr>
<td>IEC</td>
<td>Information, education, and communication</td>
</tr>
<tr>
<td>IMCI</td>
<td>Integrated management of childhood illness</td>
</tr>
<tr>
<td>IPTp</td>
<td>Intermittent preventive treatment during pregnancy</td>
</tr>
<tr>
<td>IPTp2</td>
<td>Two doses of intermittent preventive treatment during pregnancy</td>
</tr>
<tr>
<td>IRS</td>
<td>Indoor residual spraying</td>
</tr>
<tr>
<td>ITN</td>
<td>Insecticide-treated mosquito net</td>
</tr>
<tr>
<td>JHU</td>
<td>Johns Hopkins University</td>
</tr>
<tr>
<td>LiST</td>
<td>Lives Saved Tool</td>
</tr>
<tr>
<td>LLIN</td>
<td>Long-lasting insecticidal net</td>
</tr>
<tr>
<td>MAC</td>
<td>Malaria Alert Centre (University of Malawi College of Medicine)</td>
</tr>
<tr>
<td>MICS</td>
<td>Multiple Indicator Cluster Survey</td>
</tr>
<tr>
<td>MIS</td>
<td>Malaria Indicator Survey</td>
</tr>
<tr>
<td>MoH</td>
<td>Ministry of Health</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-governmental organization</td>
</tr>
<tr>
<td>NMCP</td>
<td>National Malaria Control Programme</td>
</tr>
<tr>
<td>ORS</td>
<td>Oral rehydration salts</td>
</tr>
<tr>
<td>RBM</td>
<td>Roll Back Malaria</td>
</tr>
<tr>
<td>RDT</td>
<td>Rapid diagnostic test</td>
</tr>
<tr>
<td>SP</td>
<td>Sulfadoxine-pyrimethamine</td>
</tr>
<tr>
<td>UNICEF</td>
<td>United Nations Children’s Fund</td>
</tr>
<tr>
<td>USAID</td>
<td>United States Agency for International Development</td>
</tr>
<tr>
<td>US-PMI</td>
<td>United States President’s Malaria Initiative</td>
</tr>
<tr>
<td>VHC</td>
<td>Village health clinic</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
</tbody>
</table>
This report was jointly coordinated by Eric Mouzin (Roll Back Malaria [RBM] Partnership Secretariat, Geneva), Nathaly Herrel and Christine Hershey (US-President’s Malaria Initiative [PMI], Washington DC). Additional contributors included (in alphabetical order) Rathi Asaithambi (US Centers for Disease Control and Prevention [CDC], Atlanta); Adam Bennett (Tulane University); Achuyt Bhattarai and Carrie Nielsen (US-PMI, Atlanta); Lia Florey (ICF International); Gomezgani Jenda, Pius Nakoma, and Jessica Oyugi (US-PMI, Malawi); Storn Kabuluzi, Charles Mwansambo, and Humphreys Nsona (Ministry of Health [MoH], Malawi); Don Mathanga (Malaria Alert Centre [MAC]-University of Malawi College of Medicine); and Rene Salgado (US-PMI, Washington DC).

The report benefited from inputs by Doreen Ali (National Malaria Control Programme [NMCP]); Henry Chakaniza (Illovo Sugar [Malawi] Ltd); Dave Gamboa and Daryl Pope (Paladin Energy Ltd); Peter Kazembe (Baylor College of Medicine Children’s Foundation Malawi); Norman Lufesi (MoH); Allan Macheso (United Nations Children’s Fund [UNICEF]); Grace Malenga (retired); Malcolm Molyneux (Liverpool School of Tropical Medicine [LSTM]); Ricki Orford (Population Services International [PSI]); and Jack Wirima (University of Malawi College of Medicine).

The extensive impact section in this report is based on work undertaken by the Malawi Malaria Impact Evaluation Group for the report Evaluation of the Impact of Malaria Control Interventions on All-Cause Mortality in Children Under Five in Malawi. Key individuals involved in this report include (in alphabetical order) Achuyt Bhattarai and Carrie Nielsen (US-PMI, Atlanta); Loren Bausel (JSI-DELIVER); Adam Bennett and David Larsen (Tulane University); Lia Florey and Yazoume Ye (ICF International); Ingrid Friberg (Johns Hopkins University [JHU]); Christine Hershey and Rene Salgado (US-PMI, Washington DC); Damson Kathyola and Norman Lufesi (MoH); Misheck Luhanga (NMCP); Don Mathanga and Themba Mzilahowa (MAC-University of Malawi College of Medicine); Elizabeth Molyneux (Queen Elizabeth Hospital); Bagrey Ngwira (University of Malawi College of Medicine); Jessica Oyugi (US-PMI, Malawi); Arantxa Roca-Feltrer and Anja Terlouw (Malawi-Liverpool-Wellcome Trust Clinical Research Programme, Malawi, and Liverpool School of Tropical Medicine, United Kingdom); and Andrea Sharma and Kevin Sullivan (CDC, Atlanta).

Valuable help and comments for this report were provided by Misun Choi, Kevin Griffith, Trenton Ruebush, and Julie Wallace (US-PMI, Washington DC); Richard Cibulskis and Robert Newman (World Health Organization Global Malaria Programme [WHO GMP], Geneva); Patrick Kachur, Kimberly Lindblade, and John MacArthur (CDC, Atlanta); Georges Ki-Zerbo (WHO Regional Office for Africa); and Steven Yoon (US-PMI, Atlanta).

Our sincere appreciation also goes to the editorial committee composed of Salim Abdulla (Ifakara Health Institute [IHI]), Matthew Lynch (JHU), and Richard Steketee (Malaria Control and Evaluation Partnership in Africa [MACEPA], a programme at PATH) who provided valuable help and insightful comments to this report.

Special approval and support for writing this report was provided by the Vice President of the Republic of Malawi, Right Honourable Khumbo Kachali; Honourable Minister of Health, Catherine Gotani Hara, Member of Parliament; and the Deputy Minister of Health, Honourable Halima Daud, Member of Parliament.

Laurent Bergeron (RBM Partnership Secretariat) was the production manager for the report in both English and French, and also provided editorial and proofreading assistance. The authors would also like to thank Marina Gavrioushkina, Michel Smitall, and Prudence Smith (RBM Partnership Secretariat) for their support for the release and dissemination of the report. The authors are responsible for any errors or omissions.
Her Excellency the President of the Republic of Malawi, Mrs Joyce Banda.
FOREWORD

For too long, malaria has inflicted an unacceptable burden of suffering on two of the most vulnerable segments of our population—pregnant women and children under five years of age. Over the last decade, however, Malawi has made excellent progress against this disease. I am therefore pleased to present this report, which tells the remarkable story of how Malawi has begun to lift the burden of malaria by investing in maternal and child health.

We can be proud of the achievements that we have made against this devastating disease over the period 2000–2010. More pregnant women and young children are now sleeping under insecticide-treated mosquito nets (ITNs). Most pregnant women are receiving at least two doses of sulfadoxine-pyrimethamine (SP), which is protecting them and their newborn from the ill effects of malaria. Progress has also been made with regard to treating children for malaria with recommended antimalarials. Vector control has also been reinvigorated with the reintroduction of indoor residual spraying (IRS) and the launch in 2012 of a nationwide campaign to protect all members of the population with long-lasting insecticidal nets (LLINs). We have a vibrant local research community which has guided our efforts and we have the full support of national and international partners. I am therefore confident that we can expect to see even further improvements in maternal and child health indicators over the coming years.

Malawi has been a leader in shaping malaria control policies in Africa. We were quick to change our first-line antimalarial treatment policy when resistance developed to chloroquine. We were also the first country in Africa to develop an intermittent preventive treatment during pregnancy (IPTp) policy using the drug SP and we have achieved one of the highest levels of coverage with this intervention on the continent. We can be proud of the talent of our local research institutions, who have generated evidence that has informed not only our national policies for malaria control, but also those of other countries in the region.

While we recognize that there are numerous challenges still ahead before malaria can be eliminated, Malawi clearly has all the elements in place to succeed. No child in Africa should die from a disease that can be prevented and treated. We have the tools to combat malaria. They are cost-effective and they save children’s lives. Now is the time to put all of our energy and resources towards scaling up those interventions to drive malaria transmission down to negligible levels.

The achievements described in these pages are a testament to the will and unwavering commitment of our government, our citizens, and our partners. These have been brought together under the leadership of our National Malaria Control Programme (NMCP) to achieve one goal: saving children’s lives. It is this close partnership that will be needed in the years ahead to continue on this positive trajectory.

More than ever, this is the time to renew our efforts to ensure that we reach each and every child, woman, and man in this country with these life-saving interventions. Malawi is poised to achieve its goals in this fight against malaria. I am counting upon all of us to reaffirm our commitment to making malaria a thing of the past in Malawi.

Her Excellency Mrs Joyce Banda
President of the Republic of Malawi
Honourable Minister of Health, Catherine Gotani Hara (right), Member of Parliament, handing an LLIN to a pregnant woman at antenatal clinic at Area 18 health centre in Lilongwe District.
Executive Summary

Progress and impact of malaria control in Malawi at a glance

• Since the creation of the NMCP in 1984, malaria control activities in Malawi have benefited from strong leadership and coordination.

• Malawi has successfully garnered the support of external donors and, since 2006, funding for malaria control has increased tremendously. From 2006 to 2010, external partners committed more than US$ 121 million in funding for Malawi’s malaria control efforts. Funding for malaria control in Malawi has come mainly from four sources: the Government of Malawi, the Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund), the United States President’s Malaria Initiative (US-PMI), and household level expenditures.

• These financial contributions have supported critical malaria prevention and treatment activities, including:
  - Distribution of more than 9 million ITNs over the period 2004–2010 through commercial outlets and public health facilities.
  - Expansion of IRS from one district to seven districts over the period 2004–2010, protecting nearly 2 million residents.
  - Distribution of more than 21 million doses of artemisinin-based combination therapy (ACT) over the period 2007–2010.

• These activities have translated into gains in the coverage of malaria control interventions at the national level, notably:
  - Household ownership of at least one ITN increased dramatically from less than 13% in 2000 to 55% in 2012.
  - ITN use among vulnerable populations has increased remarkably between 2000 and 2012—from less than 3% among children under five years of age and pregnant women to 56% and 51%, respectively.
  - The percentage of pregnant women receiving at least two doses of intermittent preventive treatment during pregnancy (IPTp2) in 2012 was 54%, nearly twice that recorded in 2000 and one of the highest coverage rates in sub-Saharan Africa.
  - In 2012, half of all children under five years of age with fever sought treatment from a health facility, provider, or pharmacy—a significant increase from 35% in 2000.
Thanks to these improvements in national coverage, the burden of malaria has declined and children’s lives have been saved.

- A significant reduction in malaria parasite prevalence among children (aged 6–35 months) occurred between 2001 and 2009 from 61% to 20%, as measured in surveys conducted during the low transmission season. Surveys conducted in the high transmission season in 2010 and 2012 also showed a decline in prevalence from 43% to 28%, respectively, among children aged 6–59 months.
- Severe anaemia (haemoglobin <8g/dL) among young children (aged 6–23 months), who are most vulnerable to malaria, declined from 20% (2004) to 13% (2010).
- Under-five mortality dropped 41% from 188 to 112 deaths per 1000 live births over the period 1996–2000 to 2006–2010.
- According to the Lives Saved Tool (LiST estimation model), approximately 21,600 deaths among children under five years of age were prevented by malaria vector control interventions and the prevention of malaria in pregnancy in Malawi between 2000 and 2010.

Malawi’s improved malaria and health indicators are all signs that malaria control efforts are working and delivering results. The coverage of some non-malaria maternal and child survival interventions also improved over the decade, including increased women’s literacy, women giving birth in a health facility, exclusive breastfeeding, care seeking for suspected acute respiratory infection (ARI) and diarrhea, and the introduction of the Haemophilus influenzae type b (Hib) vaccination. In addition to the impact on under-five mortality from these interventions, it is also plausible to conclude that reductions in all-cause under-five mortality in Malawi during the period 2000 to 2010 were in part due to reductions in malaria-specific mortality.

Investments in malaria control efforts in Malawi have paid off in terms of important reductions in malaria morbidity and mortality among children under five years of age. The support of the Government and the willingness of development partners to work together led to the substantial gains in malaria control during 2000–2010 as described in this report. It is paramount for these investments to continue to reach the ambitious goal of reducing malaria morbidity and mortality by half over the period 2010–2015.
Launch of the LLIN universal access campaign in Chiradzulu District in 2012 in the presence of (from left to right) the Deputy Minister of Health Halima Daud, United States Ambassador Jeanine E. Jackson and the wife of the Vice President, Madam Khumbo Kachali.
The extent of malaria in Malawi

Box 1: The extent of malaria in Malawi

Malaria in Malawi at a glance

- Malawi has an estimated 14.8 million inhabitants (2012) in its three regions (Northern, Central and Southern Regions), which are further divided into 28 administrative districts.

- Malaria is endemic in more than 95% of the country, and nearly all Malawians are at risk of infection.

- According to the Health Management Information System (HMIS), the number of reported malaria cases (clinically diagnosed either with or without parasitological confirmation) in all age groups was 6.7 million in 2010.

- Malaria is the major diagnosis in children under five years of age that are admitted to hospital. About 40% of all hospitalizations of children under five years of age and 34% of all outpatient visits across all ages are attributed to malaria. Four in ten hospital deaths are reported to be due to malaria.

Malaria is highly endemic in Malawi and nearly the entire population (an estimated 14.8 million people, National Statistical Office of Malawi, 2012) is at risk of malaria infection. Year-round transmission occurs in almost every part of the country (see Figure 1). Transmission increases with the seasonal rains that typically begin in November-December and last through March-April in most of Malawi.

*Plasmodium falciparum* is the most common malaria parasite species in Malawi, accounting for 95% of all malaria infections and almost all severe disease and deaths. Other reported species include *P. malariae* and *P. ovale*, while *P. vivax* remains very rare in Malawi.

The principal mosquito vectors of malaria in Malawi are *Anopheles gambiae ss*, *An. funestus ss* and *An. arabiensis*—all of which are highly effective at transmitting malaria. It is estimated that a person in Malawi receives 16 to 27 infective bites each year. Beginning in 2009, insecticide resistance to pyrethroids and dichlorodiphenyltrichloroethane (DDT) was detected among anopheline mosquitoes in Malawi. While the actual impact of resistance on the effectiveness of malaria vector control interventions has yet to be ascertained, it is of greatest relevance for ITNs and IRS, both of which rely on insecticides.

Children under five years of age bear the greatest burden of malaria in Malawi. It is the major cause for hospital admissions in this age group—40% of all hospitalizations among children under five years of age are attributable to malaria. Across all age groups, the disease is considered to be responsible for 34% of all outpatient visits and four in ten hospital deaths.

According to the routine health facility-based HMIS, the number of reported malaria cases (clinically diagnosed with or without parasitological confirmation) in all age groups increased from 3.7 million in 2005 to about 6.7 million in 2010. While it is unclear why reported malaria cases apparently increased while malaria control interventions were being scaled up, possible explanations include improvements in the reporting system as well as increased access to and use of health services.
In addition to causing disease and death, malaria also has important economic repercussions. It hampers development either directly—through the costs of health care and hospitalization, or indirectly—through working days lost due to illness or to caring for a sick child. It can consume a household’s resources, leaving families with less money for their basic needs. In Malawi, very poor households carry a disproportionate share of the economic burden of malaria. Among these households, total direct and indirect costs of malaria consume about one third of annual household income, compared to 4% among households in the low to high income categories.

Figure 1
Prevalence of *Plasmodium falciparum* infection among children under five years of age, Malawi, 2009–2010

*Malaria transmission is highest in the hotter, wetter and more humid low-lying areas (lakeshore, Shire River valley and central plain), while the lowest risk areas are in the highlands of the Northern Region (Rumphi, Mzimba, Chitipa Districts) and the Kirk Range in the Southern Region.*
CHAPTER I

THE EARLY YEARS

From the first malaria control efforts in 1970 to the formation of the NMCP in 1984, Malawi's malaria control efforts have evolved into a robust programme that has provided leadership in the region, including the early adoption of SP for malaria prevention during pregnancy and the change in first-line antimalarial drug when resistance to chloroquine first appeared. Malawi is now well-positioned to aim for universal coverage with malaria control interventions.

Malawi reached full independence in 1964 and the earliest attempt at establishing a national malaria control policy occurred in 1970. This policy consisted of three main strategies: (1) malaria prophylaxis for children under five years of age with chloroquine at under-five clinics, (2) treatment of symptomatic malaria cases among children and adults with chloroquine, and (3) vector control with residual spraying (usually with DDT) and larvicides in certain urban areas.

In 1984, concerns arose about \textit{P. falciparum} resistance to chloroquine in Malawi. Since malaria was a major public health problem, the Ministry of Health (MoH) established a National Malaria Control Committee to study the efficacy of chloroquine and other antimalarial drugs and to develop evidence-based malaria treatment guidelines. A committee chairperson and committee members were selected from various parts of the health sector. In 1987, the first NMCP manager was appointed and the NMCP was formally established within the Directorate of Preventive Services. This marked the start of an organized and coordinated effort to prevent and control malaria with an emphasis at that time on case management. In Africa, Malawi stands out as a leader in pioneering key changes in malaria policies on the continent—in 1993, it was the first country to implement IPTp using SP and the first to make the switch in the first-line antimalarial drug from chloroquine to SP, when chloroquine was proven to be no longer effective (see Box 5).

In 1999, the MoH, through the NMCP, embraced the Roll Back Malaria global strategy for the scale-up of malaria control activities in the country. From 2001 to date, the response to the malaria problem in Malawi has been captured through a series of five-year Malaria Strategic Plans.

The first strategic plan of 2001–2005 was aimed at renewing efforts to reduce malaria morbidity and mortality through effective case management in the context of multi-sectoral implementation of malaria control involving government, non-governmental organizations (NGOs), the private sector, civil society, research institutions, and communities. This first strategic plan was based on six pillars: (1) building and strengthening partnerships among all stakeholders; (2) promoting ownership of malaria activities at all levels of health care delivery; (3) contributing to health sector reforms; (4) strengthening the health information system and research; (5) integrating malaria control activities into primary health care and other social economic development programmes; and (6) increasing coverage of cost-effective interventions such as ITNs and home management of malaria.

The 2005–2010 Malaria Strategic Plan was focused on rapidly scaling up interventions to significantly reduce malaria morbidity and mortality. Three strategic areas were identified for scale-up, including (1) case management, (2) IPTp, and (3) use of ITNs (MoH, 2005).
Under the MoH’s current Malaria Strategic Plan, which covers 2011–2015, the primary goal is universal access to malaria prevention and treatment interventions with an aim to reduce the 2010 levels of malaria morbidity and mortality in Malawi by half by the year 2015. This new strategic plan builds on the successes achieved and lessons learned during implementation of the two previous plans. Entitled “Towards Universal Access,” this new plan aims to provide equitable access to malaria prevention, care and treatment to all Malawians at risk of malaria. The 2011–2015 plan focuses on six primary intervention areas: (1) integrated vector management; (2) case management; (3) malaria in pregnancy; (4) social mobilization and advocacy; (5) surveillance, monitoring, evaluation and operations research; and (6) programme management. Malaria prevention and treatment are also included within Malawi’s Essential Health Package.

At the global level, Malawi is a signatory to the Abuja Declaration of 2000 and member of the Roll Back Malaria (RBM) Partnership. The RBM targets therefore form a basis for Malawi’s national malaria policies. In addition, Malawi’s national malaria policy goals align with the Millennium Development Goals to reduce child mortality (Goal 4) and to halt and begin to reverse the incidence of malaria (Goal 6). Malawi is also a member of the African Leaders Malaria Alliance (ALMA), an organization of African Heads of State working in unison to end malaria-related deaths.

Malawi’s malaria control efforts have benefited from support and guidance of strong local research institutions, who have conducted critical research that has driven changes in malaria policies. With funding from the Gates Malaria Partnership, the College of Medicine established the Malaria Alert Centre in 2002 to provide a base for conducting operational research in infectious diseases, especially malaria. Over the years, with the support of various agencies (including the United States Agency for International Development [USAID], the US Centers for Disease Control and Prevention [CDC], and the World Health Organization [WHO]), the centre has carried out research in alternative distribution methods for malaria control interventions, pioneered work on the collection of routine malaria data at the community level, conducted drug efficacy trials, and evaluated the effectiveness and cost-effectiveness of intermittent preventive treatment in infants (IPTi).

The NMCP also receives technical assistance from the United Nations Children’s Fund (UNICEF) to support programmatic management, decentralized malaria prevention and treatment efforts at the district level, and for the development of information, education, and communication (IEC) materials. The WHO provides assistance on a variety of technical issues.

In common with other countries in the region, the sharp rise in funding for malaria control has enabled an accelerated scale-up of key malaria control interventions in Malawi. Malawi has secured three grants from the Global Fund in Round 2 (first funding disbursed in 2006), Round 7, and Round 9. Funding for malaria control activities has also been provided by the US-PMI starting in 2006, as well as other donor and government funds.
Operator preparing equipment prior to indoor residual spraying activities.
Box 2: Interview with Professor Jack Wirima, Chairman of the Malaria Advisory Board

How do you explain the notable success of the Malawi National Malaria Control Programme in fighting the disease?

I see four main reasons for our success.

First, political leadership and government commitment. From the time the NMCP was set up in 1984, government commitment to reduce the malaria burden in Malawi has never waned. Politicians have always recognized that we needed a strong malaria control programme. This has been tremendously helpful. Today, the President of Malawi is committed to improving maternal and child health and she is well aware that malaria control is a strong component of this agenda.

Secondly, a dynamic operational research platform. Our operational research community has always been strong and involved in guiding the strategy of the NMCP. The criteria for changing the recommended first-line treatment for malaria have been developed here in Malawi. This was a lesson to the world. We have always believed in using our own locally-generated data to guide our control interventions and to me, this is a key factor in explaining our success today.

Next, the building of a strong partnership. This effective partnership has allowed us to mobilize resources from our external partners, such as the Global Fund, the US-PMI, and the Bill & Melinda Gates Foundation. These resources have enabled implementing agencies to develop strong and effective interventions under the coordination of the NMCP and the strategic guidance of the Malaria Advisory Board.

Lastly, the focus on human resources. We believe communities should be in the driving seat of their own malaria control programmes. Hence, the role played by health surveillance assistants (HSAs) today. The malaria control programme should be as decentralized as possible. We also need to develop a critical mass of well-trained health officers, epidemiologists, monitoring and evaluation specialists so that the programme can be efficiently implemented and monitored.

What challenges have you identified to take the programme to the next step?

Since we all agree that a good malaria control programme needs to be run close to the populations, putting more people on the ground is a key challenge. The population of Malawi has increased from 4 million inhabitants in 1984 to approximately 15 million in 2012. You can imagine the direct consequences this variation has for our health workforce.

Just as importantly, sustaining the financial resources that have enabled us to get where we are today will require a lot of effort and persuasion of decision-makers at home and abroad. We should even increase them so we can move to the next step. I am talking about domestic financing of our life-saving interventions as well.

In a context of careful allocations of hard-to-find resources, we will have to keep working on defining a strategy offering best value for money. We should be looking for synergy between interventions for instance, for best use of IRS, etc.
What do you see as the way forward for malaria control in Malawi?

We might not embrace the goal of a malaria-free Malawi for now, but we are certainly committed to reducing malaria to a negligible level.

Concretely, it will mean scaling up our interventions to reach every single community in the country and, most importantly, sustaining them. It will mean beefing up our human resources. We are known for the strength of our operational research, the results of which have been very helpful to the control programme; this will need to continue.

Finally, our targets and goals will need to be regional. So, we have to build networks and partnerships, to share information and learn from others, to work closely with Mozambique, Tanzania and Zambia to achieve our common objectives. We cannot work as on an island.

There are some reports that will need to be confirmed, of areas with increasing parasitaemia and/or child mortality in spite of good coverage with malaria control interventions. What is your preliminary take on those reports?

It is a matter of seeing the glass half full or half empty. I would say that we have made tremendous
progress so far, but we are not there yet. For instance, ACTs are being deployed, but still have not reached all rural communities. Our malaria control interventions have to be very comprehensive, including prevention with LLINs and IRS, and control with early diagnosis and treatment, and not only “much better”. You have to get transmission down considerably before you can measure a significant impact. We have not reached that threshold yet.

We also have to get better at defining and monitoring our strategy. Should we add IRS to LLINs for instance? Are we carefully monitoring the evolving resistance to insecticides?

I would also add that we have to overcome a distrust of ACTs in our communities because of a perception they are “not working”. Parents insist that their child be treated for malaria when presenting with fever at the same time the malaria burden goes down. When ACTs don’t work in those situations, because of incorrect diagnosis, the distrust of the population for antimalarial therapies increases.

**Based on your experience in Malawi, what recommendations would you be willing to share with other countries?**

Let the results of operational research guide you. There are some national and even regional variations. Base your strategy on your own local data and be reactive to the evolving epidemiology of malaria.

Invest in capacity building. Establish a stable and well-trained team, and decentralize.

Build a strong partnership. Involve partners in planning and reviews.

Think regional. The fight against malaria cannot be won in isolation.
A piece of clothing designed and distributed by the NMCP to accompany the launch of the free nets campaign.
ACTs are just delivered at the warehouse.
ROLLING OUT MALARIA CONTROL INTERVENTIONS AND ROLLING BACK MALARIA, 2000–2012

This chapter describes Malawi’s efforts and successes in rolling back malaria—this includes solid management and planning, development of an evidence-based malaria strategy, securing funding, implementation of interventions, and measurement of coverage and impact. Malawi’s strong leadership and commitment have resulted in a substantial scale-up of interventions and a reduction in malaria.

a. Management and planning

Malawi’s National Malaria Control Programme at a glance

• Since its creation in 1984, Malawi’s NMCP has had strong, stable leadership, which has provided continuity and focus.

• A national Malaria Advisory Board was created in 2004 to provide assistance and guidance to the NMCP.

• Malaria control activities are informed by operational research conducted by national institutions and supported by local and external partners.

• The 2011–2015 Malaria Strategic Plan builds on lessons learned from over two decades of malaria control efforts in Malawi—the goal is to reduce malaria morbidity and mortality by half by 2015 through universal coverage with malaria control interventions.

• The NMCP has expanded from 2 technical officers in 1984 to a current total of 12 technical officers who are responsible for areas such as vector control, case management, malaria in pregnancy, and monitoring and evaluation.
### Key milestones in malaria policies, funding, planning, surveys, and implementation in Malawi

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992</td>
<td>• <em>Demographic and Health Survey (DHS)</em></td>
</tr>
</tbody>
</table>
| 1993 | • Malawi implements IPTp using SP.  
      • Based on documented resistance to chloroquine, the first-line drug for malaria treatment is changed from chloroquine to SP. |
| 1998 | • In Blantyre District, a social marketing ITN distribution pilot project is launched. Nets (with an insecticide treatment kit) are sold to pregnant women and children under five years of age at public health facilities for a subsidized price. |
| 2000 | • *Demographic and Health Survey* |
| 2001 | • *National Micronutrient Survey (including anaemia and malaria parasitaemia testing)*  
      • Malawi’s National Malaria Strategic Plan for 2001–2005 is released. |
| 2002–2003 | • ITNs are available nationwide through commercial outlets and at public health facilities. Funding for ITN distribution is provided by the United Kingdom Department for International Development (DFID), while ITNs are procured by UNICEF and distributed to facilities by Population Services International (PSI). With this expansion, Malawi becomes the first country in sub-Saharan Africa to have a national ITN programme. |
| 2004 | • *Demographic and Health Survey* |
| 2005 | • Malawi’s National Malaria Strategic Plan for 2005–2010 is released. |
| 2006 | • Global Fund and US-PMI funding begin. |
| 2007 | • LLINs are introduced.  
      • IRS is launched as a pilot programme in Nkhotakota District.  
      • The first-line drug for malaria treatment is changed from SP to more effective ACTs. |
| 2008 | • LLINs are provided for free to children born in health facilities, children attending their first Expanded Programme on Immunization (EPI) visit, and pregnant women at their first antenatal care (ANC) clinic visit. |
| 2009 | • *National Micronutrient Survey (including anaemia and malaria parasitaemia testing)* |
| 2010 | • *Demographic and Health Survey*  
      • *Malaria Indicator Survey*  
      • IRS is expanded to seven districts with a high malaria burden.  
      • Malaria programme review is conducted to inform the next malaria strategic plan. |
| 2011 | • Malawi’s National Malaria Strategic Plan for 2011–2015 is released.  
      • Nationwide coverage of health facilities with rapid diagnostic tests (RDTs) is achieved. |
| 2012 | • *Malaria Indicator Survey*  
      • Nationwide universal coverage ITN campaign is implemented. |
Management

The NMCP functions under the Directorate of Preventive Health Services. As such, the NMCP manager also serves as the Deputy Director of Preventive Health Services for the MoH. The NMCP sets policies, establishes strategies, coordinates activities, and provides technical guidance for the MoH with respect to malaria prevention and control interventions. The NMCP is advised by a national Malaria Advisory Board, which is composed of researchers, programme and policy experts, as well as technical working groups covering thematic areas such as vector control, case management, monitoring and evaluation, and behaviour change communication (BCC). Planning and review meetings are conducted annually at national and zonal levels.

Research

Malawi’s NMCP recognizes that operational research should inform the implementation of malaria control interventions and that evidence generated from research both within and outside the country is critical for the roll-out of the National Malaria Strategic Plan for 2011–2015. Research institutions are playing a key role in generating research results and findings to guide the NMCP’s strategies as well as in monitoring and evaluating the implementation of its strategic plans. In addition, these institutions will carry out essential research that will improve upon existing interventions, support their delivery, and contribute to the global research agenda (see Box 3). The NMCP has outlined the following specific roles for research institutions in Malawi including: participation in appropriate technical working groups, providing technical assistance in the monitoring of drug efficacy and insecticide resistance, and for the implementation of nationwide household surveys, such as the MIS, and strengthening of routine data collection such as the HMIS.

Planning

In addition to its Malaria Strategic Plan for 2011–2015 (see Figure 2), Malawi has developed the following policy guidelines, which align with WHO policies and RBM recommendations:

- Government of Malawi Malaria Policy (revised 2009)
- Guidelines for the Management of Insecticide-Treated Mosquito Nets (ITNs) Programme (2007)
- Trainers Manual on Case Management (2007)
- National Malaria Treatment Guidelines (2011)
- Malawi Health Policy (under review)
- Guidelines for Indoor Residual Spraying (2008)

Malaria case management guidelines are also under revision to include protocols for second-line antimalarials, use of RDTs, deployment of ACTs at the community level, and methods for delivering subsidized ACTs through the private sector.
**Figure 2**
NMCP’s Malaria Strategic Plan 2011–2015 Goal and Targets

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership of at least one ITN</td>
<td>90% of households own at least one ITN</td>
</tr>
<tr>
<td>ITN use by pregnant women</td>
<td>80% of pregnant women sleep under an ITN</td>
</tr>
<tr>
<td>ITN use by children under five years of age</td>
<td>80% of children under five years of age sleep under an ITN</td>
</tr>
<tr>
<td>IRS</td>
<td>12 high-burden districts implement IRS</td>
</tr>
<tr>
<td>IPTp</td>
<td>80% of pregnant women receive two or more doses of IPTp for malaria prevention</td>
</tr>
<tr>
<td>Case management</td>
<td>50% of outpatient suspected malaria cases confirmed by microscopy 80% of outpatient suspected malaria cases confirmed by RDT 50% of malaria cases appropriately treated within 24 hours of onset of symptoms</td>
</tr>
</tbody>
</table>

**Staffing**

In recent years, the NMCP has expanded and there is now a core group of 12 technical officers at the national level who are responsible for specific areas, including entomology, vector control (IRS and ITNs), diagnosis, case management, malaria in pregnancy, IEC and advocacy, and monitoring and evaluation. In addition, the programme includes 5 zonal malaria coordinators, 28 district-level malaria coordinators, 28 ITN coordinators, and 7 IRS coordinators in the 7 IRS implementing districts. HSAs provide malaria services at the community level and work closely with the district malaria coordinators (see Box 6).
Malawi’s National Malaria Control Programme team
Box 3: The strength of operational research in Malawi

In Malawi, the NMCP has always insisted on relying as much as possible on locally-generated data to guide its malaria control strategy. Since its establishment in 1984, the NMCP’s policies on malaria treatment and prevention have been mostly driven by locally-collected information.

Operational research studies such as the assessment of malaria burden, drug efficacy studies, Knowledge, Attitudes, and Practices (KAP) studies and economic cost of malaria have helped shape the first national policy and subsequent strategic plans. Operational research from Malawi has also contributed greatly to regional and international understanding of malaria and its control.

Drug efficacy studies in the early 1990s set the standards for in vivo studies that led Malawi to become the first country to change from chloroquine (CQ) to SP as the first-line drug for malaria treatment.

More importantly, the first study to show that IPTp with an efficacious drug (SP) could reduce low birth weight was done in Malawi. These results helped WHO develop its recommendation to use IPTp as one of the key malaria prevention interventions. This ground-breaking research was conducted through a collaboration of local and international researchers, with support from USAID and CDC.

Over the following years, operational research activities remained strong in Malawi and continued supporting the development of NMCP strategies. For example, organizations such as the Blantyre Malaria Project, Michigan State University, and Wellcome Trust have supported research to help Malawi and the international malaria community better understand the pathogenesis and management of severe malaria, the spread of drug resistance, and the interaction between HIV and malaria.

When the University of Malawi College of Medicine was established in 1989, malaria research became an important component of the College’s scientific agenda. To fulfill this task, the College established the Malaria Alert Centre (MAC) to exclusively support the NMCP with training, operational research, and monitoring and evaluation of malaria interventions, with funding from the Bill & Melinda Gates Foundation.

To ensure that operational research plans are relevant to the national programme, all research activities are first discussed and approved by the NMCP monitoring and evaluation technical working group.

Studies recently conducted by MAC in support of the NMCP include:

- assessing alternative ITN delivery strategies;
- evaluating the availability and accessibility of antimalarial medications;
- studying the role of RDTs in the context of malaria treatment scale-up;
- analyzing the durability and long-term effectiveness of different LLINs;
- monitoring the efficacy of IPTp in preventing malaria.

Ongoing research with far reaching policy implications include the impact of ITNs on malaria incidence in an area of documented high resistance to pyrethroids.
Most of these studies are conducted in collaboration with external technical partners, such as the US-CDC; hence developing capacity for malaria research within the country and providing a platform for future monitoring and evaluation activities related to the NMCP.

As the country is actively engaged in intensifying malaria control, future research priorities have been discussed by the NMCP and its implementing partners and the list has been included in the National Research Agenda. Future areas of investigation cover a wide range of topics, including:

- better understanding the trends in disease burden (recent data seem to indicate that in spite of the scale-up of control interventions, the malaria burden remains high);
- monitoring the effectiveness of available insecticides at a time of increasing resistance to pyrethroids;
- evaluating the feasibility and acceptability of using alternative insecticides for IRS such as DDT;
- exploring alternative approaches to ITNs/IRS for malaria prevention and control;
- continuing to conduct drug efficacy studies every two years to check for emergence of drug resistance;
- testing new strategies to increase early treatment of malaria within rural communities;
- studying factors affecting health workers’ compliance with treatment guidelines in the context of increased availability of diagnostic services.

Although research results are discussed directly with the NMCP through its technical working groups, Malawi also created a National Malaria Advisory Board in 2004, which reviews local and international evidence and advises the MoH before policy is changed. Current Malaria Advisory Board members include a senior medical practitioner/researcher currently working in the private sector, two prominent researchers from the university, one senior government physician, a retired pediatrician/researcher, and one community member. This Board provides a forum where policy-makers can review and discuss the latest evidence relevant to malaria control programmes with researchers, practitioners, and community members. The Board also provides a mechanism through which the NMCP can suggest research topics that would be meaningful to the programme.
b. Securing appropriate funding

External funding for malaria control in Malawi at a glance

- Malawi has been successful in attracting external funding to support its malaria control activities. From approximately US$ 8 million in 2006, external partner funding has grown to US$ 32 million in 2010—a four-fold increase in support.

- From 2006 to 2010, external partners committed a total of about US$ 121 million to the malaria control programme in Malawi.

- Funding for malaria control in Malawi has come mainly from four sources, the Government of Malawi, the Global Fund, the US-PMI, and households.

- Per capita commitments, considering only Global Fund and US-PMI resources, are insufficient for malaria control in Malawi.

The capital costs of malaria control—initial costs of scaling up interventions—are significant for any country to assume on its own. According to some estimates, ideally, a per capita amount of US$ 2.43-US$ 4.43 per annum is necessary to scale up and maintain the necessary levels of coverage for the different interventions. This can amount to as much as 1.7% of the total gross domestic product (GDP) per annum (2008 data) in a country like Malawi. Therefore, external funding from global partners is necessary for the first few years of malaria control. Additionally, considerable resources are spent out of pocket by families and communities.

Overall, total expenditures for malaria control increased from US$ 61.2 million in 2006–2007 to US$ 94.5 million in 2008–2009. For the period 2007–2009, approximately 54% of total expenditures came from donors. During the period 2006–2010, households in Malawi spent an average of US$ 1.48 per capita per annum on malaria. This is an average of 27% of total expenditures on malaria per year. The Government of Malawi spent an average of 16% of the total costs of malaria control during the same period. The rest of malaria expenditures came from international NGOs, employers, and other sources.

The boost in funding for malaria control in Malawi came mainly from the Global Fund and the US-PMI. In 2006, under Round 2, Malawi received a US$ 17.9 million Global Fund grant to fight malaria, and a further US$ 68.9 million was granted in 2011. The US-PMI has contributed close to US$ 80 million over the period 2006–2010. Figure 3 shows the increases in funding commitments and actual expenditures Malawi has received between 2006 and 2010 (amounts are less than total commitments). These resources touch on the lower limits of what was needed in 2008—the year with the highest per capita funding—at US$ 2.2. In 2006 and 2009, funding was just US$ 0.66 and US$ 1.48 per capita respectively—much less than the estimated funding needed to scale up malaria control interventions.

These expenditures include all sources, Government of Malawi, donors, households, etc.
From 2006 to 2010, the Global Fund and US-PMI committed a total of around US$ 121 million for malaria control in Malawi.

Notes:
* The total committed amount for the Round 2 and Round 7 Global Fund malaria grants is around US$ 75.7 million. This table accounts for disbursements of Round 2 and 7 Global Fund malaria grants only. Malawi has also secured a Round 9 Global Fund malaria grant totaling US$ 25.2 million and disbursements began in 2011.
* US-PMI amounts in this table are US-PMI commitments as outlined in annual US-PMI Malaria Operational Plans. The timing of disbursements from the US-PMI may be slightly different per calendar year.


Figure 4 shows Global Fund and US-PMI expenditures by commodity type in the seven-year period between 2004 and 2010.\textsuperscript{2} The largest percentage of Global Fund and US-PMI expenditures was for ITNs. More than 9 million ITNs were procured since 2004. Accounting for nets that need to be replaced and assuming homogeneous distribution in 3.4 million households across the country, a coverage of almost 100% with at least one mosquito net could have been achieved during some years. Since 2007, more than 21 million ACTs were procured. Accounting for the number of cases expected to be seen in facilities, on an annual basis, the amounts of ACTs procured filled most needs for the country.

\textsuperscript{2} These expenditures do not include Government of Malawi, pooled funds, NGO or out-of-pocket expenditures, which contribute a significant amount to all expenditures on malaria.
Figure 4
Malaria commodity expenditures by type of commodity for the period 2004–2010, from Global Fund and US-PMI sources

External funding for malaria control in Malawi related almost exclusively to ITN and ACT procurements (67% and 30%, respectively).

Note: ACTs were costed at an average of US$ 0.91 and US$ 0.82 per treatment for procurement by the US-PMI and Global Fund, respectively. ITNs were costed at US$ 4.47 per ITN for procurement by the US-PMI and Global Fund. ACT procurements began in 2007. ITN procurement began in 2004. RDTs were not procured before 2010. The total of malaria commodity expenditures over the period 2004–2010 amounts to nearly US$ 62 million.

Source: ITNs: Global Fund and DELIVER Project; ACTs: DELIVER Project; IRS: RTI International.
Box 4: Private sector contributions to malaria control in Malawi

Taking action against malaria makes sense from a public health perspective as well as from a business perspective. Malaria results in lost productivity due to absenteeism of ill employees, and lost business opportunities in terms of potential international investors and tourism. Across Africa, the private sector is recognizing that it has an important role to play in fighting against the disease. In Malawi, the sugar and mining industries have been especially active in malaria control. These include the uranium mining company Paladin Africa and the sugar company Illovo Malawi.

Paladin Africa

Paladin Africa, an Australia-based global uranium mining company, operates the Kayelekera uranium mine in the northern part of Malawi. The company estimates that each malaria episode results in an employee being absent for a minimum of three days, which amounts to thousands of lost work hours per year. Paladin has therefore taken a multi-pronged approach to curb the impact of malaria on its operations and 1200 workers. Staff at the Kayelekera mine’s International SOS Clinic (KM-ISOS Clinic, which is part of a network of remote sites operated by the company International SOS) encourage company employees living on-site to prevent malaria by using personal protective measures such as LLINs. Diagnosis with RDTs and treatment of positive malaria cases with ACTs is also provided to employees through the clinic.

In addition, Paladin Africa and International SOS have instituted a vector control programme covering the site of the mine and six neighbouring villages (Kayelekera, Juma, Wiliro, Thulwe, Amos, and Chiteka). The programme places a strong emphasis on community participation and includes IRS (quarterly), larval control (twice weekly), environmental modifications, insecticide management, and entomological monitoring. A trained team of spray operators conduct IRS and implement larval control. Mosquito vectors are also tested on an ongoing basis to determine their susceptibility to insecticides and define the right chemical for subsequent spray rounds, thereby potentially averting the development of insecticide resistance.

Educational activities have also started in 11 schools in the mine area, targeting over 4000 children and teachers with messages about malaria prevention and treatment. Story books have been developed that describe the signs and symptoms of malaria,
as well as how to prevent and treat the disease. To date, a total of 3000 books in the Tumbuka language have been distributed and a further 3000 have been printed in the Lambia language for distribution in schools.

In the coming years, Paladin Africa and ISOS plan to expand vector control activities to cover additional villages around the mining site in an effort to continue to improve people’s lives.

**Illovo Malawi**

At the Nchalo and Dwangwa Estates of the Illovo sugar company, located respectively in Central and Southern Malawi, conditions that are favourable for the growth of sugar cane are also conducive for the breeding of mosquitoes. According to company estimates, each malaria episode among employees results in two days of absenteeism. As a result, Illovo Malawi has taken a similar approach to Paladin Africa, and the company has implemented a broad set of malaria control measures in close collaboration with both governmental and non-governmental entities.

Illovo Malawi has invested heavily in IRS for malaria control. Beginning in the late 1990s, all household structures in the company’s area of operations have been sprayed twice a year using a combination of insecticides (organophosphates and pyrethroids) on a rotating basis. Given the company’s long-standing experience with IRS, Illovo Malawi played an important role in assisting with the pilot of IRS activities in Nkhotakota District. The company provided training for spray operators in that district and subsequently also instructed trainers for districts that were selected for the scale-up of IRS. The company has also provided logistical support to the national IRS program through the provision of insecticide storage facilities, as well as servicing and calibrating equipment during spray operations. During a period of acute fuel shortages in 2011, the company also ensured a secure and continuous supply of fuel for the IRS program in Nkhotakota District.

Other preventive measures supported by Illovo Malawi include environmental management, such as clearing irrigation structures to ensure continuous water flow and thus discourage the formation of malaria vector breeding sites within sugar cane fields. Illovo has built 12 clinics and health centres on the two estates, where LLINs are distributed and treatment with ACTs is provided to those patients with RDT-confirmed malaria. Informing and educating estate communities and company staff about malaria is also a priority for Illovo Malawi, and the company disseminates information through a drama group, email communication, and a free quarterly magazine *Nzimbe*.

The sugar estates have also served as a malaria research site for the NMCP and the University of Malawi College of Medicine, and data collected from the estates have informed the development of malaria control policies in Malawi. For example, company staff were instrumental in developing a national training manual for IRS in Malawi. Physicians and other staff members from Illovo have also participated in various technical committees related to malaria control in Malawi, including serving on the Global Fund Country Coordinating Committee.

To date, Paladin Africa and Illovo Malawi continue to bring malaria prevention and treatment interventions to the communities where they operate. Their work contributes to the expansion of malaria control in Malawi and sets an example for the important role the private sector can play in fighting against the disease.
c. Reaching Malawians with life-saving interventions

**Intervention delivery and coverage in Malawi at a glance**

- Household ownership of at least one ITN has increased from less than 13% in 2000 to 55% in 2012—a strong increase in net ownership.

- ITN use among vulnerable populations has increased steadily between 2000 and 2012—from less than 3% among children under five years of age and pregnant women to 56% and 51%, respectively.

- IRS has expanded from one district to seven districts over the period 2007–2010, protecting nearly 2 million residents. However, national coverage with this intervention was only 9% of households in 2012 and the programme has met with challenges, such as insecticide resistance and operational issues.

- The percentage of pregnant women receiving IPTp2 in 2012 was 54%, nearly twice that recorded in 2000 and one of the highest coverage rates in sub-Saharan Africa.

- In 2012, half of all children with fever sought treatment from a health facility, provider, or pharmacy—a significant increase over the past decade.

- Equity of ITN ownership, ITN use, and IPTp by residence, wealth quintile, and mother’s level of education has generally improved as coverage with these interventions has increased.
Figure 5
Increases in malaria control commodities distributed and structures sprayed with IRS, Malawi, 2004–2010

Malaria prevention and treatment interventions were scaled up over the period 2004 to 2010, with increases in ITNs beginning in 2004 and ACTs in 2007. Although the geographical reach of IRS was also expanded, national coverage with this intervention remained very limited.

Note: RDT distribution began in 2011. IRS data presented here reflect US-PMI and NMCP spray activities and do not include IRS implemented by the private sector (Illovo Sugar [Malawi] Ltd. and Paladin Energy Ltd.) and the military.

Figure 6
Progress in malaria control intervention coverage, Malawi, 2000–2012

Over the period 2000–2012, ownership of ITNs doubled while ITN use among children under five years of age and pregnant women increased more than 17-fold. While coverage with IPTp also increased, treatment with ACTs remained relatively stable.

Note: ITN ownership data are not available for 2000. IPTp data reported are for SP regardless of the source. SP was the first-line antimalarial in 2000, 2004, and 2006; artemether-lumefantrine (an ACT) was the first-line antimalarial in 2010.

1. Increasing ITN coverage

Key milestones in ITN implementation in Malawi 1998–2012

1998
- A social marketing ITN distribution pilot project is launched in Blantyre District.
- Mosquito nets (bundled with an insecticide treatment kit) are sold to pregnant women and children under five years of age at public health facilities at a subsidized price of US$ 0.60.
- Private sector commercial outlets also provide mosquito nets (also with insecticide treatment kits) at a cost of US$ 5-6 per net, targeting those who can afford to purchase a full-price net.
- Nets are branded and widely promoted to the public through a range of mass media and interpersonal communication channels.

2002–2003
- ITNs are available through public health facilities and private sector commercial outlets in all districts of the country.

2007–2008
- LLINs are introduced and a new policy is developed to include free LLIN distribution to children born in health facilities, children attending their first EPI visit, and pregnant women at their first visit to an antenatal care clinic.
- The new policy includes support for national distribution campaigns every two to three years, targeting pregnant women and children under five years of age.

2011
- Malawi releases its 2011–2015 Malaria Strategic Plan.

2012
- Nationwide universal coverage ITN campaign is implemented.

Malawi’s current strategy for malaria control calls for universal coverage with ITNs, defined as one net per two people. To achieve this, the NMCP supports a three-pronged approach to ITN distribution: 1) routine distribution of free LLINs through ANC and EPI clinics, 2) periodic mass campaigns covering the entire population, and 3) social marketing through private sector outlets. This strategy has proven effective and has helped Malawi to increase ITN ownership dramatically. While only about one quarter of all households owned an ITN in 2004, 55% owned an ITN in 2012 (see Figure 6).

Similarly, use of ITNs has increased significantly between 2000 and 2012 for both children under five years of age and pregnant women (see Figure 6). Although use is highest among these vulnerable groups who have traditionally been targeted by routine channels and mass distribution campaigns, increases in ITN use have also occurred in the general population (see Figure 7). Within households that own an ITN, use of ITNs is 84% for children under five years of age and 79% for pregnant women according to the 2012 MIS. ITN use among the de facto population of households (i.e. among all those who slept in the household the night preceding the survey) was 41% in 2012.
While nearly 6 in 10 households owned an ITN in 2012, only 19% owned an ITN for every two household members. When the entire population of the household is taken into consideration, access to an ITN (defined as at least one ITN for every two de facto persons in a household) and use of an ITN was 37% and 41%, respectively. Malawi is likely to make further progress towards its goal of universal coverage with ITNs following the national universal coverage campaign in 2012, with LLINs provided through the Global Fund, the US-PMI, the Against Malaria Foundation/Concern Universal, and the Millennium Villages Project.

Progress has not been equal for all segments of Malawi’s population, and inequities in ITN ownership and use persist. Despite dramatic improvements in ITN ownership and use at the national level among vulnerable populations, very little progress has been achieved in narrowing the gap for these indicators between households based on their residence (urban vs rural), wealth quintile (poorest vs least poor), and mother’s/pregnant woman’s level of education (no education vs secondary education) (see Figure 8 and Annex C, Figure 1). Children under five years of age and pregnant women from wealthier households, urban households, and households with mothers/women with secondary education are much more likely to own and use ITNs.
Malawi has substantially increased ITN use among vulnerable populations, through support for a robust ITN distribution strategy that combines sales through the commercial sector and free distribution to pregnant women and children under five years of age through public health facilities. In 2012 nearly six in ten children used an ITN the night before the survey.

Note: Data on ITN use in the general population are not available for 2000 and 2006.

Figure 8
ITN ownership by residence and wealth, Malawi, 2004–2012

ITN ownership doubled over the period 2004–2012, and equity between households based on wealth and residence has improved.

Percentage of households owning an ITN

<table>
<thead>
<tr>
<th>Year</th>
<th>Urban</th>
<th>Total</th>
<th>Rural</th>
<th>Least poor</th>
<th>Total</th>
<th>Poorest</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Squares in the above figure denote national coverage estimates for the indicator. Bars, most often positioned above and below the squares, are national coverage estimates for the indicator disaggregated by residence (urban/rural) and wealth (least poor/poorest). The closer the bars are to each other, the greater the equity of the intervention.

2. Expanding IRS

IRS implementation was launched by the MoH in 2007 in part of Nkhotakota District, and spraying continued for three consecutive years with expansion to the full district in 2009. Encouraged by the success in this district, this pilot programme was expanded to cover a total of seven districts in 2010 (Chikhwawa, Karonga, Mangochi, Nkhata Bay, Nkhotakota, Nsanje, and Salima Districts). From an initial small-scale pilot covering 28,000 households in 2007, the MoH has expanded IRS activities to protect nearly 2 million people in 430,000 households in 2010. The NMCP plans to implement IRS in ten districts during 2013 but, given various challenges with IRS implementation to date, there is discussion in-country about possibly re-evaluating this approach. Malawi recognizes that IRS is a key malaria prevention strategy and has incorporated it in the Malawi Malaria Strategic Plan for 2011–2015. By 2015, the NMCP plans to scale up IRS to 12 high-burden districts.

The 2010 DHS found that IRS coverage at the district level has been high in those districts receiving IRS (e.g. 72%-83% of households report IRS within the past 12 months in Nkhotakota District). The most recent nationwide survey (2012 MIS) shows that national coverage remains low in Malawi, with only 9% of households reporting that they had been sprayed with IRS. While IRS may be important in protecting communities in those districts receiving IRS, it is unlikely to have influenced national trends in under-five mortality over the period 2000–2010 given the small scale of the intervention.

The scale-up of IRS in Malawi has met with operational challenges such as high costs, delayed insecticide procurement, significant refusal levels among communities in some districts, and inadequate personal protective equipment and pumps for spray operators. Recent reports show growing resistance among mosquito vectors to the commonly used insecticides (pyrethroids and DDT); thus, a careful and continued monitoring of insecticide resistance in the country is required. A nationwide mapping exercise of insecticide resistance was planned in 2012 to establish the geographical extent of the problem. This study will be critical in informing future decisions around insecticide selection for IRS and the roll-out of IRS over the coming years.

3. Providing IPTp to pregnant women

Malawi has recommended SP for the prevention of malaria during pregnancy since 1993 and is recognized as a pioneer throughout the African region for being the first country to initiate this approach to malaria prevention during pregnancy—well ahead of WHO’s official recommendation of IPTp with SP in 2002 (see Box 5). In 2002, Malawi revised its national IPTp policy, calling for all pregnant women to receive at least two treatment doses of SP, at least four weeks apart, and under direct observation at an ANC clinic. IPTp is administered for free and is integrated into ANC as part of the WHO strategy of focused antenatal care (FANC), administered by Malawi’s Reproductive Health Unit.

While utilization of ANC services in Malawi is high—more than nine in ten women make at least one ANC visit during their pregnancy—and 76% of women receive at least one dose of SP (regardless of the source of the SP, i.e. during an ANC visit or not), far fewer women receive the recommended two or more doses of IPTp. Although there is still a gap between the current IPTp2 coverage and the NMCP’s target of 80%, Malawi remains one of the most successful countries in Africa in terms of IPTp2 coverage. The most current survey data (2012 MIS) show that the percentage of women receiving two or more doses (regardless of the source of the SP) has steadily increased from 28% to 54% between 2000 and
2012 (see Figure 9). Given that most pregnant women first attend ANC during their second trimester and most make at least two visits, there is substantial room for improving IPTp2 coverage.

As IPTp has been scaled up over the past decade, it has also become much more equitable (see Figure 10). For example, in the most recent survey (2012 MIS), there was little difference in IPTp use between women from households in urban and rural areas.

The advent of widespread *P. falciparum* resistance to SP is threatening the effectiveness of the current IPTp strategy, and creating an urgent need to evaluate new drugs and new approaches to reduce the burden of malaria in pregnancy (see Box 5).

**Figure 9**

**IPTp in women of childbearing age with live birth 0-2 years before survey, Malawi, 2000–2012**

With coverage of IPTp2 at 54% in 2012, Malawi has attained one of the highest coverage levels in Africa. There are opportunities for IPTp2 coverage to increase since use of ANC services in Malawi is high, with more than nine in ten women making at least one ANC visit during their pregnancy.

<table>
<thead>
<tr>
<th>Year</th>
<th>IPTp1+ (at least one dose)</th>
<th>IPTp2+ (at least two doses)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>2004</td>
<td>80</td>
<td>60</td>
</tr>
<tr>
<td>2006</td>
<td>90</td>
<td>70</td>
</tr>
<tr>
<td>2010</td>
<td>100</td>
<td>90</td>
</tr>
<tr>
<td>2012</td>
<td>90</td>
<td>80</td>
</tr>
</tbody>
</table>

Note: Data shown are for SP received by pregnant women, regardless of the source of the SP.

Figure 10
IPTp coverage by residence, wealth, and level of education, Malawi, 2000–2012

IPTp coverage has nearly doubled over the period 2000–2012 and the intervention has equitably reached households, irrespective of residence and level of education.

Note: Data shown are for SP received by pregnant women, regardless of the source of the SP. Squares in the above figure denote national coverage estimates for the indicator. Bars, most often positioned above and below the squares, are national coverage estimates for the indicator disaggregated by residence (urban/rural), wealth (least poor/poorest), and level of education (at least a secondary education/none). The closer the bars are to each other, the greater the equity of the intervention.

Malawi was the first country in sub-Saharan Africa to implement IPTp using SP in 1993, ahead of the initial recommendation issued by WHO in 2002.

In 1984, all pregnant women in Malawi were advised to take chloroquine 300 mg weekly throughout their pregnancy. Following reports of chloroquine resistance, the Malawi NMCP with technical support from the CDC, led a series of studies comparing the efficacy of the recommended 300 mg weekly chloroquine doses to other antimalarial drugs. In 1992, one of these studies showed that a two-dose IPTp regimen with SP was more efficacious than the other regimens. Based on these findings, Malawi weathered international scepticism to become the first country in 1993 to adopt the IPTp policy of two doses of SP at least one month apart in the second and third trimesters given up to 36 weeks of gestation. Ever since, Malawi has been a leader in the region on IPTp.

Since 1993, policies, strategies, and guidelines have been systematically reviewed and revised every five years in line with international recommendations. In 2002, the national IPTp policy was revised to read: “All pregnant women should receive at least two treatment doses of SP at least one month apart at the antenatal care clinic under direct observed therapy.” The change to “at least two doses” allowed for more than the original two-dose.
policy and accounted for the recommended three-dose coverage for HIV-infected pregnant women. Although SP was replaced by ACTs in 2007 as the first-line treatment for uncomplicated malaria in Malawi, SP is still used for IPTp. This is in line with WHO guidelines recommending that countries in stable malaria transmission areas should continue to scale up the SP-IPTp strategy until relative data on the effectiveness of SP for IPTp is made available.

In Malawi, IPTp is provided at ANC clinics and is fully integrated with Focused Antenatal Care (FANC) service delivery. This approach has resulted in very good coverage of IPTp. Today, 76% of pregnant women receive at least one dose of SP during their pregnancy and 54% receive the recommended two doses (2012 MIS). Even though this level of coverage still falls short of the RBM target, Malawi is far ahead of most malaria-endemic countries for this preventive intervention.

Failure to achieve RBM targets has been attributed to lack of clarity in policy guidelines on the timing of doses, lack of water and cups for administering directly observed SP treatment, concerns about administering “a strong drug” late in pregnancy, scepticism about the effectiveness of SP, and drug stock-outs.

To increase IPTp coverage even further, Malawi is promoting capacity building strategies such as pre-service education, on-the-job training, mentorship, and supervision to ensure that services are being provided in accordance with the policy guidelines. Stock-outs of SP supplies are being tracked through quarterly health facility monitoring. To address the late ANC initiation, the MoH is currently developing community-based maternal and newborn care packages which consist of visits by health surveillance assistants (HSAs) to pregnant women during their pregnancy and after delivery. These visits have a two-fold objective: encourage ANC consultations, and ensure appropriate interventions are being provided both before and after delivery.

With support from its external partners, Malawi continues to play a leadership role in shaping the future of IPTp. For instance, the Malaria in Pregnancy Consortium is conducting a multi-centre study in several countries (including Malawi, Uganda, and Zambia) to assess the effectiveness of SP for IPTp. Results from Zambia suggest that SP effectiveness for IPTp has declined, which is consistent with preliminary results from Malawi and Uganda. The efficacy of SP in the context of IPTp will need continued monitoring to provide critical information to Malawi to determine if and when policy on IPTp will need to be changed. Research on alternative antimalarial drugs and strategies which could be used for IPTp has also been commissioned. Results from these studies will again inform policies and guidelines in Malawi as well as other malaria-endemic countries.
4. Strengthening case management of malaria

Treatment

Prompt and effective treatment of clinical malaria illnesses is one of the key malaria control strategies recommended by the World Health Organization. Effective drugs to treat malaria are one of the principal tools that exist to combat malaria today. Over the years, the Malawian government has changed its national malaria treatment policies on multiple occasions due to the emergence of resistance to recommended drugs. In 1993, Malawi was the first country in sub-Saharan Africa to replace chloroquine with SP as the first-line treatment for uncomplicated malaria. In 2007, in response to scientific evidence of malaria parasite resistance to SP, Malawi changed its first-line antimalarial drug once again from SP to the ACT artemether-lumefantrine (AL). The second-line treatment is another ACT, artesunate-amodiaquine. Intravenous quinine is the recommended treatment for severe malaria. Severe malaria treatment is mainly delivered at hospitals where there are facilities for supervised treatment and other supportive care. The US-PMI procured sufficient stocks of AL to cover the initial 18 months of Malawi’s scale-up, and, with continued international donor funding, AL is now being provided free of cost to all fever patients presenting at health facilities across the country.

Diagnosis

WHO’s 2010 guidelines for the treatment of malaria state that “prompt parasitological confirmation by microscopy or RDT is recommended in all patients suspected of malaria (when possible) before initiating treatment”. In 2007, Malawi changed its malaria treatment policy to adopt ACTs, and, in 2011, the malaria case management guidelines were revised to include parasitological diagnosis of malaria. Due to the lack of widespread availability of microscopy or RDTs in many parts of the country, presumptive treatment based on clinical symptoms continues to be a common practice for patients in all age groups.

Currently only about 25% of health facilities have the capacity for malaria microscopy which is provided by trained laboratory staff at no cost to patients. Since microscopy is not widely available, it is used primarily to confirm treatment failures, in research studies, and to diagnose patients admitted to hospitals. The main constraints to expanding utilization of microscopy have been a lack of qualified health workers, lack of electricity, and inadequate laboratory supplies.

In line with Malawi’s National Malaria Strategic Plan for 2011-2015, malaria RDTs will be scaled up over a five-year period. As of November 2011, RDTs had been scaled up to health facilities nationwide. However, stock-outs occurred from mid-January until mid-June 2012, pointing to challenges associated with forecasting and the supply chain system.

Case management trends in Malawi

Although Malawi is committed to ensuring that all children are quickly treated when they present with symptoms of malaria and has included it as a key objective in its malaria treatment policies, the scale-up of this intervention has proven difficult. Overall care-seeking from formal health providers has improved significantly over the decade 2000–2010: nearly seven in ten children with fever seek treatment from a formal health provider (see Figure 11). Of all children with fever in the two weeks prior to the survey, the proportion treated with the first-line antimalarial drug remained stable between 2000 and 2006; however, a dramatic increase to 36% occurred between 2006 and 2010 (see Figure 11). Despite these improvements, only about a quarter of all febrile children under five years of age are receiving the recommended antimalarial within 24 hours, according to household surveys (see Figure 11). Of those children who were treated with any antimalarial, the proportion receiving the recommended treatment remained fairly constant.
over the ten-year period (ranging from 81% to 86%). Although the most recent nationwide survey (2012 MIS) shows that these levels of coverage appear to have dropped, the lower treatment levels may be the result of RDT introduction in 2011.

Prompt access to treatment in Malawi is a challenge because of the poor health system infrastructure and lack of human resources, inaccessibility of health services and frequent drug stock-outs. To ensure greater access to effective treatment, the Malawian government introduced integrated community case management (iCCM) of malaria in 2008, with treatment being provided by HSAs in hard-to-reach communities (see Box 6). Availability of antimalarial treatment near the home and in the community has been shown to significantly reduce malaria morbidity and mortality in children, and to increase equity in access. In Malawi, most treatment indicators have become more equitable over the decade when households are compared on the basis of residence, wealth, and mother’s level of education (see Annex C, Figure 2). However, coverage with these indicators and their equity appear to have declined in 2012.

**Figure 11**

**Treatment-seeking for children under five years of age with fever, Malawi, 2000–2012**

While only 35% of children with fever sought treatment from a formal health provider in 2000, this increased to 65% in 2010, together with improvements in the proportion of children treated with any antimalarial and the first-line antimalarial drug. Treatment of febrile children with first-line antimalarials within 24 hours of fever onset improved little during this period, with only about 24% of children receiving timely treatment in 2010. Coverage with these indicators appears to have dropped in 2012, although lower treatment levels may be the result of RDT introduction.
d. Supporting interventions through communication activities

The NMCP recognizes that information, education, and communication (IEC) and behaviour change communication (BCC) approaches are critical to reducing the burden of malaria in Malawi. A National Malaria Communication Strategy for 2009–2014 has been developed to guide advocacy and social mobilization efforts through demand creation for malaria services and key messages that are needed to affect behaviour change. The overarching goal of the communications strategy is to promote adoption of malaria prevention and treatment interventions by addressing barriers to behaviour change. Various creative communication channels are being used to reach communities including drama performances, radio/television jingles and programmes about malaria, talks held at health facilities, outreach clinics and community gatherings, and home visits by HSAs and village volunteers.

Within the MoH, the Health Education Unit provides the coordination and technical guidance for the development, implementation, and evaluation of IEC/BCC activities. This unit works in close collaboration with the NMCP and efforts are well-supported by partners and NGOs. With funds from the Government of Malawi through the sector-wide approach (SWAp) and the Global Fund, the NMCP supports all district health offices and the Health Education Unit to conduct various IEC/BCC activities. Activities are coordinated and messages are harmonized at the national level through an IEC/BCC technical working group, which brings together representatives from the NMCP, the Health Education Unit, media, national and international partners, donors and NGOs.

According to the 2012 MIS, knowledge about malaria is high—78% of respondents recognize that fever is a symptom of malaria, 87% know that mosquito bites cause malaria, and 87% cite mosquito nets as a malaria prevention measure. However, the NMCP has recognized that some attitudes and practices, such as late treatment-seeking behaviour continue to hinder the uptake of malaria prevention and control activities and that there are opportunities for the IEC/BCC programme to improve. The NMCP has identified a need to address these challenges by:

- increasing advocacy by involving political and civic leadership at all levels;
- intensifying the production and dissemination of IEC/BCC messages aimed at increasing use of malaria control interventions;
- updating and implementing the Malaria Communication Strategy in line with the new Malaria Strategic Plan;
- improving district-level coordination and collaboration between health education officers and district malaria coordinators.
Box 6: Integrated community case management in Malawi

During the 1950s-1970s, the Government of Malawi employed vaccinators. With the advent of cholera in the 1970s, the role of vaccinators was expanded to also include cholera management, and vaccinators were renamed cholera assistants. In the 1980s, this cadre was once again renamed health surveillance assistants (HSAs) and their scope of work was broadened to further strengthen the link between communities and the formal health system. All HSAs share common task responsibilities: immunization, growth monitoring, disease investigation, water and sanitation, health education/community mobilization, service delivery during child health days. Some extra tasks are performed by HSAs specially trained for that purpose: HIV counseling and testing, family planning, home visits for neonatal care, etc.

To date, over 10 000 HSAs have been trained in Malawi providing an HSA/population served ratio of 1:1200 (the official target is 1:1000). They live in the villages among the communities and each HSA has a defined number of villages to cover (typically three to seven). Newly-recruited HSAs have an average of 12 years of primary and secondary education. They are employed under the Environmental Health section of the Ministry of Health (MoH) and undergo a 12-week basic training programme.

National plans for scaling up interventions to reduce mortality and improve health among mothers, newborns and children in Malawi, as laid out in the Five-Year National Strategic Plan for Accelerated Child Survival and Development (2008-2012), have attracted international attention and support. A central strategy of the maternal, newborn and child health programme scale-up is the training of HSAs to increase the coverage of treatment for children with pneumonia, diarrhea, and eye infections with ACTs, antibiotics, oral rehydration salts (ORS) and zinc, and antibiotic ointment, respectively, and to identify danger signs and refer cases to the nearest health facility. HSAs also learn to counsel carers in administration of the prescribed medications, give the first dose of the medication, check the child’s vaccination status, and communicate prevention messages, such as use of ITNs.

The HSAs are trained in iCCM for six days, which includes approximately 25% training time in seven clinical practice sessions at the inpatient and outpatient wards, as well as various other training methodologies, such as video demonstrations of danger signs. The curriculum was adapted from WHO guidelines for integrated management of childhood illness (IMCI) in the community during in-country workshops in 2008. Reinforcement of skills learned in the training is supposed to take place through follow-up visits by an iCCM trainer/supervisor. During visits, supervisors should observe HSA consultations with sick children and provide feedback to HSAs as part of ongoing, on-the-job training.

The assessment, classification, treatment and counseling guidelines are simplified from the IMCI guidelines for workers at first level health facilities. The iCCM algorithms/guidelines are specified in an HSA job aid, the sick child recording form. HSAs provide iCCM services through “village health clinics” (VHCs) which are usually scheduled once or twice a week in a central location (e.g. the home of the HSA, the home of the village head man, or a health outpost building).

While the plan is for the iCCM programme to cover hard-to-reach areas in all 28 districts, training and implementation began in an initial ten districts with support from WHO and UNICEF under the Rapid Scale-Up for Maternal, Newborn, and Child Health grant from the Bill & Melinda Gates Foundation. Support for iCCM in Malawi has also been provided by a number of other partners, including the Canadian International Development Agency (CIDA), Save the Children, and the US-PMI.
Hard-to-reach areas are defined as sites more than five kilometres away from nearest health centre or places that are inaccessible due to geographical constraints. A total of 3622 hard-to-reach areas have been identified in Malawi. As of February 2012, 77% of these areas (or 2796) had a scheduled village health clinic and 84% (or 3044) benefited from the services of a HSA.

An assessment of the quality of care provided by HSAs trained in iCCM was carried out in 2009, after the first year of implementation, by the Institute for International Programs at Johns Hopkins University (IIP-JHU) in partnership with the MoH, WHO and UNICEF. Findings included:

- Counseling of carers of sick children about administration of treatments was found to be relatively high (67%), while administration of the first dose of medication at the VHC by the HSA (31%) and counseling messages about continued fluids and feeding for children with diarrhea (56%) both required improvement.

- Supervision of HSAs in their communities for iCCM was infrequent, with less than half the HSAs (39%) reporting any iCCM supervision visit in the three months before the assessment (an initial focus on district-level and team-based supervision seems to have been the main reason for this finding).

- The proportion of supervision visits that included observation of the HSA managing a sick child was also too low.

- Drug supply was an on-going challenge, with stock-outs of ACTs, ORS, antibiotic and eye ointment observed on the day of the visit at 11%, 31%, 26%, and 57% of VHCs, respectively. Stock-outs in the previous three months were even more common. The quantification of medicines for the community level was identified to be an important challenge.

In Malawi, the establishment of the successful iCCM programme through HSAs has relied on some essential elements:

- Clear leadership of both the MoH in implementing the programme and of district IMCI coordinators in engaging district health management team members.

- Recognition of HSAs as formal members of the health work force and organization of district-based village clinic review meetings to strengthen implementation.

- Understanding of partners about their roles and responsibilities. This enabled proper coordination of available support and collaboration of partners to roll out activities in assigned districts.

- Creation of village health committees under each functional village health clinic, and assignment of specific responsibilities to various cadres of staff (senior HSA, environmental officer, community nurse). These committees contribute to finding solutions to facilitate referral, such as arranging bicycles or ox carts for transport, and escorts at night.

- Development of integrated checklists incorporating key elements of the sick child recording form, and roll-out of standard operating procedures for Logistics Management Information Systems in order to strengthen utilization and management of medicines and other supplies.

In addition to the formal assessment of the quality of care provided by HSAs described above, it will also be important to evaluate the impact of the iCCM programme. So far, some benefits highlighted by health management teams during informal evaluations include:

- improved access to prompt treatment for sick child illnesses at community level;

- reduction of referred cases among children with danger signs to nearest health facility;

- decongestion of cases at health centre level.

The iCCM experiences acquired elsewhere, once documented and shared, will help define a clearer picture of the true impact of this intervention.
Impact at a glance

- Nationwide surveys conducted during both the low and high transmission seasons have reported a decline in malaria parasite prevalence among children (aged 6–59 months) to 28% in 2012.

- Severe anaemia (haemoglobin <8g/dL) among young children (aged 6–23 months), who are most vulnerable to malaria, declined from 20% (2004) to 13% (2010).

- Under-five mortality dropped 41% from 188 to 112 deaths per 1000 live births over the period 1996–2000 to 2006–2010.

- According to the Lives Saved Tool (LiST estimation model), approximately 21 600 deaths among children under five years of age were prevented by malaria vector control interventions (households owning at least one ITN) and the prevention of malaria in pregnancy (pregnant women receiving two doses of IPTp) in Malawi between 2000 and 2010.

Malaria parasitaemia

The proportion of the population infected with malaria parasites is a key measure of malaria transmission and examining trends in that proportion over time can be very informative in determining progress towards malaria control.

Health Management Information System

In Malawi, passive surveillance of suspected outpatient malaria cases is carried out on a routine basis at health facilities as part of the Health Management Information System (HMIS). In the HMIS, malaria cases are reported on the basis of clinical symptoms, with or without parasitological confirmation. Although this reporting system is somewhat incomplete and has not been formally evaluated for accuracy, it is one of the only sources of national-level data on clinical malaria. According to the HMIS, the number of reported malaria cases in all age groups increased from 3.7 million in 2005 to about 6.7 million in 2010. It is unclear why malaria cases increased during the period of malaria control intervention scale-up, but potential explanations for this apparent rise in reported cases include improved reporting and increased use of health services.

Household surveys

Over the period 2000–2012, four surveys have collected nationally-representative parasitaemia data from children in Malawi:

- Two cross-sectional household micronutrient surveys measured parasitaemia in children aged 6–35 months by microscopy in the dry seasons of 2001 and 2009, when transmission is expected to be low. The surveys show that malaria parasite prevalence dropped significantly from 61% to 20%.

- Two MIsSs conducted during the rainy, high transmission seasons in 2010 and 2012 found that
the proportion of children aged 6–59 months who were positive for malaria by microscopy dropped from 43% to 28%, respectively.

Given that malaria transmission is seasonal and that the four surveys were not all conducted during the same season, the parasitaemia data points available for 2001, 2009, 2010, and 2012 cannot be directly compared with one another. Although the micronutrient surveys were conducted during the season in which transmission is expected to be low, these two data points indicate that parasitaemia prevalence declined dramatically between 2001 and 2009. A decline in parasitaemia was also observed between the 2010 and 2012 MISs, which were conducted in the high transmission season.

Severe anaemia

In areas of moderate-to-high malaria transmission, severe anaemia (haemoglobin <8g/dL) among children is a good proxy measure of malaria morbidity and is a predictor of malaria-related mortality. In addition, it can be measured at population level with less variability than parasitaemia.

For Malawi as a whole, nationally-representative surveys show that severe anaemia in children aged 6–59 months did not change significantly from 2004 (11%) to 2012 (9%) (see Figure 12). From 2004–2010, a significant decline in severe anaemia prevalence from 20% to 13% was observed, however, among children aged 6–23 months, but there was no change in older children (aged 24–59 months). This observed trend is consistent with the expected impact of malaria control interventions on anaemia, since a greater impact has been noted among younger age groups.

In areas of Malawi classified as medium and high risk for malaria, the relative decline in severe anaemia between 2004 and 2010 among young children aged 6–23 months was about 45% for both. This decline was much larger than that observed in lower-risk areas (12%) (see Figure 13).

Micronutrient survey data from 2001 and 2009 were available for trend analyses for young children (aged 6–35 months). Taken together with the data from the 2004 DHS and 2012 MIS surveys, these four cross-sectional national surveys show temporal trends of decreasing severe anaemia prevalence over the period 2001–2012. In addition, sub-national data from anaemia and parasitaemia surveys show similar trends of decreasing severe anaemia in children (aged 6–30 months), although these changes are not statistically significant.

While severe anaemia prevalence has dropped slightly over the period 2004–2012, inequities between households persist—particularly on the basis of wealth and mother’s level of education (see Annex C, Figure 3).
Figure 12
Trends in severe anaemia among children under five years of age by residence and age, Malawi, 2004–2012
Severe anaemia has declined especially among children living in rural areas and among children in the 6–23 month age group.

Percentage of children under five years of age with severe anaemia (haemoglobin <8g/dL)

Note: At the time of report publication, stratification of severe anaemia by age was not available for 2012.
Source: 2004 DHS, 2010 DHS, 2012 MIS.
Figure 13
Trends in severe anaemia among children aged 6–23 months in areas with differing risk of malaria, Malawi, 2004–2010

Among children in the 6–23 month old age group, reductions in severe anaemia were greatest in areas of medium and high risk for malaria.

Percentage of children aged 6–23 months with severe anaemia (haemoglobin <8g/dL)

Note: At the time of report publication, stratification of severe anaemia by age and malaria risk area was not available for 2012.
Source: 2004 DHS, 2010 DHS.

All-cause under-five mortality

Because of the lack of malaria-specific mortality data, all-cause under-five mortality is often used as a proxy to determine if the scale-up of malaria control interventions has had an impact in malaria-endemic countries. Accurate measurements of malaria-specific mortality in young children have proven elusive in sub-Saharan Africa for several reasons, including (1) national registration systems for births and deaths have low coverage, (2) many childhood deaths occur in the home without contact with the formal health system, and (3) the validity of reported causes of death is unknown.

In Malawi, significant reductions in all-cause under-five mortality have occurred from the early 1990s through to 2010, with a 41% decline during the period 1996–2000 to 2006–2010 (see Figure 14).

- Mortality declined across almost all age groups during this time period (see Figure 15). Additional mortality analyses showed that the relative decline was similar in children aged 6–23 months, who are at higher risk of severe malaria and mortality, as compared with children aged 24–59 months.
Mortality declines were larger among children residing in rural areas (43%) as compared with children living in urban areas (10%) (see Figure 16).

Mortality among children under five years of age declined more sharply in areas of medium and high malaria risk (see Figure 17).

The timing of the change in these mortality trends corresponds with the period during which malaria interventions were scaled up (see Figure 18).

Many aspects of the mortality analysis presented in this section (urban vs rural residence, residence in areas of varying malaria risk, and timing) are consistent with the hypothesis that malaria control interventions were a major factor underlying the mortality changes observed in Malawi. Since many other factors could have contributed to the observed decline in under-five mortality, the next section of the report presents an analysis of the associations between malaria control interventions and mortality, accounting for other determinants of child survival.

**Figure 14**

*Trends in all-cause under-five mortality, Malawi, 1992–2010*

All-cause under-five mortality in Malawi has steadily declined since the late 1980s. The relative decline in child deaths over the period 1996–2000 to 2006–2010 was a remarkable 41%.

Number of deaths per 1000 live births

![Bar chart](chart.png)

Note: Mortality estimates refer to 0–4 years preceding the survey. Survey years are shown in the figure.

Figure 15
Trends in age-specific childhood mortality, Malawi, 2000–2010
Mortality has steadily declined across almost all age groups since the late 1990s.

Number of deaths per 1000 live births

0–1 month (NN)  1–11 months (PNN)  0–1 year (1q0)  1–4 years (4q1)  0–5 years (5q0)

Note: NN = neonatal mortality (first month) per 1000 live births; PNN = postneonatal mortality (age 1–11 months) per 1000 live births; 1q0 = infant mortality (first year) per 1000 live births; 4q1 = child mortality between exact age 1 and exact age 5, per 1000 children surviving to 12 months of age; 5q0 = under-five mortality, per 1000 live births. Mortality estimates refer to 0–4 years preceding the survey.

Source: 2000 DHS, 2004 DHS, 2010 DHS.
Figure 16
All-cause under-five mortality in rural and urban areas, Malawi, 2000–2010
The reduction in deaths among children residing in rural areas of Malawi has been significant over the decade, whereas the decline in urban areas has not.

Note: Mortality estimates refer to 0–4 years preceding the survey. Survey years are shown in the figure.
Source: 2000 DHS, 2004 DHS, 2010 DHS.
Figure 17
All-cause under-five mortality in high, medium, and low malaria risk areas, Malawi, 2000–2010
Mortality declines from 2000 to 2010 were larger in areas with medium or high malaria risk as compared with those with low malaria risk.

Number of deaths per 1000 live births

0 50 100 150 200 250
2010 2004 2000
Year

High-risk areas  Medium-risk areas  Low-risk areas

Note: Mortality estimates refer to 0-4 years preceding the survey. Survey years are shown in the figure.
Source: 2000 DHS, 2004 DHS, 2010 DHS.

Malaria control interventions saved children’s lives: The plausibility argument

Note: The impact analysis presented in this section of the report covers the timeframe 2000–2010. Surveys and activities that occurred outside of this timeframe are therefore not included in this analysis.

Because of the lack of malaria-specific mortality data, the RBM Monitoring and Evaluation Reference Group recommends the following approach to evaluate the impact of malaria control interventions on all-cause under-five mortality:

• Determine if all-cause under-five mortality has declined.

• Assess whether malaria control interventions have increased to a level at which impact can be expected.

• Determine if malaria morbidity (i.e. anaemia or parasitaemia) has fallen.

• Examine if alternative explanations for the mortality reductions exist.

If the first three conditions are met and no alternative explanations for the reduction in all-cause, under-five mortality can be identified, or the fall in mortality can only be partially explained by other factors, then it is reasonable to conclude that malaria control interventions contributed to the reduction in all-cause child mortality.
Changes in all-cause child mortality can be the result of improvements in many areas of health. To examine whether the marked reduction in all-cause child mortality could be attributed to the scale-up of malaria control interventions, other determinants of child survival were reviewed to determine if alternative explanations could account for the mortality changes that were observed in Malawi between 2000 and 2010 (see Annex B).

Women’s literacy improved from 57% in 2000 to 68% in 2010 (a 19% relative increase). Similarly, during the evaluation period, several child survival interventions improved in addition to malaria control interventions, which could have contributed to the decline in mortality among children under five years of age. These included:

- Increases in care-seeking for suspected ARI (relative 145% increase, from 27% to 65%) and for diarrhea (relative 120% increase, from 28% to 62%);
- Improvements in the treatment of diarrhea with ORS (relative 44% increase, from 48% to 69%) and a decline in the prevalence of suspected ARI (relative 42% reduction, from 27% to 15%)—which suggest improvements in care and prevention of childhood illness;
- Among children less than six months of age, a 62% relative increase in exclusive breastfeeding (from 44% to 71%);
- Introduction and improvements in vaccination coverage for *Haemophilus influenza* b (Hib) (relative 45% increase from 64% in 2002 to 93% in 2010, according to WHO/UNICEF); and
- A 32% relative increase in the proportion of women giving birth in health facilities (from 55% to 73%).

Coverage of other child survival interventions, including immunization services, increased less dramatically between 2000 and 2010. Sustained high coverage (exceeding 80%) of BCG, measles, DPT and OPV vaccination was observed during the evaluation period. The small increases in coverage of these vaccines are unlikely to have had a great impact on mortality in children under five years of age as sufficient levels for protection by herd immunity already existed in 2000. It is therefore likely that these interventions had little, if any, influence on the observed reduction in under-five mortality.

In summary, the 41% decline in under-five mortality in Malawi from 2000 to 2010 was observed in conjunction with a 14-fold increase in ITN use among children under five years of age and a 36% relative decline in severe anaemia prevalence in children 6–23 months. The decline in severe anaemia was larger in children aged 6–23 months, who are at higher risk of severe malaria and mortality, than in children aged 24–59 months. Larger declines in under-five mortality and severe anaemia were observed in rural areas, where the risk of malaria is higher compared to urban areas. During the evaluation period, climatic conditions favorable to malaria transmission persisted. Finally, some sub-national multivariable analyses suggest that malaria control interventions protect against malaria infection and severe illness in models that account for many other contextual factors. It is therefore plausible to conclude that reductions in all-cause under-five mortality in Malawi during the period 2000 to 2010 were in part due to reductions in malaria-specific mortality.

It should be noted that the majority of the decline in under-five mortality over the period 2000–2010 occurred in the early part of the decade (2000–2004), at a time when malaria control interventions were not yet fully scaled up (e.g. ITN use among children under the age of five was only 15% in 2004). Other child health interventions certainly played a role in this sharp decline in mortality. In the period
2004–2010, when malaria control was intensified, mortality continued to decline, albeit less sharply. With Malawi’s current efforts to accelerate malaria control, it is likely that declines in under-five mortality will continue.

**Figure 18**
*Trends in malaria control interventions, infant and under-five mortality, Malawi, 2000–2010*

*Scaling up of malaria control interventions appears to be concomitant with a decrease in child mortality.*

Note: Data shown are for SP received by pregnant women, regardless of the source of the SP. Mortality estimates refer to 0–4 years preceding the survey. Survey years are shown in the figure.

Number of deaths prevented, as estimated by the LiST model

The LiST model is used to estimate the number of deaths prevented among children under five years of age according to the estimated efficacy of the various malaria prevention interventions and changes in the coverage of these interventions.

To calculate the number of malaria deaths prevented each year through the scale-up of malaria control interventions relative to the baseline year, the LiST model uses three primary parameters: (1) the proportion of child deaths due to malaria in the baseline year (2000, in the case of Malawi); (2) the yearly population coverage of vector control and malaria prevention in pregnancy interventions from nationally-representative household surveys; (3) a protective efficacy of 55% for vector control (defined as a household owning at least one ITN or being effectively sprayed with IRS) against malaria-caused mortality among children under five years of age, and a protective efficacy of 35% for IPTp against low birth weight—both of which were derived from randomized controlled trials. Uncertainty around the LiST approximations was obtained through a non-probabilistic sensitivity analysis of varying these parameters by their 95% confidence intervals or uncertainty bounds. Coverage levels of other maternal and child health interventions were also included in the model.

The LiST model provides a conservative estimate, as it does not account for the lives saved through early diagnosis and effective treatment of malaria nor the indirect effects of malaria control on child mortality. It is therefore reasonable to assume that the actual number of deaths prevented by all malaria control interventions is much higher.

According to this model, approximately 21,600 deaths (range: 15,800–28,100) among children under five years of age were prevented in Malawi between 2000 and 2010 (see Figure 19), due to the scale-up of coverage of vector control measures (households owning at least one ITN) and prevention of malaria in pregnancy (pregnant women receiving two doses of IPTp). Household ownership of at least one ITN accounts for the vast majority (99%) of lives saved due to malaria control interventions.

This number of deaths prevented represents a 27% reduction in malaria-related mortality in children under five years of age in 2010 compared to what it would have been without the scale-up of malaria control interventions. It is estimated that the under-five mortality rate for 2010 is 4% lower than it would have been, had the NMCP not expanded malaria control intervention coverage.
Figure 19
Deaths prevented by malaria prevention for children under five years of age, Malawi, 2000–2010

The number of deaths prevented from the scale-up of malaria preventive interventions (ITNs and IPTp) has increased steadily throughout the period 2000–2010.

Annual number of deaths prevented for children under five years of age

Source: Data generated using the LiST model (US-PMI, JHU), 2012.
Figure 20
Projections of the impact of various NMCP activity scenarios between 2011 and 2015, Malawi

Four expansion scenarios were analysed using the LiST model. The first (in dark brown) achieves 100% coverage (at least one ITN per household) in 2014; the second (in light brown) maintains the annual rate of expansion of ITN coverage; the third (in orange) maintains the current coverage level (estimated at 55% for rural households); and the fourth (in red) shows reduced coverage if funding were to cease after 2010. The annual number of deaths prevented for children under five years of age according to each scenario is shown on the graph below.

By increasing the coverage to 100%, the number of deaths prevented per year among children under five years of age reaches 9000. If the expansion of ITN coverage proceeds at the same rate, it will take beyond 2015 to prevent the deaths of 9000 children. If the coverage is kept at 2010 coverage levels (55%), the number of deaths prevented stabilizes at close to 5000 per year. However, by withdrawing funding, thereby reducing the rate of coverage, the number of deaths prevented would quickly drop to only 2000 per year.

Source: Data generated using the LiST model (US-PMI, JHU), 2012.
Malawi has witnessed a decade of excellent progress in rolling back malaria. Looking forward, the NMCP’s goal for 2011–2015 is to reduce malaria morbidity and mortality by half through universal coverage with most malaria control interventions. Achieving this ambitious goal is possible, particularly if Malawi builds upon the lessons learned and successes it has achieved over the period 2000–2010.

The roll-out of malaria control interventions in Malawi has greatly benefited from a well-functioning and highly coordinated national approach to implementation. The NMCP has been able to rely on solid, technically-sound, and frequent advice from its technical groups as well as the national Malaria Advisory Board. The Board has also provided a forum for the NMCP to suggest research topics to the research community that are of relevance for the implementation of malaria control activities in Malawi. This model is producing good results and this level of coordination must continue into the future to sustain the gains achieved.

Progress has also been achieved thanks to strong local institutions that have conducted groundbreaking operational research. These institutions, working with a network of national and international partners have collected locally-generated data and successfully piloted novel interventions in Malawi. These studies have not only driven key policy

Challenges and opportunities in the coming years at a glance

- While progress with malaria control interventions has been excellent over the decade 2000–2010, achieving the ambitious goal of halving malaria morbidity and mortality as articulated in Malawi’s Malaria Strategic Plan for 2011–2015 will require a continued and sustained effort.

- Many of Malawi’s approaches to malaria control have worked well and must be continued. These include excellent coordination between the NMCP and all partners, strong in-country operational research capacity, and a focus on the platform of antenatal care for the delivery of malaria control interventions.

- Challenges to Malawi’s malaria control efforts include the growing issue of insecticide resistance, the possibility that SP efficacy for IPTp is waning, the need to intensify routine malaria surveillance and the use of data for decision-making, and the need to strengthen human resources within the NMCP.

- For enduring gains in malaria control in Malawi, a regional approach involving border countries will be essential. It will also be critical for funding to be more stable from year to year and across the required funding needs (e.g. commodities, services, and human resources).
decisions in the country, such as changes in first-line antimalarial treatment and the recommendation to use SP for IPTp, but also influenced malaria policies more broadly throughout the region.

Malawi’s success also cannot be dissociated from antenatal care—the story of Malawi’s fight against malaria is a “tale of ANC”. Malawi has truly understood the critical importance of antenatal care as the basis for the delivery of malaria control interventions. The antenatal care system is working well and Malawi can be proud of the levels of coverage it has achieved for IPTp—one of the highest levels of coverage in Africa. The ANC system will remain the backbone for the delivery of malaria control interventions and it will be critical to ensure that staff are appropriately trained to deliver malaria services, particularly laboratory diagnosis of malaria, and that the logistics systems to deliver antimalarials, RDTs, LLINs, and SP for IPTp are functioning well.

Despite these strong points and the successes seen so far, this is just the beginning. The road to achieving the ambitious goals set out in Malawi’s Malaria Strategic Plan for 2011–2015 is still long and there are opportunities to improve Malawi’s programme so that even greater gains can be achieved. For example:

- A key gap that must be addressed is human resources within the NMCP. Staffing at the national, regional, district, and community levels must be strengthened so that the NMCP can carry out its important mission.

- As the use of RDTs is expanded, efforts need to be focused on ensuring adequate supplies together with appropriate training for health workers—to ensure judicious use of ACTs only in instances where patients test positive for malaria. Strengthening the supply chain management system for all malaria commodities, including RDTs, will be critical.

- With confirmed parasite resistance to SP and preliminary evidence pointing to a possible reduced effectiveness of SP for IPTp, shifts in Malawi’s malaria in pregnancy policy might be necessary in the future.

- Levels of coverage for malaria interventions, while much improved over the decade 2000–2010, must be expanded to reach the goal of universal coverage by 2015. Much higher levels of coverage will be needed to drive malaria transmission down even further and ultimately affect mortality.

- As malaria is brought under control and transmission wanes, it will be essential to intensify monitoring and surveillance. This includes monitoring insecticide resistance more carefully, given the reliance on insecticides for two of the four malaria control interventions—IRS and ITNs.

- There is a need to better understand the factors underlying the reported increases in malaria cases at the end of the 2000–2010 decade in Malawi. The recent roll-out of RDT presents an opportunity to improve routine malaria surveillance and the use of data for decision-making.

- While funding for malaria control has increased in Malawi, greater stability in funding from year to year and for different interventions is needed to ensure that commodity and other needs are met.

- Finally, for malaria control in Malawi to progress in the coming years, efforts will need to be closely coordinated at the regional level with countries that share a border with Malawi. Scale-up and coordination at the regional level will be critical as lasting gains in malaria control in Malawi will not be possible if approaches are not harmonized between neighbouring countries.

While Malawi’s goal is not yet the elimination of malaria, the next few years will be very important as the country intensifies control efforts, such as
universal coverage with LLINs, to ultimately bring the burden of malaria down to negligible levels. Continued strong financial support of Malawi’s efforts, from both domestic and external sources, will need to be sustained to achieve this goal.
CONCLUSION

Malawi has reached an important milestone in its fight against malaria—malaria control interventions have achieved sufficient coverage to reduce malaria morbidity and mortality. Results from successive nationwide household surveys spanning the decade 2000–2010 show that all-cause mortality among children under five years of age dropped by 41%. Part of this decline in all-cause mortality could be due to the improvements in the coverage of non-malaria control interventions including increased women’s literacy, women giving birth in a health facility, exclusive breastfeeding, care seeking for suspected ARI and diarrhea, and the introduction of the *Haemophilus influenzae* type b (Hib) vaccination.

In addition, it is likely that the decline in all-cause mortality among children under five years of age was in part due to a reduction in malaria-specific mortality given that coverage of malaria control interventions improved; specifically household ITN ownership increased from less than 13% in 2000 to 57% in 2010, ITN use among children under five years of age increased 14-fold, and there was a 36% relative decline in severe anaemia prevalence in children aged 6–23 months.

Calculations using the LiST model conservatively estimate that the scale-up of malaria control interventions during 2000–2010 prevented at least 21 600 deaths among children under five years of age in Malawi. Since the model does not account for the many child deaths that are the result of the indirect effects of malaria, it is likely that many additional deaths were prevented due to malaria control interventions.

Malaria control in Malawi has clearly been successful and these gains in saving children’s lives should be celebrated. However, the country must continue to combat malaria with the vigorous support of its national and international partners to attain universal coverage with malaria control interventions. Malaria is on the decline but history has shown that the fight against malaria requires a continuous and steadfast approach over many years.

Financing of malaria control interventions together with strong political commitment must be sustained. The Government of Malawi estimates that implementation of its National Malaria Strategic Plan for the period 2011–2015 will require approximately US$330 million. While a proportion of this funding will come from its own budget, external donors (such as the Global Fund, the US-PMI, and others) will need to remain committed and continue their financial support for malaria control in Malawi. Careful targeting of these resources will be critical given the leveling off of global funding for malaria in general.

Malawi’s long-term success against malaria hinges on a number of factors including strong political support from the government and the NMCP, close collaboration and harmonization of malaria control efforts with neighbouring countries, sustained funding from both the Government of Malawi and the international donor community, continued technical guidance from Malawi’s domestic research institutions and its Malaria Advisory Board, and tight partnership with communities across the country.
ANNEX A

List of National Malaria Control Programme Partners

A variety of stakeholders joined the NMCP in implementing the activities and achieving the results described in this report. These stakeholders include:

National Partners

- Blantyre Malaria Project (BMP) and Malawi Liverpool Wellcome Trust (MLW)
- Christian Health Association of Malawi (CHAM)
- Illovo Sugar (Malawi) Ltd
- Malawi Red Cross
- Mulli Brothers Ltd
- Nkoma and Livingstonia Synods
- Paladin Energy Ltd
- Plan Malawi
- University of Malawi College of Medicine, Malaria Alert Centre

International Partners

- Abt Associates
- ActionAid
- Africare
- Against Malaria Foundation/Concern Universal
- Bill & Melinda Gates Foundation
- Canadian International Development Agency (CIDA)
- Canadian Physicians for Aid and Relief (CPAR)
- Chemonics International
- Christian Reformed World Relief Committee (CRWRC)
- Clinton Health Access Initiative (CHAI)
- Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund)
- ICF International
- Improving Malaria Diagnostics (IMaD)
- International SOS
- Japan International Cooperation Agency (JICA)
- Jhpiego Johns Hopkins University
- John Snow, Inc. (JSI)
- Johns Hopkins Bloomberg School of Public Health Centre for Communication Programs
- Malaria Control and Evaluation Partnership in Africa (MACEPA)/PATH
- Management Sciences for Health (MSH)
- Médecins Sans Frontières (MSF)
- Michigan State University
- Millennium Villages Project (MVP)
- Partnership for Child Health Care, Inc.
- Population Services International (PSI)
- Project HOPE
- Roll Back Malaria Partnership (RBM)
- RTI International
- Save the Children
- School of Tropical Medicine, University of Liverpool, United Kingdom
- United Kingdom Department for International Development (DFID)
- United Nations Children’s Fund (UNICEF)
- United Nations Development Programme (UNDP)
- United States Agency for International Development (USAID)
- United States Centers for Disease Control and Prevention (CDC)
- United States Peace Corps
- United States President’s Emergency Plan for AIDS Relief (PEPFAR)
- United States President’s Malaria Initiative (US-PMI)
- Wellcome Trust
- World Bank
- World Health Organization (WHO)
- World Vision International (WVI)
### ANNEX B

Information related to major child health programme coverage that may have contributed to reductions in all-cause child mortality between DHS 2000 and DHS 2010

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2000</th>
<th></th>
<th>2010</th>
<th></th>
<th>% change</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% 95% CI</td>
<td>n</td>
<td>% 95% CI</td>
<td>n</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Household attributes and asset ownership</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improved water source (protected, borehole, piped) (% households)</td>
<td>65.2 (62.1-68.2)</td>
<td>14 213</td>
<td>79.7 (77.7-81.5)</td>
<td>24 825</td>
<td>22.2</td>
<td>*</td>
</tr>
<tr>
<td>Time to water source &lt;15 min (% households)</td>
<td>33.4 (31.2-35.7)</td>
<td>14 213</td>
<td>34.7 (32.9-36.6)</td>
<td>24 825</td>
<td>3.9</td>
<td>Ns</td>
</tr>
<tr>
<td>Improved roof (not thatch/grass/mud) (% households)</td>
<td>25.8 (24.5-27.3)</td>
<td>30 553</td>
<td>35.0 (32.9-37.0)</td>
<td>24 825</td>
<td>35.7</td>
<td>*</td>
</tr>
<tr>
<td>Modern floor material (not earth/sand/dung) (% households)</td>
<td>18.8 (16.5-21.4)</td>
<td>14 213</td>
<td>23.3 (21.3-25.3)</td>
<td>24 825</td>
<td>23.9</td>
<td>Ns</td>
</tr>
<tr>
<td>Electricity (% households)</td>
<td>4.8 (3.8-6.4)</td>
<td>14 213</td>
<td>8.7 (7.8-9.9)</td>
<td>24 825</td>
<td>81.3</td>
<td>*</td>
</tr>
<tr>
<td>Telephone (landline or mobile) (% households)</td>
<td>5.1 (3.8-6.9)</td>
<td>13 664</td>
<td>39.3 (37.6-41.1)</td>
<td>24 825</td>
<td>670.6</td>
<td>*</td>
</tr>
<tr>
<td><strong>Women’s education and marital status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean years of education</td>
<td>4.0 (3.8-4.2)</td>
<td>13 220</td>
<td>5.4 (5.2-5.5)</td>
<td>23 020</td>
<td>34.1</td>
<td>*</td>
</tr>
<tr>
<td>Completed primary education (%)</td>
<td>19.1 (17.1-21.2)</td>
<td>13 220</td>
<td>29.3 (27.8-30.8)</td>
<td>23 020</td>
<td>53.4</td>
<td>*</td>
</tr>
<tr>
<td>Literacy (%)</td>
<td>56.5 (54.5-58.4)</td>
<td>13 220</td>
<td>67.6 (66.3-69.0)</td>
<td>23 020</td>
<td>19.7</td>
<td>*</td>
</tr>
<tr>
<td>Married (%)</td>
<td>71.5 (70.2-72.8)</td>
<td>13 220</td>
<td>67.5 (66.4-68.5)</td>
<td>23 020</td>
<td>-5.7</td>
<td>*</td>
</tr>
<tr>
<td><strong>Maternal and child health</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANC visits 4+ (% women, most recent live birth, 0-2 yrs)</td>
<td>54.2 (51.9-56.4)</td>
<td>5063</td>
<td>42.9 (41.3-44.4)</td>
<td>7724</td>
<td>-20.8</td>
<td>*</td>
</tr>
<tr>
<td>Tetanus toxoid 2+ (% women, most recent live births, 0-2 yrs)</td>
<td>78.8 (77.1-80.3)</td>
<td>5063</td>
<td>86.6 (85.5-87.6)</td>
<td>7724</td>
<td>9.9</td>
<td>*</td>
</tr>
<tr>
<td>Delivery at a health facility (% women, live births 0-4 yrs)</td>
<td>55.3 (52.7-57.9)</td>
<td>12 201</td>
<td>73.2 (71.3-74.9)</td>
<td>19 687</td>
<td>32.4</td>
<td>*</td>
</tr>
<tr>
<td>Births in any high-risk fertility category (%)</td>
<td>57.3 (56.2-58.5)</td>
<td>12 201</td>
<td>56.6 (55.4-57.7)</td>
<td>19 687</td>
<td>-1.2</td>
<td>Ns</td>
</tr>
<tr>
<td>Births with unavoidable fertility risk (%)</td>
<td>16.5 (15.7-17.3)</td>
<td>12 201</td>
<td>14.4 (13.7-15.1)</td>
<td>19 697</td>
<td>-12.7</td>
<td>*</td>
</tr>
<tr>
<td>Births with avoidable fertility risk (%)</td>
<td>56.0 (54.8-57.2)</td>
<td>12 201</td>
<td>55.5 (54.3-56.6)</td>
<td>19 697</td>
<td>-0.9</td>
<td>Ns</td>
</tr>
<tr>
<td>Low birth weight &lt;2500g (%)</td>
<td>11.1 (10.1-12.3)</td>
<td>5411</td>
<td>12.3 (11.5-13.1)</td>
<td>13 107</td>
<td>10.8</td>
<td>Ns</td>
</tr>
<tr>
<td>Small/very small size at birth (mother’s estimate) (%)</td>
<td>16.6 (15.7-17.6)</td>
<td>12 201</td>
<td>15.5 (14.8-16.3)</td>
<td>19 697</td>
<td>-6.6</td>
<td>Ns</td>
</tr>
<tr>
<td>Indicator</td>
<td>2000</td>
<td>2010</td>
<td>% change</td>
<td>Sig. 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>------</td>
<td>------</td>
<td>----------</td>
<td>--------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BCG 92.4</td>
<td>(90.7-93.8)</td>
<td>2238</td>
<td>97.2</td>
<td>(96.4-97.8)</td>
<td>3774</td>
<td>5.2</td>
</tr>
<tr>
<td>DPT3 / DPT3-HB-Hib 84.2</td>
<td>(81.8-86.4)</td>
<td>2236</td>
<td>93.0</td>
<td>(91.7-94.2)</td>
<td>3774</td>
<td>10.5</td>
</tr>
<tr>
<td>Polio3 79.8</td>
<td>(77.2-82.2)</td>
<td>2238</td>
<td>85.6</td>
<td>(83.9-87.2)</td>
<td>3774</td>
<td>7.3</td>
</tr>
<tr>
<td>Measles 83.2</td>
<td>(80.9-85.3)</td>
<td>2238</td>
<td>93.0</td>
<td>(91.8-94.0)</td>
<td>3774</td>
<td>11.8</td>
</tr>
<tr>
<td>All (BCG, measles, DPT3, polio3) 70.1</td>
<td>(67.2-72.8)</td>
<td>2238</td>
<td>80.9</td>
<td>(78.9-82.8)</td>
<td>3774</td>
<td>15.4</td>
</tr>
<tr>
<td>Under-fives had ARI symptoms in previous 2 weeks 26.7</td>
<td>(25.3-28.1)</td>
<td>10 559</td>
<td>15.4</td>
<td>(14.5-16.3)</td>
<td>18 013</td>
<td>-42.3</td>
</tr>
<tr>
<td>Under-fives with ARI sought treatment 26.7</td>
<td>(24.4-29.1)</td>
<td>2816</td>
<td>65.4</td>
<td>(62.9-67.9)</td>
<td>2774</td>
<td>144.9</td>
</tr>
<tr>
<td>Under-fives with diarrhea in previous 2 weeks 17.6</td>
<td>(16.7-18.6)</td>
<td>10 559</td>
<td>17.5</td>
<td>(16.8-18.3)</td>
<td>18 013</td>
<td>-0.6</td>
</tr>
<tr>
<td>Under-fives with diarrhea sought treatment 28.3</td>
<td>(25.7-31.2)</td>
<td>1859</td>
<td>62.4</td>
<td>(60.0-64.7)</td>
<td>3158</td>
<td>120.5</td>
</tr>
<tr>
<td>Under-fives treated for diarrhea with ORS 47.9</td>
<td>(45.0-50.7)</td>
<td>1859</td>
<td>69.0</td>
<td>(66.7-71.2)</td>
<td>3158</td>
<td>44.0</td>
</tr>
</tbody>
</table>

**Breastfeeding and undernutrition in children and women**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2000</th>
<th>2010</th>
<th>% change</th>
<th>Sig. 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exclusive breastfeeding in children &lt;6 months of age (%) 44.2</td>
<td>(40.7-47.7)</td>
<td>1260</td>
<td>71.4</td>
<td>(68.0-74.6)</td>
</tr>
<tr>
<td>Under-fives stunted (%) 54.3</td>
<td>(52.6-55.9)</td>
<td>9343</td>
<td>47.1</td>
<td>(45.2-49.0)</td>
</tr>
<tr>
<td>Under-fives underweight (%) 20.5</td>
<td>(19.2-21.7)</td>
<td>9343</td>
<td>12.8</td>
<td>(11.6-14.2)</td>
</tr>
<tr>
<td>Under-fives wasted (%) 6.3</td>
<td>(5.7-7.0)</td>
<td>9975</td>
<td>4.0</td>
<td>(3.3-4.8)</td>
</tr>
<tr>
<td>Vitamin A supplementation within last 6 months (%) children 6–59 months 70.6</td>
<td>(69.0-72.1)</td>
<td>9285</td>
<td>85.5</td>
<td>(84.6-86.4)</td>
</tr>
</tbody>
</table>

1 Sig = Statistical significance. Statistics with non-overlapping 95% confidence intervals are considered significantly different change.

2 Ns denotes no statistically significant change, and * denotes statistically significant change

3 Signifies 2006 MICS data source

4 Signifies 2004 DHS data source

5 Women aged 15–49 years

6 First order births to women between the ages of 18 and 34

7 Births to women <18 and >34 and births <2 years apart

8 Definition of ARI is based on data available in the 2000 survey: child had illness with cough in past two weeks and he/she breathed faster than usual with short, fast breaths

9 Definitions and methods per WHO reference population
ANNEX C

Equity of malaria control interventions in Malawi by residence, wealth, and mother’s/pregnant woman’s level of education

Figure C1
ITN use among children under five years of age and pregnant women by residence, wealth, and mother’s/pregnant woman’s level of education, Malawi, 2000–2012

Although ITN use has substantially improved over the period 2004–2012 among vulnerable populations, very little progress was achieved in narrowing the gap in ITN use between children under five years of age and pregnant women based on their residence, wealth and level of education.

Note: Squares in the above figure denote national coverage estimates for the indicator. Bars, most often positioned above and below the squares, are national coverage estimates for the indicator disaggregated by residence (urban/rural), wealth (least poor/poorest), and mother’s/pregnant woman’s level of education (at least a secondary education/none). The closer the bars are to each other, the greater the equity of the intervention. At the time of report publication, stratification of ITN use among under-fives by mother’s level of education was not available for 2012.

All treatment indicators markedly improved over the decade 2000–2010 and most became more equitable when households are compared on the basis of residence, wealth, and mother’s level of education. While inequities in treatment-seeking from a formal health provider clearly declined between urban and rural households, they persisted between households on the basis of wealth and mother’s level of education. In contrast, over the decade 2000–2010, the percentage of children treated with any antimalarial or the first-line antimalarial became equitable irrespective of residence, wealth, or mother’s level of education. Coverage with these indicators and their equity appear to have dropped in 2012, although lower treatment levels may be the result of RDT introduction.

Note: Squares in the above figure denote national coverage estimates for the indicator. Bars, most often positioned above and below the squares, are national coverage estimates for the indicator disaggregated by residence (urban/rural), wealth (least poor/poorest), and mother’s level of education (at least a secondary education/none). The closer the bars are to each other, the greater the equity of the intervention.

Figure C3
Severe anaemia among children under five years of age by residence, wealth, and mother’s level of education, Malawi, 2004–2012

While severe anaemia prevalence has dropped slightly over the period 2004–2012, inequities between households persist.

Note: Squares in the above figure denote national coverage estimates for the indicator. Bars, most often positioned above and below the squares, are national coverage estimates for the indicator disaggregated by residence (urban/rural), wealth (least poor/poorest), and mother’s level of education (at least a secondary education/none). The closer the bars are to each other, the greater the equity of the intervention.

Source: 2004 DHS, 2010 DHS, 2012 MIS.