Focus on Zambia
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# ABBREVIATIONS

<table>
<thead>
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<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACT</td>
<td>Artemisinin-based combination therapy</td>
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<tr>
<td>CHW</td>
<td>Community health worker</td>
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<td>DFID</td>
<td>Department for International Development (UK)</td>
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<td>DHS</td>
<td>Demographic and Health Survey</td>
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<td>GFATM</td>
<td>Global Fund to Fight AIDS, Tuberculosis and Malaria</td>
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<td>GMP</td>
<td>Global Malaria Programme</td>
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<tr>
<td>IEC</td>
<td>Information, education, and communication</td>
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<tr>
<td>IPT</td>
<td>Intermittent preventive treatment</td>
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<tr>
<td>IPTp</td>
<td>Intermittent preventive treatment for pregnant women</td>
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<tr>
<td>IRS</td>
<td>Indoor residual spraying</td>
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<tr>
<td>ITN</td>
<td>Insecticide-treated mosquito net</td>
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<tr>
<td>JICA</td>
<td>Japanese International Cooperation Agency</td>
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<tr>
<td>KCM</td>
<td>Konkola Copper Mines Plc</td>
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<tr>
<td>LiST</td>
<td>Lives Saved Tool – a model used to estimate impact based on rates of coverage of the various interventions</td>
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<tr>
<td>LLIN</td>
<td>Long-lasting insecticide-treated net</td>
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<td>MACEPA</td>
<td>Malaria Control and Evaluation Partnership in Africa</td>
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<td>MCM</td>
<td>Mopani Copper Mines Plc</td>
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<td>MDG</td>
<td>Millennium Development Goal</td>
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<td>MICS</td>
<td>Multiple Indicator Cluster Survey</td>
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<td>MIS</td>
<td>Malaria Indicator Survey</td>
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<td>MOH</td>
<td>Ministry of Health</td>
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<td>NMCC</td>
<td>National Malaria Control Centre</td>
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<td>NMCP</td>
<td>National Malaria Control Programme</td>
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<td>PPR</td>
<td>Parasite prevalence rate</td>
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<td>RBM</td>
<td>Roll Back Malaria</td>
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<tr>
<td>RDT</td>
<td>Rapid diagnostic test</td>
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<td>SP</td>
<td>Sulfadoxine-pyrimethamine</td>
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<tr>
<td>SWAp</td>
<td>Sector-wide approach</td>
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<td>UAM</td>
<td>United Against Malaria</td>
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<tr>
<td>UNICEF</td>
<td>United Nations Children’s Fund</td>
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<tr>
<td>UNITAID</td>
<td>United Nations-affiliated organization contributing to scaling up access to treatment for HIV/AIDS, malaria, and tuberculosis</td>
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<tr>
<td>USAID</td>
<td>United States Agency for International Development</td>
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<tr>
<td>US-PMI</td>
<td>United States President’s Malaria Initiative</td>
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<td>WHO</td>
<td>World Health Organization</td>
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FOREWORD

Malaria has a devastating effect on the population of Zambia: it is responsible for up to 40% of all infant mortality and represents a major socioeconomic burden on Zambian communities. Over the past five years, we have significantly intensified our efforts against malaria by initiating and scaling up internationally accepted strategies for its prevention and control.

These include: vector control through indoor residual spraying and the promotion of insecticide-treated mosquito nets; intermittent preventive treatment of malaria in pregnancy; introduction and scaling up of rapid diagnostic tests in health facilities otherwise lacking microscopy services; and prompt and effective treatment using artemisinin-based combination therapies.

To implement those interventions, we have established strong partnerships with our communities, other ministries and departments of our own Government, the faith-based health sector, the private sector, civil society and the global community. Strong, effective and coordinated partnerships have been established through the Roll Back Malaria Partnership, leading to significant technical, financial and logistical support.

Today, we are proud to tell our story in this report—not only highlighting our achievements, our progress, and our impact on the disease and the health of our fellow citizens, but also our challenges.

If today 73% of all households in Zambia have access to at least one vector control intervention, if anaemia and parasitaemia are decreasing among our children, if under-five mortality has been reduced, it is because of all the hard work that so many dedicated people have put in. I wish to acknowledge here their participation and contribution.

In 2008, we had hoped that thanks to our common efforts, results from the Malaria Indicator Survey of 2010 would be even better than the ones we have mentioned above. However, due to reductions or delays in funding, three of our provinces could not deliver malaria control interventions as planned, leading to a resurgence of malaria in these areas. This is unfortunate and represents one of the most difficult lessons learnt. Henceforth, we need to make sure that we can rely on predictable and sufficient funding to roll out the effective interventions which are needed to prevent and control malaria. Short of that, malaria will swiftly hit back—as is documented here—and people will suffer.

As Chair of the Roll Back Malaria Partnership, I wish to encourage, with this report, the information and experience sharing that partners need to harness and harmonize all available resources. I believe we will all benefit from synergies resulting from these global exchanges.

More than ever, the Government of the Republic of Zambia is committed to its goal of a malaria-free Zambia. Learning from the examples of others as well as from our own experience, we are looking forward to facing the challenges ahead with the help of dedicated individuals coming from all sectors of our society and from our partners. Together, we will need to consolidate our gains and to find new approaches to combat the disease in order to ensure a future free of malaria for the children of Zambia.

Hon. Kapembwa Simbao, MP
Minister of Health of the Republic of Zambia
Chair, Roll Back Malaria Partnership (RBM)
EXECUTIVE SUMMARY

Progress and impact of malaria control in Zambia at a glance

- Through the National Malaria Control Centre (NMCC), Zambia has built up a strong disease-control programme, with well-defined goals and organizational plans.

- Sound policies and good planning have attracted both partners and growing resources. Between 2003 and 2010, nearly US$ 200 million in external funding was allocated to scale up the malaria control programme.

- These funds, as well as a growing contribution from the Government of Zambia, were used to roll out appropriate preventive and curative services:
  - Over six million insecticide-treated mosquito nets (ITNs) were distributed between 2007 and 2010.
  - Over one million households have received indoor residual spraying (IRS) annually between 2008 and 2010, protecting at least five million people per year.
  - Health personnel have been trained in proper diagnosis and treatment of malaria, using Rapid diagnostic tests (RDT) and Artemisinin-based combination therapies (ACT), in all nine provinces—including an expanding number of community health workers.

- Careful roll-out of interventions was quickly followed by good coverage results:
  - 73% of households had either one or more ITNs or received IRS in 2010—a 41% increase in household availability of malaria prevention nationally between 2006 and 2010 and a fivefold increase between 2001/2002\(^1\) and 2008.
  - 52% of children under five in rural areas and 46% of pregnant women nationwide (regardless of mosquito-net ownership) used an ITN the night before the survey—a more than twofold increase in the same 2006 to 2010 period.
  - Among children with fever in the two weeks preceding the survey, 26% received an ACT in 2010 compared with 13% in 2008—a twofold increase in two years.

- These coverage results, in turn, allowed health staff to achieve impact, reduce disease burden and save lives:
  - The prevalence of parasitaemia in children under five was reduced from 22% in 2006 to 16% in 2010.
  - According to the Lives Saved Tool (LiST a model used to estimate impact based on rates of coverage of the various interventions), the lives of 33 000 children under five have been saved by malaria control interventions since 2001.

- These data show that malaria control is working and can generate major health gains. However, reductions in funding from 2008 to 2010 have been associated with decreases in intervention coverage in three provinces. This rapidly led to rebounds in parasitaemia and severe anaemia, highlighting the necessity of maintaining human and financial resources to sustain the gains.

- Zambia is now aiming at achieving and sustaining high national coverage rates for malaria control interventions. By anticipating the next steps in sustained control and maintaining a focused and organized approach, accompanied by adequate human and financial resources, final malaria control success could be within reach.

\(^1\) The Zambia DHS was carried out between November 2001 and May 2002.
Box 1: The extent of malaria in Zambia

Malaria in Zambia at a glance

- There are 13 million inhabitants in Zambia.
- Malaria is endemic and transmission is stable with a seasonal peak from November to April.
- There are regional epidemiological variations with a decreasing gradient in malaria transmission intensity from the north-east to the south-west.
- In 2007, there were about 4 million suspected cases and 6000 deaths attributable to malaria.
- Malaria is responsible for about 20% of deaths among children under five.

Zambia has a population of approximately 13 million people (Census Statistics Office, 2010). It is administratively divided into 9 provinces and 73 districts.

The entire country is endemic for malaria with moderate-to-high transmission in all districts. A seasonal pattern of higher transmission is associated with the rains between November and April.

Northern, Luapula and Eastern provinces have the highest annual incidence of malaria, while the lowest is found in Lusaka Province, specifically around the capital city.

The predominant malaria parasite species is *Plasmodium falciparum*. *Plasmodium malariae* and *ovale* account for less than 5% of recorded parasitaemia. *Anopheles gambiae* and *Anopheles funestis* are the main vectors.

Measuring malaria’s contribution to death and disease is challenging. Without proper parasitological confirmation, the diagnosis of malaria relies on non-specific clinical symptoms, mainly fever. Since 2007, RDTs have been made available widely to assist with parasitological confirmation, although the national health-reporting system did not begin to report confirmed cases until 2009.

Regardless, malaria has always placed an overwhelming burden on the Zambian population:
- The annual reported malaria incidence—including confirmed and unconfirmed cases—was estimated at 358 cases per 1000 population in 2007, a decrease from 412 cases per 1000 population in 2006 (MOH, 2008).
- In 2007, 4.3 million cases of malaria (confirmed and unconfirmed) were reported countrywide, with over 6000 deaths attributable to the disease (MOH, 2008).
- Malaria accounts for 40% of all outpatient attendance, for up to 40% of all infant mortality and for 15–20% of deaths in children under five years of age.

The human and economic impact of the disease is a serious curb to economic development, either directly—through the costs of health care and hospitalization—or indirectly, through work-days lost to personal illness or to caring for a sick child. Malaria accounts for 6.8 million disability-adjusted life years lost in Zambia—more than respiratory infections (5.4 million) or HIV/AIDS (3.2 million).
Figure 1.1
Predicted prevalence of malaria parasitaemia in Zambia

There is a gradient in parasitaemia in Zambia, with prevalence decreasing from the north-east to the south-west.

Malaria-control activities in Zambia have a long history. Early efforts stemmed from the recognition that reducing the malaria burden was good for mining productivity in the Copperbelt region of the country. Mining companies were instrumental in instigating malaria control measures, primarily IRS, throughout the 20th century, a trend that continues today.

After independence in 1964, efforts to sustain vector-control activities were divided among Municipal Councils, the Ministry of Health (MOH), and mining companies. Despite a long history of private-sector initiatives, malaria control services declined following the nationalization of the mining industry and the fall of copper prices in the 1970s.

As is the case for most malaria programmes in Africa, the malaria unit of the MOH in Zambia initially focused on research. In the 1980s, this unit began to notice an increase in resistance to chloroquine, most notably in Copperbelt Province. In the 1990s, with support from the World Health Organization (WHO), an effort to control antimalarial drug resistance was attempted through local councils. In December 1997, the National Malaria Control Centre (NMCC) was established.

The MOH set up institutional frameworks to coordinate a concerted action by intergovernmental and intragovernmental agencies and the array of in-country partners.

In the 1990s, the country had undergone decentralization in the health sector whereby districts controlled their local planning, resources and implementation.

Thus, RBM principles were introduced at subnational levels and included in the routine district planning cycles, enabling malaria prioritization in local resource allocation. This way, RBM became embedded within the national health-planning format and could draw upon common basket resources under the sector-wide approach (SWAp) arrangement.

The Government of Zambia increased its allocations for malaria control from the national budget and, through an act of Parliament, eliminated taxation on malaria-control tools, including mosquito nets and relevant insecticides. The stage was set for successful applications for external funding, and thus for NMCC to scale up malaria-control activities. Substantial increases in the available funding began in about 2004, increased further from 2005 to 2007, before abating slightly from 2008 to the present.

From a unit mostly focused on research, the national malaria control programme evolved into a decentralized operational structure, with a national strategic plan. The stage was set to attract external funding and embark on large-scale prevention and control activities.
Box 2: Private-sector investment in malaria control

Zambia’s private sector has historically played a significant role in malaria control. Three companies—one agricultural and two mining companies—have been leaders in this area for years.

Zambia Sugar Plc is one of Zambia’s largest agricultural enterprises. Its Nakambala estate in Mazabuka district is Zambia’s largest sugar plant and one of Africa’s main sugar processing facilities. In 2009, Zambia Sugar employed an estimated 3930 full-time-equivalent workers.

Mopani Copper Mines Plc (MCM) is a copper and cobalt producer with operations in the Kitwe and Mufulira districts in Zambia’s Copperbelt Province. MCM employed an estimated 12 630 full-time-equivalent workers in 2009.

Konkola Copper Mines Plc (KCM) is a copper and cobalt producer operating from the Chingola and Chililabombwe districts of Zambia’s Copperbelt Province. KCM employed an estimated 13 930 full-time-equivalent workers in 2009.

Figure 1.2
Map of Zambia and location of Zambia Sugar and mining business areas

The three companies have invested in an integrated malaria control and prevention programme since the year 2000. Their strategy included IRS, distribution of ITNs and early detection and treatment of malaria cases in the communities in which they operated. All activities were carried out in collaboration with the National Malaria Control Centre of Zambia, adhering to its control guidelines and treatment protocols.
On average, about 70% of the companies’ malaria control budgets was allocated to IRS. This complemented the work by the public sector that supported the distribution of ITNs in these districts.

The reductions in malaria cases recorded in the company health facilities (see Figure 1.3) eclipse the already impressive reductions (approximately 60% decreases) recorded in public facilities across Zambia in recent years. Between 2000 and 2009, across all three companies:

- The recorded malaria cases in company clinics decreased by 94%, from 27,925 to 1,631.
- The number of malaria-related lost work days decreased by 94%, from 19,392 per year to 1,133.
- Malaria-related spending at company clinics decreased by 76% from US$ 1.02 million to US$ 241,000.

More than 108,000 malaria episodes were averted from 2001 to 2009 and more than 300 lives saved through the malaria-prevention activities of these companies alone.
The net economic benefits have remained positive every year except for the first year of the programmes. Interpreted as an investment case, the malaria-control interventions proved profitable for any plausible discount rate. While malaria-control interventions appeared to pay off quickly, they also appeared fragile: temporary reductions in disease-control budgets quickly resulted in a resurgence of malaria episodes.

**Figure 1.3**

*Yearly malaria cases reported in company health clinics for Zambia Sugar, Mopani Copper Mines, and Konkola Copper Mines, Zambia, 2001–2009*

*Significant and rapid reductions in the number of malaria cases were recorded across the three companies implementing malaria control interventions over 10 years.*

Number of cases reported

Note: Includes malaria cases among employees and dependants. Where possible, other non-employee and family cases are excluded.

Source: Richard Sedlmayr (Harvard University), KCM, MCM, Zambia Sugar.
BUILDING A LARGE-SCALE MALARIA PREVENTION AND CONTROL PROGRAMME

This chapter describes the sequence of events required to set up a malaria control programme: management and planning (an essential step for securing funding), implementation of required interventions, and monitoring and evaluation, including measurement of coverage rates and impact. This last phase leads back to another planning phase using the new data, and restarts the cycle.

a. Management and planning

Zambia’s National Malaria Control Centre (NMCC) at a glance

- The NMCC was created in 1997.
- Through its technical working groups, regular planning sessions with partners and liaison with the country coordinating mechanism, the NMCC ensures good leadership and coordination of the national programme.
- The number of NMCC technical personnel increased from 3 in 2000 to 14 in 2007, but dropped to 11 in 2010.
- Prevention and control activities are guided by monitoring and evaluation as well as operational research conducted by national institutions and supported by external partners.
- While only modest resources were available in early years, funding and activities accelerated after 2005.

The National Malaria Control Centre in Lusaka assumed responsibility for coordinating Zambia’s malaria control activities in December 1997.

As a department under the directorate of Public Health and Research of the Ministry of Health, the NMCC provides technical support and coordination for a wide range of partners including research and training institutes and Provincial and District Health Offices.

The department links closely with partners in the commercial sector, churches and mission hospitals, non-governmental organizations (NGOs), and service groups such as the Zambia Red Cross Society, the Zambia Scouts Association, the Zambian Association of Chambers of Commerce and Industry, and Rotary.

In this most recent decade, a clear and focused commitment emerged with a well-defined organizational plan. Hence, under consistent leadership from the Ministry of Health and the NMCC, carefully prepared policy documents with defined targets and goals (Figure 2.1) were drafted, and included:
- a six-year strategic plan (the first one for the period 2000–2005, the second and current one, “A road map for impact on malaria”, for 2006–2010)
- a three-year implementation plan
- a monitoring and evaluation plan, 2006–2010
- an information, education and communication strategy
- a procurement and supply management plan.
The NMCC ensures good coordination of the various aspects of the programme through multiple technical working groups which meet every one to three months. An annual planning process is conducted with all partners, as is a yearly mid-term review.

Effective liaison is also maintained with the Country Coordinating Mechanism for the Global Fund, whose chair is the Permanent Secretary of the MOH.

With appropriate planning and management in place, the programme was able to deploy activities and transition to a scale-up phase:
- With mounting evidence of reduced treatment efficacy of chloroquine and sulfadoxine-pyrimethamine (SP), Zambia changed its first-line antimalarial treatment recommendations in 2002 to artemisinin-based combination therapy.
- ITNs were prioritized and first introduced through the private sector, social marketing with subsidized sales in antenatal clinics, and a variety of local community efforts. In 2005, the first mass distribution to address the scale-up needs was piloted. From 2006, ITNs were distributed via rolling mass campaigns that were expanded to national scale in 2007 and in 2008.
- First reintroduced through an employer-based scheme in 2000, IRS was also deployed in the public sector starting in 2003.
- Free distribution of RDTs in health centres was piloted in 2006 and scaled up nationally in 2007 and in 2008.
- The scale-up programme for ACTs started in 2004 after initial procurement followed a successful Round 1 application to the Global Fund.

The NMCC has made every effort to act on the basis of operational research. Each year, the programme develops an annual plan of action which incorporates the country research priorities by programme area through a consultative process.

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**Figure 2.1**
Objectives of Zambia’s national strategic plan for malaria control

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<thead>
<tr>
<th>NATIONAL MALARIA STRATEGIC PLAN 2006–2010</th>
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<tr>
<td><strong>Target</strong></td>
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<tr>
<td>ITN coverage target</td>
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<td>IRS coverage target</td>
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<tr>
<td>IPTp coverage target</td>
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<td>Target for ITN use in pregnant women</td>
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<tr>
<td>Target for ITN use in children &lt;5 years old</td>
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<td>Target for case management</td>
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*Source: Zambia NMCC.*
Research activities support all programme areas: case management, vector control (ITNs and IRS), information, education and communication (IEC) and programme management.

The NMCC was initially established as a research institute for malaria. Over time it has evolved into a malaria control programme with an established research unit which coordinates all national malaria-related research activities.

The various research activities are implemented in all 73 districts with a special focus on 10 sentinel sites selected based on their geographical locations and epidemiological profiles.

Malaria research in Zambia is implemented through strong collaboration with three primary institutions: the Malaria Institute at Macha (MIAM), the Tropical Diseases Research Centre (TDRC), and the University of Zambia (UNZA). Partnerships have also been developed with several external research institutions, including the Liverpool School of Tropical Medicine and Boston, Harvard, Johns Hopkins, and Tulane universities.

Since more funding became available, the NMCC has grown from a technical staff of 3 in 2000 to 14 in 2007. One logistical officer in particular was recruited at the end of 2007 and provided invaluable help in improving planning of delivery of diagnostic tests and treatments. However, reductions in funding levels since 2008 and a restructuring process at the Ministry of Health have led to post reductions—including the post of the logistical officer.

Today, the NMCC has a staff of 11. Frequent changes in leadership at the NMCC might also have affected the continuity of operations and might have caused institutional memory loss. Fortunately, due to the strength of the partnership and long-term commitments from some donors, additional technical staff operate through a coordinated NMCC staffing structure to fill some essential operational functions.
Zambia is often mentioned in the lead group of African countries fighting malaria. What do you see as the main reasons for its success?

First, political leadership. The Ministry of Health and the Ministry of Finance of Zambia are in the driving seat of the malaria-control effort. The president himself has been seen repeatedly wearing malaria-control tee shirts, has had his own house sprayed, and has asked publicly for more mosquito nets to be distributed. These are not only words or signals: the health-budget allocation has recently increased by 30% and so have the grants to the districts where most of the activities are taking place.

Secondly, a strong partnership based on mutual trust. Again, the Ministry of Health is in the driving seat—holding joint planning sessions with all partners and coordinating the implementation of the national strategic plan developed together. All partners are invited to participate in that plan based on their interests, strengths and financial means. Our own local research institutions guide us through sound operational research, which is carried out in-country.

Next, mobilization of resources. This strong partnership allowed us to mobilize resources from our external partners, such as the Global Fund, the United States President’s Malaria Initiative, the World Bank and the Bill and Melinda Gates Foundation. Having been made available to us, these resources have enabled implementing agencies to develop strong and effective interventions.

Lastly and above all, community engagement. Over the years, we have stressed the role of communities as critical partners that should take leadership and ownership of their own malaria control programmes. As outlined in Box 4 of this report, we have brought in traditional and religious leaders as well as ward councillors to lead the fight against malaria at the community level. We are increasingly relying on community health workers (CHWs) to implement interventions in the Zambian communities. IRS operators and mosquito-net distributors are also chosen from the communities.

On the other hand, what weaknesses have you identified?

Interestingly, some aspects can be seen as both strengths and weaknesses.

Having a strong partnership, for instance, can make us too dependent upon a single partner. When we rely on partners for commodities and supplies do not come on time, we are all thrown off balance. We are all in this together. We have to be able to plan our activities well in advance and if any of the partners does not fulfil its commitment, we all suffer. Also we have to be careful about establishing parallel programmes. All activities should be coordinated under the umbrella of the Ministry of Health. This requires vigilance.

Decentralization is another example. We have tried so much to empower the communities and the district level that we have bypassed provincial health authorities. They are a major link between the central and local levels, but currently the districts tend to be stronger than the provinces. Also, while empowering the community leaders, we need to make sure all actions are coordinated by the local health authorities if we are aiming for sustainability. I see two main ways of doing this. The first way is to re-establish departments of public health within local authorities. The second is to allocate more resources to health authorities in order to allow them to play an effective coordinating role. Seconding public-health staff to provincial and local levels—not only in large urban centres—would serve the same purpose and relieve the Ministry from some of the coordination work.

Can you share your vision about the future of the fight against malaria in Zambia?

First, we are strongly committed to the goal of a malaria-free Zambia, to scaling up interventions and sustaining them.

We also know that successes are fragile. For malaria, as for measles, we all witnessed that when we relaxed our control efforts, the disease quickly came back in the communities. So we have to sustain our efforts and our commitments, but we may need to better target interventions for
a greater impact, and to strengthen surveillance and operational research as well to be better informed and guided. Tracking resistance, in particular, will be essential.

We must increase our own Government resources and diversify our support, so that we rely less upon a few external donors. As a few companies operating in Zambia have done, we need to document clearly the economic returns of investments in malaria control to convince our colleagues in the Ministry of Finance.

Cross-border initiatives will have to be developed and strengthened, because we will only win this fight as a region and more broadly as a continent.

Finally, I want to see more emphasis placed on scaling up the integrated community-based management of childhood illnesses. By 2015, we should have a low malaria transmission rate countrywide. The fight will be won by actively tracking the remaining infected individuals—symptomatic or not—using community health workers.

With partners such as the Clinton Foundation, the UK Department for International Development (DFID), as well as Harvard, Johns Hopkins and Boston universities, we have begun to develop curricula for CHWs, to train them, and possibly to pay them. Their actions should be roughly 70% preventive and 30% curative—which will improve child survival through a comprehensive management of childhood illnesses.

**What recommendations would you have for countries which are not as advanced as yours?**

- Start small and expand. Learn through the process.
- Invest in capacity building. Establish a stable and able team.
- Build a strong partnership. Involve partners in planning and reviews.
- Learn through the sharing of country experiences. Use those experiences to solve bottlenecks.
- Adapt and use operational research to guide you as you make progress.
- Be humble. Successes are fragile, you need to sustain results.
- Know where to find help (RBM network of partners).
b. Securing appropriate funding

Outside funding for malaria control in Zambia at a glance

- Between 2003 and 2010, external partners have committed nearly US$ 200 million to the malaria prevention and control programme in Zambia.
- Other partners, such as the World Bank, WHO, UNICEF, MACEPA, DFID, JICA and UNITAID, have been actively involved.

Zambia’s sound policies and good planning attracted partners and growing resources. Encouraging results from that investment led to even more external funding. The country’s own growing Government contribution testified to the national commitment to malaria prevention and control.

Zambia has not reached the Abuja target of allocating 15% of the overall country budget towards financing the health sector. However, there has been a generally increasing trend in the health-sector budget—from 1.29 trillion kwacha (US$ 270 million) in 2007 to 1.82 trillion kwacha (US$ 380 million) in 2009—representing nearly 12% of the total national budget that year. The share of this budget that is earmarked for malaria is difficult to estimate, since it includes all support for health workers and structures (hospitals, health centres and laboratories) providing most of the care.

Partners’ collaboration is conducted on the basis of the National Malaria Strategic Plan. More than 60% of the NMCP strategic plan is funded by malaria partners. The budget for commodities (antimalarials, diagnostics, insecticides, and mosquito nets) is entirely provided by external partners.

Beginning in 2003, outside support grew considerably, starting with USAID support and expanding greatly with Global Fund grants (Rounds 1, 4 and 7).

This outside support increased further with funding from the World Bank and the Malaria Control and Evaluation Partnership in Africa (MACEPA, a programme at PATH funded by the Bill & Melinda Gates Foundation) in 2005, and gained considerable momentum when Zambia was included among the countries supported by the United States President’s Malaria Initiative (US-PMI) whose first funds were made available in 2007. More recently, DFID has approved substantial funding over 2010 and 2011 to support malaria control in Zambia.

Intermittent support from the Japan International Cooperation Agency (JICA) and district-level health funding from multiple donors contributing to the sector-wide approach (SWAp) provided a variety of sources for support needed for programme action at local levels.

Numerous other partners provided smaller financial contributions towards various aspects of technical assistance, advocacy or service delivery at local level, including WHO and UNICEF.

Of note, the fluctuation of the Global Fund allocations from year to year was a challenge for implementers. These fluctuations made planning and implementation of the scale-up expansion phase difficult.
Nearly US$ 200 million of external funds was provided for Zambia’s national malaria-control efforts between 2003 and 2010. In 2007, donors’ disbursements reached a peak of approximately US$ 41 million. However, these financial efforts have not been sustained since then, and have instead decreased—making the delivery of interventions a challenging task and compromising people’s health.

Source: Global Fund, US-PMI and Zambia NMCC.
Box 4: On the front line against malaria: community leaders and health workers

Zambia is a developing country, with an estimated two thirds of its 13 million people living beyond urban centres. In this setting, the most effective way to communicate about malaria and its prevention is at the community level. Malaria is a rural disease, but accessing rural areas in Zambia can be difficult. This difficulty includes the challenge of spreading the messages that need to accompany the increasing availability of the nets, drugs, diagnostics and insecticides that prevent and control malaria.

To reach even the most remote rural areas, the national programme has prioritized its communication to three main channels or messengers: community leaders (traditional, religious, civic), community radio, and community health workers (or CHWs).

Two of these channels—community leaders and community radio—have been the focus of intense training in provincial capitals. To date, more than 600 leaders and radio personnel have been oriented nationwide (see Figure 2.3).

Figure 2.3
Community-level interventions by communication channels, Zambia, 2007–2011

Source: Zambia NMCC.
Beginning in 2007, the national programme actively engaged traditional leaders to use their status to influence behaviour change in their chiefdoms, from discouraging the misuse of nets to encouraging people to sleep under them, and for those with fever to go for immediate testing and treatment. Since 2008, religious leaders from all faiths have undergone orientations on how they can play a role in the fight against malaria. This year the national programme began meeting with civic leaders (district commissioners, mayors, town clerks) to discuss ways in which they can prevent and control malaria in their constituencies.

Radio is inexpensive, portable, broadcast in local languages and can easily overcome an obstacle such as illiteracy (in Zambia radio reaches an estimated 80% of the population). Since 2007, the national programme has trained most of the nation’s 30 stations, working with journalists on malaria programming as well as techniques for interviewing, writing and presenting programmes, and for studio production.

It is estimated that half of those suffering from malaria seek treatment in their community instead of at a facility. Accessing health services is a challenge in rural areas, where malaria remains a serious health burden. Facilities are few and the roads can be difficult—particularly during the rainy season. These are some of the reasons why the Government has prioritized the use of community health workers in the fight against malaria.

Community health workers are trusted because they are selected by the community. In Zambia, they are lay members of society who work either for pay or as volunteers in association with the local health-care system and usually share ethnicity, language, socioeconomic status and life experiences with the community members they serve.

In Zambia, community health workers share more than malaria messages: they are also trained and equipped to test and treat for the disease. Rapid diagnostic tests are easy to use, quick and accurate. Their introduction has transformed the case management of malaria in Zambia. People with suspected malaria at the community level are tested with an RDT, and those with confirmed malaria receive prompt treatment with an ACT.

At first, there were questions as to whether a community health worker could be trusted to properly conduct a rapid test and dispense medicines. Subsequently, studies evaluating the country’s standardized training and materials have clearly shown that quality testing and treatment resulted from the empowerment of community health workers. The public benefited from better and more convenient health care. Another study demonstrated that community health workers, through household conversations and installing new treated mosquito nets as needed, can greatly increase the use of nets.

Zambia’s Ministry of Health, together with partners, is now training community health workers to actively pursue the malaria parasite. In areas of high transmission and infection, this involves supplementing the existing interventions by screening populations and treating those who are infected.

Because malaria becomes increasingly localized in Zambia, control interventions—now often delivered directly to households by community health workers—must be adapted to the new epidemiological situation. Activities such as community health workers testing people who do not present the symptoms of the disease will play an essential role in the coming phase of the national control effort.
c. Delivering interventions

Intervention delivery at a glance

- Over 6 million ITNs were distributed between 2007 and 2010.
- IRS coverage expanded from 5 districts in 2003 to 54 districts in 2010.
- Over 1 million households received IRS annually between 2008 and 2010, benefiting at least 5 million people per year.
- Over 2 million RDTs were distributed annually between 2008 and 2010, to allow for free diagnosis of suspected malaria cases in health centres and at community level nationwide.
- Health personnel have been trained in proper diagnosis and treatment of malaria, using RDTs and ACTs, in all 9 provinces—including an expanding number of community health workers.
- Information, education and communication activities using multiple channels have been conducted nationwide.

Malaria prevention and diagnostic services expanded markedly from 2003 through 2010.

1. Delivering over 6 million insecticide-treated mosquito nets to the population

Between 2007 and 2010, the Zambia Ministry of Health and partners procured and distributed over six million ITNs (since 2006, all have been long-lasting insecticide-treated nets or LLINs), with the largest distribution occurring in 2007 and fewer nets distributed in 2008 because most of the acute need had been addressed in the previous year (Figure 2.4). District-based rolling mass distribution enabled wide coverage, especially to rural and previously poorly served areas (Figure 2.5).

The national policy is now to distribute free ITNs nationwide for all ages to reach universal coverage targets. To ensure national coverage of three nets per household by the end of 2015, approximately 16 million nets would need to be delivered between 2011 and 2015.
Figure 2.4
Number of ITNs distributed (light green), structures sprayed (medium green), and rapid diagnostic tests distributed (dark green) by year, Zambia, 2003–2010

Services were provided following the receipt of external funding. The majority of ITNs were distributed during the 2007 national campaign. The distribution of ITNs in 2009 and 2010 was scaled down because of funding restrictions. Approximately two million RDTs are now distributed every year—a major improvement in diagnostic capacities for malaria.

Source: NMCC, 2011.
Figure 2.5
Estimated operational coverage of three ITNs per household in overlapping three-year intervals based on ITN distributions by district in Zambia during 2003–2010

District-based rolling mass distribution allowed a marked increase in the percentage of households with at least three ITNs, until funding restrictions impacted distribution and therefore coverage in the north-eastern provinces.


2. Expanding IRS interventions from 5 to 54 districts

National IRS activities—including mapping and enumerating IRS target areas, procurement of insecticide and spray equipment, and training of spray teams—expanded from 5 to 54 districts during the period 2003 to 2010.

IRS was reintroduced in Zambia by the private mining sector in 2000 (see Box 2). With the successful implementation and subsequent reduction in malaria incidence in areas prioritized for IRS, the NMCC decided to implement the programme in the public sector—initially on a pilot basis—in five urban districts. Since then, IRS has been scaled up to cover first 8 and then 15 and 36 districts by the years 2005, 2007 and 2008, respectively. In 2010, the IRS programme covered 54 districts. From 2008 to 2010, over one million households were sprayed every year.
**Figure 2.6**  
**IRS coverage, Zambia, 2003–2010**  
*IRS is a major intervention against malaria in Zambia. In 2010, over 1.3 million households were sprayed, offering protection to approximately six million people, or half of the population of Zambia.*

Local public–private partnerships exist in some selected districts, e.g. between the District Health Offices (DHOs) and Konkola Copper Mines, First Quantum Minerals, Mopani Copper Mines or Zambia Sugar.

In Zambia, IRS is conducted as an annual event, between the months of September and December, just before the peak malaria transmission period.

The insecticides used for IRS include two classes: the organochlorines (DDT) and the pyrethroids (alpha-cypermethrin, lambda-cyhalothrin and deltamethrin).
3. Implementing interventions (ITNs, IPTp, RDTs, ACTs) and training health workers in all nine provinces

Starting in 2005, building on a strong reproductive health programme and commitments from nongovernmental organizations, Zambia expanded and then maintained ITN distribution and IPTp implementation to antenatal clinics in all nine provinces. Similarly, Zambia expanded microscopy training, RDT use and availability of ACTs in all health facilities, and extended the use of antimalarial treatment through an increasing number of community health workers trained in malaria diagnosis and treatment.

Since 2008, after an intense training period, all of the country’s health centres have been using RDTs provided free of charge to diagnose malaria. Today, approximately two million RDTs are distributed yearly for better diagnosis of malaria.

With the intensification of preventive measures and the wider use of RDTs, the number of ACT treatments required should decrease, resulting in significant cost savings. This trend is already evident in the most recent national malaria survey.

4. Conducting information, education and communication activities nationwide

In 2006, the NMCC developed a communication strategy to guide districts in the implementation of information, education and communication (IEC) and behaviour change communication.

In collaboration with partners, various training sessions have been conducted in all nine provinces to build capacity at the regional and district levels. Examples of training include community health workers being taught by media experts how to inform the population about malaria prevention and control, or annual orientations and sensitizations of community leaders. Key messages and IEC materials have been developed for all the interventions.

To strategically deliver these messages and materials, the national programme has engaged community leaders as messengers.

Since 2007, dozens of religious leaders have been trained in malaria control in each province. The 27 chiefs comprising the House of Chiefs—the body that represents Zambia’s many traditional leaders—were similarly oriented. In 2011, the NMCC conducted nationwide provincial-level training for civil leaders—district commissioners, ward councillors, mayors and town clerks.
Box 5: Fragility of achievements

From 2006 to 2008, Zambia demonstrated remarkable progress in scaling up intervention coverage and in reducing the burden of malaria parasitaemia (see Figure 2.7) and severe anaemia. This was evident in particular with the roll-out of ITNs to several provinces, primarily through antenatal care clinics and mass distributions. Coverage and use of ITNs increased dramatically during this period in most areas of the country. IRS activities also improved nationally, especially in urban and periurban areas.

Between 2008 and 2010, Zambia experienced a resurgence of malaria and severe anaemia, most notably in three provinces: Eastern, Luapula, and Northern (see Figure 2.7). There was essentially no, or very little, increase in the other six provinces (Central, Copperbelt, Lusaka, North-Western, Western, or Southern). North-Western and Southern provinces continued to show reductions in malaria parasitaemia between 2008 and 2010.

Figure 2.7
Malaria parasite prevalence by province among children under five, Zambia, 2006–2010

After a marked reduction nationwide between 2006 and 2008, malaria parasite prevalence increased in the north-eastern area of Zambia between 2008 and 2010.
The most likely explanation for the resurgence of malaria in Eastern, Northern, and Luapula provinces is that large influxes of new ITNs did not occur (other provinces which received the majority of ITN distributions between 2008 and 2010 recorded decreased or similar levels of parasitaemia between 2008 and 2010). New ITNs were not delivered to these three provinces because of reduced funding for commodities and delays in both procurement and support for implementation.

In early 2011, the Ministry of Health re-established funding from external donors and nearly half a million ITNs—obtained through the emergency procurement mechanism of the Global Fund—were sent to the Eastern Province. Northern Province received 800 000 ITNs and one million ITNs will fill the gap in Luapula Province. Critical gaps in ITN coverage identified during the 2010 MIS were addressed through the support of partners—but not in time to prevent increases in the malaria burden.

In Eastern Province, there has been no large-scale distribution since 2007, although several districts have received some nets since the 2008 MIS. Therefore, even though ITN ownership remained stable, nets may have lost their efficacy after more than three years of use.
In summary, the group analysing the results of the 2010 MIS recommended that the national malaria-control efforts should:

1. re-establish high ITN ownership and use in Luapula and Northern provinces and encourage continued ITN uptake among all households and household members, especially in Eastern Province. This is an urgent requirement.

2. explore and address the reasons for the stabilization of malaria rates in Copperbelt Province (by reviewing IRS coverage, choice of insecticide, ITN coverage and use). In the near term, an emphasis on increasing ITN coverage and use in the Copperbelt might be the most important preventive action for the coming transmission seasons.

3. attend to the other provinces (Lusaka, Central, Southern, Western, and North-Western) to assure that their current coverage and use with malaria-prevention interventions remains high.

A number of additional external factors, such as climatic or vector dynamics, may have also contributed to the resurgence of malaria parasitaemia. Still, it is incumbent on partners to continue to work together in support of the national programme to ensure the needed commodities are swiftly procured and delivered to districts.
d. Increasing coverage of malaria-control interventions

 Intervention coverage at a glance

- In 2010, 73% of households owned at least one ITN or had received IRS in the past year—a 41% increase in four years.

- 52% of children under five in rural areas and 46% of pregnant women nationwide (regardless of mosquito-net ownership) used an ITN the night before the survey—a more than twofold increase in the same four-year period.

- 70% of pregnant women received at least two doses of sulfadoxine-pyrimethamine during antenatal medical consultations in 2010—compared with 53% in 2004.

- Among children with fever in the two weeks preceding the survey, 26% received an ACT in 2010 compared with 13% in 2008—a twofold increase in two years.

- Progress was made between 2006 and 2010 across the coverage indicators towards more equitable availability and use of malaria interventions.

Malaria-control success is evident from population-based surveys monitoring intervention coverage rates at the household and individual levels. From initial low coverage observed in the 2001/2002 DHS, Zambia expanded malaria prevention coverage between 2004 and 2010.

In 2010, 73% of households owned at least one ITN or had received IRS in the past year (MIS 2010). This represents a 41% increase in household availability of effective malaria prevention nationally between 2006 and 2010 and a fivefold increase between 2001/2002 and 2010.

The rate of ITN use among children under five increased from 24% in rural areas (MIS 2006) to 52% (MIS 2010)—a more than twofold increase in four years. In households owning a mosquito net, the rate of use on the night before the survey was even higher (66% in rural areas and 63% in urban areas).
Among pregnant women, the percentage using an ITN the night before the survey also increased twofold—rising from 22% in 2006 to 46% in 2010.

IRS coverage increased nearly 70% among districts targeted for spraying between 2006 and 2009—representing a substantial expansion of within-district coverage into rural, more malarious areas. Annual IRS operational coverage (the percentage of structures sprayed among those targeted each year) in each district has been consistently high since 2005—exceeding 85% in each target district.

In 2010, nearly a quarter of households reported having been sprayed—representing a tenfold increase since 2006 in rural areas. At this level of population coverage, a substantial community benefit can be expected, even for those without an ITN or IRS.

The proportion of pregnant women who received at least two doses of sulfadoxine-pyrimethamine during antenatal visits rose from 53% in 2004 to 70% in 2010. This percentage could have reached 80% had drug shortages not prevented some women from receiving the recommended two SP doses during their antenatal visits.

According to current malaria-control strategy, Zambia aimed to treat 80% of patients within 24 hours of onset of symptoms by the end of 2010. Prompt presentation of febrile children to health facilities is essential to meeting this still-elusive target. In 2010, among children under five who had fever in the preceding two weeks, only 31% sought treatment from a health facility or provider.

However, the rates of malaria treatment for febrile children under five years of age decreased between the MIS 2006 and the MIS 2010, from 53% to 34%, a 36% reduction.

This decrease coincided with an expansion in the distribution and the reported use of malaria diagnostics (note that over two million RDTs were distributed yearly to districts between 2008 and 2010) and an increase in the use of ACTs.

Among children with fever in the two weeks preceding the survey, 26% received an ACT in 2010 compared with 13% in 2008—a twofold increase in just two years—suggesting a marked improvement in using ACT for first-line malaria therapy. By contrast, SP was used for just 4% of these children—it was still used for 21% of them in 2008—again suggesting an improvement in first-line treatment practices.
Figure 2.10
Antimalarial drug taken by febrile children treated for malaria, Zambia, 2006–2010

In 2010, compared to 2006 data, ACTs were more frequently used while SP use decreased markedly as first-line therapy, suggesting improvement in treatment practices. In 2010, 76% of children taking antimalarials were given ACTs—up from 18% in 2006—while the percentage of them taking SP went down from 56% to 11% over the same time period.

Unfortunately, routine health-information data do not include reporting from all districts on RDT use for testing febrile children, and so full data are not available to assess national efforts in increasing use of diagnostics. Data on diagnostics use from Lusaka District and data from several rural districts demonstrate substantial increases in use in at least some parts of the country.

Knowledge and understanding of malaria, while already quite good, has also improved during the scale-up of activities. In 2010, among women aged 15–49 years, and compared to 2006 survey data:
- 75% recognized fever as a symptom of malaria (up from 64%)
- 85% reported mosquito bite as the source of malaria (up from 79%)
- 82% reported mosquito nets as a prevention method (up from 76%).

Source: MIS.
Figure 2.11
Progress in intervention coverage, Zambia, 2002–2010
The increase in coverage rates is significant for all interventions. The effect of the scaling-up phase on coverage can be observed after 2006.

Interventions have reached rural and poor populations
The high national coverage rates extend to the poorer, more rural, and more malarious areas in Zambia.

The coverage rates for the lowest-wealth quintile households are shown in Figure 2.12. Equity ratios, defined as the wealth index quintile ratio between the least-poor households and the poorest households, of the key malaria indicators are presented.

- For most prevention and fever treatment indicators, the equity index has moved closer to 1.0 in the MIS 2010 compared to the MIS 2006.
- There has been no significant change for the IPTp indicators, but these measures have an equity index close to 1.0 in both years.
- For the morbidity indicators (where their equity index is less than 1.0—with parasitaemia and anaemia more common in poorer households), the anaemia equity index has moved slightly further away from 1.0, suggesting that malaria still affects the poor disproportionately.

**Figure 2.12**

**Changes in intervention coverage and prevalence of malaria and moderate–severe anaemia in poorest households and changes in the equity index* between 2006 and 2010, Zambia**

The findings presented below suggest that progress has been made between 2006 and 2010 across the coverage indicators towards more equitable availability and use of malaria interventions.

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*Equity index = ratio of coverage or prevalence in least-poor versus poorest households using standard wealth quintiles of Malaria Indicator Surveys; a value of 1.0 indicates identical coverage or prevalence in the least-poor and poorest households.

Box 6: Improving patients’ access to antimalarial drugs and rapid diagnostic tests

In Zambia, the supply chain for essential medicines needs to be strengthened; often, critical products for malaria, family planning, and sexually transmitted infections do not reach the people who need them most.

A study conducted in 2007–2008 revealed that service delivery points (SDPs) throughout the country, including health centres, health posts, and hospitals, had a continuous shortage of almost all essential medicines. Such inadequate supply of essential medicines can lead to considerable illness and death.

“In the past, we used to get a lot of prescriptions without access to actual medication”, said Mwansa Kasonde, a patient from Kasama. “The pharmacists would tell us to go and buy from drug stores whose price was exorbitant.”

In early 2008, a stocktaking study for essential medicines showed that, among other issues, the absence of a defined logistics system, resources, and training at the district level were major barriers to product availability at SDPs.

The Ministry of Health responded to the problem by initiating a logistics system pilot project to improve the availability of key essential medicines at SDPs in a cost-effective way. With funding and support from the United States Government and the World Bank, the MOH collaborated with Crown Agents, John Snow Inc., and the USAID | Deliver Project to design the pilot system.

In 2009, two systems, model A and model B, were piloted in eight randomly selected periurban and rural districts for one year. In addition, eight control districts were evaluated to compare the two pilot systems to the existing supply chain. The main difference between the two models was in the processing and distribution of commodities.

In model A, SDPs placed their orders directly with the District Health Office (DHO) each month. The DHO then submitted one bulk order to the national-level store, Medical Stores Limited (MSL), for the entire district. The DHO stored the combined shipment and resupplied specific health centres and health posts in the district, based on their order requirements.

In model B (a pass-through system), SDPs also sent their orders to the DHO each month. The DHO sent the orders to MSL, and the national store returned individually packaged orders to the DHO. The pre-packed orders were “cross-docked” (the need to unpack or repackage them is eliminated) at the DHO and distributed to the health facilities.

Before conducting the pilot project, staff members collected baseline data in all 16 pilot districts and the 8 additional control districts. A survey conducted a year later showed that both model A and model B resulted in great improvements over the existing supply chain.

Despite the success of both pilot models over the current supply model, model B was significantly more successful in terms of stock availability—making unmet demand considerably lower in model B districts.
Figure 2.13
Days of stockouts for antimalarial drugs and RDTs (fourth quarter, 2009)

For rapid diagnostic tests and malaria treatments in pilot districts, the number of days with stockouts decreased—more for model B than for model A—compared to the control districts.

“Drug availability has improved tremendously, particularly for antimalarial drugs and antibiotics”, said Oscar Bwalya, pharmacy technician at Mungwi Rural Health Centre. “We have the ability to do a physical count and order according to demand. This has ensured access to a variety of medicines by our community.”

Model B was more successful, probably because the system was more responsive, and the workload for DHO staff was reduced, relieving the bottleneck at the district level. In cases where orders from health centres and health posts unexpectedly increased, leading to stockouts at the district level, response time for resupplying was from one to two months with model A and the existing system, but only two weeks to a month with model B. Less district staff involvement was also needed in model B when compared to model A.

When comparing model B to the existing supply chain in pilot districts:
- Stockouts of antimalarial medicines were reduced from 48% to 8%.
- ACTs were available 88% of the time in model B districts, compared to 51% in control districts.

Implementing model B throughout Zambia could provide the means to save lives. People would have access to the health products they need, when they need them.
Senior members of the MOH praised the results of the essential medicines supply chain pilot and stated their commitment to scaling up model B to all of Zambia’s 73 districts. The pilot system used in the eight model B districts will be sustained, and the 16 model A and control districts will be converted to the B model. Nationwide implementation of the new essential medicines supply chain system will take approximately two and a half years to complete.

“The implementation of model B had a positive effect on increasing antimalarial drug availability in the pilot districts”, said Minister of Health Dr Kapembwa Simbao. “Scaling up this intervention is a key step in strengthening supply chain management in our country.”
e. Saving lives and measuring impact

Impact at a glance

- The prevalence of parasitaemia in children under five was reduced from 22% in 2006 to 16% in 2010, a rebound after a greater reduction to 10% in 2008.
- Moderate-to-severe anaemia (haemoglobin less than 8g/dL) also decreased from 14% in 2006 to 9% in 2010 — here again, a rebound from the 4% observed in 2008.
- Under-five mortality fell from 168 per 1000 births in 2001/2002 to 119 per 1000 births in 2007: a decrease of 29%. Mortality among children aged 1–4 fell 36%.
- According to the Lives Saved Tool (LiST estimation model), the lives of 33 000 children under five have been saved by malaria control interventions since 2001.

Evidence of the health impact of malaria control in Zambia is mounting, especially among young children.

Compared to MIS 2006 and 2008, the MIS 2010, conducted at the same time of year, showed that:

- Malaria parasite prevalence in children under five years of age was reduced by 53% over two years, from 22% in 2006 to 10% in 2008, but increased to 16% in 2010. Hence, progress could initially be recorded after intense scaling up of delivery of malaria control interventions. The disappointing result noted in 2010 seems to have been associated with reduced scaling-up efforts due to a decrease in funding after 2007 (see preceding Box 6).

Figure 2.14
Malaria parasite prevalence among children under five, by province, Zambia, 2006–2010

This figure illustrates the fact that reductions in prevalence could be sustained except where ITNs could not be replaced due to lack of resources, most notably in Eastern, Northern and Luapula provinces.

Percentage

Source: MIS.
- Moderate-to-severe anaemia (haemoglobin <8 g/dL) in children under five was reduced by 69% (from 14% in 2006 to 4% in 2008) and the reduction was seen in all age groups. In 2010, there was an increase to 9%—most probably for the same reasons as noted for the increase in parasitaemia. Based on analysis from MIS 2006, children in households with access to vector-control measures (ITNs or IRS) had consistently lower rates of parasitaemia and moderate-to-severe anaemia.

- There was a 67% lower parasite prevalence in the first 12 months of life in 2008 compared to 2006. The same prevalence was only 47% lower in 2010 compared to 2006. It is interesting to note the shift in the peak age of prevalence from the third year of life in 2006 to the fourth year of life in 2008 and to the fifth year of life in 2010 (Figure 2.15).

This observation of delayed first infection and a longer parasite-free period in infancy is consistent with findings from the controlled trials of ITNs and with the observed improved infant survival also seen in those studies. Similarly, the substantial reduction in moderate-to-severe anaemia rates occurred in all age groups among the children under five; this reduction is consistent with further improvements in infant and child survival.

Figure 2.15
Child parasitaemia by age group, Zambia, 2006–2010
The peak prevalence is shifting to older age groups. Reductions in prevalence observed in 2008 could not be sustained to the same level in 2010, most likely because funding restrictions impaired the delivery of preventive interventions.

National survey data show that all-cause child mortality has decreased by 29% from 168 per 1000 live births in DHS 2001/2002 to 119 per 1000 live births in DHS 2007 (see Figure 2.16). While there was a non-significant decrease in neonatal mortality (an 8% decline), a substantial improvement is seen in post-neonatal infant mortality (from 28 to 365 days of life: 38% reduction) and in 1–4-year-old children (36% reduction).
While the marked reduction in all-cause infant and child mortality may not be attributable only to improved malaria control, a review of other health programmes suggests little or no change in coverage of interventions for other major causes of child mortality, as shown in recent nationally representative surveys (see Annex A).

**Number of lives saved, as estimated by the LiST model**

The LiST model (Lives Saved Tool) is used to estimate the number of lives saved among children under five according to the estimated efficacy of the various malaria prevention interventions.
The LiSt model estimates the protective efficacy of vector control at 55% against malaria-caused mortality. The protective efficacy of intermittent preventive treatment in pregnant women has been estimated to be 35% against low birth weight, which then affects child mortality.

According to this model, approximately 33,000 deaths among children under five were averted in Zambia between 2001 and 2010, thanks to the scale-up of coverage for vector-control measures (as defined as a household owning at least one ITN or having been sprayed with IRS in the past year) and intermittent preventive treatment for pregnant women. Vector control accounts for the majority of lives saved, preventing 31,500 child deaths.

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

Fig 2.17
Lives of children under five saved by malaria prevention, Zambia, 2001–2010

Among the lives saved, the vast majority has been saved since 2004—when ITN coverage rates began to increase sharply.

This number of lives saved represents a 35% reduction in malaria-related mortality in children under five since 2001. It is estimated that this mortality rate for 2010 is 44% lower than it would have been had the NMCP not expanded malaria-control intervention coverage.
Figure 2.18
Projections of the impact of various NMCP activity scenarios between 2011 and 2015

Four expansion scenarios were analysed using the LiST model. The first (in light purple) achieves 100% coverage (at least one insecticide-treated mosquito net per household or IRS in the past year) in 2012; the second (in light green) maintains the annual rate of expansion to achieve 100% coverage in 2014; the third (in dark purple) maintains the current rate of coverage (estimated at 73%); and the fourth (in dark green) shows reduced coverage if funding were to cease. The annual number of lives saved for children under five according to each scenario is shown on the graph below.

By increasing the rate of coverage to 100%, the number surpasses—more or less quickly, depending on how fast coverage spreads—10 000 child lives saved per year. When the coverage rate is kept at 73%, the number of lives saved stabilizes at less than 8000 per year. By withdrawing funding, thereby reducing the rate of coverage, the number of lives saved would quickly shrink back to zero within five years.

Source: Data generated using LiST model (Eisele T. and Larsen D., Tulane University), 2011.
Impact on health services as well as other public-health programmes

Although there was no change in childhood stunting and wasting, there was a 48% reduction in underweight children—this finding may have been due to fewer repeated malaria infections as well as to other nutrient intake factors.

Training of health workers contributed to strengthening of the health system, but it is also interesting to note that malaria control may be a powerful force in reducing the burden placed on health services. Between 2007 and 2008, the number of outpatient visits among children under five years of age decreased from 5.5 million to 4.6 million (while Zambia’s population was expanding). This finding was paralleled by a similar decrease in reported malaria cases among the same population of children—from 2.1 million to 1.5 million. Thus, malaria control may be the single biggest cause behind the reduction of outpatient visits among children, thereby alleviating the burden on health services.
An effective strategy to control malaria can be seen as three-pronged: (1) a functioning system of rural health centres; (2) comprehensive implementation of malaria prevention and control interventions; and (3) when the parasite rate in the population declines to less than 3%, an introduction of active case detection.

This third prong of attack is designed to deplete the reservoir of parasites in the population, which continue to infect mosquitoes and initiate the next cycle of infection. In Zambia, the National Malaria Control Centre has implemented the first two prongs of the strategy effectively. Hence, in the area around the Malaria Institute at Macha (MIAM), in the Southern province, malaria cases as well as hospital admissions have declined. MIAM staff members were therefore able to design and implement a research programme to assess how (with new technology and well-staffed health services) the full three-pronged strategy could be implemented.

The first step started as a pilot project set up in August 2008 to test whether data collected in health centres could be used to respond to outbreaks quickly and effectively. Nursing staff in 12 rural health centres (RHCs) in the Macha catchment area collaborated with MIAM for this project. As per Ministry of Health instructions, the staff of rural health centres in Zambia are required to perform a rapid diagnostic test on all suspected malaria cases and only treat patients with a positive RDT.

Every week, on Monday morning, each of the 12 health centres sent MIAM the number of tests used and the number of tests positive for malaria via personal mobile phones. MIAM analysed the data and transmitted them to District Medical Officers, the NMCC and the Ministry of Health. The method of communication through the mobile phone system was effective and inexpensive (text messaging was used to transmit data and personnel were reimbursed through added talk time for their mobile phones). Participation by health centre staff was excellent.

Data analysis clearly showed the seasonality of the transmission patterns (Figure 2.19). It also suggested that regular, time-sensitive data retrieval systems could help improve management of the NMCC and could enable the rapid deployment of specific interventions to prevent malaria transmission.

Discussions with MOH personnel about ways to expand this data collection system are ongoing.
Figure 2.19
Weekly incidence of RDT-confirmed malaria from rural health centres in the Macha area, Southern Province, Zambia from August 2008 to December 2010

The Macha Hospital catchment area can be divided into the Kafue River flats, a humid area in a floodplain, and the Macha heartland, a few hundred metres higher and somewhat arid in the dry months. The peak of seasonal transmission lasts from January to June. During the rest of the year (which is the dry season) transmission is rare but sporadic, making active case detection easier to implement in order to achieve interruption of transmission.

Source: Johns Hopkins Bloomberg School of Public Health, Baltimore and Malaria Institute at Macha, 2010.
After that successful experience, the next step was to test an active case detection method. Malaria transmission usually follows seasonal patterns as mosquito populations fluctuate, with the prevalence of parasitaemia at a minimum in the cooler dry season. At that time, asymptomatic infections are critical, as this reservoir is probably responsible for sustaining the parasite population from one transmission season to the next.

Among the asymptomatic cases are gametocyte carriers. Asymptomatic infections can be associated with high levels of gametocytes, and probably serve as an important parasite reservoir. If asymptomatic individuals can be identified and treated effectively with gametocytocidal drugs at a time when mosquito activities are minimal, it may be possible to reduce and eventually eliminate the parasite reservoir.

Developing an active case-detection system to identify parasites in asymptomatic reservoirs is therefore critical to the development of an elimination programme in Zambia and has been the approach in other elimination settings.

From June to August 2009, during the dry, low-transmission season, the homesteads of all RDT-confirmed cases of malaria, captured by the passive case-detection system described above, were selected for the targeted screening process. The homestead where the index case resided was screened within two weeks of the case presenting at the RHC, using RDTs as well as molecular methods. Four RHCs in the Macha catchment area were enrolled in the project. The control population participated in an ongoing community-based study of randomly selected homesteads to assess the prevalence of asymptomatic infections.

In total, 186 and 141 participants residing in 23 case and 24 control homesteads respectively were screened. Household members of clinically diagnosed cases had an 8.0% prevalence of malaria using molecular methods, compared to 0.7% positive individuals in the control group. The case and control groups had a gametocyte prevalence of 2.3% and 0% respectively, but the difference was not statistically significant.

These findings were consistent with the observation that parasitaemia clusters and that there is an increased risk of infection in homesteads having an index case of malaria.

Numerous questions remain to be answered to validate and refine this approach, including whether RDTs are sufficiently sensitive for the purpose of identifying the low levels of parasitaemia often found in asymptomatic individuals. But if the goal is to reduce transmission, then asymptomatic reservoirs, particularly gametocytes, must be targeted. To sustain reductions in malaria achieved to date in Zambia, it will be important to reduce transmission and thereby to design a system to identify these foci of infection that could easily be implemented by the local health infrastructure.

This would be more easily done when infection levels decline as a result of widespread prevention and control interventions and during the low-transmission season. When cases of malaria are few, the system will not be overloaded. Hence, foci of asymptomatic infections would be located, health personnel dispatched to the homestead of the index case in a timely manner, and all infected individuals would be treated with ACT, or perhaps with a single dose of primaquine to kill gametocytes.

Until the risk of transmission is reduced to very low levels, there will be a need for continued vector-control measures coupled with these new efforts at active case detection. However, it is conceivable that—when prevalences decline—identifying and treating a small number of people in this way might be more efficient than mounting large-scale control interventions. Such an approach could also be both sustainable and cost effective.
LOOKING FORWARD: PROTECTING THE GAINS AND REDUCING MALARIA TRANSMISSION

The challenges of the coming years will be to maintain the malaria-control efforts, to mobilize enough human and financial resources to sustain the results, and to refine malaria-control measures to interrupt transmission.

Challenges of the coming years at a glance

- Sustain high national coverage rates of malaria-control interventions to further reduce the remaining morbidity, mortality and transmission, in the knowledge that the most visibly striking results have already been produced.
- Mobilize human and financial resources in order to strengthen the progress achieved so far, since the magnitude of coverage and impact is directly related to the amount of funding available in-country.
- Take additional steps to reduce the remaining malaria transmission using innovative approaches based on experience acquired in Zambia and elsewhere.

The consistency of the findings across the spectrum of receiving funding, documenting procurement and distribution of malaria prevention commodities, achieving high and equitable coverage and showing national data on reduced morbidity and mortality, makes a compelling story that malaria control is working.

At the local level in communities and health facilities, the story is similar. The introduction of systems to record parasitologically confirmed malaria outpatient cases, inpatient cases and malaria deaths (with the presence of stable diagnostic capacity) has documented decreasing malaria rates in several facilities where reporting has been consistent.

Similarly, the routine health information systems in districts where stable reporting has been maintained over time are showing substantial declines in both malaria infections and cases and in malaria deaths. Thus, the national survey data and the local Health Management Information System data are showing consistent progress in recent years.

Efforts in Zambia from 2005 through 2010 focused on scaling up malaria prevention services (ITNs and IRS for households, IPTp and ITNs for pregnant women) while curative services emphasized provision of improved diagnostics and quality of care for those attending facilities for malaria episodes.

Despite being an early adopter of artemisinin-based combination therapy for treatment of malarial episodes, access to health-care treatment services—especially in rural areas—remains challenging due to insufficient human resources for health and the difficulties in increasing utilization of qualified care for febrile episodes. The Government of Zambia took bold steps to address universal access to health care by removing user fees in 2006 for rural areas, but many challenges remain to adequately address staffing requirements to meet established
plans. More recently, the National Malaria Control Programme embarked on an ambitious plan to train community health workers in malaria testing and treatment in response to calls for expanding the front line of malaria-control services further into the heart of affected communities.

Zambia is now moving towards completing the final steps for achieving and sustaining high national coverage rates of malaria-control interventions to further reduce the remaining morbidity, mortality and transmission. Much work remains to be done to achieve the goal of universal coverage. Nevertheless, much of the success in reducing illness and death has already been recorded and further declines in illness and death rates will be modest in comparison to what has already been achieved. Thus, future success will be seen in holding morbidity and mortality at these new low levels and any future improvements will need to be compared to the pre-scale-up mortality estimates from the DHS 2001/2002.

Sustaining these gains will be extremely important, but this next phase will not be accompanied by huge new reductions in illness and death because the current much-lower levels suggest that the remaining child morbidity and mortality may be due to other causes.

This could lead to complacency in malaria-control efforts within the country and among the external partners that have greatly aided this effort. Decision-makers could move to support new and different priorities; if the complacency or shifting focus leads to undoing current gains against malaria, high malaria morbidity and mortality rates can be expected to return—as has occurred elsewhere in recent times.

Thus, the critical next step is to sustain the current gains and further reduce malaria transmission. The scale-up phase in malaria control was initially thought to be quite challenging, but it may be the easy part, as countries and partners target sustained malaria control and, ultimately, malaria elimination.

For Zambia to take additional steps to reduce the remaining malaria transmission, continued resources and additional efforts will be required. It has been shown that the magnitude of coverage and impact was directly related to the amount of funding available in the country. In the same way, the coverage scale-up and burden reduction will be directly proportional to the intensity of the effort in terms of both human and financial resources (see Figure 3.1).
An accelerated programmatic scale-up will be associated with quick and significant results; a more incremental approach will bring slower and less-pronounced achievements.

As the infection and disease become more focal, community techniques to map malaria cases and transmission as well as an approach of testing and treating the remaining infected population will be required. This approach is under consideration in an initial set of villages (see Box 7). Only by anticipating the next steps in sustained control—presumably the same steps that will be ultimately needed for elimination—will Zambia (and other countries) be able to achieve ultimate success in controlling malaria.
CHAPTER IV

CONCLUSION

Thanks to good planning and management, as well as external funding of nearly US$ 200 million between 2003 and 2010, Zambia’s National Malaria Control Programme has been able to deliver malaria control and prevention interventions to urban and rural households.

Between 2005 and 2010, efforts have intensified markedly, resulting in a massive scale-up of interventions to both prevent and treat the disease. Rural and poor populations can now be reached as well or even better than urban and wealthier ones.

In 2010, 73% of households owned either one or more ITNs or had received IRS in the past year. The impact of these interventions has been notable: parasitaemia, anaemia, and child mortality have all decreased. The number of children’s lives saved by malaria control measures is estimated to be at least 33,000 over the last 10 years.

Zambia’s progress in malaria control has indeed been quite remarkable. Yet, success is fragile. Recent decreases in coverage of malaria-control interventions in Eastern, Northern and Luapula provinces, documented by MIS 2010, followed funding restrictions in 2009 and 2010. This clearly illustrates the absolute necessity of maintaining financial and human resources in order to sustain the gains against malaria. Without this commitment, the disease will bounce back swiftly.

The coming years will be both challenging and exciting for Zambia. They will offer the country and its partners the opportunity to pursue its vision of a “malaria-free Zambia”. But achieving this vision will require focus, persistence and the need to test new malaria-control interventions that better address evolving objectives.
### ANNEX A

Information related to major child health programme coverage that may have contributed to reductions in all-cause child mortality between DHS 2001/2 and DHS 2007

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2001/2 DHS</th>
<th>2007 DHS</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mortality rates</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infant mortality (0–11 months)</td>
<td>95</td>
<td>70</td>
<td>↓ 26%</td>
</tr>
<tr>
<td>Neonatal mortality (under 1 month)</td>
<td>37</td>
<td>34</td>
<td>↓ 8%</td>
</tr>
<tr>
<td>Post-neonatal mortality (1–11 months)</td>
<td>58</td>
<td>36</td>
<td>↓ 38%</td>
</tr>
<tr>
<td>Child mortality (1–4 years)</td>
<td>81</td>
<td>52</td>
<td>↓ 36%</td>
</tr>
<tr>
<td>Under-5 mortality (0–5 years)</td>
<td>168</td>
<td>119</td>
<td>↓ 29%</td>
</tr>
<tr>
<td><strong>Coverage of interventions among children</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage stunted (children under 5 years)</td>
<td>46.8</td>
<td>45.4</td>
<td>↓ 3%</td>
</tr>
<tr>
<td>Percentage wasted (children under 5 years)</td>
<td>5.0</td>
<td>5.2</td>
<td>↑ 4%</td>
</tr>
<tr>
<td>Percentage underweight (children under 5 years)</td>
<td>28.1</td>
<td>14.6</td>
<td>↓ 48%</td>
</tr>
<tr>
<td>Percentage of youngest children under 6 months who are exclusively breastfed</td>
<td>40.1</td>
<td>60.9</td>
<td>↑ 52%</td>
</tr>
<tr>
<td>Percentage of children age 12–15 months still breastfeeding</td>
<td>96.8</td>
<td>93.8</td>
<td>↓ 4%</td>
</tr>
<tr>
<td>Percentage of children age 20–23 months still breastfeeding</td>
<td>55.5</td>
<td>41.7</td>
<td>↓ 25%</td>
</tr>
<tr>
<td>Percentage of children age 12–23 months with BCG vaccination</td>
<td>94.0</td>
<td>92.3</td>
<td>↓ 2%</td>
</tr>
<tr>
<td>Percentage of children age 12–23 months with at least 3 polio vaccinations</td>
<td>80.2</td>
<td>77.0</td>
<td>↓ 4%</td>
</tr>
<tr>
<td>Percentage of children age 12–23 months with measles vaccination</td>
<td>84.4</td>
<td>84.9</td>
<td>↑ 1%</td>
</tr>
<tr>
<td>Percentage of children age 0–59 months with diarrhea in the 2 weeks preceding the survey who received oral rehydration salts or recommended home fluids</td>
<td>66.9</td>
<td>66.8</td>
<td>↔ 0%</td>
</tr>
<tr>
<td>Percentage of children age 0–59 months with acute respiratory infection in the 2 weeks preceding the survey who were taken to a health provider</td>
<td>69.1</td>
<td>68.2</td>
<td>↓ 2%</td>
</tr>
<tr>
<td>Percentage of households with at least one ITN</td>
<td>13.6</td>
<td>53.3</td>
<td>↑ 292%</td>
</tr>
<tr>
<td>Percentage of children 0–59 months who slept under an ITN the night preceding the survey</td>
<td>9.8</td>
<td>28.5</td>
<td>↑ 192%</td>
</tr>
<tr>
<td>Percentage of pregnant women 15–49 who slept under an ITN the night preceding the survey</td>
<td>7.9</td>
<td>32.7</td>
<td>↑ 314%</td>
</tr>
<tr>
<td>Percentage of children age 0–59 months with a fever in the 2 weeks preceding the survey who took an antimalarial drug</td>
<td>51.9</td>
<td>38.4</td>
<td>↓ 27%</td>
</tr>
<tr>
<td>Percentage of children age 0–59 months with a fever in the 2 weeks preceding the survey who took an antimalarial drug the same day/next day after developing fever</td>
<td>36.8</td>
<td>20.5</td>
<td>↓ 44%</td>
</tr>
</tbody>
</table>

*Note: Mortality calculated as deaths per 1000 live births except for child mortality, which is calculated as deaths per 1000 children surviving to 12 months of age.*
## ANNEX B

### List of National Malaria Programme Partners

A variety of stakeholders joined the National Malaria Control Programme in implementing the activities and achieving the results described in this report. These stakeholders include:

### National Partners

- Alive & Kicking
- Churches Health Association of Zambia (CHAZ)
- Community radio stations
- Community-based organizations
- Environmental Council of Zambia (ECZ)
- Evangelical Lutheran Church of Zambia (ELCZ)
- Malaria Institute at Macha (MIAM)
- Private Sector
  - Konkola Copper Mines
  - Lumwana Copper Mines
  - Mopani Copper Mines
  - MTN Zambia
  - Standard Chartered Bank
  - Total Zambia
  - Zambia Breweries
  - Zambia Sugar
- Tropical Diseases Research Centre (TDRC)
- University of Zambia (UNZA)
- Zambia National Broadcasting Corporation (ZNBC)
- Zambia News and Information Service (ZANIS)
- Zambian Anglican Council (ZAC)

### International Partners

- Boston University
- UK Department for International Development (DFID)
- Global Fund to fight AIDS, Tuberculosis and Malaria (GFATM)
- Harvard University
- Improving Malaria Diagnostics (IMaD)
- Japan International Cooperation Agency (JICA)
- Johns Hopkins University
- Malaria Consortium
- Malaria Control and Evaluation Partnership in Africa (MACEPA)
- Malaria Transmission Consortium (MTC)
- RTI International
- Southern Africa Development Community (SADC)
- Society for Family Health (SFH), a programme of Population Services International (PSI)
- Tulane University
- United Nations Children’s Fund (UNICEF)
- United States Agency for International Development (USAID)
- United States Centers for Disease Control and Prevention (CDC)
- United States President’s Malaria Initiative (US-PMI)
- World Bank
- World Health Organization (WHO)
- World Vision