## CONTENTS

Abbreviations............................................................................................................................................................. 5
Acknowledgements.................................................................................................................................................. 7
Foreword .................................................................................................................................................................... 9
Executive summary................................................................................................................................................. 11

*Box 1: The extent of malaria in Swaziland* ........................................................................................................... 14

I. History of malaria in Swaziland: the early years ................................................................................................. 17

II. Malaria control progress since 2000.................................................................................................................. 21

   a. 2003–2007 malaria control strategy .................................................................................................................. 22
   b. Scaling up control ............................................................................................................................................. 22
   c. Transition to elimination .................................................................................................................................. 24

*Box 2: Lubombo Spatial Development Initiative (LSDI)* .......................................................................................... 25

III. Gearing up a national malaria control programme for elimination ............................................................... 29

   a. Management and planning .......................................................................................................................... 30

*Box 3: Interview with Simon Kunene, Swaziland National Malaria Control Programme Manager* ................. 34
   b. Securing appropriate funding ....................................................................................................................... 37
   c. Intervention strategies ................................................................................................................................... 41

*Box 4: Health promotion strategy* ...................................................................................................................... 46
   d. Evaluating coverage of malaria control interventions .................................................................................. 47

*Box 5: Mapping risk of seasonal malaria transmission* ......................................................................................... 55
   e. Impact and cases averted ................................................................................................................................ 56

*Box 6: Malaria surveillance and response: the crux of a strong elimination programme* .................................. 60

IV. Looking forward.................................................................................................................................................. 69

V. Conclusion........................................................................................................................................................... 73

Annex : List of National Malaria Control Programme Partners ............................................................................ 74
Table of figures

1. Total confirmed malaria cases (a) and locally-transmitted cases among investigated ones (b), Swaziland, July 2011–June 2012 .........................................................................................................................................................................................15
2. Laboratory-confirmed malaria cases and parasite prevalence rates, Swaziland, 1945–2012 .........................................................................................................................................................................................18
3. Goal and objectives of Swaziland’s 2003–2007 malaria control strategy .........................................................................................................................................................................................22
4. Insecticide-treated nets distributed and house structures sprayed, Swaziland, 2005–2012 .........................................................................................................................................................................................23
5. Swaziland’s progress on the malaria continuum .........................................................................................................................................................................................24
6. National Malaria Control Programme staffing chart .........................................................................................................................................................................................31
7. Goal and objectives of Swaziland’s 2008–2015 malaria elimination strategy .........................................................................................................................................................................................32
8. Swaziland monitoring and evaluation framework, from 2008–2015 M&E plan .........................................................................................................................................................................................33
9. Domestic and external funding for malaria control and elimination, Swaziland, 2002–2011 .........................................................................................................................................................................................38
11. Financial expenditure by thematic area for Phase 1 of Global Fund Round 8 grant, Swaziland .........................................................................................................................................................................................40
12. Brief overview of elimination interventions in Swaziland .........................................................................................................................................................................................42
13. Confirmation of malaria cases before and after roll-out of RDTs, Swaziland, July 2008–June 2012 .........................................................................................................................................................................................44
14. Maps of households having received LLINs by season, Swaziland, 2009–2012 .........................................................................................................................................................................................48
15. ITN and IRS coverage, Swaziland, 2007–2010 .........................................................................................................................................................................................49
16. ITN use in children under five years of age by urban and rural areas, Swaziland, 2007–2010 .........................................................................................................................................................................................50
17. Percentage of households owning at least one ITN and/or being protected by IRS, by urban and rural areas and socioeconomic quintiles, Swaziland, 2010 .........................................................................................................................................................................................51
18. Diagnostic tools used for investigated malaria cases, Swaziland, July 2011–June 2012 .........................................................................................................................................................................................52
19. Treatment type for investigated malaria cases, Swaziland, July 2010–June 2012 .........................................................................................................................................................................................53
20. Probability for presence of locally-acquired malaria cases in Swaziland during the peak transmission months of January to April 2011 .........................................................................................................................................................................................55
21. Investigated cases of malaria (local vs imported), Swaziland, high transmission seasons of 2011 and 2012 .........................................................................................................................................................................................57
22. Malaria incidence trend and estimate of expected incidence without recent interventions, Swaziland, 1960–2020 .........................................................................................................................................................................................58
23. Cumulative malaria cases averted attributable to malaria control efforts, Swaziland, 2000–2020 .........................................................................................................................................................................................59
24. Flow path from diagnosis to response, malaria surveillance system, Swaziland .........................................................................................................................................................................................61
25. Map of surveillance sentinel sites, Swaziland, 2011 .........................................................................................................................................................................................63
26. Number of cases investigated and case investigation rate, Swaziland, 2010–2012 .........................................................................................................................................................................................64
ABBREVIATIONS

ACT  Artemisinin-based combination therapy
AL   Artemether-lumefantrine
BCC  Behaviour change communication
CHAI Clinton Health Access Initiative
DDT  Dichlorodiphenyltrichloroethane
DHS  Demographic and Health Survey
DNA  Deoxyribonucleic acid
EPR  Epidemic preparedness and response
GHG  Global Health Group
GIS  Geographic information system
Global Fund Global Fund to Fight AIDS, Tuberculosis and Malaria
HCW  Health care worker
IEC  Information, education, and communication
IRS  Indoor residual spraying
IT   Information technology
ITN  Insecticide-treated mosquito net
IVM  Integrated vector management
KAP  Knowledge, Attitudes, and Practices
LLIN Long-lasting insecticidal net
LSDI Lubombo Spatial Development Initiative
M&E  Monitoring and evaluation
MACEPA Malaria Control and Evaluation Partnership in Africa
MIS  Malaria Indicator Survey
MRC  Medical Research Council (Durban, South Africa)
MSDS Malaria Surveillance Database System
NMCP National Malaria Control Programme
PCR  Polymerase chain reaction
RBM  Roll Back Malaria
RDT  Rapid diagnostic test
RHMT Regional Health Management Team
RMCC Regional Malaria Control Commission
SADC Southern African Development Community
SAMEST Southern Africa Malaria Elimination Support Team
SMEAG Swaziland Malaria Elimination Advisory Group
UCSF University of California, San Francisco
WHO World Health Organization
Swaziland’s National Malaria Control Programme team
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Swaziland is working to become the first mainland sub-Saharan African nation to eliminate malaria. With commitment, leadership, political will, and a strong malaria programme, we are well on track to become malaria-free by 2015. We will meet this goal with an immense amount of pride and joy, and it will be an honour to celebrate this achievement with the malaria community and the many partners that are supporting us now in pursuit of our target.

Malaria represents a significant proportion of Swaziland’s historical disease burden and remains a looming public health threat to the population. Through continued investment, strong partnership, and effective control measures, we have shown that the malaria burden can be reduced to very low levels. The impressive decrease in cases over the last 15 years is the result of a scale-up of vector control activities in Swaziland’s malaria at-risk region and an effective cross-border collaboration with Mozambique and South Africa, initially started through the Lubombo Spatial Development Initiative (LSDI). Due to this success, the Southern African Development Community (SADC) and the African Union identified the Kingdom of Swaziland as a candidate for malaria elimination by 2015.

Through an improved understanding of our current malaria burden, we are working to establish the necessary systems for achieving and maintaining malaria elimination. This has led us to create more targeted and efficient case management, vector control, surveillance, and health promotion strategies. We adapted our national malaria strategic plan to focus on these four areas as we transitioned our programmatic focus from control to elimination.

We recognize that we will face several challenges on the road ahead, including the continued threat of case importation from neighbouring high endemic countries, and the task of sustaining the gains we have made in what is likely to be a less supportive donor environment. However, we believe we can achieve our goal through the strong partnerships we have developed, especially our cross-border collaborations with neighbouring countries, and increasing responsibility from our own government. We would not be where we are today without a shared commitment to realizing a malaria-free southern Africa.

Our hope is that the Kingdom of Swaziland’s achievement of elimination will have a substantial impact in the region by providing a pioneering example of the feasibility of elimination in mainland sub-Saharan Africa. Therefore, it is an honour and privilege to share our story with the Roll Back Malaria partners in this report. We hope that it influences and inspires the work of other countries as we all work towards a malaria-free future for generations to come.

Hon. Benedict Xaba
Minister of Health
Kingdom of Swaziland
EXECUTIVE SUMMARY

Progress and impact of malaria control in Swaziland at a glance

• Swaziland is making remarkable progress towards the elimination of malaria transmission. A committed National Malaria Control Programme (NMCP) has benefited from strong political support and the experience of coordinating malaria control activities since 1946.


• Elimination interventions are focused on integrated vector management, case management, case investigation and transmission containment, and information, education, and communication (IEC)/behaviour change communication (BCC). The effort to roll out universal diagnosis with rapid diagnostic tests (RDTs) in February 2010 has led to an 82% decrease in the number of reported malaria cases in 2011–2012, compared with 2009–2010 levels. The Ministry of Health, with the NMCP, has implemented case-based passive surveillance and active surveillance systems, which are essential to any malaria elimination programme.

• The strengthening of elimination interventions has resulted in improved coverage, as well as better diagnosis, treatment, and reporting:
  - 53% of the population at-risk was protected by insecticide-treated mosquito net (ITN) or IRS in 2010 (2010 Malaria Indicator Survey [MIS]).
  - Between 2009–2010 and 2011–2012, the portion of reported malaria cases confirmed by RDT/microscopy increased from 5% to 57%.
  - Aside from the administration of quinine when clinically appropriate, all malaria cases are now treated with artemisinin-based combination therapies (ACTs).
  - In 2011–2012, 60% of confirmed malaria cases were investigated at household level to identify the source of infection, using the strengthened surveillance system.

• With this progress, the Government of Swaziland has been able to reduce the disease burden to negligible levels for the second time in the history of the country and to save lives:
  - Confirmed cases decreased by 42%, from 428 to 248, between the high transmission seasons (January to June) of 2011 and 2012.
- Both local and imported cases have decreased between 2011 and 2012. Imported cases now represent the majority of investigated cases (78% in 2012).
- Between 2000 and 2012, 33,000 estimated malaria cases have been averted through control efforts.

- The country is committed to achieving its goals of reducing and sustaining locally-acquired malaria cases to zero by 2015, and to be certified malaria-free by 2019:
  - A strong and well-funded programme, established collaboration with neighbouring countries, and political commitment will help Swaziland meet its objectives.
  - However, the risk of reintroduction and a shifting focus from external donors represent challenges ahead. Increasing coverage of at-risk areas with vector control interventions, and bringing diagnostic confirmation and investigation rates to 100% will also be necessary.

- The experience gained can offer useful lessons for other countries about to move into a malaria elimination phase. They include the essential role of national leadership, the need to maintain significant human and financial resources in spite of a decreasing public health burden, and the reliance on a prompt, comprehensive, and proactive surveillance system.

- Swaziland has been close to elimination before. Let’s hope that, this time, focus and human resources will remain steady until the goal is achieved.
Box 1: The extent of malaria in Swaziland

Malaria in Swaziland at a glance

- Swaziland has an estimated 1 million inhabitants in its 4 regions, 55 administrative subdivisions, and approximately 210,000 households.
- Malaria transmission occurs primarily between January and June in the central and eastern parts of the country.
- In the 2011–2012 malaria season, 643 cases of malaria (confirmed and unconfirmed) were reported in Swaziland.
- National malaria prevalence is estimated at 0.2% (2010 MIS).

The Kingdom of Swaziland has a population of some 1 million (2007 census). The country is approximately 200 kilometres long from north to south and 130 kilometres wide from east to west. The western half of the country, known as the highveld, is mountainous, descending to the middleveld and lowveld agrozones to the east. The eastern border with Mozambique and South Africa is geographically divided by the Lubombo Mountains. Swaziland is composed of four administrative regions: Hhohho, Lubombo, Manzini, and Shiselweni (see Figure 1). Each region is broken down into subdivisions called tinkhundla; there are 55 tinkhundla in Swaziland.

Malaria transmission is most prevalent along the eastern border of the country, particularly in the Lubombo and the north-eastern part of the Hhohho Region. It is estimated that 30% of the population lives in malaria at-risk areas. Transmission occurs in the rainy season between January and June with a peak in February and March, mainly in the lowveld region of the country. However, malaria transmission is unstable and is closely related to the level of rainfall, which varies considerably each year. The low, unstable, and highly seasonal nature of malaria transmission in Swaziland leads to low levels of acquired immunity to malaria, and all age groups are therefore at risk of developing clinical malaria. *Plasmodium falciparum* is responsible for over 99% of malaria cases in Swaziland. Entomological data suggest that the main vector is *Anopheles arabiensis*.

Between July 2011 and June 2012, 643 malaria cases were reported (both presumed and confirmed) in Swaziland. The 2010 MIS measured national prevalence at 0.2%.
Local malaria incidence is highest along the eastern border with Mozambique and the north-eastern border with South Africa, while imported malaria is most common in urban towns that serve as transportation and business hubs. Local transmission is highly correlated with elevation; transmission occurs in parts of the middleveld (400m to 800m) and large portions of the lowveld (200m to 400m).

HISTORY OF MALARIA IN SWAZILAND: THE EARLY YEARS

Malaria has historically placed a significant burden on the population of Swaziland, which had to face recurring epidemics of the disease. However, for the second time in its history, the country is now close to achieving elimination.

Swaziland has a long history of commitment to fighting malaria. After country-wide epidemics in 1932, 1937, and 1942, the National Malaria Control Programme was established in 1946. That year, an estimated 45 000 presumed cases were recorded after a heavy rainfall season, and more than 60% of children aged 1–12 years were found to be infected by malaria parasites. Indoor residual spraying with dichlorodiphenyltrichloroethane (DDT) began in 1949, and by 1955 all malarious areas in the country had been included in the IRS campaign. The spray campaign effectively reduced vector densities; from 1952 to 1957, parasite prevalence decreased from 24% to 0.4%. At the Second African Malaria Conference in 1955, Swaziland was considered a leader in Africa’s efforts to control malaria.

Malaria prevalence remained at a relatively low, manageable level throughout the 1960s; control measures during this time included a large-scale surveillance programme to detect residual foci and determine importation risk. Malaria reached its lowest level in 1969 with only 46 total cases reported (see Figure 2), of which 36 were determined to have been imported. Despite these gains, a WHO consultant warned around that time that the country’s Malaria Control Unit lacked the capability and resources to effectively respond to disease outbreaks. By 1970, malaria was no longer perceived as a major public health problem, WHO reduced funding support for control measures and the staff of Swaziland’s Malaria Control Unit was greatly scaled down. The 1968 assessment by the WHO consultant was verified in 1977 when an epidemic of 1473 confirmed cases was reported and 87 deaths were attributed to malaria.

Following the 1977 epidemic, confirmed cases again decreased to 350 in 1981, and to 230 cases in 1982. However, Swaziland still faced several challenges including funding cuts, chloroquine resistance, and the civil war in Mozambique. A cyclone in 1984 caused large-scale flooding throughout the country, and the number of confirmed cases dramatically increased to 2750. In 1988, as cases surged to 5450, the Malaria Control Unit increased DDT spray coverage to the entire lowveld and areas with focal transmission in the midveld with support from the South African Trade Commission and United States Agency for International Development (USAID). Thanks to these efforts, the number of confirmed malaria cases in the country had decreased by 56% two years later, to 2400 cases in 1990.

In 1991, South Africa greatly reduced its financial support of Swaziland’s control efforts, and the country was unable to maintain its interventions. By the mid-1990s, malaria had re-emerged as a serious public health threat, returning to its...
highest level since 1947 due to a combination of above-average rainfall, *Plasmodium* resistance to chloroquine, and instability in the health system, exacerbated by the emerging HIV epidemic. In the 1994–1995 season, there were 9700 confirmed cases, and more than 38 000 clinical cases were recorded in outpatient departments across the country.

To combat the growing malaria threat, the LSDI was established in 1999 as a regional collaboration between South Africa, Mozambique, and Swaziland, with the aim to decrease the malaria burden in the border regions by increasing IRS. With a solid partnership in place, the LSDI set the stage for considerable national progress to come (see Box 2 for more information on LSDI).

The main lesson learned from more than 60 years of malaria control efforts in Swaziland seems to be that the country can really control malaria when national and external resources are sustained. At the same time, lapses in control efforts in the past have always been followed by a resurgence of the disease.

**Figure 2**

*Laboratory-confirmed malaria cases and parasite prevalence rates, Swaziland, 1945–2012*

The number of confirmed cases decreased approximately 100-fold from 28 per 1000 population in 1945 to 0.3 per 1000 in 2012, with several surges in incidence in 1977, 1988, and 1995. Prevalence rates were reduced from 75% in 1945 to 0.2% in 2010.

CHAPTER II

MALARIA CONTROL PROGRESS SINCE 2000

In 1999, Swaziland rejoined the fight against malaria by adopting RBM targets for malaria control and following the RBM inception process to build partnerships—including solidifying public and private investments in the LSDI collaboration—to establish an evidence base and develop a strategic plan. Then in 2000, the Abuja Declaration, which set the goal to halve malaria morbidity and mortality by 2010, was signed by African Heads of State, including the SADC, of which Swaziland is a member.

The launch of the RBM Partnership by WHO, the United Nations Children’s Fund (UNICEF), the United Nations Development Programme (UNDP), and the World Bank in 1998 created a global platform to coordinate partners’ activities in malaria prevention and control. Goals and targets were defined by the malaria stakeholders to establish common objectives and harmonize strategies to achieve them.

In 2000, Swaziland joined 43 other African countries in committing to achieve the RBM Abuja targets. RBM’s overarching goal was to halve malaria mortality by 2010, while also working to address these specific malaria intervention targets:

- At least 60% of those suffering from malaria have prompt access to, and are able to correctly use, affordable and appropriate treatment within 24 hours of the onset of symptoms.

- At least 60% of those at risk of malaria, particularly children under five years of age and pregnant women, benefit from the most suitable combination of personal and community protective measures, such as ITNs and other accessible and affordable interventions to prevent infection and suffering.

- At least 60% of all pregnant women who are at risk of malaria, especially those in their first pregnancies, have access to chemoprophylaxis or intermittent preventive treatment.

At the same time, LSDI efforts were implemented in Swaziland’s malaria-affected areas and in bordering endemic provinces of neighbouring countries, resulting in important successes that gave confidence to all partners involved. By 2002, there were only 342 confirmed malaria cases in the country, a considerable decrease from 5450 cases in 1998. Swaziland was awarded a Global Fund grant in 2003 (Round 2), which provided financial support to improve and intensify vector control activities. Also in 2003, Swaziland developed a five-year strategic plan, setting clear direction, targets, and indicators for the NMCP to effectively control malaria.

In 2006, African Heads of State and governments met again to review the progress that countries had made towards the Abuja targets. Swaziland was on track and had met the Millennium Development Goal 6 on malaria. In 2007, the SADC and the African Union recognized the country as a candidate for malaria elimination by 2015, joining the neighbouring countries of Botswana, Namibia, and South Africa with a vision for a malaria-free southern Africa. By July 2008, Swaziland had developed the 2008–2015 Malaria Elimination Strategic Plan to strengthen key malaria interventions towards elimination and prevention of reintroduction.
a. 2003–2007 malaria control strategy

Utilizing a broad-based situational analysis, Swaziland developed its 2003–2007 Strategic Plan to reduce malaria morbidity and mortality to the point that the disease has ceased to be a major health impediment for the population (see Figure 3).

The main interventions supporting the achievement of this goal included: i) consistent high coverage of IRS in at-risk areas; ii) ITNs for vulnerable groups, specifically pregnant women and children under five; iii) early diagnosis and prompt treatment of malaria cases presenting at health facilities; iv) improved health facility surveillance; and v) innovative IEC materials to promote personal protection and health-seeking behaviours.

Figure 3
Goal and objectives of Swaziland’s 2003–2007 malaria control strategy

<table>
<thead>
<tr>
<th>GOAL: EFFECTIVELY CONTROL MALARIA SO THAT IT CEASES TO BE A MAJOR IMPEDIMENT TO THE SOCIOECONOMIC DEVELOPMENT OF THE SWAZILAND POPULATION.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectives</strong></td>
</tr>
<tr>
<td>• Reduce the number of laboratory-confirmed malaria cases to 2 per 1000 by 2005.</td>
</tr>
<tr>
<td>• Reduce the malaria-attributed morbidity to 2% by 2005.</td>
</tr>
<tr>
<td>• Reduce the hospital case fatality rate to 2% by 2005.</td>
</tr>
<tr>
<td>• Reduce the malaria mortality rate to 10 per 100 000 by 2005.</td>
</tr>
</tbody>
</table>

b. Scaling up control

The decrease in malaria in Swaziland since 2000 can be attributed to the reduction in the source of imported cases from neighbouring Mozambique, along with high coverage rates of IRS and increased ITN coverage among vulnerable groups.

Between 2005 and 2011, Swaziland consistently sprayed between 90 000 and 100 000 structures in transmission areas (see Figure 4). Deploying effective IEC strategies and utilizing antenatal clinics in the Lubombo Region for distribution, Swaziland increased the delivery of ITNs from 5500 in 2005–2006 to 100 000 in 2010–2011. This increase was due to the continued expansion of distribution points to include mobile sites participating in the child immunization campaigns.
Between 2005 and 2012, IRS coverage remained high in at-risk areas while the distribution of ITNs was scaled up.

Source: World Malaria Report 2009 and NMCP annual reports.
c. Transition to elimination

Prior to 2008, Swaziland’s programme was focused on malaria control rather than transmission interruption. After health-facility data indicated that the burden of malaria had decreased to a low level, Swaziland began to transition to pre-elimination with the ultimate goal of malaria elimination, defined as reducing to zero the incidence of locally-acquired malaria in a defined geographical area.

Using WHO guidance, Swaziland’s transition from malaria control to pre-elimination and elimination represented a dramatic shift in terms of intervention tools and methods used. While targeted vector control coverage is important, the main objective of elimination interventions is high quality and effective case management and surveillance (see Figure 5).

Figure 5
Swaziland’s progress on the malaria continuum

Goals and interventions differ according to the control and elimination phases. The current elimination strategy is planning targeted interventions to halt local transmission and prevent reintroduction.

<table>
<thead>
<tr>
<th>Indicative milestones for transition</th>
</tr>
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<tbody>
<tr>
<td>Slide positivity rate &lt;5%</td>
</tr>
<tr>
<td>Phase</td>
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<tr>
<td>Goal</td>
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<tr>
<td>Target area</td>
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<table>
<thead>
<tr>
<th>Swaziland timeline</th>
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<tbody>
<tr>
<td>Pre-2007</td>
</tr>
<tr>
<td>1994–1995: 38 000 clinical cases</td>
</tr>
<tr>
<td>2008–2009</td>
</tr>
<tr>
<td>Global Fund grant for pre-elimination signed</td>
</tr>
<tr>
<td>2010–2012</td>
</tr>
<tr>
<td>Active surveillance programme launched nationally</td>
</tr>
<tr>
<td>2013–2015</td>
</tr>
<tr>
<td>LSDI reduces incidence by 98% over 10 years</td>
</tr>
<tr>
<td>2016 and beyond</td>
</tr>
<tr>
<td>Prevent re-establishment of local transmission</td>
</tr>
</tbody>
</table>

The LSDI, a cross-border collaboration between Swaziland, Mozambique, and South Africa, was a catalyst for Swaziland’s reduced malaria incidence and the country’s current pursuit of elimination. Launched in 1999, the LSDI started as a tri-lateral partnership focused on increasing economic...
development in the Lubombo region, an area linked by the Lubombo Mountains that includes eastern Swaziland, southern Mozambique, and north-eastern South Africa.

Recognizing that the development of the Lubombo region could not occur unless the burden of malaria in the area was reduced, the three countries established the LSDI Regional Malaria Control Commission (RMCC), composed of malaria experts from the three countries. These experts developed a malaria protocol that was endorsed by health ministers from the three countries. The RMCC had oversight responsibility for implementation of the protocol, which outlined how the malaria situation could be addressed and specified the major interventions for vector control and case management.

South Africa and Swaziland realized that, even if malaria control measures were optimal in their countries, frequent migration across the border to Mozambique made a regional approach to malaria control an absolute necessity. Therefore, the primary emphasis of the LSDI malaria control programme was to extend interventions in southern Mozambique.

The main interventions implemented in Mozambique were: \(i\) increased IRS; \(ii\) improved case management through the use of RDTs, effective anti-malarial drugs, and intermittent preventive treatment during pregnancy; and \(iii\) health system strengthening through improved infrastructure and development of human resource capacity. Between 2000 and 2009, malaria incidence in Maputo City, Maputo Province, and Gaza Province declined from 424 cases to 156 per 1000 of the at-risk population, much of which was attributable to the LSDI. The LSDI achieved high annual IRS coverage (95% of targeted households) and increased access to malaria diagnostics and drugs in southern Mozambique. This drove down parasite prevalence in regions bordering Swaziland from 75% in 1999 to 4.5% in 2008. Similarly, annual incidence in Swaziland and in South Africa (Mpumulanga and KwaZulu Natal Provinces) declined 98% and 95%, respectively, during that same time period (see map on previous page). Comparing trends in malaria incidence before and after LSDI suggests that over the course of the programme, an estimated 4 million malaria cases have been averted in the surrounding provinces of the three countries, enabling both Swaziland and South Africa to pursue elimination.

The LSDI was originally funded by the South African Business Trust and other private-sector partners. The project was awarded two multi-country Global Fund grants in Rounds 2 and 5 to support the implementation and expansion of activities, amounting to nearly US$ 30 million in disbursed funding. Although Global Fund allocations for LSDI ended in 2010, continuing this successful cross-border collaboration remains imperative to sustaining the gains made over the past ten years and achieving the region’s elimination goal. The Ministries of health from the three participating countries are advocating for the continuation of this collaboration and are actively seeking funding to support its initiatives.

The LSDI, frequently referenced as a best practice in cross-border malaria control, exemplifies the impact that regional collaboration can have on decreasing malaria morbidity and mortality. Without the LSDI, Swaziland and South Africa would not have achieved such rapid progress in reducing the malaria burden within their countries, and malaria elimination would not have been thought possible in southern Africa. The crucial next step is for the Governments of Mozambique, South Africa, and Swaziland to identify a sustainable financing model for continuing the LSDI that will guide the three countries towards a malaria-free future.
GEARING UP A NATIONAL MALARIA CONTROL PROGRAMME FOR ELIMINATION

The key programmatic components that enabled the NMCP to intensify control efforts and embark on elimination include management and planning, securing appropriate funding, and delivering the right interventions—with increased focus on identifying and managing cases and containing transmission.

In Swaziland, transitioning from malaria control towards elimination involved a systematic process of building on existing control, and developing and implementing new approaches and interventions. In the first phase (2007–2008), the country developed an elimination strategic plan, a monitoring and evaluation plan, and a communication and advocacy plan. The second phase (2009–present) includes mobilizing additional funding, implementing the interventions detailed in these plans, and monitoring progress towards elimination.

Over the past three years, the country focused on the following areas, as also included by WHO in Malaria Elimination: A Field Manual for Low and Moderate Endemic Countries (2007):

- Advocating for political commitment from government and partners.
- Increasing personnel and logistics to ensure successful implementation.
- Strengthening the health information system, including immediate notification of all malaria cases.
- Improving access to, and coverage of, good-quality curative and preventive health services to the population at risk.
- Re-training health care staff towards the goals of malaria elimination.
- Establishing an elimination database to manage all information relevant to the programme.
- Establishing a national malaria elimination advisory group to monitor progress and ensure successful implementation of strategy.

This transition from control to pre-elimination was supported by several factors, including: i) the existing foundation of a strong malaria control programme that had achieved low incidence through high coverage of vector control interventions and good case management; ii) a well-developed health care service delivery infrastructure, and iii) the support and stability of a government with political will for both elimination and prevention of reintroduction.
a. Management and planning

Swaziland’s National Malaria Control Programme at a glance

- Created in 1946, Swaziland’s NMCP leads and coordinates the planning, implementation, and monitoring and evaluation of the malaria response in the country.

- The NMCP manages and plans activities from the national to the community level.

- Malaria service delivery areas are integrated into the general health care delivery system.

- With the launch of Swaziland’s elimination campaign, technical staff at central level expanded from 9 in 2007 to 17 in 2012.

The NMCP operates under the Directorate of Public Health’s Communicable Diseases Division within the Ministry of Health. This division is coordinated by the Deputy Director of Public Health Services. The NMCP leads and coordinates the planning, implementation, and monitoring and evaluation of the malaria response in the country. At the national level, the NMCP collaborates with other departments in the Ministry of Health, including the National Clinical Laboratory Services; Central Medical Stores; Epidemic Preparedness and Response (EPR) Unit; Strategic Information Department, which encompasses the Health Management Information System; and aspects of the Health Promotion Unit at the ministerial level. The NMCP service delivery areas, including case management and diagnosis, passive surveillance, and procurement and supply chain, are integrated into the general health care delivery system and are under the management of the Ministry of Health.

Within the NMCP, the programme manager is supported by officers and coordinators in various departments covering management and administration; case management and diagnosis; vector control; surveillance and EPR (including information technology [IT] and geographic information systems [GIS]); and IEC (see Figure 6). Emphasis is placed on building capacity of NMCP through technical trainings and information-sharing of best practices with neighbouring countries. Of the 17 technical positions at central level, 12 are supported through Global Fund resources. These posts should become government-funded at the end of the grant.
Swaziland’s NMCP works with the four Regional Health Management Teams (RHMTs) and community structures to plan, implement, and monitor malaria control activities at the health facility and community level. Local health care leadership is well represented within the RHMTs, which are therefore an effective way of disseminating messages and materials to all health facilities. At the community level, health care workers (HCWs), known as rural health motivators, promote healthy lifestyles and early treatment-seeking behaviours.

Few outside partners support the NMCP, perhaps due to the low disease burden resulting from consistent implementation of malaria interventions. The Southern Africa Malaria Elimination Support Team (SAMEST), a collaboration between the Clinton Health Access Initiative and the Global Health Group at the University of California, San Francisco, provides in-country support for strategic planning and programme management, case management and diagnosis, surveillance, and operational research. The Medical Research Council of Durban, South Africa, supports the country on quality assurance of diagnosis and treatment of cases, vector control and entomological surveillance, IT and GIS, and operational research. Additionally, the NMCP receives technical support from WHO around strategic planning, programme management, and health promotion. The Southern African Roll Back Malaria Network (SARN), based in Gaborone, Botswana, also contributes to Swaziland’s elimination campaign by coordinating partner support on operational issues and facilitating information-sharing between countries.
**Elimination Strategic Plan**

The 2008–2015 Malaria Elimination Strategic Plan (see Figure 7) was marked by a significant strategic shift from the preceding period. It led to i) the revision of the diagnosis and treatment guidelines tailored for a low-transmission setting, ii) a scale-up of vector control interventions including distribution of long-lasting insecticidal nets (LLINs) to cover the entire at-risk population, iii) a strengthened surveillance programme that consists of real-time case reporting, detailed case investigation, and testing all people living within a 1 km radius of a confirmed malaria case, and iv) the implementation of a comprehensive health education campaign.

**Figure 7**

Goal and objectives of Swaziland’s 2008–2015 malaria elimination strategy

GOAL: ELIMINATE MALARIA IN THE COUNTRY BY 2015 AND PREVENT REINTRODUCTION IN SUBSEQUENT YEARS.

<table>
<thead>
<tr>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Reduce indigenous malaria cases in Swaziland to 1 per 1000 population at risk by 2011.</td>
</tr>
<tr>
<td>• Reduce indigenous malaria cases in Swaziland to 0 per 1000 population at risk by 2015.</td>
</tr>
<tr>
<td>• Maintain zero indigenous malaria cases in Swaziland by prevention of reintroduction for all years following 2015.</td>
</tr>
<tr>
<td>• Reduce indigenous malaria deaths seen at health facilities to zero for total population in Swaziland by 2015 and sustain it at this level in subsequent years.</td>
</tr>
<tr>
<td>• Prevent resurgence of malaria transmission by limiting reintroduction of parasites into the country and rapidly eliminating new sources of local transmission.</td>
</tr>
</tbody>
</table>

**Monitoring and evaluation plan**

In 2008, Swaziland developed a monitoring and evaluation (M&E) plan, directly linked to the Strategic Plan, to monitor its progress towards elimination. The country’s ability to achieve elimination is largely related to the successful deployment of key interventions, such as the coverage of IRS or the robustness of the surveillance system to capture and follow up every case. Impact, outcome, output, and process indicators were developed to measure progress (see Figure 8).

Effective monitoring requires regular collection and analysis by the NMCP of both surveillance and intervention coverage data. Feedback is then provided to all staff involved, particularly those collecting data at the facilities, to ensure awareness of disease trends. Beyond routine data collection and evaluation of progress, national-level data on malaria are collected through various surveys: a Demographic and Health Survey (DHS) in 2007; Knowledge, Attitudes, and Practices (KAP) surveys in 2007, 2008, 2010, 2011, and 2012; and a MIS in 2010.
Figure 8
Swaziland monitoring and evaluation framework, from 2008–2015 M&E plan

The monitoring and evaluation plan, and related indicators have evolved to adapt to the new elimination strategy.

<table>
<thead>
<tr>
<th>Goal</th>
<th>Objectives/Intervention areas</th>
<th>Service delivery areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>To prepare Swaziland for malaria elimination, as measured by &lt;1 malaria case per 1000 population at risk.</td>
<td>To improve case management, introduce vector management, scale up surveillance systems, and develop more rigorous IEC campaigns.</td>
<td>To operationalize the objectives through the implementation of specific interventions, such as confirmed diagnosis and LLIN distribution.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Impact indicators</th>
<th>Outcome indicators</th>
<th>Output indicators</th>
<th>Process indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure the long-term effect of all interventions; mark progress against the goal of the grant.</td>
<td>Measure the effect of each intervention area (i.e. case management, vector management, surveillance, and IEC).</td>
<td>Measure the effect of a service delivery area.</td>
<td>Measure the intermediate results of a service delivery area when lag time may delay the measurement of an output indicator.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Example</th>
<th>Example</th>
<th>Example</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of laboratory-confirmed malaria cases seen in health facilities (per 1000 population at risk)</td>
<td>Percentage of all RDT- and microscopy-confirmed malaria cases treated with ACTs</td>
<td>Percentage of suspected malaria cases confirmed by RDT/microscopy</td>
<td>Number of health care workers trained on new diagnosis policy</td>
</tr>
</tbody>
</table>

Malaria Elimination Policy

Beyond an elimination strategic plan, the adoption of a national elimination policy is a significant step that demonstrates political commitment to the malaria-free goal. Different from a strategic plan, which is time-bound and details interventions related to measurable objectives, an elimination policy is a concise set of enduring principles providing guidance to the Ministry of Health and its partners. In March 2011, Swaziland’s cabinet approved the National Malaria Elimination Policy.

Swaziland Malaria Elimination Advisory Group

Swaziland’s elimination strategy and policy are regularly reviewed by the Swaziland Malaria Elimination Advisory Group (SMEAG), an independent council of advisors formed in 2010. It includes key malaria stakeholders who meet on a regular basis to evaluate the effectiveness of the malaria strategy, monitor the implementation of policies, and revise them as appropriate. The SMEAG is composed of a general committee as well as subcommittees on surveillance, case management, vector control, and health promotion. The group consults regularly with experts, including the Malaria Elimination Group (MEG), an international elimination group convened by the Global Health Group at the University of California, San Francisco.

Box 3: Interview with Simon Kunene, Swaziland National Malaria Control Programme Manager

To what do you attribute Swaziland’s recent success in reducing the country’s malaria burden?

It all starts with leadership and vision and this does not just come out of nowhere—someone thought of it, informed it, and brought it to this direction. Our 2008–2015 Malaria Elimination Strategic Plan was informed by such leadership and vision. We invited all of our partners to contribute, both from inside and outside the country. Having input from various partners provided different experiences and perspectives on malaria control, and created shared ownership among all the partners.

The support and confidence given to the NMCP by the Government of Swaziland and Ministry of Health to pursue malaria elimination has also played a large role. This has translated into allocation of local resources for malaria. We stand a better chance of implementing our strategic plan if our government is supporting it. Our partners have then come in to complement where local resources are not enough. It is crucial for the government to show commitment when transitioning from control to elimination.

As a leader, I must be open to suggestions and feedback. I have a technical staff made up of very intelligent people and I have to let them explore beyond themselves. There are things you can teach people and some things you cannot. The love, commitment, and passion for this kind of work must already be there. Malaria is so dynamic—it keeps me motivated and I am trying to build the same motivation in my staff. This is what drives us to work hard and improve.
What do you view as your greatest gaps or challenges going forward?

We have to sustain the gains and maintain consistent allocation of resources. This requires high-level advocacy. Policy-makers will decide where the funds go, but with Swaziland’s high burden of HIV, why allocate funding for malaria? My job is to continuously advocate for resources for malaria control and to remind people why we are transitioning to elimination. Some partners prefer to fund high-burden situations, but those partners and donors who have taken a risk and funded Swaziland’s malaria efforts are happy to be associated with a programme that shows results.

Could you share your vision about the future of the fight against malaria in Swaziland?

Our emphasis is to improve our surveillance system. We need in-depth foci investigation to understand exactly where local transmission is ongoing and to target our resources where we can make the greatest impact. This will help us halt transmission and achieve elimination.

Beyond the borders, collaboration is critical. The majority of Swaziland’s imported cases originate from Mozambique. This emphasizes the need to continue our collaboration with neighbouring countries. The LSDI was and is still a great approach to address the malaria problem in the region. More than 90% of LSDI resources were going to Mozambique and this was having a residual effect on South Africa and Swaziland. The strength of LSDI was the high-level political ownership among the three countries. To inform the region’s strategy, we formed a multi-sectoral malaria commission composed of malaria experts from the three LSDI countries. We built the partnership on a sound basis and were able to attain financial support from the private sector, as well as from the Government of South Africa. In 2002, the Global Fund awarded the LSDI its first multi-country grant for malaria. With funding for LSDI uncertain, we must find ways to continue to build on this regional success story.

We will eventually need a more focused vector control programme. Some experts have recommended that we consider scaling down IRS, but this is a hard political and epidemiological decision. When do you say an area can stop being sprayed? If a locality doesn’t report any case for one to three years, should that area continue to be sprayed? If a malaria case is then reported, there could be a great political outcry. When and how we move forward in vector control will be a critical question.
Technology is critical as we move forward, especially our investments in information technology. Improved IT and greater surveillance will help us answer the critical remaining questions as we refine our elimination strategies.

What advice and best practices can you offer other countries who are considering pursuing elimination?

Political commitment is important and government support has been crucial for Swaziland. The NMCP must have a good relationship with the Ministry of Health and its directorate. If I want to see the Minister of Health, it does not take me more than two days to set up the meeting. They continue to show their support and provide valuable input.

Creating an enabling environment for strengthening partnerships with all stakeholders and collaborating with other countries is also critical because you cannot win the battle with malaria on your own. It is important to always be prepared and professional when dealing with partners. The entire team must maintain a culture of professionalism.

Documentation is imperative. If you do not document what you are doing and publish your results, then no one can possibly know what you are doing. The more you tell people about your activities and your results, the more critical input you will receive to benefit your work.

Allowing your staff to think outside and beyond the box is something you should promote. As their ideas are implemented, they will see themselves as part of the larger group and be committed to reaching the goal of malaria elimination.
b. Securing appropriate funding

Funding for malaria elimination in Swaziland at a glance

- External funding, coming from the Global Fund, surged in 2009 to US$ 2.6 million, and will total around US$ 9.4 million between 2009 and 2014 to support malaria elimination.

- Between 2009 and 2011, funds from Phase 1 of the Global Fund Round 8 grant were used for vector control, surveillance, case management, and health promotion activities (34%, 27%, 22%, and 11% of total expenditure, respectively).


As is the case in most countries pursuing elimination, Swaziland cannot rely on many external funding partners. The NMCP has two major sources of funding to support the elimination strategy: the Government of Swaziland and the Global Fund.

In 2003, Swaziland received a Round 2 Global Fund grant to increase vector control coverage. Based on progress made during implementation of this grant, Swaziland developed an elimination strategic plan and sought supplemental funding from the Global Fund to support it. With the Round 8 award in 2008, Swaziland became the first country in sub-Saharan Africa to receive funds specifically targeting pre-elimination. During the transition from control to elimination, the bulk of Swaziland’s funding envelope shifted from vector control activities to the roll-out of new diagnosis and treatment guidelines and the establishment of a surveillance system.
Figure 9
Domestic and external funding for malaria control and elimination, Swaziland, 2002–2011
Domestic funding increased from 2002 to 2008 to peak at US$ 915 000 in 2010. External support from the Global Fund has been a major source of funding, totalling US$ 4 million over the 2009–2011 period.

Source: NMCP and Global Fund.

Government of Swaziland

Between 2003 and 2007, budget expenditures were focused on programme management, case management, and IRS. As Swaziland transitioned to a focus on elimination, government costs shifted and expanded to include active surveillance, health promotion, and additional logistics support, especially costs associated with increased vehicle use for active surveillance.
Figure 10
Government budget and expenditure for the National Malaria Control Programme, Swaziland, 2010–2011

In the 2010–2011 NMCP budget of US$ 915 000, transportation and personnel costs accounted for 86% (US$ 790 000).

Source: NMCP.

Global Fund

The 2003 Global Fund Round 2 malaria grant of US$ 1.5 million focused on introducing ITNs for pregnant women and children under five years of age in the Lubombo Region, scaling up IRS to cover the entire population at risk, and strengthening capacity for early detection and response of malaria epidemics.

In 2008, the Global Fund awarded a Round 8 grant with the goal to prepare Swaziland for malaria elimination. Through that grant, US$ 9.4 million were eventually approved for disbursement over 2009–2014. These funds complement domestic resources to strengthen key malaria interventions as outlined in the national Malaria Elimination Strategic Plan.

From July 2009 to June 2011, Global Fund resources from Phase 1 of Round 8 (US$ 5 million) were used to (i) establish the malaria surveillance system; (ii) support the creation of the surveillance team, including the establishment of six malaria surveillance sentinel sites and the procurement of vehicles; (iii) purchase commodities; and (iv) develop health promotion materials (see Figure 11).
Figure 11
Financial expenditure by thematic area for Phase 1 of Global Fund Round 8 grant, Swaziland
Vector control activities account for around one third of expenditure from the Global Fund Round 8 grant. Surveillance and case management activities are the two other major areas invested in.

Source: Global Fund databases.

Phase 2 of the Round 8 grant covers the 2012–2014 period; the funding amount is US$ 4.4 million.

Additional resources

In addition to support from the Government of Swaziland and the Global Fund, intermittent funding has been provided by the Southern African Roll Back Malaria Network (SARN)—whose goal is to coordinate partner support to SADC countries on operational issues—and the WHO. Technical assistance has also been delivered by the SAMEST, funded by the Bill & Melinda Gates Foundation.

Sustainable financing for elimination and prevention of reintroduction

Securing resources to sustain the gains will be one of Swaziland’s greatest challenges to achieving elimination. The Ministry of Health and Ministry of Finance are collaborating with partners to evaluate malaria financing after the Round 8 Global Fund grant concludes in June 2014. If a funding gap cannot be filled by domestic resources, the Ministry of Health will explore innovative mechanisms to sustain financing for elimination.
c. Intervention strategies

Intervention strategies at a glance

- Elimination interventions are focused on case management, integrated vector management, surveillance, and IEC/BCC.

- The NMCP issued new diagnosis and treatment guidelines in 2009 and has trained over 900 HCWs on their implementation since then.

- The RDT roll-out in February 2010 led to an 82% decrease in the number of reported malaria cases in 2011–2012, compared with 2009–2010 levels.

- The NMCP has implemented an active surveillance programme, which includes both proactive and reactive case detection.

The transition from control to elimination led Swaziland to prioritize four intervention areas: i) integrated vector management, particularly in combining the use of IRS and LLINs; ii) effective case management through definitive diagnosis and appropriate treatment; iii) a strong surveillance system; and iv) comprehensive IEC (see Figure 12). In addition to reducing overall transmission, the aim of these interventions is to ensure that all malaria cases are confirmed and treated according to policy, immediately notified and investigated, and eventually limited to defined foci.
Figure 12
Brief overview of elimination interventions in Swaziland
The following four key intervention areas have been prioritized for the transition to the elimination phase.

<table>
<thead>
<tr>
<th>Integrated vector management</th>
<th>Case management</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Joint indoor residual spraying and long-lasting insecticidal net distribution to population at risk</td>
<td>• Confirmed diagnosis for all cases</td>
</tr>
<tr>
<td>• Ongoing entomological monitoring</td>
<td>• Prompt treatment for all confirmed cases</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Surveillance</th>
<th>Information, education, and communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Real-time case-based passive surveillance system</td>
<td>• Mass media campaign for total population and travellers</td>
</tr>
<tr>
<td>• Case investigation and detection</td>
<td>• Community outreach to endemic areas</td>
</tr>
<tr>
<td>• Epidemic preparedness and response</td>
<td></td>
</tr>
</tbody>
</table>

Integrated vector management (IVM)

Key IVM interventions in Swaziland include the use of IRS, LLINs, and larviciding at potential vector breeding sites.

Swaziland drafted national IVM guidelines covering the concurrent distribution of LLINs by spray operators during spray operations. All traditional structures made of mud are sprayed with DDT 75% wettable powder, and all modern structures made of cement are sprayed with the pyrethroid lambda-cyhalothrin. One LLIN should be distributed for every sleeping space in a household with the aim of universal coverage for the entire at-risk population.

Case management

Swaziland developed new diagnosis and treatment guidelines in 2009 that emphasize the uptake and utilization of RDTs in health facilities without laboratory capacity, ACTs for treatment of uncomplicated malaria, and a case management monitoring programme, which includes quality assurance of diagnosis and drug resistance testing.

Swaziland was one of the last countries in southern Africa to introduce RDTs and ACTs. Prior to 2010, the majority of cases in Swaziland were presumptively diagnosed and treated—often incorrectly—based on signs and symptoms. To transition HCWs to new protocols for elimination, large-scale training was required.

HCW training

The NMCP has implemented a series of training workshops for HCWs. Three-day training sessions were conducted at the beginning of each malaria season in 2009, 2010, and 2011. They were attended by HCWs from public and private health facilities, including doctors, nurse matrons, clinic supervisors, nurses, nursing assistants, laboratory technologists, and pharmacists. Since the launch of the new guidelines in 2009, over 900 HCWs have been trained.
**RDT roll-out**

Before 2010, only 14 health centres and hospitals of the over 220 health facilities in the country had laboratory capacity (i.e. microscopy) to test for malaria. Presumptive diagnosis and treatment led to over-prescription of antimalarials. Swaziland’s malaria diagnostic policy now states that all patients with suspected malaria infection should be confirmed by a parasitological diagnostic test with an RDT or microscopy. Today, all public health facilities are stocked with RDTs and all HCWs, excluding pharmacists, are trained on how to use them.

Following the RDT roll-out in February 2010, the number of reported malaria cases decreased by 82% from July 2009–June 2010 to July 2011–June 2012, while the confirmation rate increased more than eleven-fold over the same period, as shown in Figure 13. These data confirm the likelihood that a large proportion of cases treated during the malaria control phase were misdiagnosed.

The current gap between confirmed and presumptively treated malaria cases is likely related to HCWs not adhering to the new guidelines. The NMCP plans to continue to train HCWs on the national diagnosis policy, while offering onsite mentoring to health facilities at which diagnosis confirmation rate is not optimal.
The NMCP developed a national diagnosis quality assurance system. Prior to RDT distribution to health facilities, RDTs are sent to WHO-qualified international lot-testing laboratories to ensure effectiveness. HCWs are regularly trained in order to ensure compliance with proper and up-to-date diagnostic procedures.

Today, at health facilities in the highest burden region of the country (Lubombo), all positive RDTs and 10% of negative samples are cross-checked through microscopy and deoxyribonucleic acid (DNA) polymerase chain reaction (PCR). PCR testing is currently carried out by the MRC in Durban, South Africa; however, the NMCP and National Laboratory Services, in partnership with the University of California at San Francisco, are working to build PCR capacity for malaria at Swaziland’s National Reference Laboratory. This will not only reduce logistical issues and costs related to testing samples outside the country, but it will also improve promptness of results and feedback to health facilities.

**ACT roll-out**

The national treatment guidelines now list artemether-lumefantrine (AL) as the first-line treatment for uncomplicated malaria, with the exception of pregnant women in the first trimester.

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**Figure 13**

Confirmation of malaria cases before and after roll-out of RDTs, Swaziland, July 2008–June 2012

Large-scale roll-out of rapid diagnostic testing brought an eleven-fold increase in malaria case confirmation rate between 2009–2010 and 2011–2012. In 2011 and 2012, respectively, 44% and 57% of malaria cases were RDT-confirmed.

who should receive oral quinine. To ensure adherence to the recommendations, the NMCP withdrew from public health facilities all drugs not listed in the guidelines, including chloroquine and sulfadoxine-pyrimethamine. The NMCP is also working to ensure that only efficacious drugs are available at private health facilities and that diagnostic and disease-reporting guidelines are followed.

**Drug resistance testing**

Drug resistance testing is carried out by the MRC on all PCR-positive samples. To date, AL remains the most efficacious first-line drug for the treatment of uncomplicated malaria in Swaziland.

**Chemoprophylaxis for travellers**

Chemoprophylaxis for travellers to endemic areas is recommended through health promotion materials. Mefloquine is provided free of charge for that indication. The NMCP is currently developing strategies to increase demand and utilization among travellers, as the failure to provide chemoprophylaxis to those travelling to malaria-endemic areas could be instrumental in reintroducing transmission in areas currently malaria-free.

**Active surveillance**

In support of Swaziland’s goal of eliminating malaria by 2015, the NMCP has implemented an active surveillance programme, which consists of active case detection and case investigation.

A summary of surveillance efforts in Swaziland can be found in Box 6.

**Information, education, and communication**

To support community awareness and acceptance of malaria interventions, the NMCP has deployed an IEC campaign utilizing mass media and community outreach to communicate key messages to the population.

Mass media messages have been developed and disseminated through various channels, including radio, television, and newspaper publications. They focus on awareness of updated malaria interventions, early treatment-seeking behaviour, acceptance of IRS operations, and utilization of LLINs. Specific attention is placed on travellers and migrants leaving or entering the country. Partnering with the Meteorology Department of Swaziland, the NMCP incorporated malaria messages into the daily weather report.

Through outreach activities, numerous groups have been educated on malaria, including immigration officers, school health club teachers, and rural health motivators. The NMCP Health Promotion Office also produced community skits to increase awareness of the malaria elimination campaign. In collaboration with the Lubombo regional leadership, the NMCP has organized four one-day community road shows in the malaria-affected areas. Each road show includes music, dance competitions, and discussions on malaria prevention. The aim of these shows is to promote personal protection in at-risk communities where the NMCP sprays and distributes nets.
Box 4: Health promotion strategy

As malaria cases continue to decrease in Swaziland, the community may perceive malaria as less of a threat. Therefore, the NMCP defined health promotion, community engagement, and IEC as crucial for eliminating malaria and for preventing its reintroduction.

The health promotion intervention strategy involves communicating information that encourages people to:

• Recognize malaria symptoms and seek treatment early.
• Accept indoor residual spraying for vector control.
• Sleep under insecticide-treated nets.
• Clean up the surrounding environment to prevent vector breeding sites.
• Use chemoprophylaxis when traveling to malaria-infested areas.

There are three key components of the communication and advocacy strategy of the malaria elimination campaign, which differ from the communication undertaken during the malaria control phase:

Messages – Because malaria incidence has declined in recent years, general awareness of the malaria risk in Swaziland has decreased. Communities and travellers are less likely to use personal protection measures, although malaria still poses a risk in the eastern part of the country during the malaria season. Therefore, messages must emphasize the continual risk of malaria and the low immunity of the population of Swaziland to malaria. Additionally, communication must accompany the new interventions introduced during the elimination phase (e.g. active case detection, definitive diagnosis, and universal LLIN coverage to at-risk populations).

Audience – A malaria elimination IEC campaign can no longer target only the population at risk or vulnerable groups such as children under five years of age and pregnant women. Rather, it must target the total population, including travellers. Because of low malaria incidence, everyone is at risk for illness, particularly as people move from malarious to non-malarious regions. Furthermore, politicians, policy-makers, and partners must be continuously educated on malaria issues so the disease remains on the public health agenda throughout the elimination phase and into the prevention of reintroduction phase.

Channels – The 2008, 2011, and 2012 KAP surveys and the 2010 MIS provided insight into the importance of certain channels over others for communication. The communication and advocacy strategy explores a variety of new channels, as well as proven effective avenues to ensure messages are communicated to the target audiences.

Each year, the NMCP carries out a KAP survey to monitor community understanding and behaviour related to malaria and disease prevention. Based on the results of the previous year’s KAP survey, the NMCP health promotion team plans and adjusts their messages and outreach campaigns year-to-year. Their overall goals are i) to enable healthy behaviour change towards malaria within the general public, within communities in the malaria-endemic regions, and among travellers; and ii) to obtain financial and programmatic support from national leaders, community leaders, and partners for malaria elimination activities.
d. Evaluating coverage of malaria control interventions

### Intervention coverage at a glance

- More than half (53%) of the population at risk was protected by ITN or IRS in 2010 (MIS data).
- Between 2009–2010 and 2011–2012, the portion of reported malaria cases confirmed by RDT/microscopy increased from 5% to 57%.
- Aside from the administration of quinine when clinically appropriate, all malaria cases are now treated with ACTs.
- A robust passive and active surveillance system is in place (see Box 6).

### Integrated vector management

The Malaria Elimination Strategic Plan aims for universal coverage of vector control interventions in all households of the malaria at-risk regions, through a combined campaign of IRS and LLIN distribution.

#### Indoor residual spraying

During the 2010–2011 transmission season, around 100,000 of 107,000 household structures were sprayed in the targeted areas, achieving coverage of 93%. This represents an increase compared to the 2008–2009 and 2009–2010 transmission years, when a total of 90,000 and 94,000 structures were sprayed, respectively. The increase was due to a concerted effort by the NMCP to augment the number of localities covered. In 2011–2012, the number of households benefitting from IRS was significantly lower, with around 73,000 structures sprayed, due to the delayed engagement of spray operators.

#### LLIN distribution

To date, approximately 154,000 LLINs have been distributed as part of the elimination campaign. Due to late procurement of LLINs in the first year of the elimination campaign, only approximately 14,000 LLINs were distributed in 2009–2010 to a population of nearly 20,000. With adequate preparation time and planning, this number greatly increased in the 2010–2011 season, when nearly 100,000 LLINs were distributed to a total population of over 137,000. In 2011–2012, an additional 40,000 LLINs were delivered. To date, approximately 55% of the target population is covered by LLINs, and the NMCP plans to continue LLIN distribution through the next three years to achieve its target of universal coverage in the at-risk regions.

The vector control teams use GIS devices to record geographic information at households where LLINs are distributed. This provides a database of intervention coverage and allows for easy electronic access to distribution information (see Figure 14).
Malaria indicator survey

In 2010, Swaziland conducted the country’s first MIS. Its goals were i) to evaluate NMCP efforts to scale up malaria control interventions, and ii) to set baseline measures for monitoring and evaluating Swaziland’s progress towards elimination.

No previous MIS is available for comparison, but a national DHS was conducted in 2007, which assessed mosquito net ownership and use, fever prevalence, antimalarial drug use, and intermittent preventive treatment during pregnancy. Even though the 2007 DHS was conducted nationally, while the 2010 MIS focused only on malaria at-risk regions of Swaziland, it is still interesting to look at the DHS results as indicators of progress.

The 2010 MIS was conducted in Swaziland’s malaria at-risk region (parts of all four regions, but mostly concentrated in Lubombo) at the end of its transmission season (April to May), to measure the coverage of malaria control interventions. Additionally, the MIS sought to assess community understanding of malaria and population movement, estimate the prevalence of malaria parasitaemia and malaria antibodies in the population, and gain understanding of transmission risk patterns.

In 2010, 53% of households reported owning at least one ITN or had received IRS in the past year (2010 MIS). This included 44% of households that had reported receiving IRS in the past year, and 17% owning at least one ITN. This is an increase compared to the 4% of households that reported owning at least one ITN in the 2007 DHS survey, although it is important to note that 2007 data come from national sampling, whereas 2010 data come from at-risk regions only. A more appropriate comparison lies between 2007 DHS data for the Lubombo Region only and 2010 MIS data (therefore comparing at-risk areas only). In this case, the increase is moderate, going from 13% to 17% in three years (see Figure 15). Relatively low ITN coverage can be
explained in part by the fact that LLIN distribution began in January 2010, only a few months before data collection for the survey started.

The KAP survey held in April and May 2011 in the areas where the population at risk had been targeted found that 74% of households owned at least one ITN. Among households owning at least one net, 82% owned more than one. That year, 79% of households in the same areas reported their structure had been sprayed in the past 12 months. However, net usage was still found to be low, at 30% and 37% among children and adults, respectively. In a country pursuing elimination, individuals may no longer consider malaria as a health threat, and low net utilization may remain a challenge. Swaziland will need to continue to focus health promotion efforts on raising awareness about the danger of malaria and the value of LLINs as a primary prevention method.

The 2012 KAP survey, carried out at the same time of year, reflected a continued increase in LLIN coverage among populations at risk (78%). Subsequent KAP surveys will continue to monitor coverage of vector control interventions.

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**Figure 15**

*ITN and IRS coverage, Swaziland, 2007–2010*

*By 2010, 53% of the population at risk was protected by insecticide-treated nets and/or indoor residual spraying, a marked improvement compared to 2007.*

**Source:** 2007 DHS (national, and disaggregated by region) and 2010 MIS (at-risk areas).
The rate of ITN use among children under five in urban areas increased from 1% (2007 DHS) to 11% (2010 MIS). In households owning at least one mosquito net, the rate of use during the night before the survey was even higher (35%, 2010 MIS). Usage was significantly lower in rural areas (see Figure 16).

**Figure 16**
Insecticide-treated net use among children under five is low (11%) nationwide. This reflects the heterogeneity between zones based on the risk for malaria transmission. In households owning at least one ITN, 35% of children under five years of age had slept under an ITN the night preceding the survey.

Source: 2007 DHS (national) and 2010 MIS (at-risk areas).
As shown in Figure 17, interventions have reached all wealth quintiles fairly evenly, but rural populations are still at a disadvantage compared to urban ones. Whereas roughly 50% of households in all five wealth quintiles own at least one ITN or were protected by IRS in 2010, substantially more households were protected by one of these two malaria prevention methods in urban areas (57%) than in rural areas (45%) (2010 MIS). Lower coverage of malaria prevention interventions in rural households is a concern because remaining transmission foci are predominantly found in rural areas and poor housing in these areas may increase exposure.

**Figure 17**
Percentage of households owning at least one ITN and/or being protected by IRS, by urban and rural areas and socioeconomic quintiles, Swaziland, 2010

*There is very little difference of access to vector control interventions based on socioeconomic status. However, intervention coverage is lower in rural populations than in urban ones.*

Source: 2010 MIS.
Due to the overall low malaria prevalence in Swaziland, future national MIS and population-based surveys have been cancelled. The focus now is to develop targeted surveys for the at-risk areas and to identify all potential malaria foci.

Case management

The NMCP is currently working to establish better mechanisms to monitor the utilization of diagnostic and pharmaceutical commodities at health facility level. In the absence of such a system, the NMCP uses case investigation data from the active surveillance programme to monitor these commodities.

Due to the roll-out of RDTs in 2010, the proportion of reported malaria cases confirmed by RDT/microscopy increased from 5% to 57% between 2009–2010 and 2011–2012. This is a remarkable achievement but still falls short of the 100% confirmation rate that the elimination strategy calls for.

From July 2011 to June 2012, out of 643 reported cases of malaria, 369 (or 57%) were confirmed by RDT/microscopy and treated according to guidelines. The distribution of investigated cases (221) across diagnostic tools is shown in Figure 18.

Figure 18
Diagnostic tools used for investigated malaria cases, Swaziland, July 2011–June 2012
Malaria cases in Swaziland are mostly confirmed using rapid diagnostic tests.

Source: NMCP.
In April 2010, artemether-lumefantrine was distributed to all public health facilities and private sector companies in the country. Out of the 885 cases confirmed between July 2010 and June 2012, 577 were investigated and the prescribed treatment was recorded. The treatment protocol for these cases was as follows: 456 patients were treated with AL, 90 patients were treated with quinine (including pregnant women and admitted patients), 21 patients were treated with AL and quinine, and 10 patients were treated with chloroquine. The distribution is shown in Figure 19.

**Figure 19**
Treatment type for investigated malaria cases, Swaziland, July 2010–June 2012
Since 2010, the vast majority of malaria cases are appropriately treated with ACTs.

Source: NMCP.
Chloroquine was administered to some patients because, although all health facilities had AL, this antimalarial drug was still on their shelves and some clinicians felt they had the option to treat with it. All chloroquine has since been withdrawn from all health facilities.

In the 2010 MIS, 12% of children were found to have had fever in the two weeks preceding the survey. This low prevalence of fever in areas where people are at risk for malaria represented a considerable decrease from the 25% found in the 2007 national DHS data.¹

According to the current malaria policy, Swaziland aims to treat 100% of patients within 24 hours of onset of symptoms. Prompt presentation of febrile children to health facilities is essential to meeting this target. In 2010, among children under five who had fever in the preceding two weeks, 67% sought treatment from a health facility or provider, an achievement of the RBM Abuja target of 60%.

Information, education, and communication

Numerous IEC activities and campaigns have been conducted in Swaziland over the past few years (see Box 4). The country conducted KAP surveys in 2007, 2008, 2011, and 2012, and a supplemental KAP survey was added to the 2010 MIS. The purpose of these studies is to assess community knowledge around malaria, and to evaluate the coverage and utilization of control interventions. A KAP survey has been planned annually from 2010 to 2014 as part of the country’s strategic plan.

The 2011 KAP survey documented that:

- 83% of people surveyed believed bed nets were effective in controlling mosquito bites.
- 83% believed IRS was a good way to kill mosquitoes.
- 89% of people were happy with the spray service they had received.

Case investigation and case detection

Swaziland has built a robust surveillance system, as described in Box 6.

¹The 2007 DHS was carried out between July 2006 and March 2007, while field work for the 2010 MIS occurred in April and May 2010; therefore, seasonal variations may account for some of the difference in fever prevalence between the two surveys.
Box 5: Mapping risk of seasonal malaria transmission

As Swaziland moves towards elimination, the country must identify and investigate all transmission foci, target vector control interventions to ensure coverage in all high-risk areas, and monitor and manage areas at risk for introduced transmission from imported cases. To support these activities, the NMCP and partners are collaborating to create high-resolution spatial and temporal maps of malaria risk that will enable a more efficient and rapid response to potential outbreaks.

Using data collected through the active surveillance programme in 2011, specifically the global positioning system (GPS) location of households and travel histories of confirmed malaria patients, as well as variables related to climate, environment, population density, and the presence of vector control interventions, a risk map of the entire country was created for the high and low transmission seasons (see Figure 20). As Swaziland builds its data repository, the malaria risk will become more defined, allowing surveillance and vector control activities to be targeted towards remaining transmission foci, which will improve the utilization of resources and the impact of these interventions compared to blanket coverage.

Figure 20
Probability for presence of locally-acquired malaria cases in Swaziland during the peak transmission months of January to April 2011

Source: Cohen JM, Dlamini S, Novotny J, Kandula D, Kunene S, Tatem AJ. Rapid mapping of seasonal malaria transmission risk for strategic elimination planning in Swaziland. In submission.
e. Impact and cases averted

**Impact and cases averted at a glance**

- Confirmed cases decreased by 42% (from 428 to 248) between the high transmission seasons of 2011 and 2012.

- Both local and imported cases have decreased between 2011 and 2012. Imported cases now represent the majority of investigated cases (78% in 2012).

- An estimated 33,000 malaria cases have been averted through control efforts between 2000 and 2012. If these efforts are maintained, this number will have reached 63,000 cases by 2020.

- A fraction of those cases would have resulted in deaths, which have therefore been prevented.

Even though malaria is no longer a burden to the health system and the population in Swaziland, it is possible to estimate the impressive public health gains achieved through malaria control.

The impact on malaria cases has been dramatic over the recent past. A significant reduction in confirmed cases, from 428 to 248 (or 42%), has been recorded between the last two high transmission seasons (January to June) of 2011 and 2012. Both local and imported cases have decreased, as shown in Figure 21. Local cases declined markedly (only one local case was recorded in May and two in June 2012) and now represent a minority of investigated cases (54% in 2011 and only 22% in 2012).

This is particularly important because, as Swaziland prepares to apply for malaria-free certification from WHO, the NMCP needs to prove that local transmission has been interrupted. (A critical component of this effort is regular and accurate distinction between local and imported cases, coming from a strong, timely, and sensitive surveillance system—see Box 6 on surveillance for details.)
Investigated cases of malaria (local vs imported), Swaziland, high transmission seasons of 2011 and 2012

During the 2011 and 2012 high transmission seasons (January to June), the number of local cases in Swaziland has significantly declined. Imported cases remain a problem because they represent a major threat of potential outbreaks.

Imported cases now represent the majority (114 out of 146 cases, or 78%) of malaria infections investigated during the malaria season of 2012 and will represent a risk of reintroduction of malaria in the future. Surveillance systems will need to remain robust for years to come to prevent outbreaks.

Swaziland, like many other countries embarking on the elimination phase, will have to keep making the case that investing in malaria must remain a high priority in the midst of morbidity and mortality approaching zero. This will no doubt represent a challenge in times of rapidly-shifting priorities, and a desire on the part of some to focus attention and funding on issues causing more visible hardship.

History has taught us that it is possible to control malaria and that the disease burden can be brought to an extremely low level. In Swaziland, the near-zero prevalence rates of the 1950s, compared to a rate of 28 per 1000 inhabitants in 1945, starkly illustrate the effect of a strong malaria control programme. Swaziland was near elimination in 1969, with only 10 local cases recorded, but this achievement was not reached, as funding decreased for malaria control.
Epидемии в 1980-х, а также недостаток человеческих и финансовых ресурсов, выделенных на контроль малярии, были причиной резurgence болезни и полного уничтожения успехов, достигнутых в борьбе с малярией в 1990-х. Только в последние годы благодаря увеличению финансовых и человеческих ресурсов и политической воли удалось добиться контроля над малярией снова (см. рисунок 2).

Для понимания влияния страны на борьбу с малярией важно понимать контргипотезу—что произошло бы, если бы в последние годы не было ведено борьбы с малярией в стране?

При построении простой линии регрессии по годовым данным за 1960–2000 годы можно получить приближенную оценку тенденции развития малярии за этот период. Продление этой тенденции позволяет оценить среднее количество случаев в год, которое могло бы произойти в случае отсутствия мероприятий по борьбе с малярией. Эта линия представлена на рисунке 22.

**Рисунок 22**
Моделирование случая малярии и оценка ожидаемого случая без最近ных мероприятий, Свазиленд, 1960–2020

*Тенденция в малярии до вмешательства продолжается, чтобы оценить ожидаемое количество малярии, если бы контроль был прекращен.*

By comparing the actual confirmed incidence recorded between 2000 and 2010 and the extrapolated trend, an estimate of the number of cases averted by control measures can be derived. Figure 23 presents this cumulative number of malaria cases averted since 2000 by keeping a strong malaria control programme in place and pursuing elimination.

In 2012, roughly 33 000 cases (range: 16 000–49 000) have been averted since 2000. If control efforts are maintained, by 2020 this number will have reached 63 000 cases (range: 31 000–95 000) averted. A fraction of those cases would have likely resulted in deaths.

**Figure 23**
Cumulative malaria cases averted attributable to malaria control efforts, Swaziland, 2000–2020

*The national control programme has averted approximately 33 000 cumulative cases between 2000 and 2012. If these efforts are maintained, the number will reach 63 000 by 2020.*

*Source: Analysis by CHAI, 2012.*
Box 6: Malaria surveillance and response: the crux of a strong elimination programme

Accurate surveillance is essential to the elimination phase. This box details how malaria surveillance is organized and implemented in Swaziland, along with key achievements and results for 2010–2012.

A quick reference for surveillance terminology in Swaziland

**Passive case detection**: Detecting malaria cases among patients who—on their own initiative—went to a health facility for treatment, usually for a febrile illness.

**Active case detection**: Detecting malaria infections at community and household level among populations that are considered at risk.

- **Proactive case detection**: The detection process that is triggered by strong suspicion of malaria transmission within a defined area or among a high-risk group.

- **Reactive case detection**: The detection process that is triggered by the identification of cases at health facilities; testing is done within 1 km of index case residence (radius based on mosquito flight distance).

**Case investigation**: Administering a standardized questionnaire to a person in whom a malaria infection is diagnosed in order to facilitate data collection, allowing classification of a malaria case by origin of infection.

*Source: Swaziland NMCP Surveillance Manual (2011). More information is available in Disease Surveillance for Malaria Elimination, WHO (2012).*

Description of the malaria surveillance system

In Swaziland, the main objectives of the surveillance system are to promptly identify all cases of malaria; identify their sources and determine whether they are local or imported; track the malaria situation in a timely manner; and launch a prompt response to halt all outbreaks. This is achieved through case investigation and case detection.

*Case investigation*

Swaziland’s diagnosis and treatment guidelines require the confirmation of all malaria cases at health facility level by RDT and/or microscopy prior to treatment. All confirmed malaria cases are to be immediately reported through the country’s Immediate Disease Notification System, hosted by the Ministry of Health’s EPR Unit and the Health Management Information System Unit. The Disease Notification System allows health workers to report
up to 15 notifiable conditions immediately by calling the toll-free hotline 977.

When a malaria case is diagnosed, the HCW fills out a 977 notification form, which includes details such as the patient’s phone number and directions to their household. The HCW then calls 977, where an EPR officer records the information onto the web-based system. After the data have been entered, an SMS is automatically sent to the entire NMCP surveillance team informing them of the occurrence and location of the malaria case. Surveillance agents collect the contact details, visit the facility to retrieve the blood smear for secondary confirmation, and initiate a case follow-up. The process is summarized in Figure 24.

Figure 24
Flow path from diagnosis to response, malaria surveillance system, Swaziland

Source: NMCP, 2011.
Once a case has been diagnosed and notified through the passive surveillance system, the NMCP conducts a case investigation within 7 days of the case being reported, primarily to determine the source of infection. This is determined by collecting a detailed travel history of the patient over the previous four weeks both within and outside of Swaziland. A high number of locally-transmitted cases indicates the need for further investigation in order to determine transmission factors and to develop an appropriate response such as strengthening vector control interventions and/or community education. Similarly, a high number of imported cases may result in strengthening education for high-risk communities, for example travellers or seasonal farm workers.

Other details that are collected include global positioning system (GPS) coordinates of each case’s household, which are later mapped to establish the temporal-spatial relationship between cases. Demographic details such as age, gender, and ethnicity are also collected, which helps build a profile of the person at risk for malaria. Similarly, the use of personal protection measures, such as chemoprophylaxis when travelling, or IRS and LLIN in the household, is also recorded.

Case detection

The NMCP surveillance team also carries out case detection, a process in which additional malaria cases are identified within the communities through RDT. Case detection is used to identify potential parasite carriers, treat confirmed cases, and prevent or halt disease outbreaks.

Implementation of the active surveillance system

Building the active surveillance system

In October 2009, the NMCP developed a Malaria Surveillance Programme Manual to guide the implementation of the active surveillance system. During the 2009–2010 transmission period, the surveillance system was piloted in the malaria at-risk Lubombo Region, before it was revised and implemented nationwide.

One chief surveillance officer, two supervisors, and six field agents are responsible for the active surveillance programme. In addition to active case investigation and detection, field agents visit health facilities on a regular basis to ensure adequate stocks of diagnosis and treatment commodities, as well as compliance with reporting. The surveillance team is supported by a GIS analyst who leads spatial analysis and mapping of all cases detected, as well as an IT database officer and IT network officer, who ensure successful capture and management of all data collected.

Each of the six surveillance field agents is assigned an established sentinel surveillance site based at a health clinic (see Figure 25). Agents are to investigate all cases and oversee passive surveillance within their catchment area.

In partnership with Swaziland’s Department of Meteorology, the NMCP supported the installment of weather observation systems at each surveillance sentinel site to measure wind, temperature, humidity, rainfall, and atmospheric pressure. Data collected at these weather stations can be linked to case data to better understand seasonal and climatic variations in malaria transmission.
Managing data: the Malaria Surveillance Database System

According to WHO’s *Malaria Elimination: A Field Manual for Low and Moderate Endemic Countries* (2007), the establishment of a malaria elimination database is a required component of any elimination programme. In May 2010, the NMCP’s Information Technology Team, with support from the MRC of South Africa, developed the Malaria Surveillance...
Database System (MSDS), a tool used to record information on malaria cases and to monitor progress towards elimination of the disease. The MSDS consists of 12 modules that capture data on case detection, case investigation, coverage of vector control interventions, and training events.

Active surveillance in Swaziland, 2010–2012

Active case investigation

From July 2009 to June 2010, 191 confirmed cases were reported or detected through the country’s passive and active surveillance systems, of which 94 (49%) were investigated. From July 2010 to June 2011, 516 confirmed cases were reported, of which 356 (69%) were investigated. The increase in confirmed cases between 2009–2010 and 2010–2011 is likely not due to transmission patterns, but can be attributed to the RDT roll-out and the launch of the Immediate Disease Notification System in August 2010, which led to an increase in reporting.

From July 2011 to June 2012, 369 confirmed malaria cases were reported, this time likely reflecting the impact of prevention and control interventions supported by a strengthened surveillance system. Of those 369 cases, 221 (60%) were investigated.

Figure 26
Number of cases investigated and case investigation rate, Swaziland, 2010–2012

The main reason that not 100% of all cases are investigated is due to poor collection of contact details at health facility level or difficulty contacting travellers who enter and leave the country in a short period of time. A total of 68 (72%) and 160 (45%) cases were investigated within 7 days of diagnosis in 2009–2010 and 2010–2011, respectively. The decrease in the proportion of cases investigated in that time period is due to the slow expansion of the active surveillance system and the increase in the volume of cases reported. In 2011–2012, 146 (66%) cases were investigated within 7 days of diagnosis.

Of cases investigated in 2011 and 2012 (January to June high transmission seasons), 135 (46%) and 114 (78%), respectively, were determined to be imported, mostly from neighbouring countries. Among travel locations, Mozambique is reported most commonly (94% of imported cases in 2011). The highest month of importation occurs in January, after travel during Christmas and New Year’s holidays. Personal protection is low among imported cases with 84% of cases in 2011 reporting no personal protection measures. The most common personal protection measures reported were chemoprophylaxis (8%) and bed nets (6%).
**Active case detection**

Detection activities have focused primarily on reactive case detection that follows case investigation. Currently, surveillance agents conduct reactive case detection where there is suspicion of local transmission (ongoing or in the recent past). In 2010–2011, 151 (42%) out of 356 cases investigated included reactive case detection, which tested 2047 people. A total of 28 out of 151 index cases produced a total yield of 45 additional malaria cases. The yield was lower in 2011–2012, when locally-transmitted cases accounted for a lower proportion of investigated cases. All confirmed cases are promptly referred to the nearest health facility for treatment.

Nearly 50% of people tested during reactive case detection resided at the household of the index case. The NMCP plans to use new household mapping software to ensure that all households living within 1 km of an index case are screened for malaria.

**Surveillance-triggered response**

The data generated from the surveillance system must lead to rapid and targeted response to interrupt the transmission cycle. While improving its case detection system, Swaziland is deploying interventions in response to potentially local transmission. In 2011, during an outbreak in the northern part of the country, the NMCP deployed IRS and LLIN distribution, continued community screening with RDTs, and carried out health education with community members on net utilization and treatment-seeking behaviour to halt the epidemic. In 2011–2012, spray operators have been deployed in areas where recent local cases were found. The NMCP is planning to standardize vector control and active surveillance response to local transmission.

**Malaria epidemic preparedness and response**

Malaria EPR guidelines were developed to prepare various partners throughout the health system to mitigate and reduce all potential outbreaks. To this end, malaria alert and epidemic thresholds were set, and action plans were developed to adequately respond to increases in local transmission.

Swaziland’s current malaria alert threshold is set at two or more locally-acquired, confirmed cases. Reaching the alert threshold signals to health staff that further investigation is needed and that contingency plans (increase in drug stocks and supplies, and preventive measures such as health promotion) should be in place.

The malaria epidemic threshold is reached when there are five or more locally-acquired, confirmed cases per week in a geographically localized area, taking into consideration malaria seasonal changes. If the malaria epidemic threshold is reached, the NMCP and EPR unit deploy a task team to the area to effectively respond to the outbreak. Health education, IRS operations, LLIN distribution, and disease surveillance activities are carried out to halt the outbreak. As Swaziland moves closer to elimination, malaria alert and epidemic thresholds will be adjusted to reflect transmission patterns; eventually, an epidemic will be defined as one local case in any part of the country.

**Foci investigation and management**

In 2012, the NMCP hired a foci investigator/entomology coordinator to build a catalogue on all potential transmission foci in the country. This position integrates the data from the active surveillance system with entomology surveillance information and geographical reconnaissance in order to i) classify geographical areas of transmission and ii) attempt to identify the factors
driving transmission. Based on transmission factors in a particular focus area, an appropriate response will be deployed. If this area is not covered by IRS or LLIN interventions, these operations will be rolled out. In areas where the population has been given nets, but there is low utilization along with the threat of high receptivity, community outreach activities to improve use will be conducted with the help of community leaders. In areas containing large populations of migrants, especially those travelling to Mozambique, regular case detection activities will be carried out along with distribution of IEC materials promoting chemoprophylaxis, personal protection measures, and/or early treatment-seeking behaviour.

**Next steps**

After establishing a national surveillance system, Swaziland must now scale it up to ensure that all suspected malaria cases presenting to health facilities are promptly diagnosed and reported, that all confirmed cases are thoroughly investigated to determine source of infection, and that screening is robust enough to ensure that transmission is interrupted.

The NMCP has identified several areas to improve its surveillance programme for 2012–2013. It is rolling out small tablet computers with GIS capacity to more accurately capture surveillance data and improve turnaround time of analysis and response. It has updated the active case investigation tool to capture more details about travel history and travel means, housing type and personal environment, and treatment-seeking behaviour. Also, surveillance agents will be supplied with mobile phone airtime to contact and follow up with reported cases.

The NMCP is adding an operational research component evaluating the role of DNA PCR analysis in the detection of asymptomatic infections, currently not identified by RDTs, which may contribute to transmission. The tablet computers will also allow the surveillance agents to access an aerial image of the index case household and the surrounding structures that fall within 1 km. This will improve the completion rate of reactive case detection screening.

Finally, fever screening around index cases will be extended up to six weeks after a case presentation to account for a potentially longer transmission window.
Swaziland has achieved considerable gains working towards malaria pre-elimination. Still, challenges lie ahead and the country will need to keep up the effort.

**Looking forward at a glance**

- A strong and well-funded programme, established collaboration with neighbouring countries, and political commitment will help Swaziland achieve its goal to become malaria-free.

- Vector control interventions in the malaria at-risk areas must become more targeted and efficient.

- Strategies to bring confirmation and case investigation rates to 100% need to be refined before elimination can be achieved.

- The risks of malaria reintroduction and of shifting focus from external donors represent challenges ahead.

For the second time in its history, Swaziland has been able to reduce malaria to negligible levels. The goal of malaria elimination is in sight. However, the story of malaria in the country also holds some lessons for our times. Without constant focus and effort, the disease can strike back and malaria can quickly return as a major public health threat.

Looking ahead, Swaziland can feel proud of its accomplishments and is well positioned to achieve its goal of elimination:

- The reduction in malaria incidence over the last five years has been quite remarkable.

- Swaziland shares limited national border lines with malaria-endemic areas.

- Neighbouring countries have a low endemicity (prevalence in bordering provinces in South Africa and Mozambique have fallen to approximately 5 cases per 1000 population at risk).
• The population at risk is limited (around 30% of the entire population).

• There is political commitment to eliminate the disease.

• Finally, there is strong leadership and capacity at the NMCP.

Some challenges remain, however, including:

• Improving coverage of protective measures for the malaria at-risk population.

• Ensuring that all suspected malaria cases are accurately diagnosed and confirmed.

• Reaching a 100% investigation rate on all malaria cases.

• Addressing the risk of reintroduction from neighbouring Mozambique.

• Sustaining elements of the elimination programme that are currently supported by external donors.

Swaziland must address these operational challenges by improving logistical support, as well as overall management and supervision of health care workers and NMCP staff. Strengthening regional collaboration with Mozambique will remain a top priority, as source reduction in that country is critical to achieving elimination in Swaziland. Finally, the country must continue to mobilize national and international stakeholders to keep malaria elimination high on the political and donor agenda.

Swaziland has been close to elimination before. Let’s hope that, this time, focus as well as financial and human resources will remain steady until the goal is achieved.
CONCLUSION

Swaziland’s progress towards malaria elimination is remarkable. The country currently has the political will as well as the operational and technical capacity to achieve this goal, and it is rapidly strengthening the necessary systems. The risk of malaria reintroduction and the reliance on external funding still represent significant threats for the NMCP, but Swaziland is determined and well positioned to achieve its objective of freeing the country of malaria by 2015.

The experience gained can offer useful lessons for other countries about to move into a malaria elimination phase. Lessons include the essential role of national leadership, the need to maintain significant human and financial resources in spite of the decreasing public health burden, the efficiency gains in targeting the at-risk populations, and the reliance on a prompt, comprehensive, and reactive surveillance system.

The achievement of elimination in Swaziland would generate optimism and increased commitment around malaria control and elimination in Africa. It would also set the stage for neighbouring countries to follow suit. Finally, adding a new country to the list of those that have become malaria-free would boost the enthusiasm of the global community for malaria elimination in Africa and beyond, and shrink the malaria map a step further.
ANNEX

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**
- Ministry of Agriculture
- Ministry of Home Affairs (Department of Immigration)
- Ministry of Tourism and Environmental Affairs (Department of Meteorology)
- Swaziland Medical and Dental Association
- Swaziland Nurses Association
- Swaziland Red Cross
- Traditional Healers Organization (THO)
- University of Swaziland (UNISWA)

**International Partners**
- Clinton Health Access Initiative (CHAI)
- Global Fund to Fight AIDS, Tuberculosis and Malaria
- Global Health Group (GHG), University of California, San Francisco (UCSF)
- South African Medical Research Council (MRC)
- Southern Africa Malaria Elimination Support Team (SAMEST)
- Southern African Roll Back Malaria Network (SARN)
- United Nations Children’s Fund (UNICEF)
- United Nations Development Programme (UNDP)
- World Health Organization (WHO)
PROTECT YOURSELF AGAINST MALARIA WHEN TRAVELLING TO MALARIA AFFECTED AREAS

MALARIA PREVENTION TABLETS

MOSQUITO NET

INSECTICIDE REPELLENT

NMCP

National Malaria Control Programme