

REPUBLIC OF ZAMBIA



MINISTRY OF HEALTH



NATIONAL MALARIA ELIMINATION STRATEGIC PLAN 2017-2021

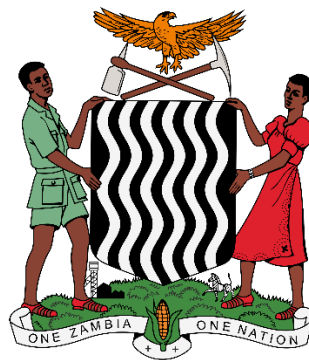


Moving from accelerated burden reduction to malaria elimination in Zambia
JANUARY 2017

NATIONAL MALARIA ELIMINATION CENTRE - WWW.NMEC.ORG.ZM

National Malaria Elimination Strategic Plan 2017-2021

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National Malaria Elimination Centre
Ministry of Health

2017

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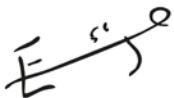
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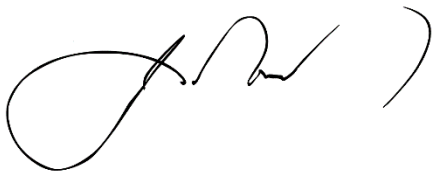
Dr. Elizabeth Chizema-Kawesha
Director, National Malaria Elimination Program
Ministry of Health

Preface

The Ministry of Health of the Republic of Zambia, in collaboration with partners, has developed the National Malaria Elimination Strategic Plan (NMESP) for 2017 to 2021. This document is in line with the WHO Global Technical Strategy (GTS) for Malaria 2016–2030 and the Southern Africa Malaria Elimination 8 (E8) Initiative.

To achieve the malaria elimination targets, it will be imperative to mobilize the requisite resources, strengthen the capacity of malaria elimination programme management, implement and monitor a package of high-impact malaria interventions driven by local epidemiology, and build and sustain a strong surveillance system.

I trust that this document will serve as a framework for a coordinated and collaborative approach to malaria elimination in Zambia. It is also meant to serve as a basis for the development of detailed and costed plans of action at the national level adapted to the provincial, district, and local realities and the response to the specific needs of each locale in Zambia.



Dr. Jabbin L. Mulwanda
Permanent Secretary, Health Services
Ministry of Health

Acronyms and abbreviations

ACT	Artemisinin-based combination therapy
ALMA	African Leaders Malaria Alliance
ANC	Antenatal clinic
CHA	Community health assistant
CHAZ	Churches Health Association of Zambia
CHW	Community health worker
COMESA	Common Market for Eastern and Southern Africa
CPx	Chemoprophylaxis
DHAP	Dihydroartemisinin-piperaquine
DHIS2	District Health Information Software 2
E8	Malaria Elimination 8
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
GTS	Global Technical Strategy
HFCA	Health facility catchment area
HMIS	Health Management Information System
IEC/SBCC	Information, education and communication / social behaviour change communication
IPTp	Intermittent preventive treatment during pregnancy
IRS	Indoor residual spraying
ITN	Insecticide-treated mosquito net
IVM	Integrated vector management
LLIN	Long-lasting insecticide-treated mosquito net
MACEPA	Malaria Control and Elimination Partnership in Africa
MDA	Mass drug administration
MIS	Malaria Indicator Survey
MOH	Ministry of Health
NMEC	National Malaria Elimination Centre
NMEP	National Malaria Elimination Programme
NMESP	National Malaria Elimination Strategic Plan
NMSP	National Malaria Strategic Plan
NGO	Non-governmental organization
PAMO	Programme for the Advancement of Malaria Outcomes
PMI	President's Malaria Initiative
RDT	Rapid diagnostic test
SADC	South African Development Community
SARN	Southern Africa Roll Back Malaria Network
SP	Sulfadoxine-pyrimethamine
SUFI	Scale up for impact
TDR	Tropical Disease Research Centre
UNICEF	United Nations Children's Fund
WHO	World Health Organization
WHOPES	WHO Pesticide Evaluation Scheme
ZEMA	Zambian Environmental Management Authority

Executive summary

Despite significant progress made over the past decade, malaria continues to be a major burden in Zambia, resulting in 2,000 deaths in 2016.¹ All four variations of the *Plasmodium* species are found in Zambia with 98 percent of cases caused by *P. falciparum*. Malaria prevalence varies across districts with 14 million Zambians at risk, including the most vulnerable groups, such as pregnant women and children under the age of five years. The country's last two iterations of the National Malaria Strategic Plan (NMSP) aimed to reduce transmission through multiple strategies, including the distribution of long-lasting insecticide treated mosquito nets (LLINs), increased indoor residual spaying (IRS), improved case management using rapid diagnostic tests (RDTs), and treatment with artemisinin-based combination therapy (ACT). Due to these successful interventions and strong political support, Zambia will continue to scale up malaria interventions in pursuit of a malaria-free nation.

The vision is to attain a malaria-free Zambia. The goal is to eliminate local malaria infection and disease in Zambia by 2021 and to maintain malaria-free status and prevent reintroduction and importation of malaria into areas where the disease has been eliminated. In order to achieve this goal, the following objectives must be pursued:

- Increase the implementation rate of interventions from 36% in 2015 to 95% by 2018.
- Reduce malaria incidence from 336 cases per 1,000 population in 2015 to less than 5 cases per 1,000 population by 2019.
- Increase the malaria-free health facility catchment areas (HFCAs) from 0.5% in 2015 to 100% in 2021.
- Reduce malaria deaths from 15.2 deaths per 100,000 in 2015 to less than 5 deaths per 100,000 population by 2021.
- Achieve 100% malaria-free certification by 2021.
- Maintain 100% malaria-free, following certification in 2021.

The following will be the milestones:

- Develop, strengthen, and maintain national political support, technical and operational capacity, and financial resources for malaria elimination;
- Clear infections and interrupt malaria transmission;
- Document the reduction of infection, illness, severe disease, and mortality in districts, provinces, and nationally, and assess progress towards elimination;
- Prevent the re-emergence of malaria transmission through importation in districts where it had been eliminated.

Zambia's elimination strategy will involve a multi-pronged approach that targets areas based on transmission levels. For districts with 50 or more cases per 1,000 population, the focus will be on reducing burden and strengthening health systems. For districts with fewer than 50 cases per 1,000 population, surveillance will be the key intervention. In both of these settings, a step-by-step approach will be used to ensure a sustainable malaria elimination project. The summary of the steps are below.

Step A—Accelerating Scale-Up: Optimize Vector Control and Case Management

Step B—Build Information Systems for Action: Quality and Timely Reporting of Infections

Step C—Community Clearance of Malaria Parasites: Population-Wide Strategies to Reduce Transmission

Step D—Detect and Investigate Individual Cases: Household and Neighbourhood Strategies to Stop

¹ Zambia Health Management Information System, Ministry of Health, 2016

Transmission

Step E—Eliminate: Document and Maintain Zero

To efficiently achieve malaria elimination in Zambia, it will be essential for individuals at the household level and in communities to take on active roles. The promotion of social and behaviour change communication (SBCC) will be imperative in ensuring community buy-in and for sustainability. Elimination will also require policy and capacity-building among mobile and migrant populations to prevent reintroduction of malaria from outside of Zambia. Similarly, Zambia will need to promote cross-border collaborations to properly maintain elimination.

Zambia's malaria elimination efforts must be evaluated regularly to ensure that objectives are being met. National and local databases will be established to monitor progress and increase inter-governmental collaboration. In addition, the Zambian government will leverage partnerships to help with collaborative efforts to measure progress towards elimination. Such partnerships will include high-level health organizations (e.g., WHO, the African Leaders Malaria Alliance [ALMA], and the Malaria Elimination 8 [E8]), funding partners (e.g., the United States Government (USG), the Global Fund against AIDS, Tuberculosis and Malaria [GFATM], the Bill and Melinda Gates Foundation, the World Bank, and the African Development Bank), and implementing partners (e.g., non-governmental organizations [NGOs]).

The total cost of Zambia's elimination strategy was estimated through a costing exercise and is evaluated at just over US \$694 million. It will be crucial for Zambia to ensure that adequate financial resources are available during all phases of the elimination strategy. This will include a resource mobilization strategy to leverage both domestic and international funds.

Introduction

Zambia is a land-locked country located in sub-Saharan Africa, with a surface area of 752,612 square kilometres. Zambia shares borders with eight countries: the Democratic Republic of Congo and Tanzania to the north, Malawi and Mozambique to the east, Botswana and Zimbabwe to the south, Namibia to the southwest, and Angola to the west. Administratively, the country is divided into 10 provinces and 106 districts. Zambia's capital city is Lusaka. Approximately 60 percent of the population resides in rural areas, while 40 percent lives in urban areas. The Lusaka and Copperbelt provinces are predominantly urban, while the other provinces are largely rural.

According to the Central Statistics Office projections, the population of Zambia was estimated to be 15.5 million in 2015, with a life expectancy of just over 53 years.² As of 2012, Zambia's population was served by a network of 1,956 health facilities, including 109 hospitals, more than 1,500 urban and rural health centres, and over 300 health posts.³

Zambia's efforts to reduce the malaria burden and address other health challenges are part of a broader agenda aimed at attaining significant and sustainable socioeconomic development. The country's long-term development agenda is guided by the Vision 2030 Strategy, which seeks to transform Zambia into "a prosperous middle-income nation by 2030."⁴ The Vision 2030 Strategy is being implemented through successive five-year national development plans, including the current National Development Plan. Vision 2030 identified malaria control as a key priority area in terms of achieving the stated development goals.

Zambia's tremendous disease burden results in high morbidity and mortality rates among the population, with significant impact on socioeconomic development. The disease burden is largely influenced by the high prevalence of preventable and treatable communicable diseases, such as malaria, HIV/AIDS, sexually transmitted infections, and tuberculosis. The country is also experiencing a growing burden of non-communicable diseases, particularly hypertension, cardiovascular disease, diabetes mellitus, mental health conditions, trauma and cancer.

Though major achievements have been made in malaria control, the disease remains a significant cause of morbidity and mortality in Zambia, with one in five children under age five infected with malaria parasites, and other vulnerable population groups at risk.⁵ Reported malaria deaths have dramatically decreased in Zambia over the past ten years, though more than 2,000 deaths are still reported annually.⁶

² Zambia Population and Demographic Projections, 2011–2035, Central Statistics Office, Zambia, July 2013

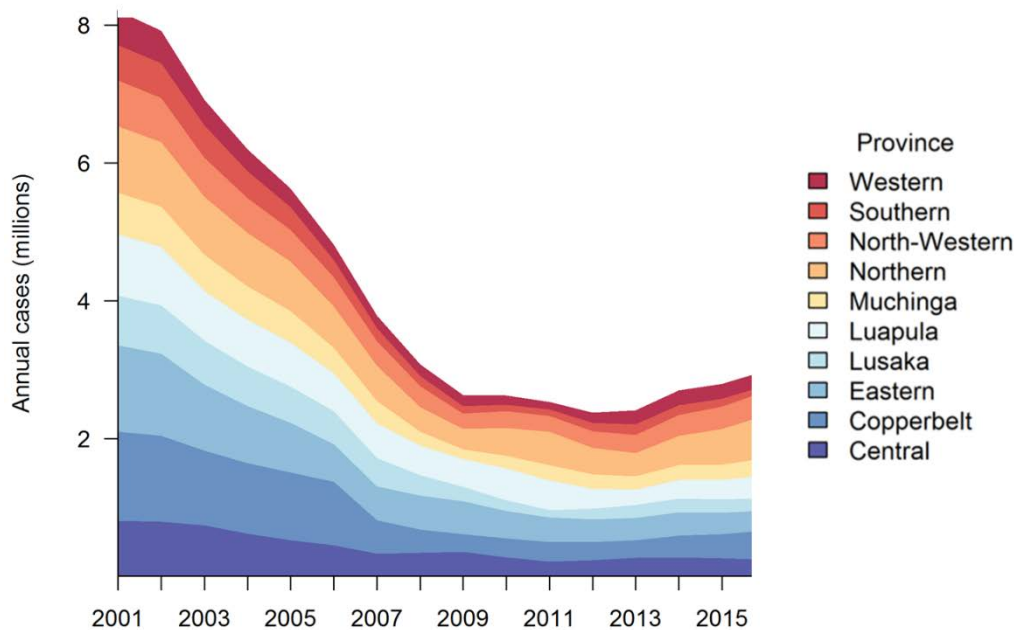
³ The 2012 List of Health Facilities in Zambia, Ministry of Health Zambia, April 2013

⁴ Vision 2030, Republic of Zambia, December 2006

⁵ Zambia 2015 National Malaria Indicator Survey, Ministry of Health Zambia, April 2016

⁶ Zambia Health Management Information System, Ministry of Health, 2016

Figure 2: Annual malaria cases by province, 2001–2015.



Generated by MRC Centre for Outbreak Analysis and Modelling, Imperial College, London

The need for a Zambia elimination strategy

The substantial impact of current interventions at scale, the commitment from national and local governments, a keen interest among partners, and the momentum of scientific advances all converge to create an environment of urgency to eliminate malaria in Zambia.

The rationale for undertaking a malaria elimination strategy in Zambia at this time is based on the following:

- The substantial progress in recent years towards addressing malaria;
- Zambia's domestic financial commitments to control malaria, which have led to the goal of elimination;
- The trend that in many districts, malaria incidence has been reduced to levels where transmission interruption is a feasible objective;
- A delay in addressing elimination allows the problem of drug and insecticide resistance to emerge, making both malaria elimination and control more challenging in the future;
- Political and financial commitments from neighbouring countries and partners to achieve a greater impact and eliminate malaria;
- Solid evidence that has accumulated over the last decade on approaches for addressing malaria, and new elimination tools that are on the horizon;
- Effective mechanisms that are being established to ensure proper coordination of malaria elimination activities with neighbouring countries, particularly where there is movement across international boundaries.

International attention and political commitments towards malaria elimination that have been mobilized in recent years are being translated into real actions to plan and implement an elimination intervention package in Zambia.

1. Vision, mission, goals, objectives and strategies

The ultimate goal of the new strategy is to interrupt malaria transmission, eliminate infections, and maintain zero transmission locally. This will be achieved through:

- Strengthening the capacity to plan and implement budgets, execute payments on schedule, and to rapidly reallocate or mobilize funds to deal with unexpected events.
- Sustaining the national political support, technical and operational capacity, and financial resources for malaria elimination

Vision

A malaria-free Zambia.

Mission

To provide equitable access to cost-effective, high-quality health services as close to the family as possible.

Goals

- To eliminate local malaria infection and disease in Zambia by 2021.
- To maintain malaria-free status and prevent reintroduction and importation of malaria into areas where the disease has been eliminated.

Objectives

- Increase the implementation rate of interventions from 36% in 2015 to 95% by 2018.
- Reduce malaria incidence from 336 cases per 1,000 population in 2015 to less than 5 cases per 1,000 population by 2019.
- Increase the malaria-free health facility catchment areas (HFCAs) from 0.5% in 2015 to 100% in 2021.
- Reduce malaria deaths from 15.2 deaths per 100,000 in 2015 to less than 5 deaths per 100,000 population by 2021.
- Achieve 100% malaria-free certification by 2021.
- Maintain 100% malaria-free, following certification in 2021.

Key elimination interventions

- Vector control
 - Indoor residual spraying (IRS)
 - Long Lasting Insecticide-treated mosquito nets (LLINs)
 - Larval source management (LSM)
- Case management
 - Diagnosis
 - Treatment
 - Integrated community case management (iCCM)

- Malaria in pregnancy
 - Intermittent preventive treatment during pregnancy (IPTp)
- Parasite clearance
 - Mass drug administration (MDA)
 - Reactive case investigation
 - Focal drug administration
- Health promotion
 - Advocacy with key policy and decision makers on malaria elimination
 - Community engagement
 - SBCC for mobile and migrant populations including cross-border collaboration
- Incorporate emerging tools as they become available and are epidemiologically relevant, such as vaccines.

Key elimination programmatic components

- Enhanced surveillance, monitoring, evaluation and research for informed decision making
 - Quality and timely facility/community reporting
- Health systems capacity
 - Staffing
 - Decentralization
- Funding

2. Guiding principles for malaria elimination

Our guiding principles of malaria elimination are:

1. The unit of elimination and of intervention implementation will be the HFCA.
2. Malaria incidence thresholds will guide the intervention package towards the goal of malaria elimination.
3. Epidemiologic and entomological information (clarified using data reviews and verification procedures) will be critical in directing action and tracking progress.

Tactical approaches

Lowering the burden in high-transmission settings: Despite visible progress in reducing the malaria burden across Zambia, the goal of elimination is still distant in some areas, due to the relatively high disease burden, low coverage of interventions, insufficient development of the local health system, and technical and operational constraints. In these settings, specific recommended actions include:

- Achieving effective coverage with malaria curative and preventive services;
- Improving the quality and timeliness of information systems for decision-making to further reduce malaria transmission;
- Reducing the malaria burden to a sufficiently low level to enable the implementation of parasite-clearance strategies.

Eliminating malaria in low-transmission settings: In settings with low transmission rates, or where recent progress has markedly reduced transmission, priority should be given to elimination. In these settings, specific recommended actions include:

- Interrupting malaria transmission;
- Reporting and responding to all confirmed cases, and preventing continued transmission;
- Determining the underlying causes of residual transmission;
- Maintaining and documenting malaria elimination.

Preventing the reintroduction of malaria transmission: HFCAs, districts, and provinces that have become malaria-free must implement measures to prevent the reintroduction of malaria. The probability of malaria becoming re-established in a malaria-free area varies with the degrees of receptivity and vulnerability of the area. In these settings, specific recommended actions include:

- Notifying all confirmed cases of malaria;
- Detecting any possible reintroduction of malaria transmission;
- Determining the underlying causes of resumed malaria transmission;
- Applying rapid curative and preventive measures.

3. Targets

The following timeline with accompanying targets is proposed for the implementation of Zambia's elimination strategy:

By the end of 2017:

- Launch and roll out the national elimination strategy and planning exercise at all levels;
- Design and launch a national malaria elimination communications campaign to ensure community buy-in;
- Develop and implement a malaria policy document;
- Develop and implement a malaria business plan;
- Undertake the previously specified actions in all HFCAs for malaria elimination;
- Establish a surveillance system.

By the end of 2018:

- Ensure that quality and timely malaria reporting is available in 100% of HFCAs countrywide
- Reduce malaria prevalence to less than 5% in 50% of HFCAs
- Reduce malaria deaths by 20% of 2015 baseline.

By the end of 2019:

- At least 50% HFCAs report zero locally transmitted cases of malaria;
- Zero reintroduction of malaria in HFCAs and districts where malaria has been eliminated;
- Reduce malaria deaths by 30% of 2015 baseline.

By the end of 2020:

- 100% of HFCAs report zero locally transmitted cases of malaria;
- Reduce malaria prevalence to less than 5% in 100% of HFCAs
- Zero reintroduction of malaria countrywide;
- Reduce malaria deaths by 70% of 2015 baseline.

By the end of 2021:

- Eliminate malaria in all HFCAs;
- Zero reintroduction of malaria countrywide.

4. The malaria situation in Zambia

Zambia's malaria epidemiology is a result of several forces, including:

- The geographic, climatic, and social features of the country that are conducive or restrictive to malaria;
- The introduction and scaling-up of malaria control interventions across the country, which alter transmission and the consequent infection, morbidity, and mortality rates associated with malaria.

Not only is Zambia a highly malaria-endemic country, but malaria is also endemic in all eight neighbouring countries. Malaria incidence in Zambia varies widely from under 50 cases per 1,000 population in some districts to above 500 cases per 1,000 population in others.⁷ Malaria prevalence in the most vulnerable age group (children under five years) varies from below 3 percent in some districts (such as urban Lusaka) to over 30 percent in the most rural provinces.⁸ There have also been changes in disease prevalence within the same locations over time, owing to variations in coverage rates of preventive interventions.

The malaria burden has markedly decreased with the massive scale-up of control efforts in the past decade, although the disease is still a major public health challenge in Zambia and remains endemic across all ten provinces. There is a wide variation in infection prevalence across provinces and districts.⁹

Malaria transmission is highly seasonal, with the rainy season (December to April) leading to transmission peaks between January and April, and peak parasite prevalence at the end of the transmission season in April and May.

In Zambia, there are four types of *Plasmodium* parasites that can cause malaria in humans: (1) *P. falciparum*, (2) *P. malariae*, (3) *P. vivax*, and (4) *P. ovale*. Out of these, *P. falciparum* is the most predominant, causing the most severe form of malaria. *P. falciparum* accounts for 98 percent of all malaria infections in the country, with low frequency of infections from *P. malariae* (>1 percent) and *P. vivax* (<1 percent), and little or no transmission of *P. ovale*.

Malaria in Zambia is transmitted by the members of the *Anopheles gambiae* complex and of the *Anopheles funestus* group of mosquitoes. The main vector species are *Anopheles gambiae s.s.*, *An. arabiensis*, and *An. funestus*. Recent field research demonstrated the presence of *An. nili* in the *An. nili* complex, and *An. funestus*-like and *An. rivulorum* within the *Anopheles funestus* group. However, their role in malaria transmission has yet to be established.

During the last decade, under the previous (2005–2010 and 2011–2016) NMSPs, Zambia made substantial progress in scaling up proven interventions, including the use of LLINs, IRS, prevention during pregnancy with LLINs and IPTp, and improved case management at health facility and community levels with diagnostic confirmation using RDTs and/or microscopy along with ACT treatment.

⁷ Zambia Health Management Information System, Ministry of Health Zambia, 2015

⁸ Zambia 2015 National Malaria Indicator Survey, Ministry of Health Zambia, April 2016

⁹ Zambia 2015 National Malaria Indicator Survey, Ministry of Health Zambia, April 2016

Recent history and current trends

National profile

More than 16 million people are at risk of malaria in Zambia. It is estimated that in 2015, there were over 5 million malaria cases, of which over 98 percent were due to *P. falciparum* (see Table 1).

Table 1. Malaria incidence in Zambia.

Province	Population 2015	Total malaria OPD cases reported	Total reported malaria incidence per 1,000
Central Province	1,541,688	407,229	264.1
Copperbelt Province	2,362,216	815,988	345.4
Eastern Province	1,813,450	670,838	369.9
Lusaka Province	2,943,695	92,185	31.3
Luapula Province	1,102,625	773,710	701.7
Muchinga Province	895,054	449,445	502.1
Northern Province	1,304,434	608,925	466.8
North Western Province	843,156	680,375	806.9
Southern Province	1,714,787	45,794	26.7
Western Province	993,472	496,326	499.6
TOTAL	15,514,577	5,040,815	352.4

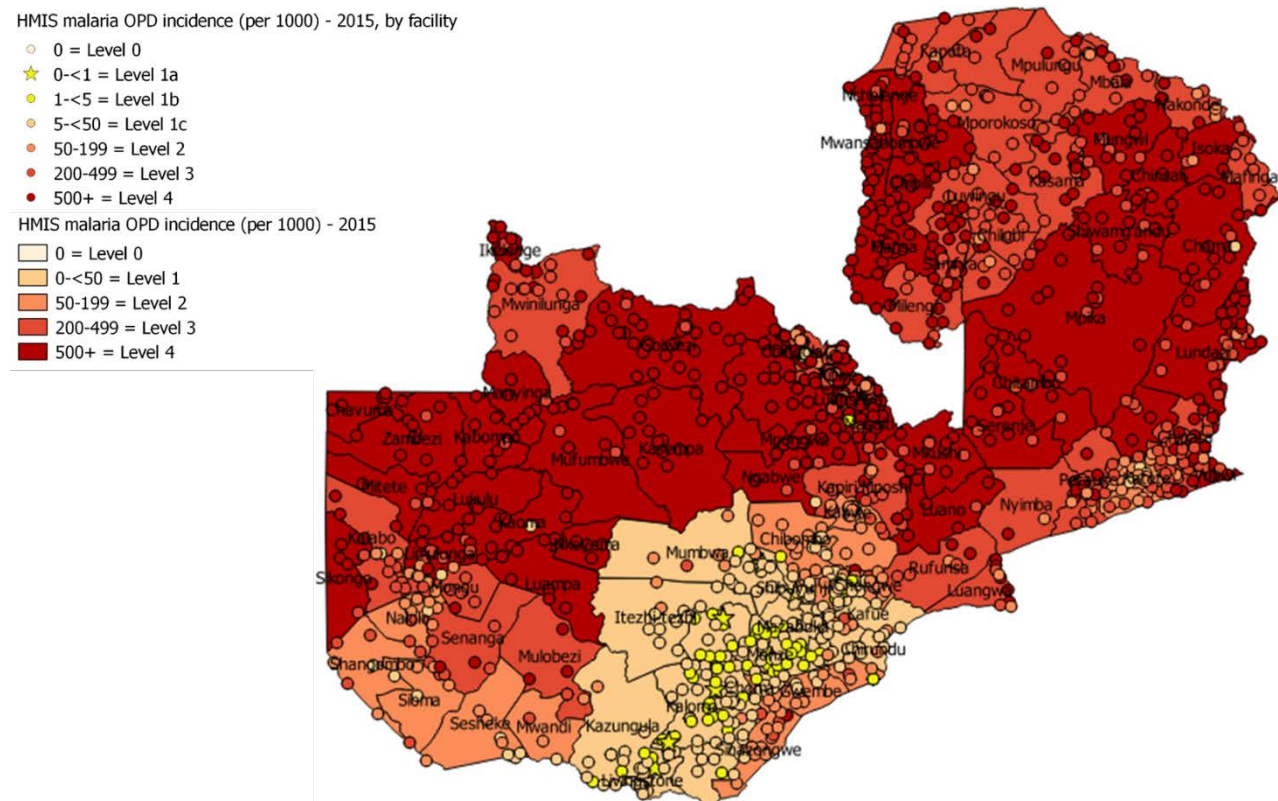
Source: HMIS 2015, OPD = outpatient daily

Retrospective data suggest that the decline in malaria burden has been variable. The annual numbers of reported inpatient cases and deaths due to malaria have been reduced by 52 percent and 65 percent, respectively, since 2010.¹⁰ However, the malaria landscape remains heterogeneous, with different levels of transmission coexisting within communities in the same district and within districts in the same province (Figure 3). Malaria incidence has declined in some areas, but remains largely unchanged since 2010.

Over the last five years, Zambia has focused on scaling up key interventions towards universal coverage to control malaria. However, the reductions in disease burden have been variable over time due to unstable financing and flows of critical antimalarial commodities, such as LLINs, IRS chemicals, antimalarial medicines, and RDTs. As mass distributions of LLINs have occurred, notable drops in parasitaemia have been reported, though the pattern of quick declines has been followed by gradual upticks in malaria parasitaemia in some areas. These upticks may be attributed to worn-out LLINs, as replacement has been slow. IRS coverage has been steadily shifting from less malarious urban areas to more malarious rural areas, increasing its potential impact at the community level. Attribution of impact has been a challenge due to the IRS implementation approach. As evidence from insecticide resistance studies increases, the programme has adopted a mosaic rotation of insecticides for IRS. Coverage of key interventions has been steadily increasing over time, demonstrating the commitment to controlling malaria, in alignment with previous national strategic goals.

¹⁰ Zambia Health Management Information System, Ministry of Health Zambia, 2015

Figure 3. Malaria (all cases) distribution in provinces, districts, and health facility catchment areas (circles represent health facilities) based on 2015 HMIS data, Zambia.



Risk groups

The main risk groups in Zambia differ based on morbidity/mortality considerations versus infection incidence/prevalence.

The risk groups for severe illness and death include:

- Young children less than five years of age;
- Pregnant women;
- HIV-infected persons (especially those not on treatment and with compromised immune responses);
- Others with compromised immune systems.

The risk groups for infection include:

- Rural populations (compared to urban or peri-urban populations);
- Populations at lower altitudes and/or living close to water bodies that may be potential mosquito breeding sites;
- Poorer and less educated populations;
- Mobile populations that shift seasonally for work (e.g., farming or fishing), and therefore pose a risk to themselves and to reintroducing infection into their home communities;
- Children and adolescents, especially those not sleeping under LLINs or accessing other vector control measures;
- Military and police forces deployed on national security operations.

Other determinants of malaria burden

The reduction in Zambia's malaria burden during the last decade has resulted not only from investments in malaria control but also from contextual changes such as urbanization and poverty reduction. Although economic growth should be expected to reduce migration-related malaria risk, factors such as inequity and infrastructure projects near transmission areas will maintain migration-related malaria risk, possibly exacerbated by the development of transport networks and the opening of borders.

Mobile populations are particularly noteworthy. Recognizing mobility as a system involving multiple demographic groups, localities, and intersecting socio-economic processes is proving increasingly important.¹¹ When Zambia reaches the final stage of malaria elimination, the main concern will be the risk of importation from the few remaining foci in Zambia and other countries, especially malaria-endemic neighbouring countries.

Zambia's political stability since its independence in 1964 provides an appropriate environment for malaria elimination. This status quo is conducive to further national development—including efforts for malaria elimination—thus increasing the likelihood of elimination and maintenance of the many recent gains in malaria control.

Status of intervention implementation (2011-2016)

The NMSP 2011–2016 focused the malaria control efforts in Zambia around select interventions. These included:

- Malaria diagnosis and case management: prompt diagnosis and effective treatment with ACT within 24 hours of symptom onset; management of severe malaria.
- Integrated vector management: provision of LLINs and IRS and larval control.
- Prevention of malaria in pregnancy: provision of LLINs and IPTp with sulfadoxine-pyrimethamine (SP) to pregnant women at antenatal clinics (ANCs).
- Advocacy, communication, education and social mobilization.

Prompt confirmatory diagnosis and effective treatment: During the 2015 Malaria Indicator Survey (MIS), almost one-fifth of children under the age of five were reported to have had a fever in the previous two weeks. Among those, 35.5 percent of children were tested for malaria, 37.3 percent took an antimalarial drug, and 25.2 percent took the drug within 24 hours of symptom onset. Increased messaging around the importance of testing and treatment could likely improve these numbers. Artemether-lumefantrine remains the dominant antimalarial in use in Zambia, having been used with 34.4 percent of children with fever in the previous two weeks.

Forty six per cent of population obtained treatment from a government health facility. The percentage received from community health workers (CHWs) increased substantially from previous MIS surveys—from 2.1 percent in 2010 to 8.1 percent in 2012 to 25.0 percent in 2015. This reflects the investments that the Ministry of Health (MOH) and partners have made in training CHWs to provide testing and treatment services for malaria in some parts of the country. The rise of community-level case management is a hopeful trend for Zambia, especially as increasing emphasis is put on elimination at the local level, where treatment services are needed closer to communities.

Insecticide-treated mosquito nets (LLINs): The 2015 Malaria Indicator Survey results show that overall

¹¹ Smith C. & Whittaker M. (2014). Beyond mobile populations: a critical review of the literature on malaria and population mobility and suggestions for future directions. *Malaria Journal*, 13:307

ownership of nets has risen since the 2012 MIS: 77.0 percent of households have an ITN and 46.9 percent of households own more than one ITN. The average number of LLINs per household is 1.6. ITN ownership is fairly comparable in rural and urban areas. Overall, in households with an ITN, 63.9 percent had enough LLINs to cover every sleeping space. Almost every province increased their ITN-to-sleeping-space ratio between 2012 and 2015. The most notable jumps were observed in Copperbelt, Luapula, and Eastern provinces. ITN use has generally increased among children under age five over the past several years, with 57.7 percent of children under five reporting having slept under an ITN during the 2015 MIS. ITN usage among women of reproductive age is an important indicator in protecting reproductive-age women and young children (who may often sleep with their mothers). Coverage remained high in 2015, with more than half (58.2 percent) of women reporting sleeping under an ITN the night before the survey.

Indoor residual spraying (IRS): During the 2015 MIS, an estimated 28.9 percent of Zambian households reported having benefitted from IRS in the previous 12 months. IRS was initially deployed in more urban and peri-urban areas, but has recently been expanded to include more malarious, rural areas. This allows for higher impact of IRS on malaria burden. Insecticides used for IRS have also rotated through different compound classes as evidence of resistance patterns has become available to the malaria program.

Intermittent preventive treatment during pregnancy (IPTp): In 2015, 90.1 percent of all women reported taking a first dose of IPTp. The uptake of the first dose of IPTp was fairly even across provinces, with the lowest province still reporting 83.0 percent, with 78.8 percent and 60.8 percent of pregnant women receiving at least two doses and at least three doses, respectively, of SP during pregnancy.

5. The elimination strategy in action

Depending on malaria elimination levels (Table 2, below), eliminating malaria in Zambia will be based on the following approach:

- *In higher transmission settings* (levels 2–4): Strategies will aim to bring to scale the coverage of effective curative and preventive interventions and strengthen information systems to ensure each case is reported and followed.
- *In low transmission settings* (levels 0 and 1): surveillance and response are the core interventions informed by population-based reporting from HFCAs with high and reliable case notification (≥ 95 percent reporting completeness).

The objectives of the national elimination programme will have been achieved when (1) locally acquired malaria cases have been reduced to zero, and (2) the health services and surveillance operations are fully capable of preventing reintroduction of malaria transmission. After elimination has been achieved, prevention of the reintroduction of malaria transmission and maintenance of a malaria-free status continues to be the responsibility of all relevant stakeholders.

Table 2: Malaria levels in Zambia.

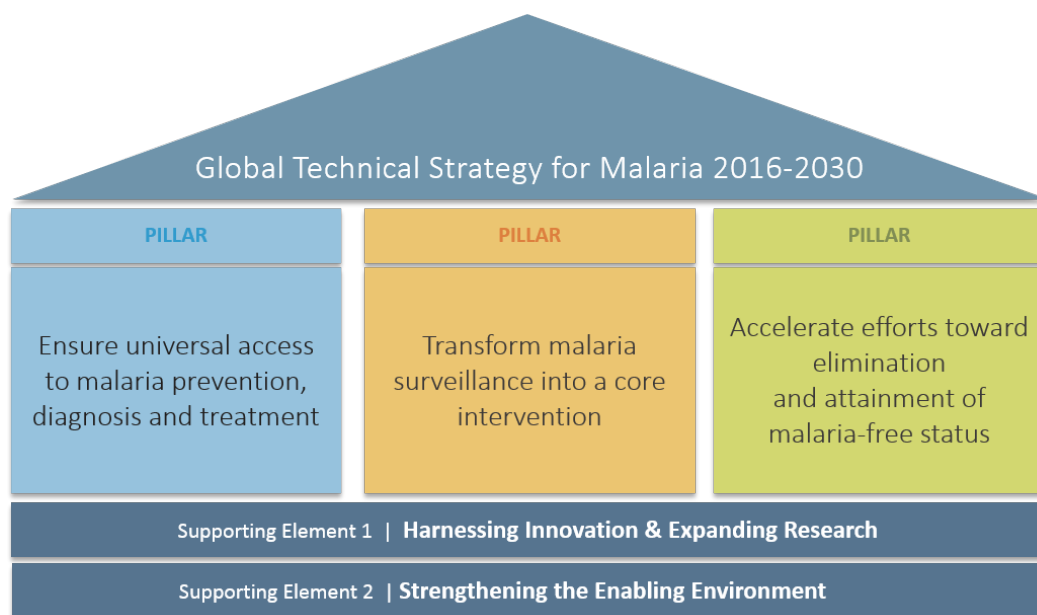
LEVEL	MALARIA INDICATOR
LEVEL 0	0 cases, No local transmission
LEVEL 1	1–49 cases/1,000 population; No detectable impact with parasite prevalence measurement
LEVEL 2	50–199 cases/1,000 population; 0.5%–<5% parasite prevalence
LEVEL 3	200–499 cases/1,000 population; 5%–<15% parasite prevalence
LEVEL 4	>500 cases/1,000 population; >15% parasite prevalence

Accelerating to elimination

The World Health Organization recently developed the Global Technical Strategy for Malaria 2016–2030 setting out the goals, principles, and a strategic framework that promote the accelerated transition across the continuum from reducing malaria morbidity and mortality to eliminating malaria transmission and preventing its re-establishment.¹² The strategy builds on three pillars and two supporting elements (Figure 4):

¹² Global technical strategy for malaria 2016–2030. World Health Organization, Geneva, 2015 (www.who.int/malaria/areas/global_technical_strategy/en/)

Figure 4: WHO Global Technical Strategy framework—pillars and supporting elements.



Under each of these pillars, a set of specific interventions should be implemented to reduce transmission all the way to zero and prevent re-establishment. These interventions serve as a series of steps that aim to:

- Ensure universal access to malaria prevention, diagnosis and treatment;
- Increase the sensitivity of surveillance systems to provide increasing granularity and timely information, allowing the programme to detect, characterize, and monitor every case or foci of cases;
- Accelerate transmission reduction by implementing population-wide interventions in a time-bound manner;
- Document and maintain elimination.

According to transmission levels, a set of interventions will be implemented as described in Table 3 and the explanatory notes*.

Table 3. Transmission intensity levels and proposed intervention packages and actions in Zambia.

LEVEL	MALARIA INDICATOR	INTERVENTION PACKAGE/ACTIVITIES	ACCELERATOR
LEVEL 0	0 cases, no local transmission	No malaria, maintenance of malaria-free zone <ul style="list-style-type: none"> • High quality surveillance and vigilance • Vector control and case management • Epidemic Preparedness package • Case investigation capacity maintained • Chemoprophylaxis 	
LEVEL 1	1–49 cases/1,000 population/yr; Typical range <1% parasite prevalence	Very-Low malaria transmission <ul style="list-style-type: none"> • High quality surveillance • Vector control (possibly enhanced) • Community and facility-based case management • Case and foci investigation 	• Mass drug administration
LEVEL 2	50–199 cases/1,000 population/yr; Range 0.5%–<5% parasite prevalence	Low malaria transmission <ul style="list-style-type: none"> • Build high quality surveillance • Vector control (possibly enhanced) • Community and facility-based case management • Establish case and foci investigation capacity 	• Mass drug administration
LEVEL 3	200–499 cases/1,000 population/yr; Range 5%–<15% parasite prevalence	Moderate malaria transmission <ul style="list-style-type: none"> • Improve quality surveillance • Vector control (possibly enhanced) • Facility-based case management; build community case management and outreach • Establish case and foci investigation capacity 	• Mass drug administration (may be considered for specific areas with case investigation capacity) • Enhanced vector control if relevant
LEVEL 4	>500 cases/1,000 population/yr; Range >15% parasite prevalence	High malaria transmission <ul style="list-style-type: none"> • Build quality surveillance • Vector control to high coverage (100% coverage of IRS or sustained high coverage of LLINs) • Facility-based case management; begin to build community case management and outreach • Prepare for case and foci investigation capacity 	• Prepare for mass drug administration • Enhanced vector control if relevant

***Explanatory notes:**

- **Surveillance:** Parasitological and entomological surveillance and potential use of molecular testing techniques for monitoring at clinic and community level.
- **Vector control:** Vector control at high coverage (100% IRS coverage of eligible structures or LLINs).
- **Enhanced vector control:** Introducing additional interventions where specifically appropriate (e.g., larviciding; baited traps; space spraying; etc.); vector surveillance (abundance, species, resistance) to direct updated action.
- **Facility-based case management:** Malaria infection surveillance at health facility level, including diagnostic confirmations with RDTs and treatment, strengthened microscopy, and potentially more sensitive tools. Quality assurance of diagnosis and treatment, and supervision of community level case management (see below).
- **Community case management:** Extension of infection detection and case management into communities through community health worker outreach—including integrated community case management (ICCM).
- **Malaria case investigation and malaria foci investigation and transmission containment:** Extension of case surveillance at community level, including reporting of confirmed cases and investigation of households and local neighbourhoods; identification and detection of ongoing transmission foci and active clearance of local transmission.
- **Use of “malaria elimination accelerator strategies,” e.g., mass drug administration (MDA):** Time-limited and geographic targeted population-wide treatment in line the national treatment guidelines (80% coverage) to clear the infectious reservoir and prevent infection for a time interval; e.g., enhanced vector control strategy.
- **Chemoprophylaxis:** When level 0 is attained in all health facility catchment populations preventive chemoprophylaxis may be implemented as required depending on vulnerability.

Elimination criteria

In planning for elimination at any level, several factors must be considered. Generally, these can be grouped into two broad categories:

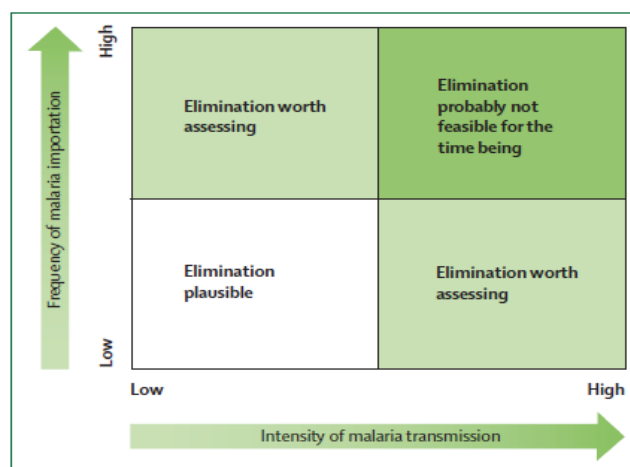
- The eco-epidemiology of malaria and the likelihood of achieving and maintaining elimination;
- The operational capacity of the malaria programme and the public health system to meet technical requirements and implement the activities needed to achieve and maintain elimination quickly and effectively.

Epidemiological criteria

The goal to reduce malaria in all health facility catchment populations to an epidemiological level where the last mile can be achieved relies on the following for each catchment population:

- Demonstration of low infection per 1,000 population annually (<5 cases/1,000 population/year) over three recent consecutive years, allowing follow-up for every malaria patient;
- Location in a cluster of low-transmission or malaria-free zones;
 - Health facility catchment populations in close geographical proximity (contiguous) to each other should be considered instead of isolated health facility catchment populations. Benefits are derived from grouping the efforts and bringing transmission down in one area at a time, rather than in various “islands” across the country. Otherwise, carry-over of cases from a non-elimination health facility catchment population to an intervention health facility catchment population might be a major challenge.
- Demonstration of the ability to monitor internal and external migration (spatial and temporal) to and from well-identified endemic areas (low migration) and mitigation of the potential for transmission from this migration;
- Demonstration of the possibility of low-risk malaria resurgence after elimination and the capacity required to avoid it;
- Placement in the first quadrant (bottom left) of figure 6.

Figure 6: Simple matrix of epidemiological factors that determine technical feasibility of elimination.¹³



¹³ Feachem, R.G.A., with A.A. Phillips and G.A. Targett (eds) (2009). *Shrinking the Malaria Map: A Prospectus on Malaria Elimination*. San Francisco: The Global Health Group, Global Health Sciences, University of California, San Francisco.

Operational capacity

Operational capacity is defined as the ability to effectively implement all activities needed to achieve and maintain elimination given the infrastructural, geographic, social, political, and economic realities. This includes the following requirements:

Administration effectiveness and commitment—leaders at provincial and district levels must be politically and financially committed to:

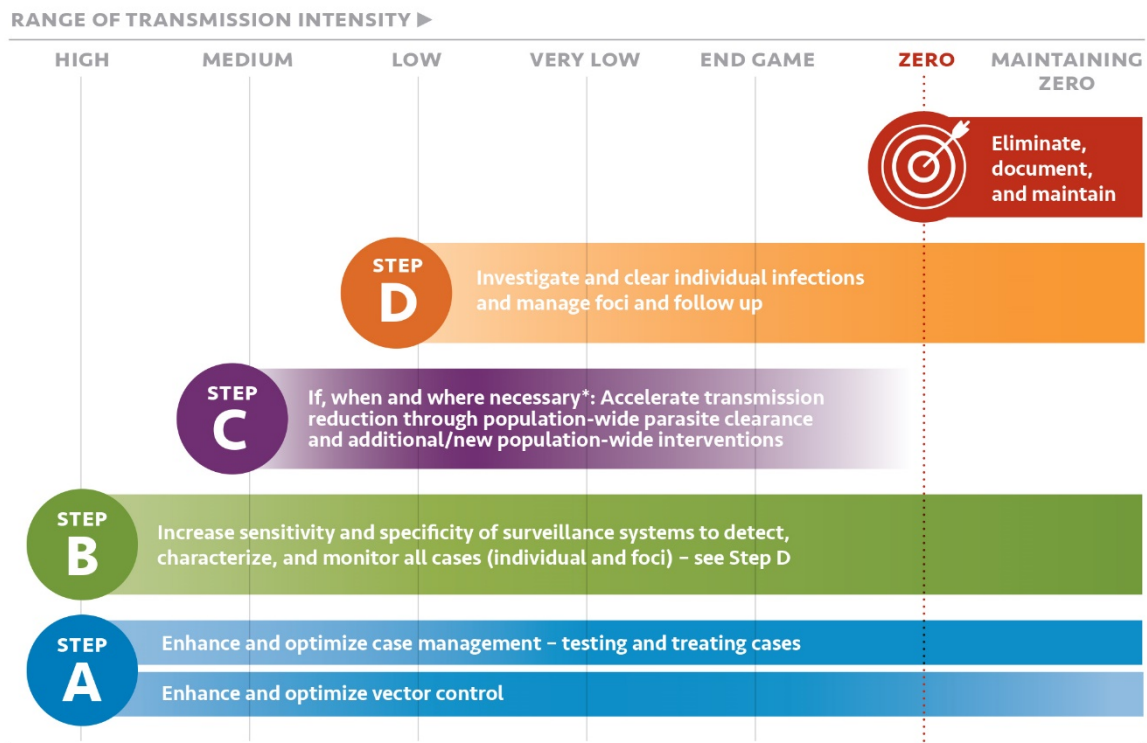
- Allocating sufficient budget for malaria interventions;
- Considering elimination to be an urgent commitment and providing continuous political leadership;
- Displaying strong inter-sectoral collaboration (i.e., steering committee involving administration, education, agriculture, finance, water resource development, etc.);
- Fulfilling the necessary programmatic requirements and creating an enabling environment to facilitate the elimination process by re-orienting malaria programme structure, activities, and staff at national, provincial, district, health facility, and community levels to align with elimination requirements;
- Placing additional personnel at the community level to implement surveillance as an intervention (e.g., active case detection [both reactive and proactive] and enhanced case and foci information systems [real-time notification, investigation, and classification]).

Health systems readiness—the health system in provinces/districts/health facility catchment populations should:

- Exhibit high health service coverage and utilization of core health interventions;
- Demonstrate high capacity in malaria diagnosis (including microscopy and/or PCR);
- Exhibit high-quality regular reporting (effective surveillance and response);
- Ensure ongoing high coverage and quality implementation (effective coverage levels of the existing antimalarial interventions);
- Demonstrate potential to implement and sustain the interventions needed to achieve elimination and the potential to implement active case detection and supervision of sites and community-level activities;
- Possess strong organizational, management, and technical infrastructure;
- Possess a good communications system and infrastructure (logistical feasibility and accessibility) that allows transport of staff and antimalarial supplies and equipment;
- Implement a quality monitoring and evaluation system to measure malaria outcomes and impacts;
- Demonstrate sufficient access to microscopy quality assurance and quality control reference laboratories and to supportive supervision.
- Elimination efforts will be applied across the country, with different intervention packages taking place simultaneously in different health facility catchment populations. The intervention packages will be determined by transmission intensities (Table 3).

All HFCAs in Zambia will be targeted for elimination and each will receive a specific intervention package depending on its epidemiology. Figure 5 below illustrates the components of acceleration to malaria elimination. The intervention package that will be applied in each HFCA will be determined during the National Malaria Elimination Programme's annual operational planning process.

Figure 5: Components to accelerate to elimination.



* depending on local context

Elimination Components:

Zambia’s national elimination plan for the 2017–2021 period aims to cover all health facility catchment populations following a step-wise approach, as described in Figure 5. The Steps are lettered A–E and are described in more detail below:

Step A: Accelerating scale-up—Optimize vector control and case management

Vector control: The two main interventions for vector control in Zambia aimed at preventing transmission are the use of LLINs and the spraying of eligible structures. These are implemented within the framework of Integrated Vector Management.

Indoor Residual Spraying (IRS)

The goal for this elimination strategy is to attain operational coverage of over 90 percent of eligible structures benefitting up to 80% of the population of Zambia, in a timely manner according to transmission season. To mitigate the reported vector resistance to insecticides in Zambia, the WHOPES approved insecticides will be used in rotation but to be reviewed as per Zambia Insecticide Resistance Management Plan (IRMP).

Long-lasting insecticide-treated nets (LLINs): LLINs will be provided to people living in high burden areas but in IRS ineligible structures and to vulnerable groups such as children under the age of five years and pregnant women. Continuous distribution of LLINs will be through channels such as antenatal care (ANC), Expanded Programme for Immunization (EPI) and selected primary schools. Mass campaigns have been conducted every 3 years to ensure universal coverage. The LLINs mass distribution in 2017

will be the last nationwide mass campaign but there will be mini mass campaigns in non IRS eligible areas.

Entomological surveillance: Vector control interventions require support in terms of regular monitoring of vector habits, vector densities, and sensitivity to the insecticides being used. Insecticide resistance of malaria vectors—which is likely to evolve with extensive use of pyrethroids on LLINs, IRS insecticides, and in agriculture—may well prove to be an important risk factor. Zambia will ensure that entomologists and vector control specialists are available to monitor and make recommendations if changes in insecticide or other components of the strategy are required, as outlined in the national insecticide resistance management plan.

Larval source management: Although larval control is part of the IVM strategy of the National Malaria Elimination Programme (NMEP), it has not been widely implemented in vector control, as attention and resources have been primarily invested in the IRS and ITN strategies. The lack of larval control is also attributed to the hard-to-reach breeding sites in the rainy season, and difficulties in implementing this intervention in the rural areas. However, with the emergence of insecticide resistance in the country, larval control by environmental management and larviciding could provide alternative vector control.

Case management: In Zambia, case management coverage has greatly improved through strengthening of general health services and the provision of adequate diagnostics and medicines according to national guidelines. The national objective is to ensure that 100 percent of all suspected malaria cases in all districts receive parasitological (microscopy or RDT) analysis and 100 percent of parasitologically confirmed malaria cases receive prompt (within 24 hours), effective antimalarial treatment. Universal coverage with early diagnosis and effective treatment is a key strategy in reducing morbidity and mortality, and can be achieved by detecting malaria infections through passive case detection or active case detection targeting high-risk groups. Achieving universal coverage of case management should consider three channels of service delivery: public, private, and community-based. In areas where malaria incidence remains high, coverage should be maximized through all three channels, with efforts made to improve the quality of services delivered.

Diagnosis: The detection of malaria infection is based on blood examination by RDTs or microscopy. With quality assurance, both are now suitable for surveillance and case management. Microscopy has advantages for patient follow-up, gametocyte detection, speciation, and determination of parasite density. RDTs are useful at the point of care, and are accessible and easy to use. As more sensitive RDTs become available, they can also be used. RDTs should be available at the community level and at all health facilities, while quality-assured microscopy should be available at health centres, hospitals, and malaria laboratories at the district, higher intermediate, and central levels. Multi-species RDTs may be appropriate where available. Molecular techniques will be used for quality assurance according to national guidelines.

Treatment: Treatment for malaria will be based on WHO and national treatment guidelines.¹⁴ The current first-line therapy for the treatment of uncomplicated *P. falciparum* malaria in Zambia is a quality-assured ACT. New, more effective drugs will be used as they become available. Treatment may also include low-dose primaquine to eliminate gametocytes, which are responsible for mosquito-borne transmission for *P. falciparum* malaria.

Malaria in pregnancy: The NMEP has developed and is implementing a well-defined malaria in pregnancy policy, which includes the provision of free IPTp with at least four doses of SP during pregnancy, free LLINs, and free prompt diagnosis and treatment of clinical malaria. This malaria control

¹⁴ Guidelines for the treatment of malaria – 3rd edition. World Health Organization, Geneva, 2015.

package is implemented as part of routine ANC. The high ANC attendance in the country and a long-standing consistent policy regarding malaria in pregnancy have resulted in high IPTp uptake, which currently stands at 90.1 percent for any dose and 60.8 percent for three doses. Use of LLINs among women of reproductive age currently stands at 58.2 percent.

Chemoprophylaxis (CPx): As transmission is markedly reduced, chemoprophylaxis (CPx) should be provided to international travellers going to high-risk areas in and outside of Zambia. It may be considered as an alternative to standby treatment in certain mobile groups within Zambia, noting that proper adherence must be ensured. In countries eliminating (or that have eliminated) malaria, CPx for travellers is one of the means of prevention of reintroduction. It is already widely applied for travellers in malaria-endemic countries around the world. CPx is not currently recommended for migrants and mobile populations in Zambia, but could be considered in the future. The drugs for CPx among travellers are currently limited to mefloquine, doxycycline, and atavoquone-proguanil.¹⁵

Step B: Build information systems for action—Quality and timely reporting of infections

Building a strong information system requires a series of measures to reduce transmission to sufficiently low levels so that all cases can be detected and radically cured and all transmission foci managed. Building a “data culture” is essential to the success of the elimination strategy—ensuring that data are captured, reported, and used at every level. Once transmission has been interrupted, surveillance must be maintained, but oriented mainly towards the risks associated with case importation. Thus, surveillance systems must enable the following:

- Understanding of the transmission heterogeneity that exists within the country to determine which areas are ready for elimination;
- Provision of data at a sufficiently granular level to ensure each case is detected, characterized, and monitored;
- Prevention of reintroduction by continuously identifying and investigating new cases.

DHIS2 is the standard system for data aggregation and analysis in Zambia. It should include all of the data (including Health Management Information System [HMIS] data) and all levels (including community and public/private clinics and hospitals).

When transmission is high, there are still many malaria cases and it is not possible to examine and react to each confirmed case individually; rather, information is based on aggregate numbers, and action is taken at a population level. As transmission is progressively reduced, it becomes increasingly possible (and necessary) to track and respond to individual cases or foci.

Disease surveillance in elimination areas should focus on:

- **Rapid reporting:** “Test, treat, and track”—detection and notification of all malaria infections, whether symptomatic or not, and ensuring that they are treated quickly and radically to prevent onward transmission;
- **Case investigation:** Investigation of each malaria case to determine whether it was locally acquired or imported. The result of such investigation is an epidemiological diagnosis and classification of each case in terms of its place, time, and source. In areas where transmission interruption is planned, it is mandatory that all reported cases be subject to epidemiological investigation, ideally within one to two days (see Step D).

Step C: Community clearance of malaria parasites—Population-wide strategies to reduce transmission

¹⁵ WHO (2012). International Travel and Health. World Health Organization, Geneva. <http://www.who.int/ith/en/>

When all supportive systems are in place—including health facility and community surveillance systems and adequate human resources (e.g., a cadre of trained CHWs)—districts can consider implementing strategies and intervention opportunities to aggressively clear parasites from communities.

Malaria control relies heavily on prevention through vector control and a case management strategy that focuses on passively detected cases. Population-wide strategies aim to clear infections from entire communities in order to achieve very low transmission. This step is used as an “accelerator” to drive down transmission to a level where the remaining cases/infections in individuals and small foci (i.e., households and neighbourhoods) can be detected and driven out to achieve a malaria-free area. Transmission reduction strategies can include drug-based strategies (such as MDA), transmission-blocking vaccines, and could—in the future—include innovative vector control methods, such as ivermectin.¹⁶

Mass drug administration (MDA)

Mass drug administration (MDA) refers to mass treatment of all—or a section of—the population, whether or not symptoms are present. It has been implemented in the past as a way to control epidemics or to reduce or interrupt transmission. In recent years, MDA has received renewed interest, both as part of malaria elimination strategies and as part of efforts to contain multidrug resistance, especially in the Greater Mekong Sub-region of Southeast Asia. MDA was successfully used in 2015 in Sierra Leone to control malaria during a time when the health system was completely overwhelmed by the Ebola virus.¹⁷

Based on the results of the MDA trial in Southern Province, MDA will be implemented where appropriate (see Table 3) in elimination-targeted areas of Zambia as part of an intervention package that includes highest coverage with vector control methods and case management, a robust surveillance system (see Step B), as well as a system to detect and treat individual cases (see Step D).

The drugs used for MDA should be chosen according to the following considerations:

- Efficacious and optimal regimen;
- Pregnancy testing and active follow-up;
- Monitoring of drug resistance;
- Monitoring of concurrent interventions (including for other pathogens) to avoid interactions between the drugs.

In Zambia, drugs with long half-lives—currently DHAP—will be used for MDA campaigns. The long half-life of piperaquine provides extended post-treatment prophylactic effect against additional malaria infections. Additionally, the dosing schedule and requirements for DHAP are currently simpler than those for artemether-lumefantrine, which supports patient adherence to treatment.

In order for MDA campaigns to be successful, the highest possible coverage should be attained. Interventions to promote community buy-in are therefore essential to ensure that as many people as possible are reached (see section on IEC/SBCC). Full therapeutic dosage should be used and treatment completion is critical. Minimal directly observed treatment will be used. The success of MDA and

¹⁶ Establishment of the Ivermectin Research for Malaria Elimination Network: updating the research agenda Carlos J. Chaccour*, N. Regina Rabinovich, Hannah Slater, Sara E. Canavati, Teun Bousema, Marcus Lacerda, Feiko ter Kuile, Chris Drakeley, Quique Bassat, Brian D Foy and Kevin Kobylinski *Malaria Journal* 2015, 14:243 doi:10.1186/s12936-015-0691-6

¹⁷ Malaria Policy Advisory Committee Meeting 16–18 September 2015, Geneva, Switzerland. Background document on Mass drug administration, mass screening and treatment and focal screening and treatment for malaria. WHO Evidence Review Group meeting report. WHO Headquarters, Geneva 20–22 April 2015 <http://www.who.int/malaria/mpac/mpac-sept2015-erg-md-report.pdf>

sustained elimination over time will also heavily depend on continued information quality and timeliness, as well as the reach of the health system to identify the majority of cases or infections (including introduction of cases/infections into these areas). MDA should be implemented in the low-transmission season, using as many rounds as operationally feasible for the highest coverage.

Technical selection criteria for deciding where to target community parasite clearance interventions in the future may include malaria burden indicators—such as baseline malaria prevalence and case incidence—as well as measures of importation vulnerability. Operational selection criteria include health system capacity to conduct MDA campaigns (such as the presence of trained and motivated CHWs) and to monitor MDA impact. As MDA is a time-limited intervention, long-term operational feasibility will require that the local health system have the capacity to transition smoothly to case detection (see Step D) based on high-quality reporting and surveillance systems after MDA activities conclude, to identify and treat residual or imported malaria cases and protect against resurgence.

Step D: Detect and investigate individual cases—Household and neighbourhood strategies to stop transmission

After achieving community-wide reduction to an operationally feasible level in a facility catchment area (approximately 25 cases per week per facility catchment area), the next step is to proactively find and treat those few infections as soon as they arise. This will require rapid and intense investigation, and will be feasible only when transmission levels are very low.

Action required for this step includes:

- Registering each index case and determining the likelihood of local acquisition of the infection (as opposed to acquisition during travel);
- Visiting each affected household and neighbourhood;
- Screening all residents of each household and neighbours for fever, travel history, or other risk factors;
- Testing everyone in the household and some (or all) in the neighbourhood;
- Treating any confirmed infections and possibly providing presumptive treatment for a wider group if indicated;
- Enhancing other malaria prevention strategies including LLIN ownership and use, IRS, or other interventions.

Once a local malaria case has been detected and reported, malaria staff will conduct a focal investigation to describe the locality where malaria occurred. Focal investigation will include clinical and epidemiological diagnosis of the reported case, description of the locality in relation to receptivity/vector species, vulnerability/migration patterns, and antimalarial measures carried out; as a result, the focus is classified. Malaria foci will be classified depending on (1) age (i.e., residual versus new), and (2) the presence of malaria transmission (i.e., non-active versus active versus potential).

The following types of foci are distinguished:

Type of focus	Definition	Operational criteria
Active	A focus with ongoing transmission	Locally acquired case(s) have been detected within the current calendar year.
Residual non-active	Transmission interrupted recently (1–3 years ago)	The last locally acquired case was detected in the previous calendar year or up to 3 years earlier.

Cleared	A focus with no local transmission for more than 3 years	There has been no locally acquired case for more than 3 years, and only imported or/and relapsing or recrudescing cases or/and induced cases may occur during the current calendar year.
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If the number of cases uncovered exceeds the capacity of the health facility catchment area, districts should consider reinforced control measures and potentially Step C to clear infections in the community.

Step E: Eliminate—Document and maintain zero

Step E is the last step to be conducted when there is no local malaria transmission, with the objective of documenting and maintaining zero transmission. The process for documenting zero should be scalable and easy to implement.

A strong surveillance and response system that is able to quickly report any cases that arise and respond with investigation and treatment to prevent further spread will be key to maintaining elimination and preventing reintroduction. The surveillance system is necessary to reach zero, and will be used to demonstrate that zero has been achieved. Case investigations should continue indefinitely as a mechanism to prevent reintroduction.

Health Promotion for Malaria elimination

The government of the republic of Zambia has placed health promotion on high agenda in order to prevent diseases and promote good health of the people through a primary health care approach. Health promotion cuts across and facilitates all the elimination steps from A to E above. Advocacy and social behavioural change communication will form the anchor in health promotion utilising household and community settings, in order to increase and sustain malaria elimination efforts.

Advocacy with decision-makers and stakeholders

Involvement of policy and decision-makers in health increases acceptance, uptake and utilisation of health services. Further, community engagement will play a big role in enhancing sustainability of key malaria elimination interventions.

Social behavioural change communication and knowledge management

The malaria elimination transformation agenda will focus on house-to-house campaigns in order to create champion communities for malaria elimination. The champions become peer behavioural change agents. The purpose of SBCC is to increase knowledge, awareness, and risk perception of individuals¹⁸ and to mobilize communities to create long-term changes towards desired behaviours and to sustain enabling behaviours around the key malaria elimination interventions.

The specific objects are:

- To increase knowledge levels of malaria from the baseline to 100% by 2019
- To improve uptake and correct use of key malaria interventions from the baseline to 90% by 2019.

A formative research (FR) study will be conducted in 2017 to inform the development of the national malaria advocacy and communication strategy for 2017–2021 and the subsequent development of information, education, and communication materials. Behavioural specific FRs will be encouraged and

¹⁸ PMI Communication and Social Mobilization Guidelines

will preferably be conducted every after two years.

Coordination, supervision, and mentorship, including routine monitoring, will be central to increase the capacity of SBCC at all levels and by all stakeholders. Further, documentation of malaria elimination efforts and best practices will be encouraged.

Many partners support advocacy/SBCC activities. PATH/MACEPA supports community engagement activities in Southern and parts of Western provinces of Zambia. PMI/PAMO and PMI/AIRS supports only 36 districts of four provinces of Zambia (Eastern, Muchinga, Northern and Luapula provinces). Isdell:Flowers is supporting cross-border malaria elimination activities between Namibia and Zambia around the Kaprivi-Sesheke border. FQML is a mining company that conducts health promotion activities in the mining townships and surrounding areas around the mining sites. FQML conducts roadshows as educational entertainment, or “edutainment,” to mobilize communities for malaria test and treat, encourages community dialogue around malaria elimination including consistent use of LLINs and acceptance of IRS.

Therefore, gaps exist in the implementation of consistent and regular SBCC nationwide coverage at household and community levels.

Rationale

Social behavioural change communication is an umbrella for interpersonal and dialogue-based communication, and social mobilization to systematically accelerate change in the underlying drivers of risk to malaria, vulnerability, and impact. The absence of an integration of social change communication into broader communication strategies has been a key factor in the inability to affect sustained behaviour change. Social and behaviour change communication approaches have been rigorously evaluated with demonstrable impact in behaviour change, raising awareness, and influencing social norms¹⁹. It has been shown to make durable change in deeply rooted practices, including refusals to participate in key malaria interventions like IRS, misuse and abuse of LLINs, late treatment seeking behaviour/self-medication.

Key implementation risks

The major risks to achievement of malaria elimination will border on refusal to accept key malaria elimination interventions by the communities or abuse/misuse of LLINs. To mitigate these and many other undesired behaviours, advocacy and SBCC will adopt a multiple approaches involving engagement of policy makers/community leaders and implementing SBCC at household level in order to influence positive behaviours.

Community Health Workers (CHWs) and Community Health Assistants (CHAs)

Community health workers (CHWs) and Community Health Assistants (CHA) serve on the front lines of malaria elimination. When properly trained, equipped, and motivated, their efforts deep in communities demonstrate the ability to identify and contain individual infections. The data they collect—submitted regularly into the national database—plays a critical role in Zambia’s malaria surveillance system. CHWs are selected by their communities and are attached to a health facility; they are respected as a source of information and a conduit for health service delivery. To recruit and retain these volunteers, and in turn keep communities engaged and committed to the malaria elimination agenda, CHWs must be motivated with a sustainable package of support (e.g., commodities to conduct malaria testing and treatment, periodic trainings, an MOH-branded apron and shirt, a bicycle and other possible incentives).

Stakeholder buy-in

¹⁹ WHO & UNAIDS: Technical Guidance for Global Fund Proposals – Prevention: Social Change Communication

A national malaria elimination campaign will help organize all malaria activities and partners (including the private sector) under a united theme, and will amplify the reach of elimination communication efforts. At the community level, it will show that meetings and household testing are not isolated, but are part of a large and long-term effort led by the MOH. Guided by provincial and district personnel, communities will then understand their role in making and keeping their areas free of malaria, and will take pride in doing so.

Strengthening the enabling environment: Health system strengthening

Health system strengthening: While Zambia has shown strong economic growth, the health systems are still developing (relative to those in other countries that have previously eliminated malaria) in terms of human resources, provision of health services, financing, information systems, and governance. The following health system functions are of particular concern; they should be analysed at the highest level of the MOH and possibly at cabinet level for decision-making and elimination planning:

- **Human resources:** Due to the need for strong surveillance systems and high-quality operations, human resources at all levels must improve, such as dedicated malaria focal point persons at all levels. CHWs are essential to the successful implementation of the malaria elimination intervention package.
- **Financial allocations:** Finances must be maintained through the elimination phase despite low burden, and even after the attainment of malaria-free status, as surveillance systems to prevent reintroduction are costly in countries with high receptivity and vulnerability.²⁰
- **Governance and regulation:** Adoption of a malaria elimination strategy increases the need for strengthened leadership, stewardship, accountability, and transparency in malaria programme management. Introduction and use of elimination-related commodities require close collaboration with regulatory authorities, the private sector, and the malaria programme. In order to achieve elimination, malaria must be a notifiable disease.
- **Access to services:** Malaria interventions should be accessible and affordable to all populations, with particular emphasis on discrete, hard-to-reach populations.
- **Administrative capacity:** The recruitment and maintenance of human resources (from the CHW to the programme manager) and access to services depends not only on commitment and financial allocations, but also on the system's capacity to plan and implement budgets, execute payments on schedule, and rapidly reallocate or mobilize funds to deal with unexpected events. Administrative disruptions can lead to malaria epidemics and can derail elimination programmes. These functions may appear mundane, but they require extreme attention to be adequately managed, especially when other programmes and sectors may question whether large allocations to a seemingly small disease are justified.
- **Service integration:** As malaria incidence falls to low levels, pressure mounts to reduce the number of specialized structures and health personnel. Transforming malaria vector control units into integrated vector control or management units is a rational way to maintain expertise. This, along with refresher trainings on malaria, may allow the public health services to maintain the expertise needed in the final push for elimination. Integration of malaria treatment services with the management of other diseases at the community level can sustain the malaria workforce well into the elimination phase. Adding malaria to the list of notifiable diseases will broaden the support for sustaining malaria surveillance.

The public health sector: In areas well served by health facilities, all health institutions in the public and private sectors will serve as diagnosis and treatment centres for malaria. Most malaria services are delivered through the public health sector in Zambia. This sector is the link for providing malaria

²⁰ Tatarsky A et al. (2011). Preventing the reintroduction of malaria in Mauritius: a programmatic and financial assessment. *Plos One*. 6 (9): e23832. doi: 10.1371/journal.pone.0023832

commodities and services at the community level. The public health sector must be well resourced to ensure adequate human resources and availability of commodities in a timely manner.

Community-level services: CHWs bring basic health services closer to the family, in line with the MOH's mission statement; they function as a link between the community and the health care system. They will play a key role in rolling out malaria elimination interventions and will serve as the frontline implementers of community-wide approaches, such as treatment interventions, ITN distribution and monitoring, SBCC, and surveillance.

The private health sector: Private health facilities include for- and not-for-profit facilities owned by private business entities and civil society organizations. These include health facilities at various levels and some institutions directly involved in the delivery of malaria treatment services.

The private sector: Zambia has a long history of private sector support for health, including malaria. As the country pursues malaria elimination, the role of business will be increasingly critical. Relevant malaria data must be shared regularly with companies through national, provincial, and district authorities, so that they can better understand the disease burden in their areas of operation. In addition, engaging with the private sector is an opportunity to grow the country's evidence base. This can mean direct support to a research institution conducting malaria studies, or ensuring that baseline data is in place before introducing a company-sponsored malaria initiative. Catchment area reporting could be used to measure the change in numbers of people accessing malaria testing at health facilities or through CHWs, or could measure the change in the number of confirmed malaria cases.

To partner with the private sector, a costed suite of malaria activities (e.g., a standardized package to motivate CHWs, or an expansion and co-branding of a national communication campaign) can reveal areas of intersection between the company and national programme priorities. There are many areas in which to engage the private sector in the fight against malaria. For instance, a company with a national distribution network might help to save on transport costs by using their fleet to deliver malaria commodities. Alternatively, a business might support CHWs' bicycles or aprons in exchange for co-branding. Similarly, a school programme might creatively sensitize the next generation on their role in eliminating malaria, and a company with an extensive system of seed distribution sheds might leverage those outlets to disseminate health information and LLINs to thousands of cotton farmers. In addition, a mobile phone provider, in exchange for branding, could be a partner on the data that are submitted regularly from low-transmission areas. Alerts could be sent via SMS to targeted areas, informing people about an upcoming activity. Alternatively, health workers could receive periodic reminders on correct case management practices via SMS.

With a national communication campaign in place, engaging the private sector will help mobilize communities and disseminate information, as businesses often have more experience in marketing than do government or other partners. Advertising platforms (e.g., billboards, wall fences, TV, radio, newspapers/magazines, and social media) can be great resources for promoting malaria elimination to a range of audiences. Malaria is highest in rural areas, which can be attractive for companies looking to access emerging markets.

An exciting example of long-term investment potential for malaria elimination is the plan to identify, carve out, and maintain malaria-free areas. These areas will have a robust surveillance system in place to maintain zero transmission status and to detect and contain any imported malaria cases (and alert officials). Malaria-free zones will represent a unique and historic health achievement for the government and its partners. This is also an opportunity for the private sector to assume discrete parts of a costed system, sponsoring those elements that are most aligned to a company's social investment objectives. In exchange, the branding of a malaria-free zone can be an attractive opportunity for

businesses (e.g., a billboard on the road to Livingstone reading “You are entering a malaria-free zone! Brought to you by the Ministry of Health, Chief ____, and ____ [business]”).

Strengthening the enabling environment: Cross-border collaboration

Cross-border collaboration: Zambia is a part of the African Union, Common Market for Eastern and Southern Africa (COMESA), WHO African Region, South African Development Community (SADC), African Leaders Malaria Alliance (ALMA), and Malaria Elimination 8 (E8) groupings, among others. Engagement with these groups and with neighbouring countries promotes the regular exchange of malaria-related information of mutual interest, notification on malaria situations in border areas, organization of border meetings, and participation in international trainings. As progress towards malaria elimination in the region gathers momentum, it is necessary to strengthen international engagement and communication on cross-border collaborations that can quickly resolve issues that might jeopardize elimination efforts. Such collaboration should be facilitated at the higher levels of governance (i.e., through the establishment of a regional task force that can coordinate sharing of data, information, and IEC/SBCC strategies, as well as harmonize and synchronize interventions across borders).

Product quality is also a cross-border issue; there may now be a need for a well-coordinated and funded regional programme that involves relevant government agencies and stakeholders, including regional bodies.

In the context of malaria elimination, special attention should be given to situations where there is a risk of transmission between countries, with joint statements on cross-border collaboration and development/implementation of joint border action plans to facilitate malaria elimination measures in border areas.

Harnessing innovation through focused research

Optimizing current strategies: Ongoing research on the following topics is needed to ensure that existing tools and approaches are implemented efficiently.

- Therapeutic efficacy of antimalarial treatments;
- Insecticide resistance in vector populations;
- Uptake of malaria interventions.

Potential new interventions and strategies that could become available: Adding to the base set of malaria control interventions and novel interventions, in addition to existing tools used in novel ways, could facilitate the process of reaching the elimination goals. These include the following:

Information systems:

- Enhanced timely information on cases and transmission to rapidly direct action.

Diagnostics:

- More sensitive point-of-care RDTs;
- More sensitive and field-applicable molecular diagnostic tools (e.g., LAMP).

Drugs:

- Longer-acting ACTs;
- New non-artemisinin-based combination therapies;
- Ivermectin to help reduce transmission.

Strategies for drug use:

- Population-wide or mass drug administration (MDA) to at-risk populations to clear existing infections and provision of an interval of prophylaxis to markedly reduce the potential of humans transmitting parasites to mosquitoes;

- Population-wide or mass testing and treatment in at-risk populations to find and clear current infections and provide an interval of prophylaxis to these individuals;
- Focal (e.g., household or neighbourhood) MDA to find infections and treat all persons in the household or neighbourhood where a positive case is identified;
- Chemoprophylaxis for certain high-risk groups such as travellers or eligible HIV-infected persons (of note, cotrimoxazole prophylaxis is used in HIV-infected persons and has been shown to have good antimalarial prevention properties).

Vector control:

- Mosquito repellents;
- Mosquito attractants that kill the mosquito;
- Larval source management;
- Improved insecticide formulations;
- Non-chemical based interventions.

Other interventions:

- Vaccines that interrupt malaria transmission.

6. Measuring progress and impact

Principles and assumptions that guide monitoring and evaluation include the following:

- Progress on the path to malaria elimination in Zambia will be based on surveillance efforts;
- Progress will be measured using multiple data sources, including routine information systems, household and health facility surveys, and longitudinal studies;
- Progress will be monitored through a minimal set of outcome and impact indicators (see Annex 1), drawn from a larger set of indicators recommended by WHO and routinely tracked.

Monitoring and evaluation

Zambia's malaria elimination programme should be evaluated at regular intervals for compliance with the appropriate targets and objectives. Parameters should be established to monitor and evaluate all programme areas with a focus on four key issues:

- Monitoring the operational aspects of the programme and measuring impact or process indicators to ensure that the activities are yielding the desired results and moving the programme towards achieving its operational targets and objectives;
- Monitoring changes in epidemiological indicators resulting from the activities implemented;
- Appropriately interpreting results and informing policy and strategy revisions, when needed, to help ensure progress;
- Documenting progress towards malaria elimination—information on coverage and quality of interventions, mapping out residual and new active malaria foci, maintaining relevant eco-epidemiological data, and ensuring first-line treatment efficacy is particularly important. This type of information is usually collected through a national information system for disease surveillance and health management.

A malaria elimination database will be established at local levels and will connect with the national level when a decision has been made to proceed towards elimination. This database will serve as the repository of all information related to malaria elimination, including:

- National malaria case register: a single database of all individual case information from identified sources in the entire country. This register will allow for a detailed analysis and synthesis of epidemiological information and trends that will help guide the elimination programme over time;
- Malaria patient register: a central repository of all malaria patient records;
- Laboratory register: a single database, linked to the patient register, which will contain all pertinent information regarding malaria diagnosis of the patient. Comparison of these two registers allows for cross-checking for completeness of case data. This register should be linked to the parasite strain bank;
- Parasite strain bank: samples of parasites from individual cases will be stored in a central strain bank;
- Entomological monitoring / vector control records: a central repository of information related to entomological monitoring and application of chosen vector control interventions. Ideally, management and maintenance of the malaria elimination database would be the responsibility of a national committee that is independent of the malaria programme.

The National Malaria Strategic Plan goals and objectives will be reviewed during the annual planning process, and will be evaluated in mid-term and end-term reviews. These periodic reviews are critical in taking corrective actions to ensure achievement of the goals and objectives.

Coordination and partnerships

Malaria elimination remains a very high priority among all stakeholders with leadership provided by the Zambian government through its MOH. For malaria elimination to occur, it is crucial to harness the demonstrated commitment at the highest levels (i.e., government and partners) through a well-established coordinating mechanism.

The following are Zambia's partners in this elimination strategy:

- WHO
- UNICEF
- ALMA
- SADC
- E8
- Civil society
- Communities
- Media
- Private sector
- Rotary International
- Churches Health Association of Zambia (CHAZ)
- Existing and potential funding partners (the Global Fund to Fight AIDS, Tuberculosis and Malaria [GFATM], President's Malaria Initiative, UK Department for International Development, World Bank, African Development Bank, Bill & Melinda Gates Foundation, Isdell:Flowers Cross Border Malaria Initiative, and others)
- Research partners (universities, Tropical Disease Research Centre [TDRC], Macha Research Trust, and others)
- Implementing partners (NGOs, faith-based programmes, and university-based programmes)

7. Costs and financing

In 2016, Zambia’s national malaria programmes collaborated on a costing exercise for their elimination work. To provide a preliminary rough estimate of costs, but with sufficient precision to allow partners to assess financial needs and consider possible financing mechanisms, a costing for malaria elimination was prepared, using the following assumptions and costs.

Assumptions around implementation and changes in prevalence:

Implementation is assumed to be completed according to the following schedule:

- 2017: Routine work, continuing efforts to increase use of LLINs and IRS at 30% coverage nationally;
- 2018: IRS at 50% coverage in categories 2–4, and MDA at 80% coverage in category 2; case investigation scale-up in places eligible for MDA next year, and ongoing case investigation in categories 0–2;
- 2019: IRS at 50% coverage in categories 2–4 and MDA at 80% coverage in category 2; case investigation scale-up in places eligible for MDA next year, and ongoing case investigation in categories 0–2;
- 2020: IRS at 50% or higher coverage in categories 1–3; ongoing case management and investigation in lower level catchments to drive towards elimination;
- 2021: IRS sustained at high coverage, ongoing identification and treatment of cases, almost all catchments reach elimination;
- It is assumed that the combination of IRS and MDA will result in 85% annual decreases in prevalence, with IRS at 50% coverage results in 65% declines in prevalence and Step D coverage results in 35% declines in coverage. Catchments are assumed to move into elimination after one year of exposure to Step D.

Table 4. Unit costs per intervention.

Intervention	Unit Cost
LLINs	\$2.6 per person reached
IRS (Actellic)	\$4.8 per person reached
Case management	\$2.5 per person treated
MDA	\$4.5 per person treated per round
Case investigation	\$1.1 per person covered by investigation system
Rapid reporting	\$829 per health facility

Figure 7 Projected costs by intervention over time.

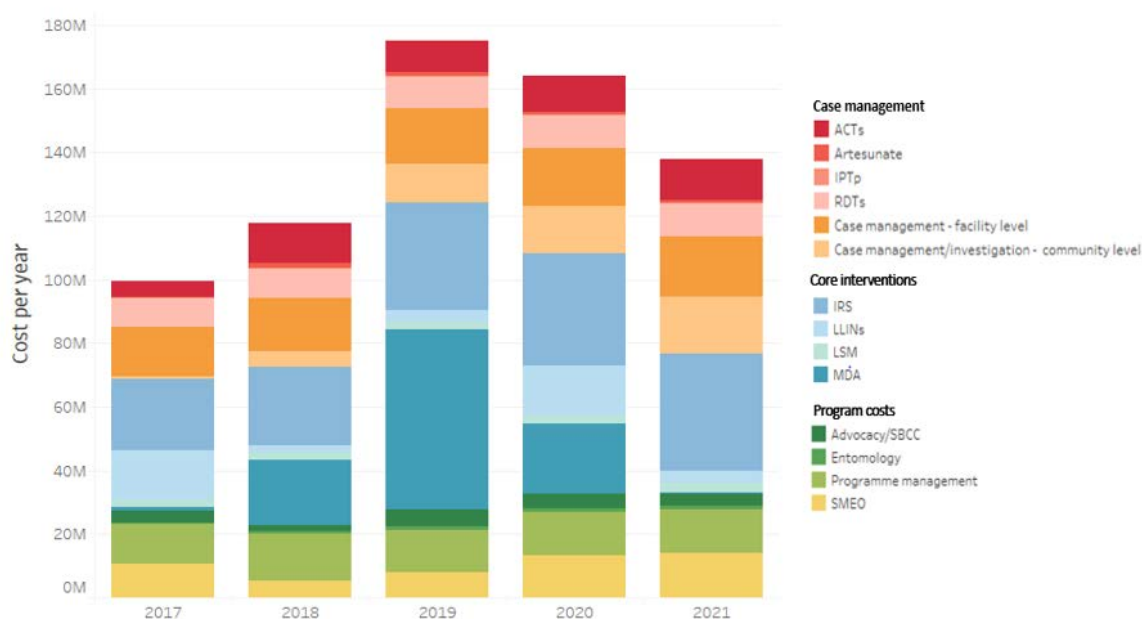


Table 5. Projected costs by intervention over time.

Category	2017	2018	2019	2020	2021	Five year total
ACTs	4,584,853	12,447,525	9,958,020	11,279,312	12,775,922	51,045,631
Artesunate	171,000	1,493,105	1,194,484	955,587	764,470	4,578,647
IPTp	210,397	221,145	232,343	241,592	251,209	1,156,685
RDTs	9,126,146	9,476,443	9,840,185	10,115,710	10,398,950	39,831,288
Case management - facility	15,849,241	16,589,578	17,364,497	18,232,722	19,144,358	71,331,154
Case investigation - community	772,358	4,969,212	12,276,864	14,744,259	17,707,550	50,470,243
IRS	22,110,981	24,504,569	33,799,536	35,342,459	36,955,815	152,713,360
LLINs	15,610,143	2,332,070	3,675,008	15,776,937	3,858,759	41,252,917
LSM	2,250,792	2,302,663	2,475,363	2,661,015	2,860,591	12,550,423
MDA	1,332,105	20,569,243	56,464,535	21,796,951	-	100,162,834
Advocacy/SBCC	3,897,312	1,924,367	5,358,504	4,800,185	4,300,038	20,280,406
Entomology	365,275	693,049	1,315,382	1,205,382	1,104,581	4,683,669
Programme management	12,570,227	14,761,434	13,186,363	13,467,191	13,754,000	67,739,215
SMEO	10,475,486	5,432,134	7,928,683	13,374,097	14,042,802	51,253,201
TOTAL	99,326,315	117,716,536	175,069,767	163,993,399	137,919,044	694,025,062

Financing

It will be crucial for Zambia to ensure that adequate financial resources are available during all phases of the elimination strategy. Zambia may see the malaria burden reduced to low levels shortly. As Zambia's income classification is upgraded, external funding may be scaled down. Zambia will still be eligible for external funding, though the level of local counterpart financing will increase.

Zambia must be prepared to increase national investments. This is not only a consequence of lower donor priority—indeed, as the elimination programme proceeds, costs will shift towards human resources, and, when the country is malaria-free, towards general health services. The government of Zambia already supports much of the human resources and general health services, and greater flexibility will be needed as the epidemiology changes. With such changes, government funding is likely to be more effective. Therefore, national commitment—so crucial for the achievement and maintenance of elimination—will be gauged by the extent to which domestic investments are increased, and this increase will be important in leveraging ongoing donor support.

A resource mobilization strategy or business plan will be developed to allow Zambia to explore innovative financing mechanisms to fund its malaria elimination efforts.

Annex 1: Indicators to measure progress and impact on the path to malaria elimination in Zambia

Surveillance, monitoring and evaluation (M&E) of the current national strategy are a key component to ensure progress and ultimately attainment of the stated goals. A more comprehensive M&E Plan is available to support the national strategy. A list of the key indicators is presented here.

Outcome indicators

- Proportion of population at risk who slept under an insecticide-treated net the previous night;
- Proportion of population at risk protected by IRS per year;
- Proportion of patients with suspected malaria who receive parasitological diagnosis by microscopy or RDTs;
- Proportion of patients diagnosed and treated with quality-assured diagnostics and medicines;
- Proportion of patients with confirmed malaria who received first-line antimalarial treatment according to national policy;
- Proportion of cases reported to the national malaria surveillance system;
- Proportion of private facilities reporting to the national malaria surveillance system;
- Proportion of reported active foci that were protected by effective vector control per year (programmes engaged in elimination);
- Proportion of malaria cases fully investigated and correctly classified (programmes engaged in elimination).

Impact indicators

- Malaria mortality rate (number of malaria deaths per 100,000 persons per year);
- Number of severe malaria cases;
- Proportion of malaria in pregnancy cases;
- Malaria case incidence (number of confirmed malaria cases per 1,000 persons at risk per year);
- Proportion of locally acquired cases (number of locally acquired cases reported per year [programmes engaged in elimination]);
- Proportion of active foci reported (number of active foci reported per year [programmes engaged in elimination]);
- Number of health facility catchment populations where elimination programmes have become operational as planned;
- Number of health facility catchment populations where the set elimination targets have been reached as planned.

