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Introduction
Malaria remains a major public health challenge

Several factors contribute to Ethiopia’s malaria burden: a large and mobile population, heterogeneous transmission, and the presence of both *Plasmodium falciparum (Pf)* and *Plasmodium vivax (Pv)* malaria parasites. Today, 60 percent of Ethiopia’s population is at risk of contracting malaria — approximately 68 million people. Compared to other endemic countries in Sub-Saharan Africa, malaria prevalence in Ethiopia is relatively low, but a few high-burden areas in the western lowlands remain a major threat to the elimination efforts in other districts.

The heterogeneous transmission in Ethiopia is largely due to variation in elevation. Elevations below 2,000 meters have the highest transmission potential and contain the majority of the population. Finally, the presence of *Pv* malaria, which causes relapses and requires a complicated treatment regimen, poses a challenge not found elsewhere in Sub-Saharan Africa (See Figures 1 & 2).

Strong national political leadership, community engagement, sustained funding, and a proactive approach to policy adoption and intervention scale-up have all had a major impact on malaria transmission, morbidity, and mortality. Building on that momentum, the country has set its sights on eliminating malaria in 239 selected districts located in six different regions by 2022. Among the elimination-designated districts, 184 (77 percent) have observed fewer than five cases per 1,000 annually (or <5 annual parasite index).

Ethiopia’s progress toward reducing its malaria burden is an inspiring public health success story, and a source of potential learning for other countries on the path to elimination. This case report describes Ethiopia’s three major success factors—(1) committed national leadership and partnership support, (2) scale-up of activities to support national control and elimination targets, and (3) the extension of prevention to the communities—and explores several exciting new opportunities to consolidate and expand upon Ethiopia’s decade of impact.

**FIGURE 1. Elevation and population density**

**FIGURE 2. Pf & Pv clinical incidence per 1,000 per year (2018)**
Ethiopia’s progress towards elimination

As a result of major investment, access to preventive interventions has been dramatically expanded to at risk communities along with expansion of access of treatment interventions to public health facilities.\textsuperscript{1} Due to sustained high coverage of these interventions, the country observed a 50 percent reduction of hospital malaria morbidity and 60 percent reduction in mortality between 2006 and 2011.\textsuperscript{2,3}

In 2005, following a renewed interest in controlling the malaria burden, Ethiopia launched a major scale-up of the country-wide distribution of rapid diagnostic tests (RDTs), artemisinin-based combination therapy (ACT), indoor residual spraying (IRS), and long-lasting insecticidal nets (LLINs). In total, the Federal Ministry of Health (FMOH) distributed 18.2 million LLINs from 2006 to 2007, 13 million in 2010, and 42.4 million between 2014 and 2016 (Figure 3).\textsuperscript{4} The country also launched and scaled a health extension program that trained community members in malaria case management. Together, these efforts have moved Ethiopia towards achieving malaria free districts in low-transmission areas.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{malaria_cases_per_year_2011-2016}
\caption{Malaria cases per year 2011-2016}
\end{figure}
## Ten Top Diseases

<table>
<thead>
<tr>
<th>No.</th>
<th>Disease</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Malaria</td>
<td>3.97</td>
</tr>
<tr>
<td>2</td>
<td>Typhoid</td>
<td>3.97</td>
</tr>
<tr>
<td>3</td>
<td>Cholera</td>
<td>3.97</td>
</tr>
<tr>
<td>4</td>
<td>Diarrhea</td>
<td>3.97</td>
</tr>
<tr>
<td>5</td>
<td>Polio</td>
<td>3.97</td>
</tr>
<tr>
<td>6</td>
<td>TB</td>
<td>3.97</td>
</tr>
<tr>
<td>7</td>
<td>AIDS</td>
<td>3.97</td>
</tr>
<tr>
<td>8</td>
<td>Hepatitis</td>
<td>3.97</td>
</tr>
<tr>
<td>9</td>
<td>Dengue</td>
<td>3.97</td>
</tr>
<tr>
<td>10</td>
<td>Malaria</td>
<td>3.97</td>
</tr>
</tbody>
</table>

### Table: Medication

<table>
<thead>
<tr>
<th>Duration</th>
<th>Dosage</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensive Phase</td>
<td>10 mg/kg/day</td>
<td>(2 months)</td>
</tr>
<tr>
<td>Continuation Phase</td>
<td>5 mg/kg/day</td>
<td>(6 months)</td>
</tr>
</tbody>
</table>

- To be prescribed in children 7-14 years of age who are not pregnant.

### Note
- Ethambutol should be replaced with INH in children 6 months to 15 years of age where visual acuity cannot be evaluated.
- Ethambutol dose changing daily.
Strategy
An ambitious national malaria strategic plan

A bold strategy from Ethiopia’s National Malaria Control and Elimination Program (NMCEP) sets forth a roadmap to further reduce the malaria burden from 2017 to 2020. The framework for this plan stratifies districts by transmission level and assigns an appropriate package of interventions to each group. This strategy was developed with the guidance of the 2016 WHO Global Technical Strategy and the National Malaria Elimination Roadmap developed in 2017.5

Going forward, Ethiopia plans to explore several promising opportunities to accelerate implementation of the current national strategy and introduce new tools and approaches for malaria elimination. One opportunity is to transform the NMCEP’s community engagement and advocacy initiative—“Zero Malaria Starts with Me!”—into a country-wide platform. The campaign will highlight Ethiopia’s malaria efforts, successes, and remaining challenges, and will seek renewed commitment from private sector and financial partners. Ethiopia will also build on its thriving data-use culture and cutting-edge information systems to expand rapid reporting of malaria nationally, and to develop data visualization dashboards that facilitate decentralized decision-making.
A decade of leadership:
Success factors

- Committed national leadership and partner support
- Extending prevention to the communities
- Scale-up of activities to support national control and elimination targets
SUCCESS FACTOR

Committed national leadership and partner support

Ethiopia has a history of strong political leadership when it comes to fighting malaria. As a result of catalytic government commitment, and the support of partners, the vast population at risk of malaria has been reached with preventive vector-control interventions (LLINs and IRS). The government has also made several impactful decisions that will greatly enable further reduction of the malaria burden. These decisions include the launch of sub-national malaria elimination plans, changes to the national guidance for malaria case management, the recently launched “Zero Malaria Starts with Me!” campaign, the creation of the National Malaria Elimination Task Force for elimination endeavors, and continued support for the Malaria Control Support Team (MCST). The MCST is an advisory group that guides and supports the FMOH on national malaria policy, strategy, and priorities; the RBM Global Malaria Action Plan; and cross-border issues. The MCST has proven to be a successful initiative, enabling the FMOH to make informed decisions with the latest evidence of impact.

Ethiopia has reduced malaria transmission, morbidity, and mortality using integrated service-delivery programs that address multiple disease areas at once. These health service programs were delivered through a partnership between US government agencies, implementing partners, and the FMOH. Programs include not only enhanced malaria prevention and case-management, but maternal, neonatal, and child health activities; family planning; nutrition services; expanded immunization; and water, sanitation, and hygiene. In total, these programs reached over 32 million people (35 percent of the Ethiopian population) across 301 districts in eight of the nine regional states, and parts of the Ethiopian Somali region. As a result, dedicated care was transferred to the community level across Ethiopia.

32 million
people across 301 districts have been reached.
SUCCESS FACTOR

Extending prevention to the communities

Ethiopia has been a leader in bringing critical care services to the community level. In 2004, the country launched the Health Extension Program (HEP) to develop a community-based accelerated expansion of health facilities. Through the HEP came a new community-level care provider: the health extension worker (HEW). The HEP has trained almost 40,000 HEWs across the country to diagnose and manage malaria cases, as well as other health issues. HEWs spend half of their time conducting home visits and outreach activities and the remaining half at their health post providing basic curative, promotive, and preventive services.

To expand prevention outreach within communities, the HEP also developed the Health Development Army (HDA). The HDA is a household-based program where women are trained to facilitate preventative health activities with neighboring families in their community. HEWs partner with the HDA to disseminate prevention messaging, distribute LLINs, register households and family sizes, document coverage, and track loss and damage of LLINs. HEWs also support door-to-door mobilization of IRS activities. The activities within the HEP have played major roles in bringing the low burden areas closer to elimination, as well as reducing the burden in areas with high transmission.

SUCCESS FACTOR

Scale-up of activities to support national control and elimination targets

The Scale-Up for Impact (SUFI) of proven interventions—including LLINs, targeted IRS, and improved case management using RDTs and ACTs—is largely responsible for Ethiopia’s success in reducing its malaria burden. In 2007, the percentage of children under five years of age who slept under a mosquito net was 60.2 percent. By 2011 it increased to 64.5, and by 2015 it was 70 percent. In 2015, 74 percent of pregnant women reported at least one LLIN in their home. Overall, 71 percent of households are protected either by owning an LLIN or having received IRS in the past 12 months.

almost 40,000 HEWs trained across the country to diagnose and manage malaria cases and other health issues.
Opportunities

- Targeting the high burden in the west
- Building a data use culture
- Expanding access to radical cure

OPPORTUNITY

Targeting the high burden in the west

In western districts of Ethiopia, transient and seasonal migrant populations, as well as an influx of refugees, contribute to the complexity of reducing the malaria burden and jeopardizing the elimination efforts in the central districts due to parasite bridging. In addition, individuals and families from Eritrea, Sudan, and South Sudan cross Ethiopian borders in the northern and western regions, potentially contracting malaria and bridging to other districts or regions. In partnership with the United Nations High Commissioner for Refugees, basic health services, after including distribution of LLINs, are being provided in refugee camps in an attempt to reduce incidence.

Migrant workers often travel during malaria transmission season in search of seasonal work opportunities in the agricultural growth corridors of the western lowlands. This migration increases the risk of transmission within the workers’ home communities when they return after the harvest season (see Figure 4). For example, in Amhara, between 2014 and 2016, a total of 71,818 outpatients were tested in 133 health posts with RDTs, out of which 9,044 (with or without travel history) were RDT-positive and RDT-negatives with travel history were extracted. Of this, a total of 2,371 (26 percent) had a travel history and 62.4 percent were RDT-positive for malaria. Patients with travel history had a 6.1 times greater risk of having malaria compared to patients without travel history. Nearly all destinations were high-risk areas located in the western lowlands. As part of school and community surveillance, students across 75 kebeles were trained to collaborate with HEWs and report when migrant workers returned to their home community. HEWs provided follow-up diagnosis and treatment of malaria through home visits. In 2017, 455 migrant workers were tested with 20 percent testing positive for malaria.
Determining the role of seasonal movement be important in determining optimal interventions in very low transmission areas. Stratification of the geography and population by seasonal or permanent residence for appropriate interventions should include innovative outdoor protection for nocturnally active migrants. Enhancing surveillance and vector control efforts, as well as targeting hard-to-reach populations with preventative messaging will all be critical in reducing the high malaria burden. (see Figure 5)

**FIGURE 5. Malaria cases on western border**

**OPPORTUNITY**

**Building a data use culture**

The development of robust and timely data collection systems has contributed greatly to Ethiopia’s reduced malaria burden. Malaria data is collected regularly through two reporting systems: the health management information system (HMIS) and Public Health Emergency Management (PHEM). The FMOH collects monthly HMIS data, mainly for program planning purposes such as quantification of anti-malaria commodity needs (RDT, ACTs, LLINs, and insecticides). The Ethiopian Public Health Institute (EPHI) collects weekly malaria data as part of the PHEM system. Within the PHEM there are 22 reportable diseases; 15 are reported immediately and 7 are reported weekly, including malaria. These data are collected to monitor trends and detect upsurges should they occur locally in a community, in a primary health care unit, or at the district level.

The FMOH adopted District Health Information Software 2 (DHIS2) in 2017 and conducted trainings to build capacity nationally and at mid- and higher-level health facilities using trained healthcare professionals from the FMOH, regional health bureaus, universities, and implementing partners. This included equipping health centers, hospitals, and district health offices across the country with hardware and software to facilitate data
collection, analysis, visualization, and use. To collect data in areas where the internet is not accessible, an offline version of DHIS2 is available. This means local staff can continue to use the system to monitor disease in their area and report by phone if there is an emergency or they encounter a time-sensitive illness.10

To make data from these health information systems more available to decision-makers, Ethiopia is working with data visualization partners to create dynamic dashboards. Currently, only staff at federal level have access to this platform. However, this access will eventually be extended to regions, zones, districts (woredas), and health facilities. The FMOH seeks to foster a culture of data use at district and zonal levels. They are empowering health officials at the district level to make decisions in collaboration with the PHEM focal point so they can respond to outbreaks and roll out interventions without waiting for alerts from federal or regional level officials.11

By increasing integrations across all health information systems, there is a great opportunity to make informed decisions at the level data are collected, and to extend capacity building for data use and analysis.

**OPPORTUNITY**

**Expanding access to radical cure**

Pv accounts for approximately 40 percent of the malaria burden in Ethiopia.2 Pv comes with specific challenges, stemming from having both a blood and liver stage of infection. The latter is responsible for causing relapses of malaria. To achieve “radical cure”, or full elimination of a Pv infection, patients must take 14 days of primaquine (PQ) or a single-dose of tafenoquine (TQ). In people with a glucose-6-phosphate dehydrogenase (G6PD) deficiency, taking these drugs can lead to acute hemolysis. To improve the safety of these drugs, the WHO recommends that patients be tested for G6PD deficiency prior to treatment.

The NMCEP and partners are working to evaluate the most effective protocols and approaches for appropriate radical cure in National Treatment Guidelines. Such protocols and approaches include finalizing G6PD deficiency prevalence studies, introducing TQ as a single dose treatment option (once provisioned with WHO prequalification and registered by the Ethiopian Federal Drug Administration), and introducing point-of-care G6PD diagnostics to facilitate access to radical cure. Currently, the Department for International Development is funding a PATH-led evaluation of G6PD diagnostic tests. Bill & Melinda Gates Foundation has also invested in an initiative co-led by the Medicines for Malaria Venture and PATH to support appropriate policy change and ensure new product supply chains function effectively. Together, these initiatives will expand access to radical cure tools, including G6PD diagnostics, PQ, and single-dose TQ. Expanding appropriate access to these medicines and technologies will be critical for continued progress in eliminating Pv infections.

34% of all malaria cases in Ethiopia are due to Pv.
Conclusion

Due to the coordinated efforts of the NMCEP and its partners, Ethiopia has made great strides in reducing malaria burden and charting a path to elimination. Elimination will mean an end to malaria-related illness and death, and healthier lives for children and others most vulnerable to the disease. It will make communities more prosperous and financially stable and enable health care facilities and community workers to focus on other pressing health and development priorities.

Ethiopia is building on the substantial progress of the past decade to achieve even steeper reductions in sickness and death, and to push toward national elimination. Reaching these goals will require the deployment of innovative tools and approaches for malaria elimination. Specifically, it will require concurrent investments in the high burden areas in the west, which could otherwise jeopardize malaria elimination efforts in the rest of the country, as well as the targeted scale-up of proven interventions for vector control and case management. Ethiopia’s assets—strong leadership and program engagement, data-informed decision-making, and a successful partnership model—will be crucial to these efforts. A malaria-free Ethiopia is now within reach, but we will never achieve it without proper resources and sustained funding. Together, with partners across sectors, the region, and the world, we have an opportunity to make malaria history—and Ethiopia can lead the way.
### Citations

**1.** Ethiopia FMOH. National Malaria Elimination Roadmap (2016)


**5.** Ethiopia FMOH. National Strategic Plan (2017-2020).


### Photo Credits

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