



# Eliminating malaria in BOTSWANA

Botswana achieved a 98 percent decrease in reported malaria cases between 2000 and 2014 and aims to eliminate malaria by 2018.

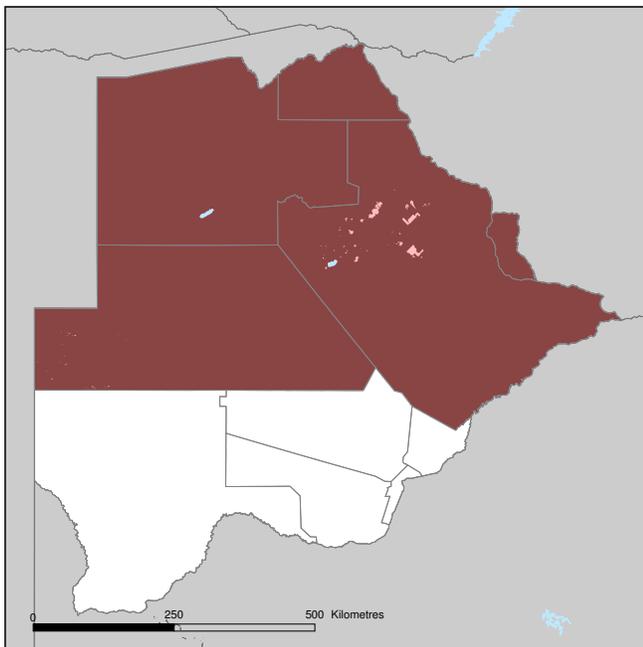
## At a Glance<sup>1</sup>

|              |  |
|--------------|--|
| <b>1,485</b> | Total cases of malaria<br>(100% <i>P. falciparum</i> )           |
| <b>22</b>    | Deaths from malaria  |
| <b>66</b>    | % population at risk<br>(total population: 2.0 million)          |
| <b>0.67</b>  | Annual parasite incidence<br>(cases/1,000 total population/year) |
| <b>N/A</b>   | % slide positivity rate  |

N/A: Data not available

## Malaria Transmission Limits

### *Plasmodium falciparum*



## Overview

Botswana lies along the southern endemic margin of transmission in sub-Saharan Africa and has experienced a substantial decline in malaria. The country reported 71,555 cases in 2000 and just 1,485 cases in 2014. All malaria cases in Botswana are due to *Plasmodium falciparum*.<sup>1</sup> The primary vector responsible for malaria transmission is *Anopheles arabiensis*. *An. gambiae* s.s. and *An. funestus* have been implicated in the past, but intensive vector control eliminated them as malaria parasite carriers.<sup>2,3</sup> Malaria transmission is unstable and largely occurs during Botswana's rainy season, between October and May, with peaks from February to mid-April. Intensity of transmission fluctuates with the country's varying rainfall each year, resulting in sporadic malaria epidemics.<sup>3</sup> Transmission is highest in the northern districts of Chobe, Ngami, and Okavango, all of which neighbor the highly endemic Zambezi region and account for more than 85 percent of the country's malaria cases. North central districts experience focal transmission and are at high risk for outbreaks after heavy rains; the southern part of Botswana is considered non-endemic and at low risk for sporadic cases.<sup>4</sup>

Starting in 2009, Botswana began reorienting its programmatic focus from control to elimination by enhancing its surveillance systems, improving case management, and

|  |                                   |
|--|-----------------------------------|
|  | Water                             |
|  | <i>P. falciparum</i> free         |
|  | Unstable transmission (API < 0.1) |
|  | Stable transmission (≥ 0.1 API)   |

*P. falciparum* malaria risk is classified into no risk, unstable risk of < 0.1 case per 1,000 population (API) and stable risk of ≥ 0.1 case per 1,000 population (API). Risk was defined using health management information system data and the transmission limits were further refined using temperature and aridity data. Data from the international travel and health guidelines (ITHG) were used to identify zero risk in certain cities, islands and other administrative areas.



increasing community engagement on malaria. Botswana is a member of the Elimination Eight (E8), a regional initiative composed of eight countries wherein the four “front-line” countries embarking on malaria elimination—Botswana, Namibia, South Africa, and Swaziland—coordinate their efforts with the four “second-line” countries—Angola, Mozambique, Zambia, and Zimbabwe.<sup>5</sup> With improvements to the country’s surveillance system and enhanced cross-border coordination with higher endemicity neighbors Zambia and Zimbabwe, Botswana is close to achieving malaria elimination by 2018.<sup>3</sup>

### Progress Toward Elimination

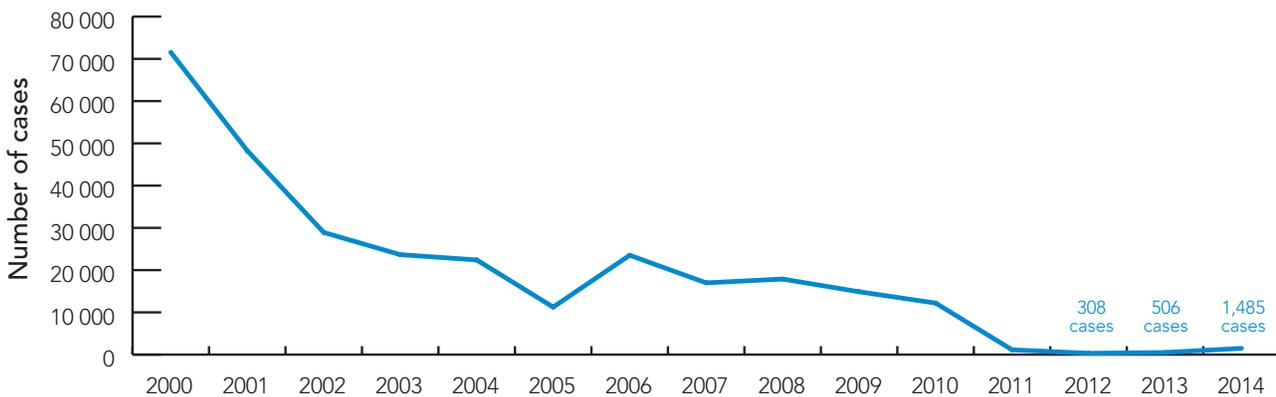
The earliest record of Botswana’s malaria situation dates to 1939, when the documented spleen rate among children in various villages of what was then known as the British Bechuanaland Protectorate was 40 to 84 percent. Malaria control activities began in 1954, consisting almost entirely of indoor residual spraying (IRS) with DDT.<sup>6</sup> During this early period, malaria control was the responsibility of district

medical officers and local health inspectors who oversaw IRS of dwellings and offices, antilarval measures, and the distribution of paludrine and quinine as prophylaxis.<sup>7</sup> Between 1961 and 1962, parasite rates in hyper-endemic districts such as Chobe recorded malaria prevalence as high as 43 percent, but following intensification of IRS activities, prevalence dropped to 14 percent by 1973.<sup>6</sup> An alternative insecticide, fenitrothion, briefly replaced DDT between 1971 and 1973. However, due to its limited efficacy, DDT was reinstated as the main insecticide. IRS with DDT served as Botswana’s principal vector control intervention against malaria through the 1970s. The vertically-operated National Malaria Control Programme (NMCP) was officially launched in 1974, focusing on vector control, case management, and community health education.<sup>6,8</sup>

Annual IRS and weekly chloroquine prophylaxis for pregnant women and children were the main malaria control interventions during the 1980s.<sup>9</sup> In the early part of the decade, Botswana experienced a serious drought that substantially, albeit briefly, reduced malaria cases. However, a spike in

**Goal:<sup>3</sup> Achieve national malaria elimination by 2018.**

### Reported Malaria Cases\*



\*Botswana implements case-based surveillance to classify malaria cases, but has not distinguished between local and imported when reporting case numbers to World Malaria Report.

Source: World Health Organization, World Malaria Report 2015



malaria cases and deaths occurred when heavy rains returned in 1988.<sup>10,11</sup> In Kasane hospital, located in northern Botswana, there were more than 500 malaria cases reported in February 1988, compared to just 15 cases during the same month in 1986.<sup>2</sup> The country's major malaria epidemics during the 1990s also occurred after unusually heavy seasonal rains. Botswana's most devastating epidemic in 1997 claimed 141 lives and resulted in over 100,000 cases.<sup>12</sup>

Until 1997, chloroquine served as the first-line treatment for uncomplicated malaria in Botswana, but reports of treatment failures increased, particularly after an epidemic in 1993. In 1998, sulfadoxine-pyrimethamine (SP) replaced chloroquine as the first-line drug.<sup>13</sup> In the same year, Botswana halted IRS with DDT in favor of pyrethroid insecticides because high-quality DDT was no longer readily available. Distribution of insecticide-treated nets (ITNs) as a complementary strategy to IRS began at this time.<sup>10,14</sup> Also in 1998, the NMCP decentralized from the national to the district level, consolidating its operations to just two main offices in Gaborone and Francistown. Francistown hosted entomological research and vector control, whereas Gaborone oversaw overall coordination, weekly malaria surveillance, advocacy, and case management. Under the coordination of district public health specialists, community and district health teams implemented malaria activities including reporting malaria cases and deaths on a weekly basis, monitoring case management practices, and linking communities with clinics and health posts for malaria education and intervention needs.<sup>3</sup> This decentralized program structure is still in place today.

The NMCP began preparing annual malaria reports and conducting regular malaria meetings and staff trainings in 2000, signifying its commitment to improved malaria control activities.<sup>15</sup> In 2003, malaria indicators were incorporated into an integrated disease surveillance and response system, and the NMCP prepared national and district level epidemic preparedness plans.<sup>8,15</sup> IRS continued to serve as Botswana's mainstay vector control intervention throughout the early 2000s, despite the increased use and acceptability of ITNs over time. Spray teams were trained and deployed annually, and community education on the importance and proper use of ITNs coincided with annual net re-treatment efforts.<sup>14,15</sup> Artemether-lumefantrine, an artemisinin-based combination therapy (ACT), replaced SP as Botswana's first-line drug for uncomplicated malaria in 2007, prompted by escalating

drug treatment failure rates for SP.<sup>13</sup> Malaria cases steadily declined throughout this period to a low of 11,242 in 2005, but an epidemic in 2006 disrupted this downward trend and cases doubled to over 23,000. Cases resumed their decline in 2008.<sup>1</sup>

In an effort to improve program performance and reorient the NMCP toward malaria elimination, Botswana's Ministry of Health convened a malaria review task force to evaluate the country's malaria program in 2009. As a result, the NMCP identified several action items to drive Botswana closer to zero malaria transmission, including: (1) focusing interventions and implementation strategies on transmission hotspots where focal malaria occurs; (2) expanding the distribution and availability of educational materials about malaria elimination via a range of communication modalities; (3) improving the country's epidemic preparedness and response systems; and (4) increasing the use and quality control of malaria diagnostic tools and corresponding treatment.<sup>3,4</sup>

In 2010, Botswana launched its malaria elimination strategic plan, in part based on the findings of the programmatic review, outlining the NMCP's approach to malaria elimination by 2015. A mid-term review of progress on the plan led to an updated strategy in 2014, which amended some of the recommendations and goals and further elaborated the program's approach to achieving and maintaining malaria elimination by 2018. Highlights of the elimination strategy include household-level case-based surveillance and investigation, 90 percent coverage with IRS in high transmission areas and reactive IRS in response to outbreaks in non-endemic areas, mass free distribution of long-lasting insecticidal nets (LLINs), winter larviciding in transmission foci, operational and entomological research for evidence-based planning, and enhanced intersectoral collaboration.<sup>3</sup> Botswana is also seeking to expand cross-border coordination of malaria control activities with neighboring Namibia, South Africa, Zambia, and Zimbabwe through multi-country collaborations, including the Trans-Zambezi Malaria Initiative and the Trans-Limpopo Spatial Development Initiative.<sup>16</sup> While the government finances the majority of Botswana's malaria elimination activities, the program is currently collaborating with other member countries of the E8 to submit a concept note for regional funding in order to achieve its goal of malaria elimination by 2018.<sup>17</sup>



## Eligibility for External Funding<sup>18–20</sup>

|   |     |
|---|-----|
| The Global Fund to Fight AIDS, Tuberculosis and Malaria | Yes |
| U.S. Government's President's Malaria Initiative        | No  |
| World Bank International Development Association        | No  |

## Economic Indicators<sup>21</sup>

|  |              |
|--|--------------|
| GNI per capita (US\$)                                    | \$7,240      |
| Country income classification                            | Upper middle |
| Total health expenditure per capita (US\$)               | \$397        |
| Total expenditure on health as % of GDP                  | 5            |
| Private health expenditure as % total health expenditure | 43           |

## Challenges to Eliminating Malaria

### Low community uptake of vector control interventions

Although IRS has been the primary vector control intervention in Botswana for decades, average coverage has hovered around 70 percent in the high transmission districts for the past five years, falling well short of the 90 percent goal stated in the elimination strategic plan. Community acceptance of IRS is believed to be declining, and the quality of spraying is inconsistent.<sup>4,17</sup> Despite mass free distribution of LLINs by partner organizations in these same districts, coverage averages only 60 percent and anticipated funding gaps may prevent sufficient distribution in the future.<sup>16,17</sup> Because Botswana is prone to seasonal epidemics, and with the increase of importation from endemic countries into high transmission areas, it is essential that the populations at greatest risk are covered with basic interventions.

### Inadequate stakeholder engagement

The Botswana NMCP has several international, regional, and local/private partners that participate in elimination activities to various degrees. However, stakeholder engagement needs improvement, particularly at the regional level. To date, consultations and meetings have been held with Namibia and South Africa to discuss regional cross-border elimination efforts, an action plan for collaboration with South Africa has been developed, and some coordinated activities between neighboring districts have commenced.<sup>17</sup> In order to strengthen collaboration and address malaria importation, regional stakeholders must expand this type of engagement.

### Sustained financial commitment

Botswana has historically not been eligible for financial support from traditional donor agencies such as the Global Fund because of its upper middle income status. Instead, the country has relied on domestic funding streams generated by the federal government and private sector partners. As malaria becomes a less pressing public health issue, the Botswana Ministry of Health is faced with competing priorities, particularly the country's heavy HIV/AIDS and tuberculosis burdens. The regional financing sought by E8 will provide much-needed support for malaria elimination activities, but the country must continue to identify ways to maintain financial resources to achieve and sustain elimination.

## Conclusion

Botswana has made significant progress toward its elimination goal, despite continued seasonal malaria epidemics and the increasing threat of importation. The country has good infrastructure and a highly functional health system, which facilitates malaria intervention access in all communities. Through expansion of surveillance capacity, sustained funding of its national malaria program and continued cross-border collaborations with its malaria endemic neighbors, Botswana will be in a strong position to achieve national elimination by 2018.



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## Transmission Limits Maps Sources

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## About This Briefing

This Country Briefing was developed by the UCSF Global Health Group's Malaria Elimination Initiative, in collaboration with Botswana's National Malaria Control Programme. To send comments or for additional information about this work, please email [Anne.Bulchis@ucsf.edu](mailto:Anne.Bulchis@ucsf.edu).



The **Global Health Group** at the University of California, San Francisco is an 'action tank' dedicated to translating new approaches into large-scale action that improves the lives of millions of people. Launched in 2007, the UCSF Global Health Group's **Malaria Elimination Initiative (MEI)** works at global, regional, and national levels to accelerate progress toward malaria elimination in countries and regions that are paving the way for global malaria eradication. The MEI believes that global eradication of malaria is possible within a generation.

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The **Malaria Atlas Project (MAP)** provided the malaria transmission maps. MAP is committed to disseminating information on malaria risk, in partnership with malaria endemic countries, to guide malaria control and elimination globally. Find MAP online at: [www.map.ox.ac.uk](http://www.map.ox.ac.uk).