



# Eliminating malaria in BELIZE

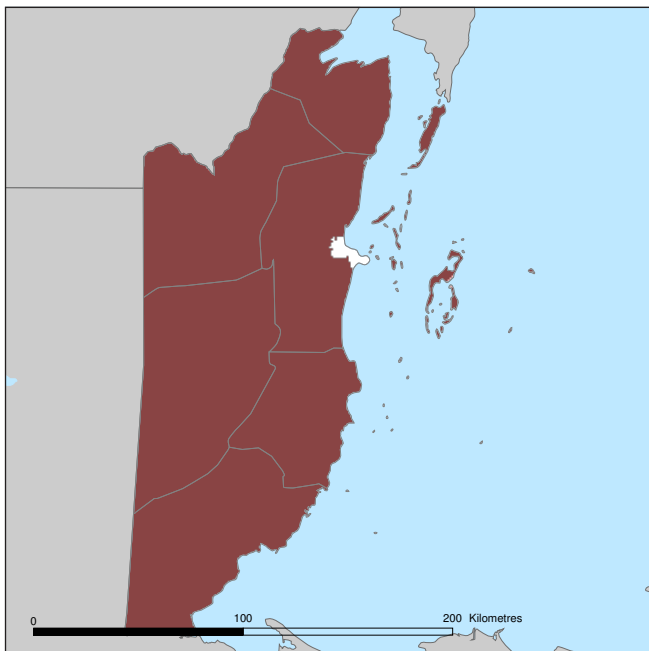
Reporting only 22 local cases in 2013, Belize is making remarkable progress toward national malaria elimination in advance of the 2020 goal set for the region.

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

- 22** Local cases of malaria (100% *P. vivax*)
- 0** Deaths from malaria (Last death reported in 2006)
- 1.4** % population living in areas of active transmission (total population: 0.3 million)
- 0.07** Annual parasite incidence (cases/1,000 total population/year)
- 0.09** % slide positivity rate

## Malaria Transmission Limits





*Plasmodium vivax*



## Overview

Belize has experienced a 99 percent decline in reported malaria cases between 2000 and 2013, from 1,486 cases to just 22, and is classified in the pre-elimination phase by the World Health Organization (WHO). No deaths due to malaria have been reported since 2006.<sup>1</sup> The vast majority of the country's malaria cases occur in the western districts of Toledo and Cayo along the Guatemalan border and the southern district of Stann Creek along the Caribbean coast, which are mostly rural with relatively large indigenous and migratory populations.<sup>2</sup> All local cases in 2013 were caused by *Plasmodium vivax*; only 77 cases of *P. falciparum* have been reported since 2000. Two cases of *P. malariae* were reported in 2004, the first since the mid-1990s.<sup>1,3</sup> The primary mosquito vectors for malaria in Belize are *Anopheles albimanus*, *An. vestitipennis*, and *An. darlingi*.<sup>4</sup> Malaria transmission occurs from February to April during the dry season and from August to October during the wet season.<sup>3,5</sup>

Indoor residual spraying (IRS) has been the primary malaria control intervention implemented in Belize over the past several decades, and has contributed significantly to the rapid decline in cases since the peak in 1994.<sup>2,3</sup> In recent years, however, the country has increasingly prioritized surveillance strengthening, intersectoral cooperation, and cross-border collaboration with Guatemala and Mexico.<sup>6</sup> Belize is

-  Water
-  *P. vivax* free
-  Unstable transmission (API < 0.1)
-  Stable transmission (API ≥ 0.1)

*P. vivax* 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.



a member of the Amazon Malaria Initiative (AMI), a regional program fostering collaboration in malaria prevention and control supported by the U.S. Agency for International Development (USAID), as well as a participating country of a new regional grant from the Global Fund entitled Elimination of Malaria in Mesoamerica and the Island of Hispaniola (EMMIE). With the support of both initiatives, Belize has begun reorienting its malaria strategy toward elimination, aiming to achieve the regional goal of elimination by 2020.<sup>7,8</sup>

### Progress Toward Elimination

The history of malaria control in Belize prior to the eradication era is not well documented. In 1930, records of deaths in health facilities in what was then called British Honduras indicate that more than 10% were due to malaria. In 1939, an estimated 50% of the population outside of city centers had malaria, and severe malaria was particularly common in the southern districts.<sup>9,10</sup> Belize began an IRS program in 1950

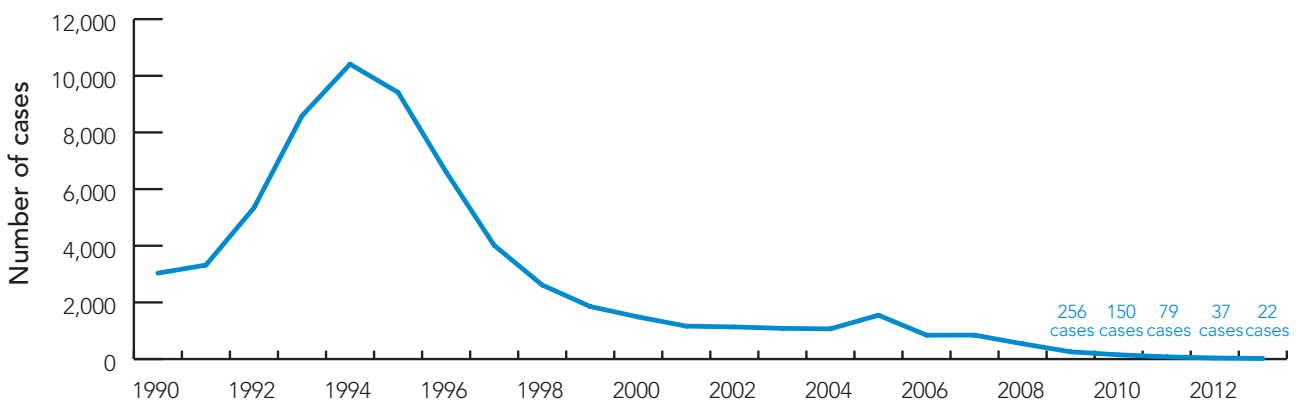
with the assistance of UNICEF, which led to an 80 percent reduction of the malaria burden by 1957. At this time, the National Malaria Eradication Service (NMES) was established within the Ministry of Health in response to the global push for eradication, and the country’s elimination strategy was based on annual spraying of all households with DDT. The systematic collection of national malaria case data was initiated in 1959 to monitor performance of the program.<sup>3,10</sup> The IRS campaign was so effective that malaria had essentially disappeared by 1963, and the NMES ceased regular spraying activities under the consolidation phase of its elimination strategy.<sup>3</sup>

Unfortunately, cases reappeared after spraying was stopped, and throughout the 1960s and 1970s, the malaria burden fluctuated in response to the inconsistent implementation of IRS. By 1982, over half of all localities in Belize’s six districts reported malaria cases. Incidence continued to rise in the early 1980s, a trend attributed to the shrinking NMES budget

**Goal:<sup>8</sup> Regional goal of zero local malaria cases in Mesoamerica and Hispaniola by 2020\***

\*Participating countries include: Belize, Costa Rica, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama

### Reported Malaria Cases\*



The increase in cases during the early 1990s has been attributed to inconsistent control measures, primarily IRS, as a result of inadequate malaria program funding and concerns over the safety of DDT. Regular, targeted spraying resumed in the late 1990s.<sup>3,4</sup>

\*Graph shows total reported cases from 1990–2012; in 2013, only local cases are shown.

Source: World Health Organization, World Malaria Report 2014



as well as an influx of refugees from neighboring endemic countries in political upheaval.<sup>3</sup> At this time, *P. falciparum* accounted for around 14% of all reported cases after being eliminated in the early 1970s.<sup>4</sup> From 1985–1989, USAID provided assistance to the Vector Control Unit (VCU) of the National Malaria Service, as it was now called, through provision of vehicles and spray equipment and overall strengthening of the program; cases declined during this period.<sup>3</sup>

The conclusion of USAID support and the inconsistent application of IRS as a result of insufficient VCU funds prompted a reduction in spraying activities throughout the early 1990s. In 1994, in response to environmental concerns regarding the safety of DDT, the VCU limited spraying to only those localities along the border with Mexico.<sup>3,4</sup> The consequences were seen immediately; about 10,000 cases were reported annually throughout Belize in 1994 and 1995, nearly double the 1992 caseload of 5,341.<sup>1</sup> Annual spraying of all houses with DDT was reinstated in 1995 and cases dropped by 30 percent to 6,605 in 1996. Because of budget constraints, the VCU shifted to a stratified IRS approach, spraying only the ten localities per district with the highest malaria burden, and cases declined an additional 40 percent in 1997.<sup>1,10</sup> That same year, DDT was discontinued in favor of deltamethrin.<sup>3</sup>

In 2001, Belize decentralized national health services, including malaria control operations, under the Health Sector Reform Project. The country was divided into four health regions, with services managed by regional administrative centers. The VCU of the Malaria Control Program (MCP) for each region was housed under the Environmental Health Division along with several other public health programs all competing for a share of the limited budget allocation.<sup>3,11</sup> Throughout the early 2000s, the VCU maintained its stratified approach to IRS with deltamethrin and malaria cases averaged about 1,000 per year. Roughly 90% of cases occurred in the districts of Toledo, Stann Creek and Cayo, where socio-economic and sanitation conditions limited effective control of the disease.<sup>3,12</sup>

After a 2005 outbreak in Toledo and Stann Creek when cases rose above 1,500, malaria incidence steadily declined and became increasingly focal. The 2007–2011 National Health Plan outlined priorities for the MCP, including achieving 90% IRS coverage of households in high-risk localities, reducing breeding sites, strengthening surveillance and cross-border collaborations with Mexico and Guatemala, and increasing public awareness and acceptance of malaria prevention and control activities through community education programs.<sup>6</sup> In addition to these activities, the MCP trained voluntary

collaborators and community nurse aides to conduct community-level diagnosis and treatment, initiated weekly reporting of confirmed cases to a centralized epidemiological unit, and conducted ultra-low volume spraying in additional localities to increase IRS coverage.<sup>3,12</sup> By 2011, malaria cases had fallen below 100 annually, and only 22 local cases were reported in 2013.<sup>1</sup>

With support from AMI, Belize is now focusing on improving the accuracy of malaria diagnosis and conducting joint trainings on proper use of diagnostics with Mexico. In addition, the program has recently undergone an assessment of its limitations in order to address necessary gaps as it reorients toward elimination.<sup>7</sup> Under the EMMIE regional grant, which supports the acceleration toward elimination in the ten participating countries through the provision of results-based financing, Belize is revising its malaria control strategy to one of elimination. The country has made remarkable progress and will benefit from standardized approaches to diagnostics, treatment and integrated vector management, regional surveillance strengthening and data sharing, and an operational research framework designed to address the common challenges faced by countries in Mesoamerica.<sup>8</sup>

## Eligibility for External Funding<sup>13–15</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

\*Belize is eligible for regional Global Fund malaria grants only; it is not eligible for national grants.

## Economic Indicators<sup>16</sup>

GNI per capita (US\$)	\$4,510
Country income classification	Upper middle
Total health expenditure per capita (US\$)	\$259
Total expenditure on health as % of GDP	6
Private health expenditure as % total health expenditure	35



## Challenges to Eliminating Malaria

### Malaria importation

A large percentage of laborers in Belize are seasonal agriculture workers who travel throughout Central America with the harvest season, moving in and out of malaria endemic areas and increasing the rate of malaria importation across borders.<sup>3</sup> Cross-border cooperation with Guatemala and Mexico, including the coordination of spray cycles, has directly contributed to the control and prevention of malaria, particularly in the southern districts of Belize where the migrant population is highest.<sup>6</sup> The regional EMMIE grant will further facilitate collaboration across borders.<sup>8</sup>

### Malaria program capacity

Since health system decentralization in 2001, Belize has had difficulty maintaining the staff and financial resources

necessary to eliminate malaria. Historically, malaria incidence in Belize increased when resources were cut back, so continuing financial and political commitment at this stage is essential.<sup>11,12</sup> Key strategies under the regional EMMIE grant include the strengthening of health systems in participating countries, as well as identifying new funding streams at the national and regional level.<sup>8</sup> Both should help Belize improve its program capacity.

## Conclusion

Belize has experienced a very dramatic decline in malaria cases since 1994, and its burden has been minimal and increasingly focal over the past several years. With the significant boost in financial and political support for malaria elimination within the region, Belize is in an excellent position to achieve national elimination well in advance of the regional 2020 goal.

## Sources

1. Global Malaria Programme. World Malaria Report 2014. Geneva: World Health Organization; 2014.
2. Pan American Health Organization. Report on the Situation of Malaria in the Americas, 2008. Washington, DC: World Health Organization; 2008.
3. Fernandez M. Diagnostic Situation on the Use of DDT and the Control and Prevention of Malaria in Belize. Belize: Pan American Health Organization and the Belize Ministry of Health Vector Control Unit; 2001.
4. Manguin S, Carnevale P, Mouchet J, editors. Biodiversity of Malaria in the World. London: John Libbey Eurotext; 2008.
5. McSweeney C, New M, Lizcano G. UNDP Climate Change Country Profiles: Belize. 2010. [Available from: <http://country-profiles.geog.ox.ac.uk>].
6. Belize Ministry of Health. National Health Plan: Health Agenda 2007–2011. 2006.
7. US Agency for International Development. Amazon Malaria Initiative Quarterly Bulletin. Volume 1, Issue 4; 2014.
8. Population Services International. The Global Fund to Fight Aids, Tuberculosis and Malaria Program Grant Agreement: Elimination of Malaria in Mesoamerica and the Island of Hispaniola. 2014.
9. Komp WHW. The occurrence of *Anopheles darlingi* Root in Central America. *Am J Trop Med Hyg* 1941; s1-21(5): 659–670.
10. Roberts DR, Vanzie E, Bangs MJ, Grieco JP, Lenares H, Hshieh P, et al. Role of residual spraying for malaria control in Belize. *J Vector Ecol* 2002; 27(1): 63–69.
11. Pan American Health Organization Area of Health Systems and Services. Health Systems Profile: Belize. Washington, DC: World Health Organization; 2009.
12. Epidemiology Unit, Belize Ministry of Health. National Malaria Epidemiological Profile 2002–2007. Belmopan City, Belize: 2008.
13. International Development Association. IDA Borrowing Countries. 2014. [Available from: <http://www.worldbank.org/ida/borrowing-countries.html>].
14. President's Malaria Initiative. PMI Focus Countries. 2014. [Available from: <http://www.pmi.gov/where-we-work>].
15. The Global Fund to Fight AIDS, Tuberculosis and Malaria. 2014 Eligibility List. 2014. [Available from: [www.theglobalfund.org/documents/core/eligibility/Core\\_EligibleCountries2014\\_List\\_en/](http://www.theglobalfund.org/documents/core/eligibility/Core_EligibleCountries2014_List_en/)].
16. The World Bank. World Development Indicators Database. 2014. [Available from: <http://data.worldbank.org/data-catalog/world-development-indicators>].

## Transmission Limits Map Sources

Guerra CA, Howes, RE Patil, AP Gething PW, Van Boeckel TP, Temperley, WH, Kabaria CW, Tatem AJ, Manh BH, Elyazar IRF, Baird JK, Snow RW and Hay SI. (2010). The international limits and population at risk of *Plasmodium vivax* transmission in 2009. *Public Library of Science Neglected Tropical Diseases*, 4(8): e774.



## About This Briefing

This Country Briefing was developed by the UCSF Global Health Group's Malaria Elimination Initiative. Malaria transmission risk maps were provided by the Malaria Atlas Project. This document was produced by Gretchen Newby; to send comments or for additional information about this work, please email [Gretchen.Newby@ucsf.edu](mailto:Gretchen.Newby@ucsf.edu).



The **Global Health Group** at the University of California, San Francisco (UCSF) 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 works at global, regional and national levels to accelerate progress towards eradication by conducting operational research to improve surveillance and response, strengthening political and financial commitment for malaria elimination, and collaborating with country partners to shrink the malaria map.



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).