



Eliminating malaria in COSTA RICA

Costa Rica reported just one relapsed case in 2014 and is very likely to achieve national malaria elimination well in advance of the 2020 goal set for the region.

At a Glance^{1,2}

- 0 Local cases of malaria
- 0 Deaths from malaria
(Last death reported in 2009)
- 0 % population living in areas of active transmission
(total population: 4.8 million)
- 0.0002 Annual parasite incidence
(cases/1,000 total population/year)
- 0.02 % slide positivity rate

Overview

Costa Rica has experienced a considerable decline in malaria cases over the past two decades, reporting fewer than 100 local cases annually since 2010, zero local cases in 2013, and just one relapsed case in 2014. The World Health Organization (WHO) classifies the country in the elimination phase.^{1,2} *Plasmodium vivax* has always been the dominant parasite species in Costa Rica, accounting for more than 95% of all cases; other than a localized outbreak in 2006, *P. falciparum* cases have been minimal.³ However, of the seven local cases reported in 2012, three were determined to be caused by *P. malariae*, which had not been reported in Costa Rica since 1970.⁴ The country has only reported one death due to malaria since 2000.¹ *Anopheles albimanus* is the primary mosquito vector, and *An. pseudopunctipennis* is a vector of secondary importance.⁵

Malaria transmission in Costa Rica has historically been the lowest of all countries in Central America.⁵ While approximately 70% of the country is favorable to *An. albimanus* breeding, transmission is highest in the rural areas of Limón Province,

located along the Caribbean coastal lowlands and home to a large indigenous population. The vast majority of annual cases since 2000 have occurred in Matina Canton, a county of Limón Province; other areas of transmission in recent years lie along the northern border with Nicaragua.⁶⁻⁸ Malaria in Costa Rica is strongly associated with outdoor labor, and populations at risk include undocumented migrants in border areas and agricultural workers moving with the seasonal harvest. Limón Province is also prone to year-round rainfall and seasonal flooding, increasing the risk of malaria transmission.^{3,9}

Throughout its history, the activities of the malaria program have been largely funded by the Costa Rican government.³ However, Costa Rica is now a participating country of a new regional grant from the Global Fund entitled Elimination of Malaria in Mesoamerica and the Island of Hispaniola (EMMIE), which will provide results-based funding and facilitate cooperation for regional elimination efforts. With support from EMMIE, Costa Rica is aiming to achieve a shared regional goal of elimination by 2020.¹⁰

Progress Toward Elimination

The first documented malaria activity in Costa Rica was a parasitological survey conducted in 1925 by the Rockefeller Foundation, in which annual parasite incidence (API) was determined to be 125 per 1,000 population. With assistance from the Rockefeller Foundation, the Ministry of Public Health began its first concerted malaria control efforts in 1938, including construction of drainage canals and other environmental modifications to eliminate vector breeding sites. During the period 1940–1945, an estimated 10% of all mortality was due to malaria.¹¹ Then, in 1946, the United Fruit Company began indoor residual spraying (IRS) with DDT on its estates in order to control malaria. By 1950, a collaboration between the Costa Rican government, the Pan American Sanitary Bureau and UNICEF led to the launch of an official national malaria control program centered around DDT application in areas with the highest malaria burden.¹²



Costa Rica launched its malaria eradication program in 1957 and expanded IRS with DDT into additional malarious areas; the program also made use of an extensive network of community volunteers that conducted local-level diagnosis and treatment. These interventions were highly successful, and by 1962, transmission in 74 percent of endemic areas had been interrupted. Unfortunately, administrative and financial gaps in the malaria program led to an increase in incidence: API jumped from 2.9 in 1963 to 9.3 in 1967.¹¹ In response, a mass drug administration campaign using chloroquine and primaquine was used as a supplementary measure with DDT, which had a significant and sustained impact on transmission. From 1970–1990, annual cases averaged fewer than 500, many of which were imported.^{11,13}

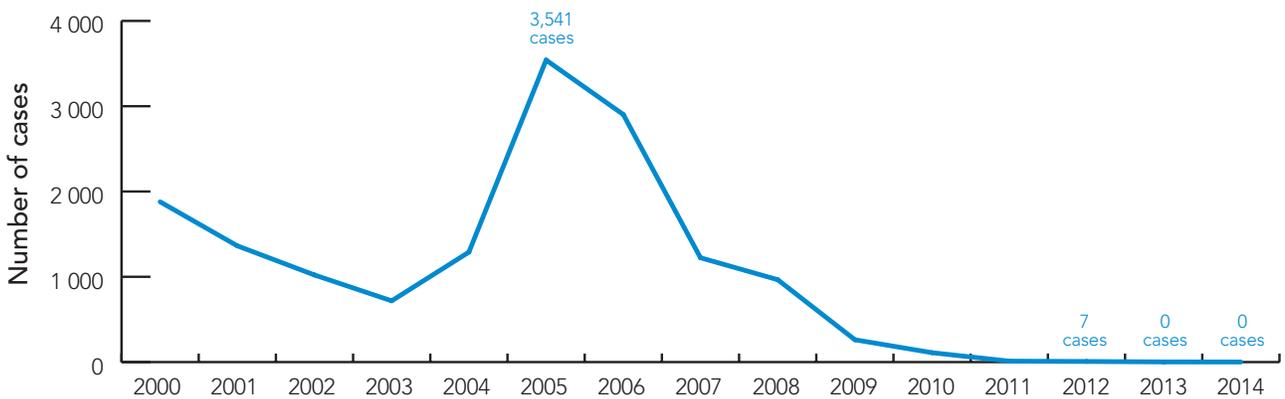
A major earthquake in Limón Province and the widespread expansion of banana plantations in the Atlantic Huetar

Region, where Limón Province is located, in the early 1990s resulted in a spike in malaria cases to 6,951 in 1992.^{14,15} Aggressive deforestation, which created ideal breeding grounds for *An. albimanus*, also contributed to an increase in transmission during this period.¹¹ Between 1991 and 1999, transmission foci shifted from the Pacific coast to the Atlantic coast, coinciding with the growth of the banana industry; the Atlantic Huetar Region has reported the majority of Costa Rica’s annual cases ever since.^{8,14} Around this time, Costa Rica reoriented its malaria control program according to WHO’s Global Malaria Control Strategy of 1992, and implemented the use of synthetic pyrethroids, first deltamethrin and then cyfluthrin, for IRS in place of DDT due to concerns over environmental impact and vector resistance.^{11,12} Through risk area stratification, biannual IRS, and cooperation of communities and volunteer malaria workers conducting diagnosis and treatment, cases began to decline by the late 1990s.¹²

Goal:¹⁰ 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*



*Graph shows total reported cases from 2000-2009; as of 2010, only local cases are shown.

Sources: World Health Organization, World Malaria Report 2015; Costa Rica Ministry of Health



Throughout the early 2000s, Costa Rica diversified its vector control techniques to tackle both malaria and dengue, including the use of fogging, selective spraying with pyrethroids, introduction of fresh water fish and copepods in stagnant water sources for biological larval control, and community-led garbage removal initiatives.¹⁶ Active case detection was used extensively, and cases were treated with chloroquine and primaquine. Other than a 2005 peak in transmission, which occurred throughout the region and was thought to have been a result of an active hurricane season, malaria cases continued to decline steadily, and reached just one local case in 2014.^{2,17}

Today, guided by the EMMIE regional grant, which supports the acceleration toward elimination in the ten participating countries through the provision of results-based financing, Costa Rica is very close to interrupting local malaria transmission. The country 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.¹⁰ The Costa Rica Ministry of Health has strong political support for elimination, and is currently working to establish a centralized elimination database with automated reporting and analysis of epidemiological and entomological data, and it is also setting up a quality assurance system for microscopy. Other priorities are streamlining the fragmented surveillance system and incorporating geospatial data to improve intervention targeting.^{2,8} Continued efforts to strengthen the quality of program activities will allow Costa Rica to achieve malaria elimination well before 2020.

Eligibility for External Funding¹⁸⁻²

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

*Costa Rica is eligible for regional Global Fund malaria grants only; it is not eligible for national grants.

Economic Indicators²¹

GNI per capita (US\$)	\$10,120
Country income classification	Upper middle
Total health expenditure per capita (US\$)	\$1,005
Total expenditure on health as % of GDP	10
Private health expenditure as % total health expenditure	25

Challenges to Eliminating Malaria

International migrant populations and importation risk

Costa Rica is an upper middle income country with greater employment opportunities available for unskilled laborers compared to many of its neighbors. Undocumented workers from nearby endemic countries frequently seek work in Limón Province, Costa Rica's most malaria-endemic area. The high rate of population movement requires intensified surveillance and data sharing with other countries in the region. The regional EMMIE grant will facilitate necessary cross-border collaboration.¹⁰ An additional challenge is the risk of imported *P. falciparum* cases from Africa. In 2014, three out of six total cases in Costa Rica were imported from Nigeria, Ghana, and Mozambique, respectively. Hospitals in the country do not currently stock the necessary drugs to treat *P. falciparum* infections and must request them from the WHO office, located in the capital, potentially causing critical delays in treatment.²

Maintaining human resources

Costa Rica does not have a true malaria program, in that it has been entirely integrated into the health system with different departments in charge of various malaria activities. As malaria cases decline and the country shifts toward a goal of elimination, health staff must maintain focus and undergo elimination training even as other health priorities compete for their time and attention. In addition, the Ministry of Health has acknowledged the need for more trained entomologists to guide decision-making for vector control activities.⁸



Conclusion

Costa Rica is in an excellent position to achieve elimination, reporting only one relapsing case in 2014 and gearing up for increased collaboration with its neighbors under the regional EMMIE grant. The country is concentrating its malaria prevention efforts in at-risk populations in Limón Province,

investing in surveillance to improve accuracy and speed of diagnosing and treating cases and increasing the scope and participation of malaria elimination activities at the community level. With continued financial and political support, Costa Rica will be able to achieve national malaria elimination well in advance of the 2020 regional goal.

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About This Briefing

This Country Briefing was developed by the UCSF Global Health Group's Malaria Elimination Initiative, in partnership with the Costa Rica Ministry of Health. To send comments or for additional information about this work, please email 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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