El Salvador reported only 6 local cases of malaria in 2013 and will very likely achieve national malaria elimination well in advance of the 2020 goal set for the region.

Overview

El Salvador is the smallest country in Central America and one of the most densely populated. The country has experienced a 99 percent decline in malaria cases between 2000 and 2013, and is categorized in the pre-elimination phase by the World Health Organization (WHO). The last reported death from malaria occurred in 1984. *Plasmodium vivax* is the predominant malaria parasite, and since 2000 there have been just 29 reported cases of *P. falciparum*, nearly all of which have been imported. Since 2004, nearly 40 percent of all reported cases have been imported, the vast majority occurring among migrant laborers who came to El Salvador for agricultural or artisanal work. Anopheles albimanus is the primary vector, and *An. pseudopunctipennis* is a potential vector of secondary importance. Malaria transmission occurs year-round but is highest during the May to October rainy season, peaking in July and August.

Although El Salvador now maintains low transmission with few reported cases, the scattered transmission foci require a dispersed concentration of malaria activities. San Salvador Province in the central part of the country contains nearly one third of El Salvador’s population and had 42 percent of all reported malaria cases in 2008. Cases have also recently been reported throughout the southwestern region along
the border with Guatemala, including in the provinces of Ahuachapán, Santa Ana, and Sonsonate, and in the province of La Unión along the eastern border with Honduras.\textsuperscript{3}

Over the past five years, El Salvador has been working to improve microscopy practices, implement community-driven education activities, increase epidemiological surveillance, reduce transmission foci, and control the number of imported malaria cases.\textsuperscript{3} The malaria program also performs active case detection in areas where temporary employment is found, such as brick and tile factories, plantation estates, and mills, and conducts focal indoor residual spraying (IRS).\textsuperscript{2,3}

El Salvador 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). With the financial and political support bolstered by this regional effort, El Salvador is aiming to achieve a shared regional goal of elimination by 2020.\textsuperscript{6}

**Goal:**\textsuperscript{6} 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

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**Progress Toward Elimination**

Prior to the 1950s, malaria was a main cause of morbidity and mortality in El Salvador. In 1931, malaria was responsible for 217 deaths per 100,000 population, and by 1941 malaria mortality rate had only slightly declined to 204 deaths per 100,000 population.\textsuperscript{7} El Salvador’s malaria control program was converted to an elimination program in 1956, the chief strategy of which was annual IRS with dieldrin in all malariaous areas. Dieldrin was replaced with DDT in 1958 when resistance was detected among the An. albimanus population.\textsuperscript{8} Resistance to DDT was observed almost immediately because its usage was already widespread on cotton plantations; however, field trials of other insecticides including malathion and fenthion indicated that DDT was the most effective option. Despite good coverage with IRS, the malaria burden remained high, even in areas where An. albimanus was still susceptible to DDT. In 1958, 10,925 cases were recorded; by 1963, the burden had risen to 17,846 cases.\textsuperscript{8,9}

Other than an outbreak in 1996, malaria cases in El Salvador have been consistently declining for more than two decades. This progress has been attributed to robust surveillance, focal vector control, and strong program management.

*Graph shows total reported cases from 1990–2006; as of 2007, only local cases are shown.

In 1961, the Campaña Nacional Antipalúdica (CNAP) along with the Government of El Salvador and the Pan American Health Organization (PAHO) began conducting studies to determine why the elimination activities implemented in the late 1950s had failed to reduce malaria transmission. The studies included community surveys, case mapping, entomological surveillance, and active and passive case detection in both DDT-susceptible and DDT-resistant areas, and concluded that poor housing construction and the exophagic behavior of An. albimanus limited the effectiveness of DDT in preventing malaria transmission. The CNAP also initiated a mass drug administration campaign using chloroquine and primaquine in 1961 to supplement IRS, and this intervention was found to be very effective in reducing transmission. The testing of different larvicides also began during this period.

Through continued IRS, larval control, and mass drug administration, reductions in mortality and morbidity were achieved, but by the early 1970s resistance to DDT and other insecticides had intensified and IRS was scaled back. During this same period, the cotton industry expanded greatly, causing extensive deforestation, thereby increasing mosquito breeding habitats. Seasonal workers from the low-risk highland regions of El Salvador migrated to the high-risk Pacific coastal plains for work and were more susceptible to contracting malaria because of their low levels of immunity, poor housing structures, and limited access to health services.

In 1980, the Salvadoran Civil War broke out, causing a near standstill in health services, industry, and malaria control efforts; this same year, malaria cases peaked at 95,835. The cotton industry collapsed, and seasonal worker migration no longer played a significant role in malaria transmission. The quality and availability of health services during the war deteriorated, and environmental degradation resulting from misuse of land greatly increased the presence of vectors, thus presenting a serious challenge to the effectiveness of malaria surveillance and vector control. Yet, by 1988, cases had dropped by over 90% to 9,095 cases. In 1992, the armed conflict ended and thousands of displaced people and ex-combatants settled in agricultural communities as part of the national land transfer program. Over the next few years, the malaria program was strengthened to include a new focus on surveillance, vector control, and an increased government role in managing malaria—all of which contributed to a steady decrease in incidence. Other than a 1996 outbreak, most likely due to the continuation of poor land management by agricultural industries, cases have continued to decline since the 1980 peak.

Since 2003, in coordination with PAHO, El Salvador has reduced its insecticide usage and employed alternative, environmentally sustainable control methods such as planting neem trees, which have insect-repelling properties. The malaria program has also continued to conduct passive and active case detection, increased case investigation and contact tracing, and improved community engagement on malaria prevention. The Ministry of Health increased funding in 2007 to strengthen the monitoring and control of vector-borne diseases and deliver equipment for thermal fogging and microscopes for malaria surveillance and case management. Certification criteria for malaria-free municipalities in El Salvador were developed as well.

Over the past decade, El Salvador’s malaria burden has been very low, with fewer than 100 cases reported annually. The success of the country’s malaria control efforts has been attributed to improved surveillance, strong human resources and program management, quality diagnosis, public and private sector collaboration, and effective social mobilization. El Salvador continues to employ focal IRS in high-risk areas along the borders with Guatemala and Honduras and at labor sites, and has increased its efforts to control malaria importation through screening at borders and in areas that attract migrant workers. Under the EMMIE regional grant, which supports the acceleration toward elimination in the ten participating countries through the provision of results-based financing, El Salvador 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.

**Eligibility for External Funding**

<table>
<thead>
<tr>
<th>Fund</th>
<th>Eligibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Global Fund to Fight AIDS, Tuberculosis and Malaria</td>
<td>Yes*</td>
</tr>
<tr>
<td>U.S. Government’s President’s Malaria Initiative</td>
<td>No</td>
</tr>
<tr>
<td>World Bank International Development Association</td>
<td>No</td>
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</table>

*El Salvador is eligible for both regional and national malaria grants from the Global Fund.
Economic Indicators

<table>
<thead>
<tr>
<th>Economic Indicator</th>
<th>Value</th>
</tr>
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<tr>
<td>GNI per capita (US$)</td>
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<tr>
<td>Country income classification</td>
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<tr>
<td>Total health expenditure per capita (US$)</td>
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</tr>
<tr>
<td>Total expenditure on health as % of GDP</td>
<td>7</td>
</tr>
<tr>
<td>Private health expenditure as % total health expenditure</td>
<td>37</td>
</tr>
</tbody>
</table>

Challenges to Eliminating Malaria

Migrant populations

El Salvador's greatest challenge to successfully eliminating malaria is managing the threat of importation. Many immigrants from neighboring countries cross into El Salvador in search of employment in the sugar industry, or pass through El Salvador on their way to Mexico and the United States.\(^{20,21}\) The regional EMMIE grant will facilitate cross-border collaboration between El Salvador and nearby Guatemala, Honduras, and Nicaragua.\(^6\)

Conclusion

El Salvador has made remarkable progress in reducing its malaria burden and is now very close to elimination. With the increased financial and political support for malaria elimination within the region and bolstered cross-border collaboration, El Salvador is likely to achieve national elimination well in advance of the regional 2020 goal.

Sources

Eliminating malaria in EL SALVADOR


Transmission Limits Map Sources

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.

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.