After maintaining zero local cases since October 2012, Sri Lanka received its certification of malaria elimination from the World Health Organization in September 2016.

Overview

Sri Lanka has made tremendous progress in reducing its malaria burden since it recorded 264,549 cases in 1999. The country has maintained zero local cases since interrupting local transmission in 2012.\(^1,2\) In September 2016, Sri Lanka became the second country in the WHO South-East Asia Region to receive certification for having eliminated malaria.\(^3\) Sri Lanka's anti-malaria campaign and international partners are now committed to maintaining elimination and preventing reintroduction with sustained surveillance and response capacity.\(^3\)

Plasmodium vivax has historically caused the majority of annual malaria cases, although increasing numbers of imported cases in recent years have been \(P. falciparum\) infections.\(^4,5\) Anopheles culicifacies is the primary malaria vector in Sri Lanka, and vectors of secondary importance include An. subpictus, An. annularis, and An. varuna, among others.\(^1,6,7\) Malaria transmission has historically varied across Sri Lanka's three climactic zones. The wet zone is surrounded by the intermediate zone, with areas of high altitude that tend to be uninhabitable for anophelines. However, major outbreaks have occurred in these two zones in the past, typically during years with little rainfall, and the areas remain vulnerable to epidemic malaria. In the dry zone, covering about two-thirds of the country, malaria was endemic due to favorable environmental conditions including temperature, rainfall, and humidity, heavy agricultural land use, and reliance upon irrigation schemes that provide additional breeding places for An. culicifacies. Malaria transmission has historically occurred year-round in the dry zone, with a significant peak from November to February and a lesser peak in June and July.\(^5,8\)

Sri Lanka's tumultuous history with malaria control is often cited in discussions about resurgence and lessons learned from the eradication era of the mid-20th century. Intense indoor residual spraying (IRS) with DDT throughout the 1950s led to a dramatic reduction in the national malaria burden, and by 1963 only 17 cases were reported, 11 of which were imported. The IRS campaign was subsequently cut back, malaria resurged, and over 1.5 million cases were reported between 1967 and 1970.\(^8,9\) It took Sri Lanka about five decades to get back to elimination levels, finally achieving zero local transmission as of November 2012.\(^1,2\) The Anti-Malaria Campaign (AMC) recently launched its new National Malaria Strategic Plan for Elimination and Prevention of Re-introduction 2014–2018, emphasizing rigorous surveillance activities, maintenance of diagnostic facilities, and strengthened outbreak preparedness.\(^10\) As a country partner in the Asia Pacific Malaria Elimination Network (APMEN), a network composed of 18 Asia Pacific countries and other stakeholders working to eliminate malaria in the region, Sri Lanka's success story serves as a model for its neighbors as they actively pursue elimination.\(^11\)

Progress Toward Elimination

Malaria has been present in Sri Lanka for centuries, possibly introduced to the island along with the primary vector, An. culicifacies, as early as the 13th century. From 1911, when the first anti-malaria center was established, to 1920, less than one million cases of malaria were reported annually. Epidemics occurred approximately every five years through-

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*Data is from 2014*
Trials of IRS using DDT began in 1945; prior to this, the growing vector resistance and environmental concerns. As years went on, IRS was scaled back, vigilance units were expanded to maintain entomological surveillance and provide rapid diagnosis and treatment. IRS had a dramatic impact on the malaria burden during this period: cases dropped from 2,768,385 in 1946 to 7,317 in 1955. In 1958, Sri Lanka joined the WHO Global Malaria Eradication Program and maintained these remarkable downward trends during its initial attack phase. By 1963, only 17 malaria cases were reported and malaria mortality had plummeted to near zero. In light of the low malaria burden and the strength of the surveillance and reporting system, the government disbanded the IRS program and transferred passive case detection activities to general health services. However, two outbreaks of *P. vivax* were detected in 1967, leading to a massive epidemic of over 500,000 cases by 1969. Several factors, including extensive population movement, relaxed malaria program surveillance and control activities, increasing drug and insecticide resistance, and insufficient financial support for the program contributed to the epidemic. IRS was reintroduced to contain the epidemic, and subsequently, the Sri Lanka malaria program reoriented from elimination to control.

In 1975, DDT was replaced with malathion as a result of the early 20th century, the most significant of which took place in 1934–1935, resulting in more than five million cases and over 80,000 deaths. Shortly after, regular entomological activities were established in vigilance units throughout epidemic areas, consisting of larval and adult mosquito collections and observations of breeding sites. By 1940, public health inspectors began conducting parasitological surveillance activities in the same locations.

In 1989, the national antimalaria program was decentralized and provincial malaria control programs were established to manage local malaria operations. New pyrethroid insecticides for IRS were introduced in 1994 due to widespread malathion resistance. Between 1991 and 1995, cases dropped from 400,263 to 142,294, a 64 percent decline. However, the separatist war peaked during the mid- to late-1990s, and malaria cases, primarily occurring in the northern and eastern conflict areas, rose to 264,549 in 1999. Despite the ongoing war, a dramatic decline in malaria cases began in 2000 that continued until 2012 when the last local case was reported. In the late 1990s, Sri Lanka began distributing insecticide-treated nets (ITNs) and instituted a targeted IRS approach based on spatial insecticide rotation, prioritizing historical transmission areas and proximity to vector breeding sites. This strategy improved community acceptance of IRS by eliminating unnecessary spraying, and limited the development of resistance. At the same time, the use of larvivorous fish and other larval control methods were introduced where IRS was discontinued. Active case detection and prompt treatment were expanded through mobile malaria clinics and the establishment of diagnosis centers at health facilities throughout the country.

Starting in 2003, Round 1 and Round 4 grants from the Global Fund supported the continued scale-up of IRS, active surveillance through mobile clinics, appropriate treatment, and distribution of ITNs, with a focus on poor and vulnerable populations at increased risk for malaria due to occupational factors. In 2008, Sri Lanka was awarded a Global Fund Round 8 grant to pursue a phased strategy to eliminate *P. falciparum* transmission and reduce *P. vivax* by 75 percent in the non-conflict areas by 2012. The strategy included increasing control measures in the former conflict zones through collaboration with private sector entities such as community-based organizations, security forces, and international relief organizations. The cessation of the separatist war that had raged for nearly 30 years encouraged the AMC to revise its strategy, with new goals of nationwide elimination of *P. falciparum* by the end of 2012 and *P. vivax* by the end of 2014. With Global Fund support, malaria cases had
**Reported Malaria Cases***

![Graph showing reported malaria cases from 2000 to 2016.](image)

Malaria incidence in Sri Lanka began to decline through the use of targeted vector control measures and early diagnosis and prompt treatment facilitated by mobile malaria clinics. The last local case was reported in October 2012.

*Graph shows total reported cases from 2000–2007; as of 2008, only local cases are shown.

World Health Organization, World Malaria Report 2015; Sri Lanka Anti-Malaria Campaign

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**Goal:** Maintain malaria-free status and zero mortality due to malaria

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decreased by 94 percent between 2003 and 2008, from over 10,000 cases to just 649, putting elimination within reach.\(^1\)

Since 2009, the Sri Lanka AMC has carried out intensive parasitological and entomological surveillance, implemented closely observed radical cure with artemisinin-based combination therapies (ACTs) and primaquine, continued a strategy of integrated vector management based on focal IRS, distribution of long-lasting insecticidal nets (LLINs), larval control, and environmental management, and conducted rigorous community engagement at the grassroots level. These efforts drove the successful interruption of local *P. falciparum* and *P. vivax* transmission in late 2012, allowing Sri Lanka to receive WHO certification of malaria elimination in September 2016. The remarkable achievement of maintaining zero local cases led to the development and implementation of the AMC’s Prevention of Reintroduction (POR) strategy in 2014. This strategy is being supported with committed funds from the Sri Lanka Ministry of Health and the Global Fund through 2017.\(^2,10\)

**Challenges to Eliminating Malaria**

**Imported cases**

Much of Sri Lanka remains both receptive and vulnerable to malaria transmission, and the number of imported malaria cases has increased in recent years. The majority of imported cases originate in highly-endemic India, but recent clusters of imported infections have been detected among Pakistani asylum-seekers and Sri Lankan fishermen returning from Sierra Leone.\(^4\) Robust surveillance, border screening, prompt diagnosis and treatment, and thorough case investigation and follow-up are essential POR phase activities outlined in the AMC’s current strategic plan.\(^10\)

**Sustaining Political and Financial Investment**

In order to maintain elimination, Sri Lanka must sustain a high level of funding for malaria surveillance and response. As the country nears its fourth year of zero local cases, there
Eligibility for External Funding[^21-23]

<table>
<thead>
<tr>
<th>Fund</th>
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<tr>
<td>The Global Fund to Fight AIDS, Tuberculosis and Malaria</td>
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<td>U.S. Government’s President’s Malaria Initiative</td>
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<tr>
<td>World Bank International Development Association</td>
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Economic Indicators[^24]

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<th>Indicator</th>
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<td>Total health expenditure per capita (US$)</td>
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<td>Private health expenditure as % of total health expenditure</td>
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</table>

[^2013 data]

Conclusion

Sri Lanka interrupted local malaria transmission two years before its 2014 elimination goal, and has maintained zero transmission for three years. This success is all the more remarkable considering the country’s near miss of elimination 50 years ago. With sustained political and financial commitment and an active surveillance and response system, Sri Lanka will be in an excellent position to achieve certification of its malaria-free status by the end of 2016 and prevent reintroduction of malaria into the future.

Sources

About This Briefing

This Country Briefing was developed by the UCSF Global Health Group’s Malaria Elimination Initiative (MEI), in cooperation with the Sri Lanka Anti Malaria Campaign. 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.

shrinkthemalariamap.org

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.

map.ox.ac.uk

APMEN

Asia Pacific Malaria Elimination Network