



# Eliminating malaria in IRAN

*Iran has made impressive progress in reducing its malaria burden since 2000 and has a national goal to eliminate malaria by 2025.*

## Overview

Iran achieved a 97 percent decrease in local malaria cases between 2000 and 2014, from 12,294 cases to just 376, and is categorized in the elimination phase by the World Health Organization (WHO). The country has reported only four malaria-related deaths since 2010.<sup>1</sup> Several vectors are responsible for malaria transmission in Iran, and the four dominant vectors are *Anopheles stephensi*, *An. culicifacies*, *An. superpictus*, and the *An. fluviatilis* species complex.<sup>2,3</sup> Nearly all malaria transmission occurs in the southeastern part of the country, near the Persian Gulf and the Gulf of Oman, as well as the border with Pakistan where most imported cases originate. The majority of local malaria cases in Iran are due to *Plasmodium vivax*; about one quarter of all imported cases are due to *P. falciparum*.<sup>1,4</sup> Duration of malaria transmission varies throughout Iran, with a three to four month season in the north during the summer months, and a nine month season in the south with peaks in late spring and early autumn.<sup>5</sup>

The vast majority of malaria cases over the past several years have been reported in three southeastern provinces—Hormozgan, Kerman, and Sistan and Baluchestan—all of which lie along or near the border with Pakistan.<sup>4</sup> Socio-economic conditions and access to health services in these provinces are lower in comparison to the rest of the country, presenting significant challenges for malaria control. In addition, imported cases occur in several provinces throughout Iran, requiring regular surveillance and outbreak preparedness.<sup>6</sup> The national malaria program launched its strategic plan for elimination in 2010, focusing on improved access to early diagnosis and prompt treatment, expanded coverage of integrated vector management (IVM), and enhanced surveillance. Through these efforts, Iran is aiming to interrupt *P. falciparum* transmission by the end of 2015, and to become entirely malaria-free by 2025.<sup>7,8</sup>

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

- 376** Local cases of malaria  
(82% *P. vivax*)
- 0** Deaths from malaria
- 0.8** % population living in areas of active transmission  
(total population: 78.1 million)
- 0.005** Annual parasite incidence  
(cases/1,000 total population/year)
- 0.08** % slide positivity rate

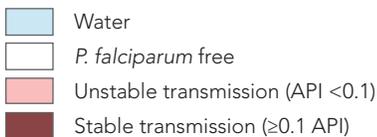
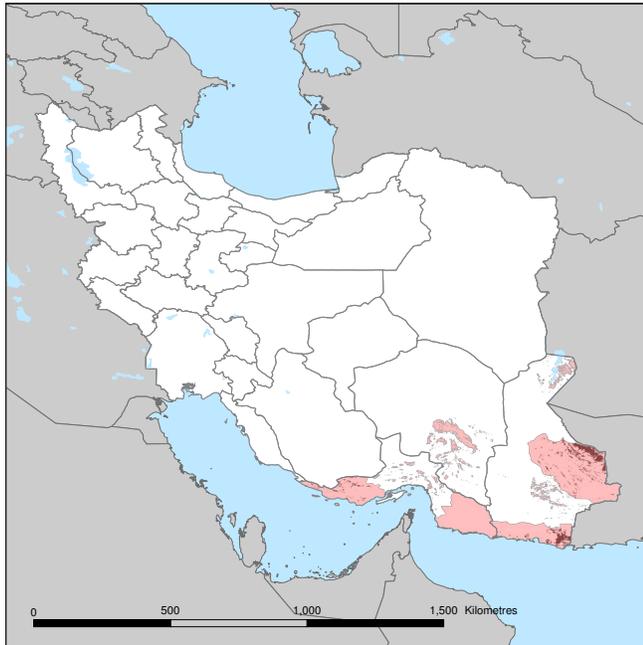
## Progress Toward Elimination

While malaria has been present in Iran since ancient times, the earliest records of the malaria burden are from the 1920s. A malariometric survey was conducted in 1921 in Gilan Province along the Caspian Sea, in which the parasite rate was 19 percent. In 1924, it was estimated that more than one-third of Iran's 13 million population had contracted malaria. Most of the country was considered endemic and malaria was such a public health burden that it hampered economic development of the country.<sup>9,10</sup> The first malaria research post was formed in 1934, with the establishment of the Malaria Unit within the Pasteur Institute of Iran. During the 1940s, the Iran Ministry of Health (MOH) collaborated with the US Army, the Iranian Army, landowners, oil companies, and other private sector organizations to conduct larval control and distribute free antimalarial drugs. The US Army then introduced indoor residual spraying (IRS) with DDT in 1945 and provided training for local staff.<sup>10</sup> With the launch of Iran's Malaria Control Program in 1950, IRS with DDT was conducted annually on a large scale in all endemic areas, covering nearly one-third of the population, and malaria incidence declined very dramatically.<sup>11</sup>

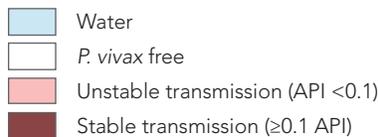
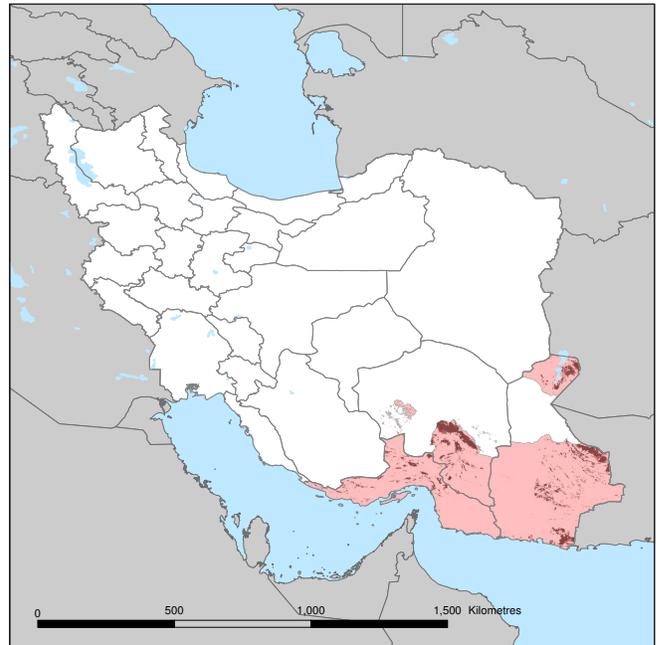


## Malaria Transmission Limits

### *Plasmodium falciparum*



### *Plasmodium vivax*



*P. falciparum*/*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.

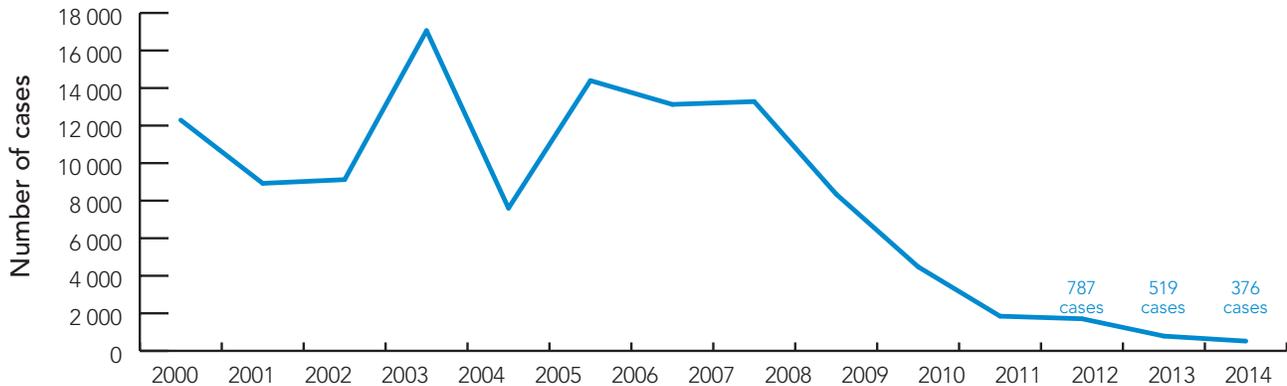
The malaria program expanded its activities considerably throughout the 1950s. The Institute of Malariology was formed in 1951 in association with Tehran University, providing technical support and conducting research and training for malaria staff of the MOH. A Scientific Council made up of representatives from the MOH, Institute of Malariology, US Army, WHO, and Iranian universities made decisions on malaria strategies and procedures. In 1953, spray operations were decentralized and autonomous malaria control units were formed at the provincial level. These units received materials and equipment from the MOH, but planned their own operations using locally-hired spraymen.<sup>11,12</sup> By 1956, malaria control had proven so effective that, after consultations with

WHO and UNICEF, Iran formed a Malaria Eradication Organization (MEO); the national eradication campaign was formally launched in 1957.<sup>9</sup>

While IRS with DDT proved very effective in most of the country, the eradication campaign faced major challenges in the south. In 1957, resistance to DDT was detected in *An. stephensi*, the primary vector in southern Iran, and DDT had to be discontinued. Resistance to its replacement, dieldrin, was subsequently detected in *An. stephensi* in 1959, and all IRS was discontinued in the south by 1960. Several alternative interventions were tested in southern Iran throughout the late 1950s and into the 1960s, including IRS with other insecticides (malathion and baygon), fumiga-



## Reported Malaria Cases\*



Iran has significantly reduced its malaria burden over the last two decades, primarily due to improvements in vector control, surveillance, and cross-border operations in endemic areas.

\*Graph shows local malaria cases only.

Source: World Health Organization, World Malaria Report 2015

**Goal:<sup>7,8</sup> Eliminate all forms of malaria by 2025.**

tion with dichlorvos, mass drug administration (MDA) with chloroquine-medicated salt, and biological larval control using *Gambusia* fish.<sup>13–16</sup> While some interventions were able to bring incidence down significantly during the trial period, the most effective and applicable intervention was the use of *Gambusia* fish, and the program was expanded throughout the country.<sup>16</sup> MDA was also continued among the large nomad populations. By 1968, IRS with malathion had resumed in the southern provinces; other interventions included active case detection, prompt treatment, and chemical larviciding near cities, resulting in parasite rate reductions of 30–90 percent.<sup>17</sup> In the same year, the northern part of the country entered the consolidation phase of the eradication program after successfully interrupting malaria transmission.<sup>9</sup>

In 1973, malaria burden had dropped to approximately 12,000 cases, all restricted to the southeastern region. This success encouraged the government to integrate the malaria program into the general Communicable Diseases Control program, which led to a scaling back of malaria control activities and, ultimately, an increase in malaria incidence.<sup>9</sup> In

response to this increase, the malaria program regained its autonomy and began to re-strengthen its control activities by 1977. However, in 1980, 23 years after the malaria eradication strategy was launched, and without having eliminated malaria in the south, Iranian MOH officials decided to shift their goals away from elimination and instead focus on control.<sup>9,10</sup>

Following the Iran-Iraq War (1980–1988), malaria control activities such as case diagnosis and treatment were integrated into basic health care services.<sup>5</sup> Cases had steadily risen during the 1980s, and due to a reorganization of the government and an increase in international economic sanctions following the war, cases increased to nearly 90,000 by 1991. However, once malaria control measures resumed in the early 1990s, indigenous cases fell by 87 percent to just 12,294 by 2000.<sup>1,5</sup> In 2003, Iran reported 17,060 malaria cases, 30 percent of which were imported from Pakistan and Afghanistan. In response to the disproportionately high malaria endemicity in the border regions, WHO/EMRO held the first cross-border malaria meeting in 2003 in Sistan and



Baluchestan Province, in collaboration with national malaria program staff from Iran, Afghanistan, and Pakistan. The objective of the meeting was to increase cooperation in malaria control by conducting joint trainings and spray operations, improving surveillance efforts, sharing data, and monitoring efficacy of antimalarial drugs across borders.<sup>18</sup>

Starting in 2004, Iran began scaling up IRS, larviciding, and distribution of insecticide-treated nets. In 2008, the MOH received a Global Fund Round 7 grant to target 20 districts in the three southeastern provinces, covering 90 percent of the population at risk, with the goal of reducing local transmission by 80 percent through early detection, prompt and effective treatment, and the expansion of free malaria diagnostic and treatment services.<sup>19</sup> A Global Fund Round 10 grant in 2011 supported the development of a malaria early warning system and epidemic preparedness plan and funded increased training of microscopists, rural malaria mobile teams, and community volunteers in targeted areas.<sup>8</sup> Cases declined by 87% with the onset of Global Fund support, from 13,278 in 2007 to 1,710 in 2011.<sup>1</sup>

## Eligibility for External Funding<sup>21-23</sup>

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

## Economic Indicators<sup>24</sup>

GNI per capita (US\$)	\$7,120
Country income classification	Upper middle
Total health expenditure per capita (US\$)	\$432
Total expenditure on health as % of GDP	7
Private health expenditure as % of total health expenditure	59

In 2010, Iran's National Strategic Plan for Malaria Elimination was ratified by the central government and the local governments of the three endemic southeastern provinces. The plan is centered around scale-up of IVM, expanded access to prompt diagnosis and treatment, and strengthening of surveillance, supported by monitoring and evaluation, operational research, and building and maintaining capacity of human resources. There is strong political support for elimination within the country and the region, and Iran has considerable academic expertise to draw upon from its local universities to guide elimination strategy development.<sup>7,20</sup> With only 376 local cases reported in 2014, Iran is very likely to achieve elimination well before 2025.

## Challenges to Eliminating Malaria

### Cross-border importation

The vast majority of malaria cases in Iran occur in its southeastern provinces that share or are near the border with Pakistan. Uncontrolled population movement across the Pakistan border, and, to a lesser extent, the border with Afghanistan, leads to continued importation of malaria. Malaria control is less of a priority and operations are not as robust in these countries as compared to Iran, and in 2013, Pakistan and Afghanistan reported 281,755 and 39,263 malaria cases, respectively.<sup>1</sup> Thus, the threat of importation of malaria into Iran presents an ongoing challenge.

## Conclusion

Iran has made considerable progress in reducing its malaria burden over the last two decades. Although it faces a significant risk of malaria importation across its eastern border, Iran is working to improve its cross-border collaborations, particularly with regard to data exchange and coordination of interventions. Further, strengthened surveillance, outbreak preparedness, and rapid identification of transmission foci will put Iran in an excellent position to achieve malaria elimination well before its 2025 goal.



## Sources

1. Global Malaria Programme. World Malaria Report 2015. Geneva: World Health Organization; 2015.
2. Sinka ME, Bangs MJ, Manguin S, Coetzee M, Mbogo CM, Hemingway J, et al. The dominant Anopheles vectors of human malaria in Africa, Europe and the Middle East: occurrence data, distribution maps and biometric precis. *Parasit Vectors* 2010; 3: 117.
3. Manguin S, Carnevale P, Mouchet J, editors. Biodiversity of Malaria in the World. London: John Libbey Eurotext; 2008.
4. Raeisi A. Malaria elimination in Islamic Republic of Iran, Achievements and Challenges. Al Ain, United Arab Emirates: The Seventh Malaria Elimination Group Meeting; 2012.
5. Sadrizadeh B. Malaria in the World, in the Eastern Mediterranean Region and in Iran: Review Article. *WHO/EMRO Report* 2001; 1: 13.
6. Hemami MR, Sari AA, Raeisi A, Vatandoost H, Majdzadeh R. Malaria Elimination in Iran, Importance and Challenges. *Int J Prev Med* 2013; 4(1) 88–94.
7. Raeisi A, Gouya MM, Nadim A, Ranjbar M, Hasanzehi A, Fallahnezhad M, et al. Determination of Malaria Epidemiological Status in Iran's Malarious Areas as Baseline Information for Implementation of Malaria Elimination Program in Iran. *Iranian J Publ Health* 2013; 42(3): 326–333.
8. Country Coordinating Mechanism Iran. Elimination of *falciparum* malaria in priority areas in the Islamic Republic of Iran. Round 10 Proposal: The Global Fund to Fight AIDS, Tuberculosis and Malaria; 2010.
9. Edrissian, G., Malaria in Iran: Past and Present Situation. *Iranian J Parasitol* 2006; 1(1): 1–14.
10. Ziony M. Malaria Control in Iran. *Public Health Reports* 1950; 65(11): 351–367.
11. Palmquist EE, Aldridge FF. Malaria Control in Iran. *Public Health Reports* 1954; 69(10): 976–981.
12. World Health Organization. Information on the Malaria Control Programme in Iran. Inter-Regional Conference on Malaria for the Eastern Mediterranean and European Regions, 1956; WHO/Mal/163.21.
13. Mofidi CMH. A Medicated Salt Project in the Kazeroun Area, Iran: Preliminary Report 1962–1965. World Health Organization, 1966; WHO/Mal/66.569.
14. Samimi B, Motabar M, Rouhani F. Report on the Evaluation of Baygon, 50% w/w in Shabankareh Area, Southern Iran, 1966. World Health Organization, 1968; WHO/Mal/68.646.
15. Samimi B, Motabar M, Rouhani R, Mottaghi M. A Field Trial Using Dichlorvos in Mamasani Area, Kazeroun, Southern Iran 1965–1966. World Health Organization, 1969; WHO/Mal/69.677.
16. Tabibzadeh I, Behbehani G, Nakhai R. Use of Gambusia Fish in the Malaria Eradication Programme of Iran. World Health Organization, 1970; WHO/Mal/70.716.
17. Motabar M, Behbehani G. Nomadism and the Problem of Malaria Eradication in Southern Iran. World Health Organization, 1973; WHO/Mal/73.813.
18. World Health Organization Regional Office of the Eastern Mediterranean. First Border Meeting: Afghanistan, Iran and Pakistan. Chabahar, IR Iran: WHO EMRO; 2003.
19. The Global Fund to Fight AIDS, Tuberculosis and Malaria. Round 7: Malaria Intensified Control in High Burden Provinces of South Eastern Iran. 2008: IR Iran.
20. Raeisi A, Mirkhani V, Alkaran FN, Jalali BP, Faraji L, Keykha MR, Tabatabaie SM. Poster presentation: Achievements of malaria elimination program in the face of a difficult situation of population movement with appropriate use of available resources, involvements of research entities and academia. *Malar J* 2014; 13(Suppl 1): P75.
21. International Development Association. IDA Borrowing Countries. 2014. [Available from: <http://www.worldbank.org/ida/borrowing-countries.html>].
22. President's Malaria Initiative. PMI Focus Countries. 2014. [Available from: <http://www.pmi.gov/where-we-work>].
23. 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/)].
24. The World Bank. World Development Indicators Database. 2014. [Available from: <http://data.worldbank.org/data-catalog/world-development-indicators>].

## Transmission Limits Maps Sources

- Guerra, CA, Gikandi, PW, Tatem, AJ, Noor, AM, Smith, DL, Hay, SI and Snow, RW. (2008). The limits and intensity of *Plasmodium falciparum* transmission: implications for malaria control and elimination worldwide. *Public Library of Science Medicine*, 5(2): e38.
- 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 (MEI), in collaboration with the WHO Regional Office for the Eastern Mediterranean. 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.

[shrinkingthemalariamap.org](http://shrinkingthemalariamap.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.

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