



# Eliminating malaria in VIETNAM

Vietnam achieved a 93 percent reduction in reported malaria cases between 2000 and 2015 and aims to eliminate malaria by 2030.

## Overview

Malaria morbidity and mortality in Vietnam decreased significantly between 2000 and 2015, with a 93 percent decline in malaria cases (from 274,910 down to 19,252 cases) and a 98 percent decline in malaria deaths (from 142 down to 3 deaths).<sup>1-3</sup> All five *Plasmodium* species have been identified in the country; *P. falciparum* accounts for 64 percent of all reported cases, as well as most asymptomatic malaria infections.<sup>1,4,5</sup> Malaria transmission is primarily attributed to three vector species: *Anopheles minimus*, *An. dirus*, and *An. epiroticus*, though more than twenty anopheles species have been detected in Vietnam.<sup>1,6,7</sup> Transmission is concentrated in the central and southern provinces of Tay Nguyen highlands, with seasonal peaks between May to June and October to November.<sup>8</sup>

Although sustained vector control and improved diagnostics and treatment have succeeded in reducing the malaria burden in most of Vietnam, malaria continues to pose a threat to communities inhabiting remote forest, forest-fringe, and mountainous regions, and disproportionately affects ethnic minorities, forest workers, and migrants in cross-border areas.<sup>6,9</sup> Undetected malaria parasites in central Vietnam and antimalarial drug resistance remain barriers to malaria elimination.

Vietnam's success in malaria control and elimination is attributed to widespread distribution of insecticide-treated bed nets (ITNs) and later, long lasting insecticidal nets (LLINs), extensive community education, and diversified vector control interventions in high-risk populations.<sup>10</sup> In addition, utilization of rapid diagnostic tests (RDTs) has reduced the likelihood of misdiagnosis and inappropriate treatment with antibiotics, which contributes to antimalarial drug resistance in Vietnam.<sup>11</sup> To curb the threat of drug-resistance, Vietnam is coordinating its malaria control efforts with its neighbors in the Greater Mekong Subregion (GMS) by participating in the Regional Artemisinin Initiative (RAI) and is aiming to eliminate *P. falciparum* malaria by 2025.<sup>12,13</sup>

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

- 19,252** Total cases of malaria  
(64% *P. falciparum*)
- 3** Deaths from malaria
- 74** % of population at risk  
(total population: 92.4 million)
- 0.21** Annual parasite incidence  
(cases/1,000 total population/year)
- 0.42** % Slide positivity rate

Vietnam is aiming to eliminate all malaria by 2030. Political support for this goal is strengthened through the country's participation in the Asia Pacific Malaria Elimination Network (APMEN), a network composed of 18 Asia Pacific countries and other partners working to eliminate malaria in the region, and the Asia Pacific Leaders Malaria Alliance (APLMA).<sup>14,15</sup> The APLMA Elimination Roadmap emphasizes regional cooperation and cross-border collaboration to achieve malaria elimination in the Asia Pacific region by 2030.<sup>15</sup>

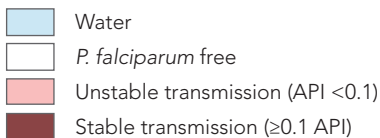
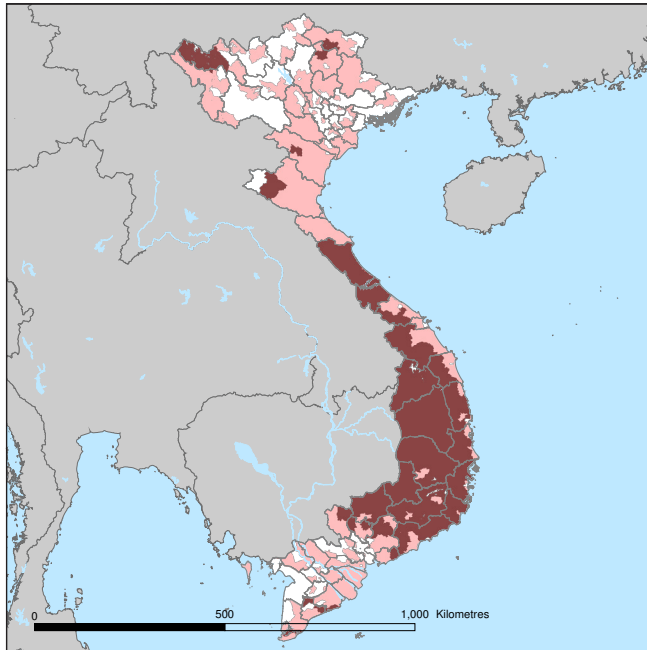
## Progress Toward Elimination

Vietnam was divided into two autonomous regions—North Vietnam and South Vietnam—until 1975 and operated separate health programs during this period.<sup>16</sup> North Vietnam experienced a remarkable decline in malaria mortality and morbidity after the launch of its malaria program focused on case management and indoor residual spraying (IRS), with a decrease in slide positivity rates from 5.6 percent in 1958 to 0.3 percent in 1964. However, the Vietnam War reversed progress toward elimination: the slide positivity rate increased to 0.7 percent by 1973.<sup>17</sup> Health services in South Vietnam were especially affected by the war; most health facilities lacked electricity, drinking water, and sanitation and

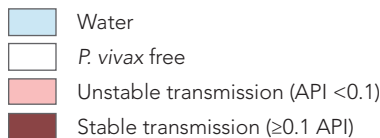
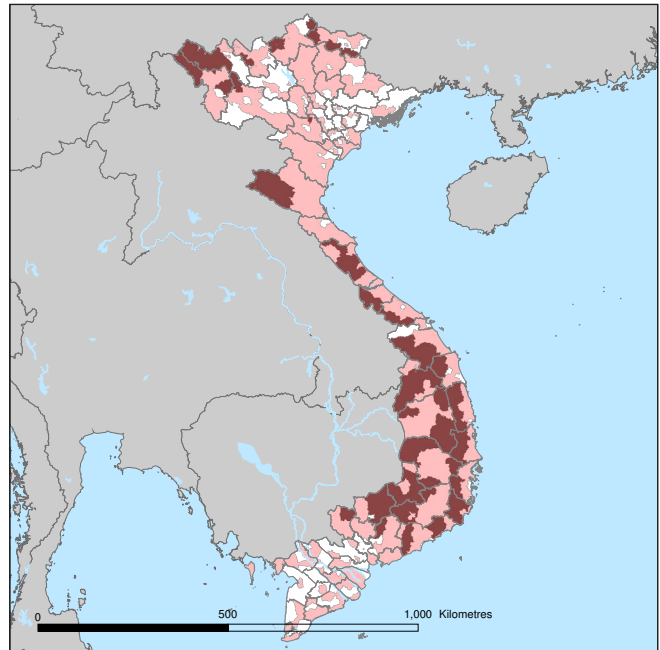


## Malaria Transmission Limits

### *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 region did not have the institutional capacity to manage a malaria control program.<sup>18</sup> Disrupted supplies of antimalarial drugs and insecticides, the interruption of DDT spraying, the migration of vulnerable individuals, and a weak health system all contributed to the increase in cases throughout the country.<sup>17</sup>

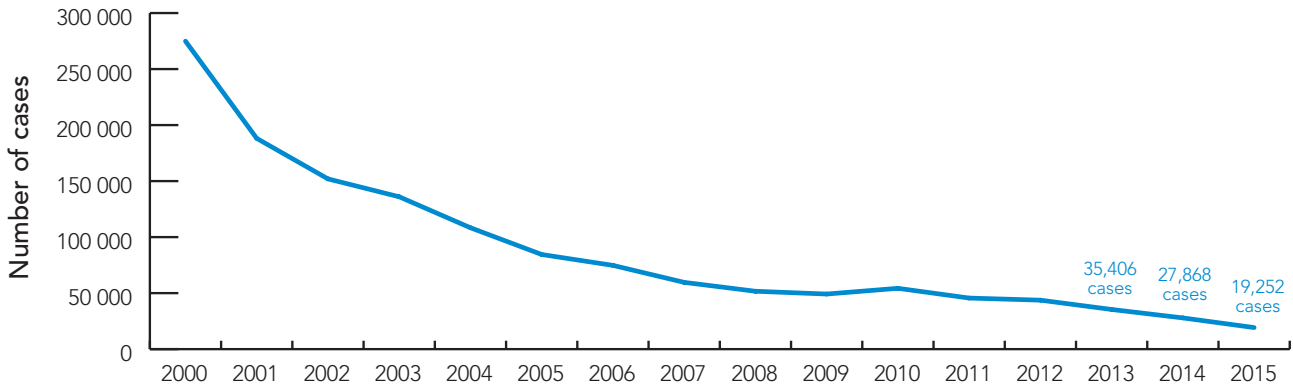
Although North Vietnam's malaria program was expanded to encompass the southern part of the country after the reunification in 1976, malaria cases and deaths increased through the mid-1980s; by 1986 over a million cases were recorded with almost 2,000 deaths.<sup>16,17,19</sup> A peak was reached in 1991, with more than 4,000 reported deaths.<sup>19</sup> The impact of the malaria program was weakened by antimalarial drug failure among *P. falciparum* infections, which increased in the 1980s

and early 1990s.<sup>19</sup> Lack of resources and weak health structures exacerbated the situation.

By 1991, the government shifted its strategy to malaria control and established the National Malaria Control Program (NMCP); interventions included distribution of ITNs, intensified IRS activities, and community health education.<sup>17,19</sup> Between 1991 and 1995, the malaria program budget increased from \$500,000 USD to more than \$6 million USD, the largest amount dedicated to any single disease in Vietnam at the time.<sup>17</sup> The NMCP introduced artemisinin-based combination therapy (ACT) between 1992 and 1997 to treat confirmed cases of *P. falciparum* malaria. In addition, the NMCP partnered with nongovernmental organizations to distribute free ITNs in high-endemic areas between 1991



## Reported Malaria Cases\*



Vietnam's decline in malaria cases is attributed to sustained vector control and improved diagnosis and treatment, though elimination is contingent upon continued funding and a robust program.

\*Vietnam does not distinguish between local and imported infections when reporting case numbers

Source: National Institute of Malaria, Parasitology and Entomology, 2016

- Goals:**<sup>6</sup>
- Reduce malaria morbidity to below 0.15 per 1,000 population by 2020
  - Reduce malaria mortality to below 0.02 per 100,000 population by 2020
  - Achieve national malaria elimination by 2030

and 1996; after 1996, the Government budgeted funds for further distribution of ITNs in poor areas and partnered with UNICEF and the Women's Union to subsidize this expense for others.<sup>17</sup> By 2000, malaria cases had decreased to 293,000 cases and only 148 deaths.<sup>19</sup> Vietnam's success in reducing malaria deaths and cases can be attributed to increased political support and funding and the subsequent strengthening of the malaria program.<sup>19</sup>

With support from the Global Fund (Round 3 grant), Vietnam was able to improve access and utilization of malaria prevention measures, surveillance, diagnosis, and treatment.<sup>20</sup> Vietnam received additional Global Fund support through a Round 7 grant in 2008 to expand key malaria interventions to high-risk communities, such as mobile populations and ethnic minority groups inhabiting remote areas.<sup>21</sup>

In 2011, the Vietnamese government launched the National Malaria Control and Elimination Program with the goal of national malaria elimination by 2030.<sup>6</sup> Elimination strategies include improved surveillance, greater utilization of rapid diagnostic tests (RDTs) to diagnose malaria cases, intensified community education, and diversified vector control interventions for high-risk populations.<sup>10,11</sup>

## Eligibility for External Funding<sup>22-24</sup>

The Global Fund to Fight AIDS, Tuberculosis and Malaria	Yes
U.S. Government's President's Malaria Initiative	Yes*
World Bank International Development Association	Yes

\*PMI support for the Greater Mekong Subregion includes Vietnam; the country is not eligible for national support from PMI.



## Economic Indicators<sup>25</sup>

GNI per capita (US\$)	\$1,890
Country income classification	Lower middle
Total health expenditure per capita (US\$)	\$111
Total expenditure on health as % of GDP	6
Private health expenditure as % total health expenditure	58

## Challenges to Eliminating Malaria

### Asymptomatic parasitaemia

Recent utilization of polymerase chain reaction (PCR) tests, which are more specific and sensitive than traditional methods of malaria diagnosis, has revealed hidden *Plasmodium* reservoirs in central and southern Vietnam.<sup>5,24</sup> Although the prevalence of asymptomatic malaria is unknown, a study conducted in the forested areas of central Vietnam suggests PCR tests were able to detect 300 percent more malaria cases than microscopy (77 cases versus 26 cases).<sup>26</sup> Other studies conducted in Vietnam report similar findings, suggesting the national malaria burden is greater than previously understood.<sup>5</sup> This is particularly true in high transmission areas with partial herd immunity.

The existence of hidden malaria has implications for elimination; infected individuals who do not develop symptoms are not prompted to seek treatment, inadvertently contributing to ongoing transmission in the region. Specialized interventions that target asymptomatic malaria, including mass drug administration (MDA), mass screen and test (MSaT), and focused screen and test (FSaT), could help to mitigate this problem.<sup>27</sup> If implemented, these interventions should be paired with vector control and robust surveillance to minimize malaria resurgence.

### Confirmed artemisinin resistance

*P. falciparum* resistance to artemisinin was first detected in Binh Phuoc in 2010 and has since been confirmed in other provinces in central and southern Vietnam, including Gia Lai, Dak Nong, Quang Nam, and Khanh Hoa.<sup>3,28,29</sup> Because ACTs are considered the most effective antimalarial medication, reduced artemisinin effectiveness could hamper elimination efforts. This is especially true in areas with high rates of *P. falciparum*, as these parasites have likely developed resistance to other antimalarial drugs, including chloroquine, quinine, and sulfadoxine/pyrimethamine.<sup>30</sup> Scaling up of prevention and control efforts and improved surveillance of asymptomatic malaria is required to minimize the spread of artemisinin-resistant parasites.

Under the Regional Artemisinin Initiative, the Global Fund granted Vietnam \$15 million USD to implement activities to reduce antimalarial drug resistance, including the distribution of LLINs and hammock nets and monitoring of antimalarial drugs.<sup>12</sup> Although these steps have assisted the country in controlling the spread of drug-resistant malaria, complete elimination of *P. falciparum* malaria will be required to fully address this challenge. In September 2014, the Malaria Policy Advisory Committee proposed a regional strategy to eliminate *P. falciparum* malaria in the Greater Mekong Subregion by 2025.<sup>13</sup> Affected countries, including Vietnam, adopted the strategy and were advised to incorporate proposed activities into their malaria elimination plans by the end of 2015.

## Conclusion

Although intensified malaria control activities have reduced cases and deaths, malaria remains a concern to communities inhabiting mountainous and remote highlands due to increased exposure to vectors, reduced access to health services, and *P. falciparum* resistance to antimalarial drugs. Continued support from international and coordinated regional collaboration will help Vietnam achieve its goal of national elimination by 2030.



## Sources

1. WHO Global Malaria Programme. World Malaria Report 2015. Geneva: World Health Organization; 2015.
2. WHO Global Malaria Programme. World Malaria Report 2008. Geneva: World Health Organization; 2008.
3. Thang N. Vietnam National Institute of Malariology, Parasitology, and Entomology, Personal Communication. 2016.
4. Marchand RP, Culleton R, Maeno Y, Quang NT, Nakazawa S. Co-infections of *Plasmodium knowlesi*, *P. falciparum*, and *P. vivax* among Humans and *Anopheles dirus* Mosquitos, Southern Vietnam. *Emerg Infect Dis*. 2011 Jul;17(7):1232–9.
5. Imwong M, Nguyen TN, Tripura R, Peto TJ, Lee SJ, Lwin KM. The epidemiology of subclinical malaria infections in South-East Asia: findings from cross-sectional surveys in Thailand–Myanmar border areas, Cambodia, and Vietnam. *Malar J*. 2015;14(381):1–13.
6. National Institute of Malariology, Parasitology and Entomology. National monitoring and evaluation plan for malaria control & elimination in Viet Nam for the period 2011-2020. Vietnam Ministry of Health; 2011.
7. Ngo CT, Dubois G, Sinou V, Parzy D, Le HQ, Harbach RE, et al. Diversity of *Anopheles* mosquitos in Binh Phuoc and Dak Nong provinces of Vietnam and their relation to disease. *Parasit Vectors*. 2014;7(316):1–12.
8. Erhart A, Thang ND, Hung NQ, Toi le V, Hung le X, Tuy TQ, et al. Forest malaria in Vietnam: a challenge for control. *Am J Trop Med Hyg*. 2004;70(2):110–118.
9. The Global Fund to Fight Aids, Tuberculosis, and Malaria. Grant Performance Report. 2015.
10. Barat LM. Four malaria success stories: How malaria burden was successfully reduced in Brazil, Eritrea, India, and Vietnam. *Am J Trop Med Hyg*. 2006 Jan;74(1):12–6.
11. Phuong HL, Nga TT, Giao PT, Hung LQ, Binh TQ, Nam NV, et al. Randomised primary health center based interventions to improve the diagnosis and treatment of undifferentiated fever and dengue in Vietnam. *BMC Health Serv Res*. 2010;10:275.
12. Asia Pacific Malaria Elimination Network. About Us - Asia Pacific Malaria Elimination Network [Internet]. 2015. Available from: <http://apmen.org/about>.
13. The Regional Artemisinin-resistance Initiative. About [Internet]. Regional Artemisinin-resistance Initiative (RAI). 2016. Available from: <http://www.raifund.org/en/about-us>.
14. World Health Organization. Strategy for Malaria Elimination in the Greater Mekong Subregion (2015-2030) [Internet]. WHO Western Pacific Regional Office; 2015. Available from: [http://www.who.int/malaria/areas/greater\\_mekong/national-strategies-plans/en](http://www.who.int/malaria/areas/greater_mekong/national-strategies-plans/en).
15. Asia Pacific Leaders' Malaria Alliance. APLMA Malaria Elimination Roadmap [Internet]. 2015. Available from: <http://aplma.org/blog/24/East-Asia-Summit-leaders-endorse-APLMA-Malaria-Elimination-Roadmap>.
16. Thuan LK. Evaluation of the malaria control in 2002 and plan of action for 2003-2004 [Internet]. 2003. Available from: <http://www.actmalaria.net/downloads/pdf/info/2003/Vietnam.pdf>.
17. Schuftan C. A Story to be shared: the successful fight against malaria in Vietnam. *Afr Netw Health Res Dev*. 2000.
18. Sidel, V, Levy, B.S. War and Public Health. Oxford University Press; 1997. 219-221 p.
19. Ettling, MB. The Control of Malaria in Viet Nam from 1980 to 2000: What went right? WHO Regional Office for the Western Pacific; 2002.
20. Viet Nam's National Malaria Control Programme (NMCP). Round 4 proposal: to consolidate and sustain the achievement of the last decade and to decisively roll back malaria in the remaining high risk areas. The Global Fund to Fight AIDS, Tuberculosis and Malaria: Vietnam; 2004.
21. Viet Nam's National Malaria Control Programme (NMCP). Round 7 proposal: intensify community-based malaria control targeting key risk groups, and enhance the functionality and sustainability of Viet Nam's malaria control efforts. The Global Fund to Fight AIDS, Tuberculosis and Malaria: Vietnam; 2007.
22. The Global Fund to Fight AIDS, Tuberculosis and Malaria. GFATM Eligibility List 2014 [Internet]. 2014. Available from: [http://www.theglobalfund.org/en/fundingmodel/updates/2014-02-04\\_Eligibility\\_List\\_for\\_2014\\_now\\_available](http://www.theglobalfund.org/en/fundingmodel/updates/2014-02-04_Eligibility_List_for_2014_now_available).
23. President's Malaria Initiative. PMI Focus Countries [Internet]. 2016. Available from: <http://www.pmi.gov/where-we-work>.
24. International Development Association. IDA Borrowing Countries. 2016.
25. The World Bank. World Development Indicators Database [Internet]. 2014. Available from: <http://data.worldbank.org/data-catalog/world-development-indicators>.
26. Thanh PV, Van Hong N, Van Van N, Van Malderen C, Obsomer V, Rosanas-Urgell A, et al. Epidemiology of forest malaria in Central Vietnam: the hidden parasite reservoir. *Malar J*. 2015;14:86.
27. Lindblade KA, Steinhart L, Samuels A, Kachur SP, Slutsker L. The silent threat: asymptomatic parasitemia and malaria transmission. *Expert Rev Anti Infect Ther*. 2014 Jan;11(6):623–39.
28. Thanh NV, Toan TQ, Cowman AF, Casey GJ, Phuc BQ, Tien NT, et al. Monitoring for *Plasmodium falciparum* drug resistance to artemisinin and artesunate in Binh Phuoc Province, Vietnam: 1998-2009. *Malar J*. 2010;9:181.
29. World Health Organization. Status report on artemisinin resistance [Internet]. 2014. Available from: <http://www.who.int/malaria/publications/atoz/status-rep-artemisinin-resistance-sep2014.pdf>.
30. Ngo T, Duraisingh M, Reed M, Hipgrave D, Biggs B, Cowman AF. Analysis of pfprt, pfmdr1, dhfr, and dhps mutations and drug sensitivities in *Plasmodium falciparum* isolates from patients in Vietnam before and after treatment with artemisinin. *Am J Trop Med Hyg*. 2003 Mar;68(3):350–6.



## 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. 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. Find MAP online at: [www.map.ox.ac.uk](http://www.map.ox.ac.uk).

