



Eliminating malaria in BHUTAN

Bhutan achieved a 99 percent decline in reported malaria cases between 2000 and 2014 and aims to eliminate malaria by 2018.

Overview

Bhutan is a small, landlocked country with a mountainous terrain and a mostly rural population. The country has experienced an impressive decline in malaria incidence in the past two decades, and is classified in the pre-elimination phase by the World Health Organization (WHO). Cases peaked at nearly 40,000 in 1994 and dropped to just 19 local cases in 2014.^{1,2} Malaria in Bhutan is caused by both *Plasmodium falciparum* and *P. vivax*; in 2014, *P. vivax* accounted for nearly two-thirds of all malaria cases in Bhutan.^{1,3} *Anopheles culicifacies* and *An. pseudowillmori* are suspected as the current primary vectors for malaria transmission, while *An. maculatus*, *An. minimus*, *An. fluviatilis*, and *An. dirus* have all been implicated as important vectors in the past.^{3,4}

Bhutan typically has two transmission peaks according to rainfall patterns; the first occurs in April–May, and the second in August–September. However, the seven districts with the highest malaria burden, located along the southern border with the Indian states of Arunachal Pradesh, Assam, and West Bengal, have perennial transmission. Of the remaining thirteen districts in Bhutan, eight have low or potential transmission during the rainy summer months, and five are at high enough altitude that there is no local transmission.⁴ The groups most at risk of malaria are males, specifically farmers, students and migrant workers, due to various occupational factors including traveling to India for business or working in the fields or forests. The seven high-transmission districts are also at high risk for cross-border importation of malaria from India.^{4,5}

The Vector-borne Disease Control Program (VDCP) of Bhutan launched a strategic plan for phased malaria elimination in 2011, targeting 2016 for elimination of malaria in the eight districts with seasonal transmission while reducing incidence in the seven high-transmission districts.⁶ However, in light of the impressive reduction of transmission in all districts since the launch of the phased elimination plan, Bhutan revised its goal to national elimination by 2018.^{2,4} Political support for

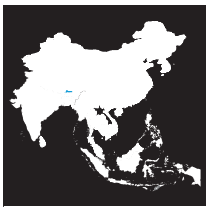
At a Glance^{1,2}

- 19** Local cases of malaria
(65% *P. vivax*)
- 0** Deaths from malaria
(Last death reported in 2012)
- 16** % population living in areas of active transmission
(total population: 0.8 million)
- 0.02** Annual parasite incidence
(cases/1,000 population at risk/year)
- 0.07** % slide positivity rate

this goal is strengthened through Bhutan's membership 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.^{7,8}

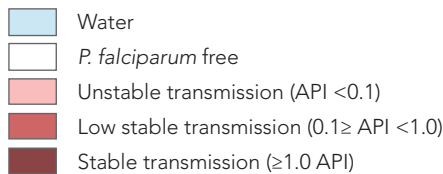
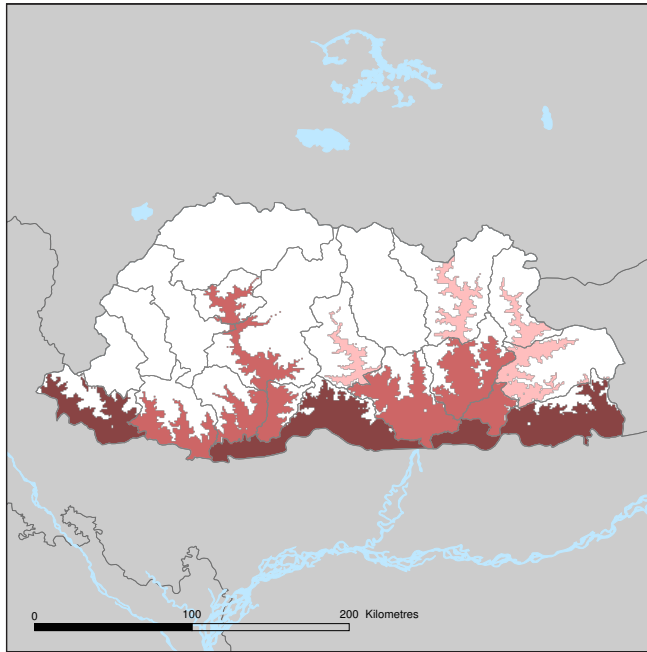
Progress Toward Elimination

Bhutan's National Malaria Eradication Programme (NMEP), one of the oldest health programs in the country, was established in the early 1960s with the technical and financial support of the Government of India. A pre-eradication survey conducted at this time indicated a parasite prevalence of 11–56% among children in malaria endemic villages.⁹ Indoor residual spraying (IRS) with DDT, procured by the Government of India, was introduced in 1962 when the malaria burden was low, with only 518 reported cases.⁵ Through case management and vector control, annual parasite incidence decreased from 5.5 percent in 1965 to only 1.2 percent in 1968.¹⁰ Active case detection was initiated in 1969 through the establishment of malaria centers in the endemic districts.^{9,10} However, despite these efforts, cases began to increase in the 1970s, and the percentage of cases due to *P. falciparum* rose dramatically from 12 percent of cases in

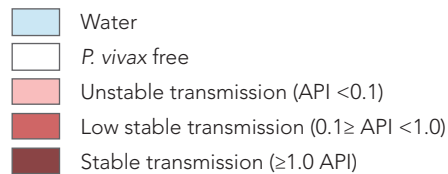
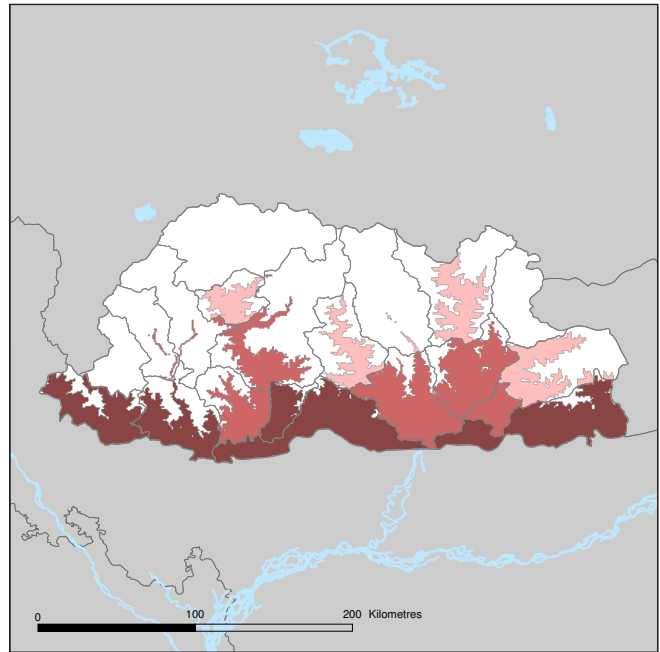


Malaria Transmission Limits

Plasmodium falciparum



Plasmodium vivax



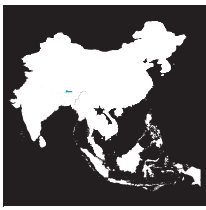
P. falciparum/*P. vivax* malaria risk is classified into no risk, unstable risk of <0.1 case per 1,000 population (API), low stable risk of ≥0.1 to <1.0 case per 1,000 population (API), and stable risk of ≥1.0 case per 1,000 population (API). Risk was defined using health management information system 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.

1968 to 57 percent of cases by 1975. An increase in density of the *An. maculatus* vector was the suspected cause of this trend.^{3,10}

Total malaria cases from 1976 to 1983 fluctuated between 3,500 and 5,000, but an outbreak in 1984 caused cases to spike to over 18,000.¹¹ *P. falciparum* resistance to chloroquine was first reported in 1984, followed by resistance to sulfadoxine-pyrimethamine in 1989 in Sarpang District. From 1984 to 1994, malaria prevalence steadily increased to Bhutan's historic peak of 39,852 cases in 1994.^{1,12} By 1996, *P. falciparum* totaled 63 percent of all malaria cases in the highly-endemic southern districts of Sarpang and Samdrup Jongkhar. The observed increase in case burden and the proportion of

cases due to *P. falciparum* has been attributed to the rise of both drug resistance and DDT resistance in Bhutan's malaria endemic districts.^{3,13}

By 1992, the NMEP was no longer pursuing elimination as a goal and had changed to the National Malaria Control Programme (NMCP). In 1995, Bhutan banned the use of DDT and began using pyrethroids, specifically deltamethrin, which led to an 85 percent decrease in cases between 1994 and 2000.^{1,13} In addition, the NMCP began distributing insecticide-treated bed nets (ITNs), introduced temephos and *Bacillus thuringiensis* for larval control, and initiated efforts to strengthen surveillance and effective treatment.^{3,13} In 2003, the NMCP was incorporated into Bhutan's Vector-



borne Disease Control Programme (VDCP), along with other disease programs including dengue, kala-azar, and Japanese encephalitis.¹¹ By this time, ITNs had become the primary vector control intervention and IRS with deltamethrin had been phased out. However, due to low coverage with ITNs, focal IRS was reintroduced in 2004 in areas with the most cases and deaths and highest proportion of *P. falciparum* infections.^{9,11}

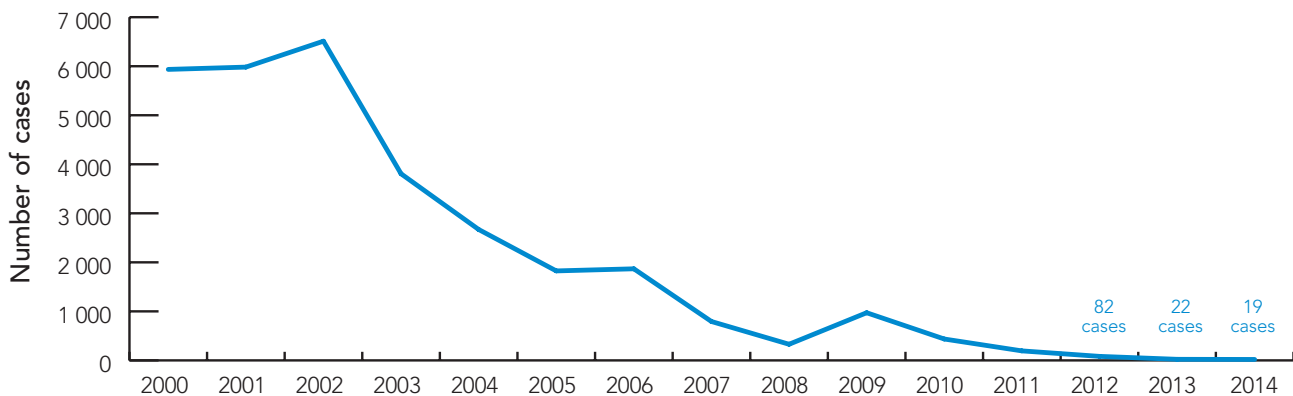
From 2005 to 2010, the VDCP was supported by a Global Fund Round 4 grant for enhanced malaria control through community outreach to epidemic-prone districts, targeting the 15 most-affected malaria districts by training health care providers in quality-assured diagnosis and treatment of malaria. In 2006, artemether-lumefantrine, an artemisinin-based combination therapy (ACT), became the first-line treatment for *P. falciparum* infections, and distribution of long-lasting insecticide treated nets (LLINs) to the five high-risk districts along the southern border commenced, gradually replacing ITNs.¹⁵ Beginning in 2008, a Global Fund Round 7 grant supported the scale-up and continuation of existing program activities—including LLIN distribution, focal IRS, early diagnosis and prompt treatment, and deployment of village health workers to remote areas—in all affected districts, with a goal to achieve a 50 percent reduction in malaria-related

cases and deaths by 2013 compared with 2005.¹⁶ In fact, this goal was achieved by 2010 when cases and deaths fell to 436 and 2, respectively.^{1,2}

As a result of the rapid success of the VDCP's malaria program since the onset of Global Fund support, a strategic plan for phased malaria elimination by 2020 was launched in 2011, guided by five main objectives: 1) Intensify vector control and other preventive measures; 2) provide early diagnosis and prompt treatment; 3) strengthen surveillance; 4) strengthen technical and managerial capacities for elimination; and 5) sustain political and inter-sectoral support for elimination.⁶ However, as the program was strengthened and cases continued to decline, in 2014 the VDCP revised its strategic plan with a more ambitious goal of malaria elimination by 2018.^{2,4}

Objectives are similar under the new strategic plan; however, new priorities include regular microstratification using Geographic Information System mapping to improve intervention targeting, social mobilization for community awareness, establishment of a national quality assurance system for malaria diagnosis, more extensive case investigation and reactive case detection, and expansion of cross-border collaboration with India.⁴

Reported Malaria Cases*



Bhutan's malaria burden decreased significantly between 2000 and 2014, from nearly 6,000 to just 19 cases, as a result of improved surveillance, prompt and effective treatment, and targeted vector control.

*Graph shows total reported cases through 2011; as of 2012, only local cases are shown.

Source: World Health Organization, World Malaria Report 2015; Bhutan VDCP



- Goals:**^{2,3}
1. Eliminate malaria by 2018
 2. Obtain World Health Organization malaria-free certification by 2020

Eligibility for External Funding¹⁷⁻¹⁹

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

Economic Indicators²⁰

GNI per capita (US\$)	\$2,370
Country income classification	Lower middle
Total health expenditure per capita (US\$)	\$90
Total expenditure on health as % of GDP	4
Private health expenditure as % total health expenditure	26

Challenges to Eliminating Malaria

Cross-border challenges with India

The vast majority of malaria cases in Bhutan in recent years have come from the seven districts along the border with India. These districts are under development, with many new construction and mega-hydroelectricity projects attracting domestic and foreign workers. Malaria cases among foreign migrant workers as compared to Bhutanese nationals have been higher in recent years, increasing the risk of reintroduction of malaria in districts that have already eliminated, and increasing the likelihood of outbreaks in the seven border districts.^{2,4}

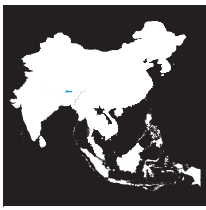
In addition to frequent cross-border movement into and out of Bhutan for employment opportunities, many Indians living in remote communities along the border will seek out health care, including malaria treatment, in Bhutan. Because the Bhutan-India border is porous, population movement is largely unregulated, making malaria surveillance and case management very difficult. Under the new strategic plan, Bhutan will engage India and other international partners to address public health issues at regular border meetings, conduct joint malaria activities, and improve surveillance and data sharing.^{4,9}

Limited institutional and human resource capacity

Bhutan faces a shortage of skilled personnel, particularly trained epidemiologists and entomologists to monitor efficacy of drugs and vector control interventions. The program also needs to strengthen its capacity for communication and advocacy, operational research, and information technology to support its geographical reconnaissance efforts for surveillance. Bhutan's new elimination plan has identified these gaps as well as strategies to fill them, including the establishment of a Center for Tropical & Zoonotic Diseases to conduct training courses, and the formation of a Malaria Elimination Commission and Technical Committee to monitor and advise on program activities.⁴

Early diagnosis and prompt treatment

Long travel distances to health facilities and rugged, mountainous terrain often prevent people living in remote areas from promptly seeking malaria treatment. Additional delays occur because many Bhutanese consult religious leaders or local healers on malaria treatment before seeking medical assistance at a health facility. Lack of accessibility to health services also presents a challenge to surveillance if these patients are not documented, and poses a risk for outbreaks and increased transmission if malaria is left untreated. Bhutan has a goal to treat all febrile patients within 24 hours of the onset of fever and within one hour of arrival at a health facility, and these practices are being encouraged through community education efforts.^{4,21}



Conclusion

Despite the challenges it faces, Bhutan benefits from strong national and regional political support for malaria elimination and financial support from the Government of India and

the Global Fund. With continued strengthening of program capacity and surveillance, and ongoing collaboration with India to address cross-border importation, Bhutan is in an excellent position to achieve elimination by 2018.

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Transmission Limits Maps Sources

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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 Bhutan Vector-borne Disease Control Program. 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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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.

