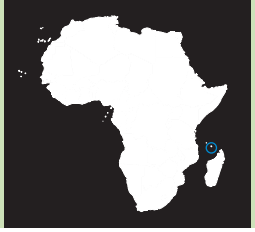
COUNTRY BRIEFING



Eliminating malaria in MAYOTTE, FRANCE

Mayotte reported only 11 local malaria cases in 2013 and is making remarkable progress towards elimination.

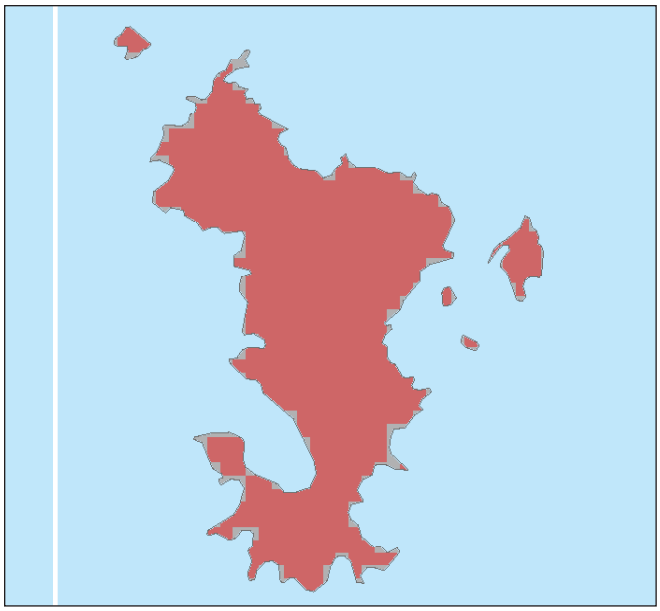
At a Glance[2]

11	**Local cases of malaria*** (100 % *P. falciparum*)
0	**Deaths from malaria**
0	**% population living in areas of active transmission** (total population: 0.2 million)
0.05	**Annual parasite incidence** (cases/1,000 total population/year)
N/A	**% slide positivity rate**

N/A: Data not available

Malaria Transmission Limits

Plasmodium falciparum



P. falciparum 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.

Overview

Mayotte is part of the Comoros archipelago, located in the Indian Ocean between the island of Madagascar and Mozambique on the east coast of mainland Africa. Mayotte has been governed by France since 1841, and after gaining independence in 1975 along with the other Comoros islands, opted to remain an overseas department of France. The territory is made up of two islands, Mahoré and Pamanzi, and several small islets; the majority of the population lives along the coastline of Mahoré.[1] While Mayotte's malaria burden has always been relatively low, the territory has achieved a remarkable 99 percent decline in malaria cases since 2003, reporting just 11 local cases in 2013. All of the cases reported in 2013 were due to *Plasmodium falciparum*, although a handful of *P. vivax* cases have been detected in recent years.[2] *Anopheles gambiae* is the primary vector responsible for malaria transmission. *An. funestus* was eradicated from Mayotte in the 1980s but reappeared two decades later and now plays a secondary role in transmission.[3,4]

Mayotte has a humid, tropical climate with a rainy season from October to March. Malaria transmission occurs year-round, but peaks during the rainy months.[4] As a result of the increased pace of development in recent years, as well as the expansion of malaria control interventions, there are no

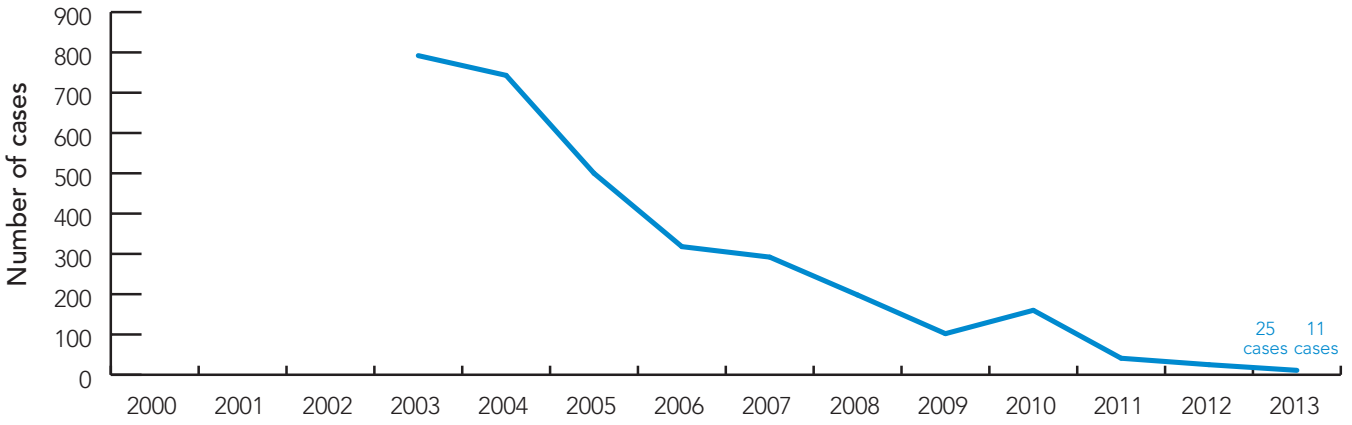
longer any active transmission foci on Mayotte. However, most remaining cases are concentrated in the northern part of Mahoré in the same areas where *An. funestus* re-emerged, near the capital of Mamoudzou where many Comoran migrants arrive.[1,2,5] Mayotte's malaria elimination strategies include free distribution of insecticide-treated nets (ITNs), indoor residual spraying (IRS) of dwellings, larval control, prompt treatment with free artemisinin-based combination therapies (ACTs), active case detection and case investigation, and mandatory reporting from the private sector.[2] As a French territory, Mayotte has access to a high level of funding and sophisticated health services that are not available in other countries in the region,[6] putting the island in an excellent position to achieve and sustain malaria elimination.

Progress Toward Elimination

As with the rest of the Comoros archipelago, Mayotte has been inhabited by settlers of Arab and East African descent since the 10th century. Severe epidemics of malaria in the archipelago were first recorded in the 1920s, and an archipelago-wide malaria control campaign was launched in 1954 with the introduction of IRS with dieldrin.[1,4] Prior to the 1970s, malaria in Mayotte was stable and hyperendemic, with parasite rates of over 50 percent in school children.[3] In 1972, malaria control interventions expanded to include school-based chemoprophylaxis with chloroquine, and by 1974, dieldrin had been replaced with DDT, malathion, and fenitrothion.[1,4] Concerted efforts to eliminate malaria launched in 1976, primarily through high coverage with IRS, chloroquine prophylaxis, and larval control with temephos and larvivorous fish. The effect on malaria incidence was pronounced: overall population parasite rate was 25 percent in 1976, and declined to just 0.9 percent in 1980.[1,7] In addition, these interventions appeared to have eradicated *An. funestus* from the island by the early 1980s.[3]

In 1984, a cyclone struck the Comoros archipelago and caused major damage on Mayotte, destroying over 90 percent of dwellings.[5] In the aftermath of the cyclone, the annual IRS campaign was disrupted and an outbreak of malaria occurred; there were 394 recorded cases in 1984, and parasite rate rose to 2.5 percent. Around the same time, the first evidence of *P. falciparum* resistance to chloroquine was observed among Comoran immigrants in Mayotte. In response to the outbreak, IRS and larval control were implemented on a quarterly basis, and active case detection through mass blood surveys was conducted.[1]

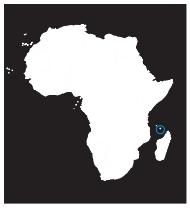
Reported Malaria Cases*



The expansion and intensification of vector control, ACTs, and surveillance in the early 2000s led to a significant decline in cases in Mayotte, from 792 total cases in 2003 to just 11 local cases in 2013.

*Graph shows total reported cases from 2003–2005; as of 2006, only local cases are shown; no data available prior to 2003.

Source: World Health Organization, World Malaria Report 2014



From 1985 to 1990, malaria transmission on Mayotte was steady but low, with fewer than 100 annual cases reported. Then, in 1991, an outbreak of 1,724 cases occurred as a result of a lapse in IRS, the cause of which is unknown.[3] Throughout the 1990s, malaria cases and hospital admissions for severe fever averaged about 1,000 and 252 per year, respectively, likely due to increasing prevalence of multidrug-resistant *P. falciparum* parasites. *P. falciparum* was responsible for over 90 percent of all malaria cases in Mayotte during this period.[1,7]

In 2001, in response to the persistently high malaria burden, Mayotte began implementing more consistent and widespread interventions. IRS with deltamethrin, which replaced DDT in 1993 when evidence of resistance was detected, was scaled up and accompanied by a community education campaign to improve acceptance. ITNs were distributed to pregnant women, rapid diagnostic tests (RDTs) were distributed to all rural health centers to discourage clinical diagnosis, and an entomologist was hired to oversee vector control activities.[1,7] A drug resistance study was conducted in 2000–2001 to compare efficacy of several malaria drugs. Chloroquine and sulfadoxine-pyrimethamine, Mayotte's first- and second-line drugs, as well as quinine, which was used to treat severe *P. falciparum* cases, were all found to have limited efficacy; as a result, artemether-lumefantrine was introduced as the new first-line treatment in 2002.[6,7]

The intensification of malaria control activities in 2001 and 2002 was successful in bringing Mayotte's malaria burden down. By 2003, cases had declined to 792, and this downward trend has continued at a remarkable rate.[2,4] However, *An. funestus* reappeared in 2004 during routine entomological surveys, and has since been found in additional surveys conducted between 2008 and 2012, indicating that its presence on the island has been reestablished, albeit at much lower density than the primary vector, *An. gambiae*.[4,8] Economic development in recent years has led to the pollution and reduction of *An. gambiae* breeding sites, primarily estuaries along coastal areas, but construction projects have created man-made water sources, potentially favoring *An. funestus* which is more adaptable to human surroundings.[3,4]

Beginning in 2010, Mayotte began scaling up ITN distribution to the entire population, reaching 100 percent coverage in 2012. IRS with deltamethrin has simultaneously been scaled back, but larval control has continued.[2] In light of European rules regarding insecticide usage as well as detected resistance in *An. gambiae*, temephos was banned in 2012, and Mayotte currently uses *Bacillus thuringiensis israelensis* as a biological larval control agent. Extensive social mobilization campaigns are conducted to encourage proper ITN usage and generate community participation in vector control activities.[9] Mayotte's malaria control efforts are supported by a modern public health system that provides free care, as well as a robust private sector that contributes to malaria surveillance.[2,6]

Eligibility for External Funding[10–12]

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

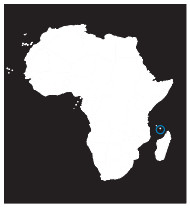
Challenges to Eliminating Malaria

Importation of malaria

Mayotte's proximity to malaria-endemic Union of the Comoros and Madagascar puts the island territory at risk for re-introduction of malaria. Informal and unregulated traffic between these islands via fishing boats occurs at great frequency, and the arrival of temporary and permanent immigrants to Mayotte is largely undocumented. Many Comoran citizens come to Mayotte for financial and employment opportunities, access to free healthcare, and to give birth to ensure their children become French citizens. Strengthened surveillance at ports of entry is essential to ensure that imported malaria cases are detected promptly before secondary transmission is established.[7,13]

Conclusion

Mayotte has experienced an impressive 99 percent decline in malaria cases in the past decade. With sustained surveillance and ongoing financial support from the French government, the island territory will likely achieve malaria elimination very soon.



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Transmission Limits Map Sources

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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.

UCSF Global Health Sciences
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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.

map
malaria atlas project

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.