Spatial analysis of malaria distribution in the Union of Comoros
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Spatial analysis of malaria distribution in the Union of Comoros

Malaria incidence in Comoros has decreased in recent years, with a significant drop from 2010 to 2014. Several factors have contributed to this decline, including the establishment of a National Strategic Plan in 2007. This plan was crucial in integrating various aspects of its epidemiology, including the identification of its origin and spread. The decrease of malaria incidence has been driven by different control actions, including the distribution of Long Lasting Insecticidal Treated Nets (LLINs).

The decrease of malaria incidence has been driven by different control actions organized since 2010, based on spraying campaigns and the distribution of Long Lasting Insecticidal Treated Nets (LLINs). Starting in 2013, the government conducted a massive distribution campaign of LLINs. Finally, the authors would like to thank IRD for the PhD fellowship that allows conducting this study.

**Conclusion**

The fight against malaria action of the Comorian government has achieved its goals. Moheli and Anjouan are in pre-elimination phase, while Grand Comore is in control phase.

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**Remote sensing analysis and landscape metrics**

An homogeneous high resolution land cover was realized for the three islands with 7 classes. Based on these maps, landscape metrics (such as the percentage of each class and edge densities per landscape) were calculated in order to search for environmental indicators that describe the epidemiology of malaria.

A PCA can discriminate the islands by using the environmental variables. Because Grande Comore reported the highest malaria incidences, the environmental variables that characterize Grande Comore present also a strong positive correlation with the average incidence of malaria: the proportion of urban land ($r = 0.79, p<0.0001$), bare land ($r = 0.59, p<0.01$) and the population density ($r = 0.64$).

**Epidemiological information**

The monitoring and evaluation service of the “Programme National de Lutte contre le Paludisme” (PNLP) is regularly tracking notification of identified cases of malaria at public health centers, private hospitals and medical and biological laboratories. The diagnosis of malaria is made with a thick blood smear and a rapid diagnostic test. Monthly cases, as reported by the PNLP from 2010 to 2014, were geo-referenced in each island at the sanitary district level (7 in Grande Comore, 7 in Anjouan, 3 in Moheli). The incidence of malaria by district was calculated using population data from the National Census.

**Study area**

Located at the northern of the Mozambique Channel between the east coast of Africa and Madagascar, Union of Comoros is composed of three islands: Grande Comore (1,147 km²), Anjouan (424 km²), and Moheli (360 km²). Despite a clear decline of malaria several aspects of its epidemiology should be clarified including the identification of endemic areas.

The occurrence of malaria shows spatial variations between and within islands. Several factors determine its transmission, including environmental and climatic factors, social conditions, individual behaviors, physical conditions, control actions. This has shown the importance of a spatial and multidisciplinary study of malaria.

Therefore, the purpose of this study is to:

- characterize the spatial and temporal dynamics of malaria;
- describe its ecological and social patterns;
- assess the impact of control actions;
- statistically model its distribution.

**Material and methods**

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