Spatial analysis of malaria distribution in the Union of Comoros
Artadji Attoumane, Rahamatou Silai, Affane Bacar, Christophe Révillion, Eric Cardinale, Gwenaëlle Pennober, Vincent Herbreteau

To cite this version:

HAL Id: ird-01377919
https://hal.ird.fr/ird-01377919
Submitted on 7 Oct 2016

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Distributed under a Creative Commons Attribution - NonCommercial - NoDerivatives| 4.0 International License
Spatial analysis of malaria distribution in the Union of Comoros

Artadjou Attoumane1, Rahamato Siila2, Affane Baco3, Christophe Révillon1, Eric Cardinal3, Gwenaelle Pennibon3, Vincent Herbret4

1UMR ESPACE-DEV (IRD, UMR, UR, UAG), Saint-Pierre, La Réunion, France, 2Programme Nationale de Lutte contre le Paludisme, Ministry of Public Health, Union of Comoros, 3CIRAD, UMR 15 CMACIE, Sainte Clotilde, La Réunion, France

Introduction

Malaria remains endemic in Comoros. In 2006, malaria was the leading cause of mortality, morbidity and consultation in hospitals. The Government of the Union of the Comoros is committed in the fight against malaria through the establishment of a National Strategic Plan in 2007 that was later updated for the period 2012-2016. The results of these efforts show that the disease is in a pre-elimination phase. Despite a clear decline of malaria several aspects of its epidemiology need to be improved. The establishment of a National Strategic Plan in 2007 that was later updated for the period 2012-2016. The results of these efforts show that the disease is in a pre-elimination phase. 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.

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 Mohéli (360 km²).

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 tests. 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 Mohéli). The incidence of malaria by district was calculated using population data from the National Census.

Land cover mapping

A land cover map was realized for each island by remote sensing analysis (Object-Based Image Analysis) of SPOT 5 images (2.5m in panchromatic mode), provided by SEAS-OI station (http://www.seas-oi.org/).

Spatial database

We completed the spatial database with data on environmental and social factors including meteorology, physical geography, population characteristics, and health care facilities.

Results

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 pixel) were calculated in order to search for environmental indicators that describe the epidemiology of malaria.

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 and distributed Long Lasting Insecticidal treated Nets (LLINs). Starting in 2013, the Government conducted a massive distribution campaign of LLINs and treated Nets (LLINs).

Conclusion

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

The landscape metrics built from the land cover map can describe the environmental characteristics of each island. We can use them to have a better knowledge of ecological conditions for malaria. At this step, the ecological analysis shows some environmental indicators that are characteristics of Grande Comore (more urbanized, with more barelands and grasslands).

The perspectives for this study are:

- to assess locally the environmental patterns and the vulnerability of the populations to the disease (case-control study with interviews);
- to integrate in a statistical model other indicators related to climate, sociological data and control actions.

Acknowledgements

The authors wish to warmly thank the organizers of the 9th European Congress on Tropical Medicine and International Health for the invitation to present this poster and the financial support provided.

The authors also thank the Ministry of Health of the Comoros and the « Programme National de Lutte contre le Paludisme » to support this study.

Finally, the authors would like to thank IRD for the PhD fellowship that allows conducting this study.

Material and methods

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 Mohéli (360 km²).

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 tests. 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 Mohéli). The incidence of malaria by district was calculated using population data from the National Census.

Land cover mapping

A land cover map was realized for each island by remote sensing analysis (Object-Based Image Analysis) of SPOT 5 images (2.5m in panchromatic mode), provided by SEAS-OI station (http://www.seas-oi.org/).

Spatial database

We completed the spatial database with data on environmental and social factors including meteorology, physical geography, population characteristics, and health care facilities.

Results

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 pixel) were calculated in order to search for environmental indicators that describe the epidemiology of malaria.

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 and treated Nets (LLINs).

Conclusion

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

The landscape metrics built from the land cover map can describe the environmental characteristics of each island. We can use them to have a better knowledge of ecological conditions for malaria. At this step, the ecological analysis shows some environmental indicators that are characteristics of Grande Comore (more urbanized, with more barelands and grasslands).

The perspectives for this study are:

- to assess locally the environmental patterns and the vulnerability of the populations to the disease (case-control study with interviews);
- to integrate in a statistical model other indicators related to climate, sociological data and control actions.

Acknowledgements

The authors wish to warmly thank the organizers of the 9th European Congress on Tropical Medicine and International Health for the invitation to present this poster and the financial support provided.

The authors also thank the Ministry of Health of the Comoros and the « Programme National de Lutte contre le Paludisme » to support this study.

Finally, the authors would like to thank IRD for the PhD fellowship that allows conducting this study.

9th European Congress on Tropical Medicine and International Health, 6-10 September 2015, Basel, Switzerland

Corresponding author: attoumane.attoum@ird.fr