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EPIDEMIOLOGY OF MALARIA IN MADAGASCAR: SPATIO-TEMPORAL DISTRIBUTION OF COMPLICATED AND UNCOMPLICATED MALARIA

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[1] Pasteur Institute of Madagascar, Madagascar, [2] UMR ESPACE-DEV (IRD, UM2, UR, UAG),Saint-Pierre, La Reunion, France, [3] Center for Communicable Disease Dynamics, Harvard School of Public Health, [4] Department of Epidemiology, Harvard School of Public Health, USA, [5] Ecology and Evolutionary Biology, Princeton University, [6] Woodrow Wilson School of Public Affairs, Princeton University,USA.

Introduction

Malaria transmission occurs in many countries around the World causing approximately 660,000 deaths per year. Madagascar is one of these countries where malaria remains endemic and a leading cause of mortality and morbidity. Geographical distribution of malaria in Madagascar is heterogeneous throughout the country, in relation to climatic, environmental (Figure 1) and social factors. Malaria transmission is stable along the eastern and the western coasts. Two regions have unstable and short transmission: the southern sub-desert and the highlands (altitude above 1000m).

The aims of this study are:
- to describe the spatio-temporal distribution of malaria caused by *Plasmodium falciparium*
- to identify seasonal trends
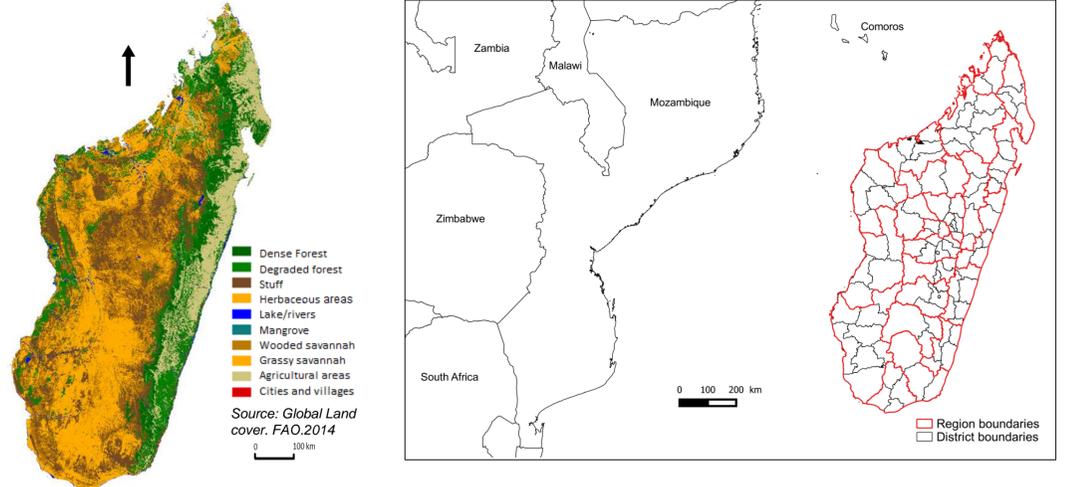- to identify the most vulnerable age group of each malaria form

Figure 1: Location and land cover of Madagascar

Material and methods

Epidemiological data:
The national Health Management Information System (HMIS) in Antananarivo provided monthly epidemiological data related to complicated and uncomplicated malaria cases from 2010 to 2014. Uncomplicated cases were reported by 3,074 public and private health centers and complicated cases were reported from 186 hospitals in 112 health districts throughout the country.

Population data:
The population by district was provided by the National Institute of Statistic (INSTAT). This population data is the projection of the latest general census of population and housing in 1993 and includes spatial distribution and structure by sex and by age.

Malaria trends:
- descriptive analyses of epidemiological data
- integration of data into a Geographic Information System to map malaria trends by year, by month and by age for each district.

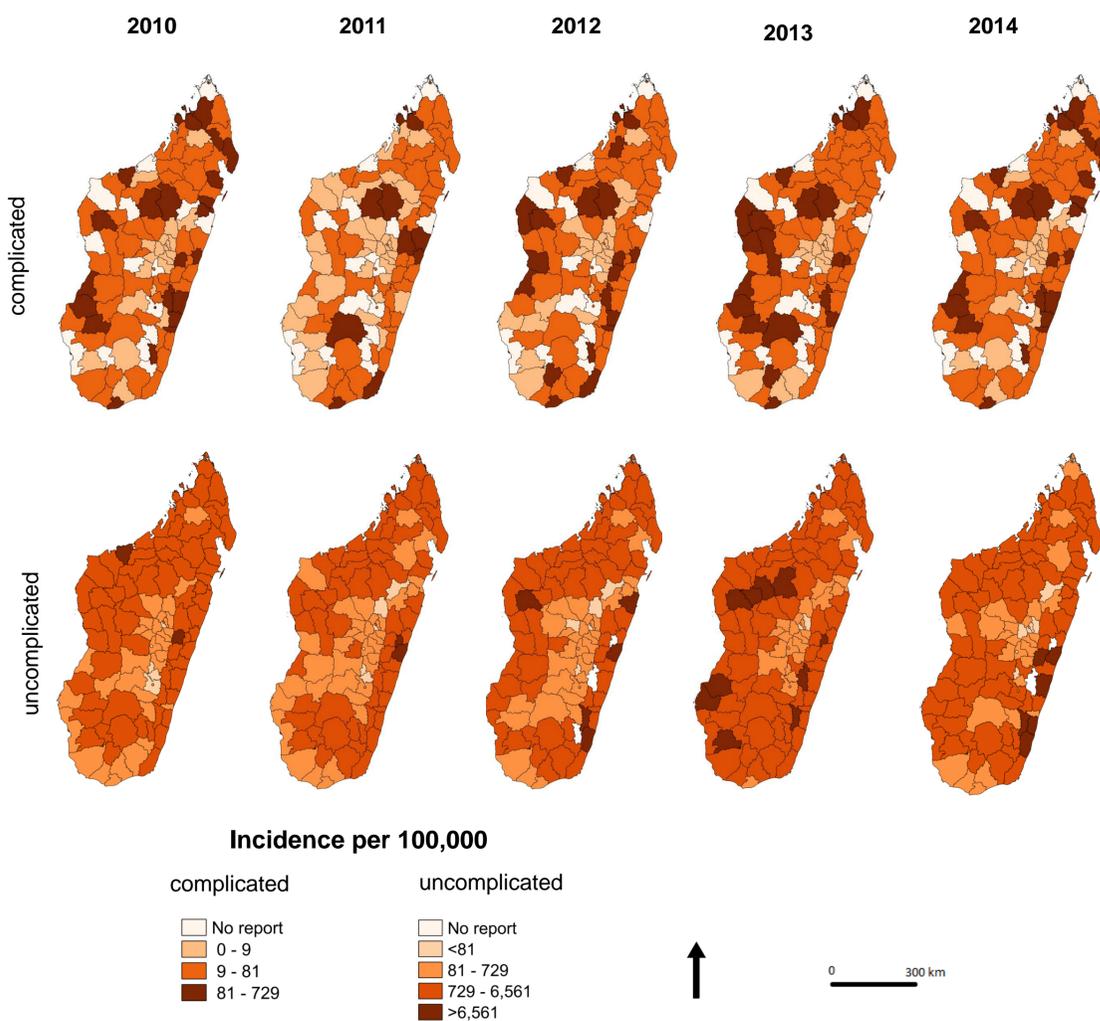## Results

Annual trends

Figure 2: Annual trends of complicated and uncomplicated malaria

- Annual spatial trends of complicated malaria is heterogeneous for each year. The highest value belong to the eastern and western coats (Figure 2).

- For uncomplicated malaria the district of Central Highlands and the South have the lowest value of incidence but until 2013 the incidence increased in the entire of country (Figure 2).

Seasonal trends

- The peak season of complicated and uncomplicated malaria is in the beginning of the year from January to April.

- The lowest period of incidence is during dry season and early fall from July to October.

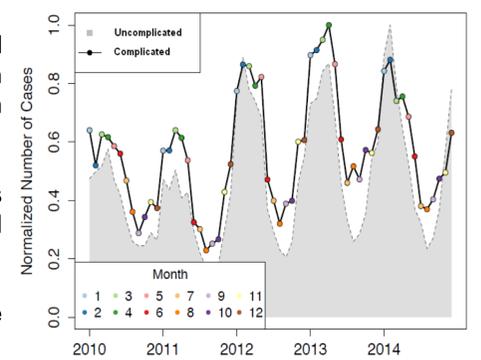- The two forms of malaria have similar seasonal trends (Figure 3).

Figure 3: Monthly trends

Age trends

Uncomplicated malaria was reported for four age classes (Figure 4):
0-4 years: 39%
5-14 years: 32%
15-24 years: 11%
25+ years: 18%

Complicated malaria was reported into two age classes: 0-4 years (26%) and 5+ years (75%).
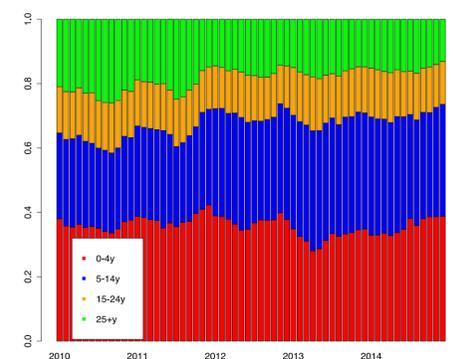

Figure 4: Uncomplicated malaria age cases per month per year

Conclusion

- Coastal districts have the highest value of incidence for both forms of malaria.
- The season trends is similar for each year.
- The vulnerable age group are under 5 years and 5 to 14 years.

The connectivity between districts and the persistence of malaria on the coast could induce the emergence of malaria in central highlands following reintroduction by travelers. Thus, non-endemic areas are at risk of emergence with complicated clinical malaria form. Districts presenting significantly high incidences should be carefully monitored in order to reduce transmission.

Contact

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