Mapping the Risk

Vector-borne diseases such as malaria and arboviruses (Dengue, Zika, Chikungunya, etc.) constitute a major public health problem in the Amazon biome countries, particularly in the Guiana Shield.

Preparation of a thick smear to check for the presence of the malaria-causing parasite – Photo credit EL

Arbovirus outbreaks make headlines cyclically in French Guiana.

Screenshot of the platform gathering epidemiological information on malaria in French Guiana and Amapá, Brazil.

Overview of a part of the conceptual model (under construction) on which the risk mapping is based.

However, epidemiological situations, transmission mechanisms, knowledge, and action priorities differ significantly from one disease to another.

Brazil, France, and Suriname are committed to the eradication of malaria.

The knowledge gathered, methodological developments made, and cooperation efforts deployed over the past 10 years now allow for the construction of integrated risk models shared by different stakeholders working on the issue, from remote sensing specialists to public health managers.

Since 2012, a Franco-Brazilian team has been involved in the construction of a cross-border malaria observatory. Its goal is to improve disease surveillance on both sides of the border.

Studies, carried out mainly within the framework of two doctoral theses, have allowed the establishment of a map of the main malaria vector's habitat quality. Combining entomological and epidemiological data with expert knowledge and information on land use and land cover has led to defining a landscape hazard index.

This approach can also be adapted to other vector-borne diseases.

Dengue causes recurrent epidemics, while Chikungunya and Zika emerged in the region in 2014 and 2016, respectively.

When estimated from remote sensing data, the risk of mosquito-borne diseases is calculated based on the proximity of mosquito-friendly habitats to human settlements. This risk can now be considered in relation to population exposure factors: density and human activity linked to the forest environment, as well as the circulation of pathogens.

To achieve this, specialists are working to map the proven or probable presence of different mosquito vector species according to environmental conditions. Some of the required data for this mission exist at the regional level, while others are at the scale of French Guiana.

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The PROGYSAT (Regional Cooperation Project for Observing the Guianas by Satellite) allows for the completion of the inventory of available environmental information. Missing maps for urbanization and deforestation are produced.

The level of exposure of human populations to different vectors will then be estimated. Finally, the circulation of pathogens will be taken into account through disease cases detected by epidemiological surveillance systems.

The combination of all this information, according to a specially designed mathematical model, will establish a risk map.

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* Malaria is caused by a parasite of the genus Plasmodium, transmitted by a mosquito of the genus Anopheles.
** Arboviruses are caused by viruses, transmitted by mosquitoes of the genus Aedes.

Read more about PROGYSAT :
Cooperating with the Guianas
Real-time pollution monitoring

Website of the IRD in French Guiana, PROGYSAT project partner: www.ird.fr/guyane