Horizon
The EU Research & Innovation Magazine

European Commission

Predicting disease outbreaks in East Africa

Researchers are taking data from satellite observations and combining it with first-hand experience from health workers to make smart tools that can predict where outbreaks of diseases such as malaria might strike.

11 November 2013 - By REX MERRIFIELD

Malaria and other water-related diseases kill hundreds of thousands of people in Africa every year – most of them children.

That's partly driven by changes in environmental conditions, including climate, which bring rains and floods that carry such diseases into previously unexposed populations with little immunity. It can result in more frequent, severe epidemics, with dire socioeconomic consequences.

Climate researchers, public health workers and environmental scientists came together as part of the EU-funded HEALTHY FUTURES project to work out how to improve prediction of future outbreaks of the water-related diseases malaria, Rift Valley fever and schistosomiasis.

'HEALTHY FUTURES will contribute to the identification of vulnerable populations or areas through the use of models and risk maps that help to predict where potential future outbreaks of the diseases can occur,' said Dr Laragh Larsen, of the Geography Department at Trinity College.

Snail fever

The role of water in the spread of the three diseases is crucial. Scientists know that the likelihood of 'vector-borne disease' epidemics in tropical countries increases soon after seasons of good rainfall, when insects that can carry disease thrive in the heat and humidity.

But the links between the environment and such diseases are extremely complex and often under-explored. While scientists have detailed knowledge of the climatic triggers for specific diseases, it is not always clear why particular areas become vulnerable, particularly given changes in the environment. It can also be difficult

to assess how far ahead outbreaks can be predicted.

Even where reliable environmental data have been collected and research provides significant insight into the patterns of climate and disease, translating this into effective action to prevent outbreaks or manage epidemics is far from simple, according to Professor David Mark Taylor, the coordinator of HEALTHY FUTURES.

Combining the data

To bridge this gap, the 16-member HEALTHY FUTURES consortium, coordinated by Trinity College in Dublin, is combining data from satellites with computer modelling tools, information from regional government health departments, and first-hand accounts from health workers in the field, and using the information to develop tools that can help predict outbreaks.

The live malarial parasites, carried by the mosquito are visible in green. ©Inserm
The live malarial parasites, carried by the mosquito are visible in green. ©Inserm

The live malarial parasites, carried by the mosquito and transmitted to humans through its bite, are visible in green. ©Inserm

The region in focus covers most of Africa's Great Lakes, and has a wide range of environmental conditions, from the near-desert lowland plains in eastern Kenya to the cool, humid rainforests of western Uganda and Rwanda, meaning researchers need to adapt their models for each area.

Crucially, the project relies on interested parties and those working in the region to identify what tools could be most useful in making decisions.

By the time it finishes at the end of 2014, it hopes to have developed and applied statistical and dynamic disease models, as well as provided high-resolution regional climate projections. In addition, the project plans to construct future disease risk and vulnerability maps – highlighting the areas that could face the most difficulty as a result of changes in the local environment. This will help inform health services as they decide what actions to take, and how best to use their often scarce resources.

'These tools could support health planners to formulate and assess strategies for managing responses to disease risks, including environmental management for vector (disease carrying agent) control or directing finances to at-risk areas for the provision of insecticide-treated bed nets, for example,' Dr Larsen said.

Not only has the project already succeeded in ensuring closer links between researchers and health workers in the fight against disease in East Africa, Dr Larsen said, but it has also been able to bridge the research gap between eastern Africa and western Europe.

Water-related diseases

Mosquitoes, which are the carriers or 'vectors' of the parasite that causes malaria and of the virus responsible for Rift Valley fever, need water to breed.

Schistosomiasis, also known as snail fever, is caused by a small parasitic flatworm which lives in a freshwater snail during part of its lifecycle. The parasite's larvae are transmitted to humans wading or swimming in water infested by the snails.

The World Health Organization (WHO) says schistosomiasis causes 200 000 deaths in sub-Saharan Africa each year. Even when it does not kill its victims it is extremely debilitating, damaging their internal organs, and stunting growth and cognitive development in children.

Tropical Africa also has the highest number of malaria cases in the world and the disease can have an overwhelming impact on populations where it is endemic or seasonal, particularly among the poor who have the least protection. WHO figures show malaria kills an African child every minute.

Rift Valley fever mostly affects livestock and can have a devastating economic impact through deaths of cattle, sheep, camels, or goats. Between animals it is mostly spread by mosquitoes, which can also transmit it to humans, though this is uncommon.

More info

HEALTHY FUTURES

Quantifying Weather and Climate Impacts on Health in Developing Countries (QWeCI)