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17 DECEMBER 2014

New computer system predicts malaria outbreaks in Ethiopia (https://blogs.agu.org/geospace/2014/12/17/new-computer-system-predicts-malaria-outbreaks-ethiopia/)

Posted by kwheeling (https://blogs.agu.org/geospace/author/kwheeling/)

By Leigh Cooper

Scientists have created a computer system that will help predict malaria outbreaks in northwestern Ethiopia. The advance warning system, which uses local epidemiological information and real-time environmental data, will allow

public health officials to transport resources to high-risk areas and contain outbreaks early, explained ecologist Chris Merkord from South Dakota State University.

(https://blogs.agu.org/geospace/files/2014/12/malaria_image001.jpg)

A village in the Amhara region of Ethiopia. Bad roads throughout the region inhibit the transport of medicine and health personal to areas experiencing malaria outbreaks. The new computer system will help the public health system move gear to malaria hotspots prior to an outbreak.
Credit: Michael Wimberly

There are two ways to predict a disease outbreak. Health officials can track the number of cases being reported by hospitals and react after numbers spike. Or, scientists can use environmental precursors of a disease to create an early warning system.

The new system, EPIDEMIA, combines both techniques in a user-friendly interface. The team presented their new project (http://globalmonitoring.sdstate.edu/epidemia/) Tuesday afternoon at the American Geophysical Union's Fall Meeting in San Francisco.

The team focused their project in the Amhara region of Ethiopia where regional malaria outbreaks occur every five to eight years and localized, smaller outbreaks spring up more frequently. Sixty-eight percent of the 17 million people in Amhara live in areas where malaria can occur. Spread by mosquitoes, malaria causes chills, fever and flu-like symptoms, and can cause death in severe cases.

In Amhara, public health officials may not hear about an outbreak until it has already spread. And they will still need to ship people and medicine over bad roads.

"We can rapidly reduce the time required to respond," said Merkord.

The team is narrowing down the parameters they will use to predict outbreaks. They will include temperature, vegetation type, soil moisture and at least one measurement of precipitation. Scientists typically use total rainfall to predict outbreaks, because mosquitoes need water to reproduce. But the team thought other rain parameters might predict outbreaks better. They found that the number of dry days between rainfall events forecasted the chance of malaria outbreaks during the following month better than total rainfall. "Total rainfall was not anywhere near the top [predictor]," said Merkord.

Although mosquitoes need water to reproduce, too much rain flushes the larvae downstream. In rainy regions, a dry period allowed mosquitoes to successfully hatch and then spread malaria. Alternatively, malaria cases flared up after wet periods in drier areas.

Once the EPIDEMIA prototype launches in January, the Amhara Regional Health Bureau and the Ethiopian non-governmental organization Health, Development, and Anti-Malaria Association will load malaria data directly into the EPIDEMIA system. At the same time, the system will download climate data in nearly real time. With the data, the team can generate forecasts of potential malaria hotspots. If they can succeed in creating a user-friendly program, "the concepts and the technology would be transferrable to other parts of Ethiopia and other diseases," said geographic information scientist Michael Wimberly from South Dakota State University.

The team hopes to be forecasting outbreaks by September. The whole project should be complete in two and a

half years. “Ultimately the goal is to pass this system onto the Ethiopian health system and let them run it,” said Merkord.

– Leigh Cooper is a science communication graduate student at UC Santa Cruz

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