

# Early warning system for epidemics

February 21 2014

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The EU's EO2HEAVEN project developed a hazard map for correlating environmental and health data in order to identify where disease may break out next. Credit: © Fraunhofer IOSB

The environment has an impact on our health. Preventing epidemics relies on activating the right counter-measures, and scientists are now trying to find out how better use of forecasting can help. The EU's EO2HEAVEN project developed a risk map for correlating environmental and health data in order to identify where a disease may break out next. The concept will be on show at Booth E40 in Hall 9 of

the CeBIT trade fair in Hannover.

Cholera has been all but eradicated in Europe, but this bacterial, primarily waterborne disease still claims thousands of lives in Africa every year. Scientists are examining the effects various [environmental factors](#) have on cholera epidemics in Uganda. As part of this work, the Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB in Karlsruhe developed a software architecture for [early warning](#) systems that compares environmental and health data and presents the results graphically. "This allowed us to visualize the complex relationships between these factors for the first time on risk maps, leading to a better understanding of the processes," explains project coordinator Dr. Kym Watson.

The scientists use sensors to measure environmental parameters such as rainfall, exposure to solar radiation and pH value, as well as temperature and concentration of nutrients in the water. Weather and climate forecasts are also factored into the analysis. At the same time, they use mobile applications to collect health data on cholera cases from hospitals and doctors, such as where patients have been and what their symptoms are. This data is collected and stored – anonymously – on a central server at the health authority in the Ugandan capital Kampala. Using the new software, each case appears as a red dot on a digital map. By correlating this information with the environmental data, scientists can see how fast and how far an outbreak is spreading.

"For the first time, Ugandan officials were able to visualize and comprehend the full extent and implications of the cholera outbreaks. Prior to this, individual cases were only ever recorded manually in written lists. Decision makers are now in a position to better deploy medical resources in the affected areas, and hospitals and doctors are better prepared and can respond much more effectively," says Watson, recounting the project's successes.

## A variety of applications

This kind of early warning system can also be put to good use in other areas. As part of their work for EO2HEAVEN, the scientists investigated a further two case studies. In the German city of Dresden, they looked at the relationship between air quality – measured in terms of temperature, Particulate Matter and ozone – and cardiovascular diseases. And in the Durban industrial basin in South Africa, they investigated the correlation between air pollution and asthma.

In the long-term, members of the public also stand to benefit directly from the early warning system. "It's conceivable, for example, that an app for asthmatics would allow a user to set up a personal profile with their own allergic reaction thresholds for pollen count and air quality," says Watson. "By comparing this set of values with measured [environmental data](#), the app would enable each individual to access a personalized risk map, and could issue a warning whenever the threshold values are exceeded."

## Strictly confidential

But the project was not without its challenges. In Germany in particular, obtaining the necessary [health data](#) from [health insurance companies](#) is difficult since it goes without saying that these data are strictly confidential. So it is important to prepare data in a way that guarantees anonymity in order to safeguard data protection.

What's more, once a high-risk situation has been identified it's not always easy to determine the right measures and actually carry them out; the IT solution is merely a tool that helps people in their decision-making. Whether cholera outbreaks in Uganda can really be confined naturally depends above all on the speed of the response, and on the

quality of drinking water, hygiene practices and available [medical resources](#).

Provided by Fraunhofer-Gesellschaft

Citation: Early warning system for epidemics (2014, February 21) retrieved 11 May 2024 from <https://medicalxpress.com/news/2014-02-early-epidemics.html>

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