Kenyan researchers team up with leading universities to create a mobile-phone–based system that helps gather field data crucial to understanding and fighting malaria.

Mobilizing against malaria

Photo: Nathan Eagle/EPROM

Efficient information: Field workers use mobile phones to transmit data over the air to the Kenya Medical Research Institute server.

For more than a decade, the Kenya Medical Research Institute (KEMRI) has been conducting demographic surveys in the nation's eastern district of Kilifi to research and combat the region's unusually high malaria infection rate. By monitoring the health and demographic factors of the approximately 200,000 citizens in the area, researchers can better comprehend the spread of the disease and develop responses.

To improve the efficiency and accuracy of data collection and input, KEMRI has been collaborating with University of Nairobi (UON) and Massachusetts Institute of Technology (MIT) to replace the paper-based data collection system with innovative, mobile-phone–based methods. The project forms part of MIT's Entrepreneurial Programming and Research on Mobiles (EPROM) program, which fosters education, research and entrepreneurship related to mobile phones.

"By tracking the dynamics of what is happening in this community over a long period of time, KEMRI researchers have a better shot at inferring percentages and possibilities of outbreak," says Mr. Nathan Eagle, a visiting lecturer at UON and research scientist at MIT, who is leading the mobile data collection project. "How do changes in disease outbreak correlate with demographic changes during the same period?"

For data collection, KEMRI relies on field workers who visit villages and homesteads at four-month intervals to conduct interviews. In the paper-based system, they record the responses on paper forms and the data – births, deaths, illnesses, building activity and movement of people – is later entered in KEMRI's electronic medical database for future comparison and research.

Mobile advantages

The paper-based system contains many sources of error. Before visiting a location, field workers print out records of the previous visit. They return to KEMRI with updated data. Other employees input the information. Anything from untidy handwriting to data-entry errors can interfere with reliability.

The mobile-based solution Eagle and his team are implementing addresses these issues, while keeping the technological interface simple by utilizing a device familiar to field workers. "There are a variety of survey tools that people are using in the field for surveys and data collection," says Eagle, but "phones have two real advantages" over other options such as personal digital assistants (PDAs).

"First, most of the field workers have their own personal mobile phones, so they are very familiar with text entry on the device. They are inherently more comfortable with a phone, and do not need much instruction in navigating the menus or inputting text.

"Second is the connectivity. Mobile phones have connectivity lacking in other devices, such as PDAs. Because mobile phones allow field workers to receive and send data while in the field, they can stay out longer and collect more data" without returning to KEMRI to print out or hand in papers or connect a PDA. Background information can be uploaded to the phone and the new data is pushed directly to KEMRI's database over the air.

"Cell tower information and built-in or Bluetooth-enabled GPS connectivity allow us to record latitude, longitude and time for each visit," says Eagle. This encourages greater field-worker accountability while also helping to reduce errors.

Attracting interest

Field tests and evaluations of the project are returning encouraging results. Other nongovernmental organizations (NGOs) have already taken note of the project – Eagle has received inquiries about how to switch PDA-based projects to mobile devices.

"Three fourth-year students at UON developed this in less than a year using the Python programming language on Series 60 devices," says Eagle. "Python is something you can pick up relatively fast."

EPROM's goals include incorporating mobile phone programming into computer science departments in Ethiopia, Kenya, Rwanda and South Africa, paving the way for future innovations and enterprises. The KEMRI project shows the opportunities offered by mobile phones, which are cheaper and more widespread than other options, such as PDAs and computers.

"Our application should work for any type of survey in rural areas, and there are many reasons to do surveys in these new growth markets," says Eagle. Real-life benefits are on offer if data can be collected and organized conveniently and efficiently. "One of the major research goals of the KEMRI is to uncover the fundamental mysteries that underlie malaria, a disease extraordinarily prevalent in the Kilifi district," says Eagle. "Hopefully increased understanding of this population will lead to increased understanding of the disease." ■

For more about EPROM: web.mit.edu/eprom