

# Scientists use cell phone records to predict spread of malaria

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University of Florida researchers at work on a malaria elimination study in Africa have become the first to predict the spread of the disease using cell phone records.

The scientists analyzed more than 21 million calls to determine how often residents of Zanzibar travel and where they go. A semi-autonomous region composed of two islands off the coast of Tanzania in East Africa, Zanzibar has drastically reduced malaria in recent years. Its government commissioned the study as part of deliberations on whether to launch a total elimination campaign.

The calls indicated that most residents who leave the region make short trips to Dar es Salaam on the Tanzanian mainland nearby, where malaria is relatively uncommon. However, they also revealed that a few Zanzibar residents travel back and forth from more distant areas of Tanzania where the risk of getting the disease is much higher - posing the greatest threat to elimination.

"That group of the population is the real risk if Zanzibar wants to eliminate malaria," said Andy Tatem, an assistant professor of geography, member of UF's Emerging Pathogens Institute, and lead author of a paper on the research likely to appear in the January issue of the *Malaria Journal*. "That is the population group that is likely to be continually reintroducing infection."

Malaria is not transmissible from person to person. But if infected

elsewhere, travelers can be bitten by mosquitoes once back in Zanzibar - and those [mosquitoes](#) could then fly on to bite and infect other Zanzibar residents, forestalling elimination.

Over the past decade, Zanzibar's aggressive campaign against malaria has reduced infections from as much as 40 percent of its 1.2 million people to less than 1 percent, Tatem said. The country is weighing the cost of a campaign to eliminate the disease against the cost of continuing indefinitely with the control measures now in place. Its government commissioned what Tatem described as Africa's first "elimination feasibility study," including the travel research.

Most Zanzibar residents journey to and from mainland Tanzania via four- to six-hour ferry trips, but records of their origin and destinations are poor, Tatem said. Inspired by recent cell phone-based epidemiological research in Europe, he and five colleagues obtained records of three months of calls from customers of the Zanzibar Telephone Company, which covers all of Zanzibar and Tanzania.

The October-December 2008 records, which contained no names or other identifying information, tracked the movements of a 770,369 customers by showing each customer's calls and where the calls originated - or at least the region where the call originated.

So, for example, the researchers could see that a person made calls from Zanzibar's main city of Stone Town Monday, Tuesday and Wednesday, but on Thursday and Friday from Dar es Salaam.

Most callers never left Zanzibar, which means they posed no threat of reintroducing the Malaria parasite, Tatem said. About 12 percent did leave the islands, but most of those only visited relatively safe Dar es Salaam, and usually for just one or two days at a time.

However, a few hundred residents made trips to regions of western and southern parts of Tanzania, where as many as 40 percent of the residents have the malaria parasite.

The cell records did not reveal any information about the threat from non-residents visiting Zanzibar. Many visitors to the historic center of the spice trade are likely to be tourists who either come from countries where malaria is not a problem or are taking anti-malarial drugs, so pose little threat for malaria importation. However, mainland residents visiting for work may carry infections, so future work will need to assess these risks too, Tatem said.

Tatem said the study gives Zanzibar's government several options should it move forward with elimination. The government could choose to give Zanzibar residents prophylactics against malaria before they travel, or it could screen all residents as they return, both very expensive propositions. Or it could launch a targeted information and/or screening campaign aimed at the high-risk travelers.

Zanzibar will use the study in combination with another study — of the challenges and costs of eliminating the remaining infections within the country — to make its decision.

"Going for elimination can be very expensive, much more expensive than continuing with current sustained control, involving giving people bed nets (to protect against mosquito bites at night), spraying the inside of houses with insecticide and providing anti-malarial drugs," he said. "But in the very long term the savings having no [malaria](#) may outweigh those costs."

Provided by University of Florida

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