

How disease detectives are fighting Ebola's spread

Rapid 'contact tracing' will be key to containing the disease in west Africa.

Declan Butler

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On 30 September, the US Centers for Disease Control and Prevention (CDC) confirmed [the first case of Ebola](#) to be diagnosed outside of Africa since the start of the current epidemic in Guinea, Sierra Leone and Liberia. The patient is a man who flew to Dallas, Texas, from Liberia after helping to transport a pregnant woman with Ebola to a hospital there.

News of a case outside Africa is not surprising. Experts have warned for months that the risk of exporting cases to other continents was low but that such events [would happen occasionally](#), with the potential for limited onward spread of the disease. In the United States and other countries with well-developed health systems, the virus poses little public-health threat.

The greater and more pressing threat is the spread of Ebola from the current outbreak zone in west Africa to poorer neighbouring countries — and, possibly, to far-away cities — that lack adequate health systems.

A major tool for epidemiologists who are trying to limit the virus's spread is 'contact tracing', which can, if applied promptly, easily stop isolated cases of Ebola from degenerating into full-blown outbreaks. *Nature* explains how contact tracing works — and what its limitations are.

What is contact tracing?

Once public-health agencies detect someone infected or suspected of being infected with Ebola, they isolate the person. Public-health workers then immediately start to trace every person in contact with the infected patient since his or her symptoms emerged. People with Ebola are only infectious after symptoms develop, and contracting the virus requires contact with a sick person's bodily fluids, such as blood or vomit.

The public-health workers monitor all contacts for 21 days, the maximum incubation period of the disease. If any contacts develop high fever or other symptoms of Ebola, they are isolated, and anyone that they have been in contact with since developing symptoms is

traced in turn.

In this way further spread can be stopped. Tracing of hundreds of contacts of two cases in Nigeria and Senegal, for example, has prevented them from sparking any outbreaks in these countries.

Is contact tracing difficult?

Sometimes. Contact tracing works best when cases of Ebola are detected quickly — ideally from the moment a patient begins showing symptoms. This reduces the number of people who come into contact with an infected person.

Health agencies worldwide have long warned doctors and hospitals to be on the lookout for suspected Ebola cases. But the initial symptoms of Ebola — which can include high fever, vomiting, and diarrhoea — resemble the symptoms of many other diseases. (Interestingly, the presence of hiccups can help to distinguish Ebola from other conditions.) So doctors also take into account a patient's potential risk of exposure — for example, if that person cared for or attended the traditional burial rite of an Ebola victim.

But assessing that risk is easier said than done. The man diagnosed with Ebola in the United States had flown from Liberia to Dallas and was not showing symptoms when he landed on 20 September. He developed symptoms on 24 September, and sought care at Texas Health Presbyterian Hospital of Dallas on 26 September, but neither his symptoms nor the fact that he had just come from Liberia set off alarm bells. He was allowed to leave the hospital, and was admitted to a hospital isolation ward on 28 September — meaning that he could have infected others for five days.

Now the CDC and Texas officials are tracing the man's contacts, a major undertaking akin to a door-to-door police investigation. The CDC has sent ten outbreak-response experts to assist local health workers. They will need to identify anyone who spent time or shared living space with the man in Dallas and anyone he might have had close contact with in places such as churches or restaurants.

If contact tracing is so effective, why is Ebola out of control in west Africa?

Tracing an Ebola patient's contacts is much more difficult in countries that lack basic health and epidemiological infrastructure. Past Ebola outbreaks also have occurred in rural African villages where those infected tended to have few contacts, often concentrated in a small area. This made it relatively easy to identify people who may have been exposed to Ebola.

The current outbreak has seen Ebola spread to dense urban areas, where contact tracing is harder, as people there tend to come into contact with more people over a wider area.

Contact tracing also becomes vastly more complex as the number of cases increases. Tracing the contacts of the single Dallas patient will require substantial effort, which gives a sense of the sheer manpower and effort that would be needed for effective contact tracing in west Africa, where Ebola cases number in the thousands.

Moreover, affected west African countries did not have enough health workers or other resources available for comprehensive contact tracing early in the outbreak, when case numbers were still manageable. Now, in many parts of the epidemic zone, the disease is so widespread that contact tracing has become next to impossible.

Can the method still be useful in areas where Ebola is epidemic?

Yes, but only if the international community can [massively increase the number of trained health workers](#) there. Until that happens, experts say that contact tracing in Africa should shift from Guinea, Sierra Leone and Liberia to neighbouring, unaffected areas where it would still be feasible to quickly detect any Ebola cases and stop them from sparking new outbreaks.

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