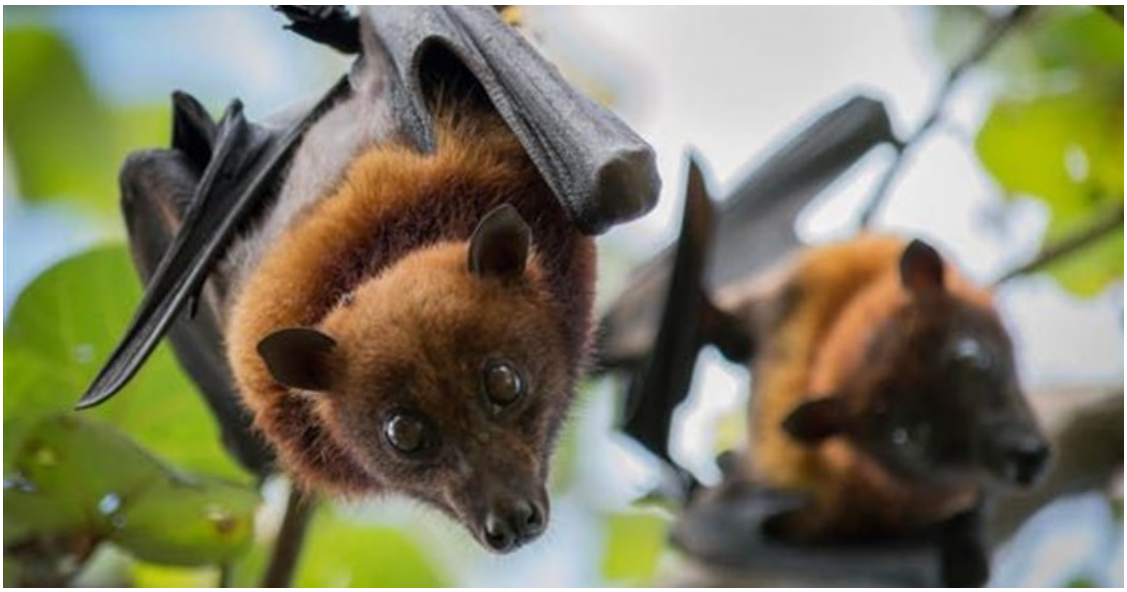
BIZCOMMUNITY

Ebola outbreaks may be more common than we think

The best defence against Ebola outbreaks is early detection. If detected early enough, an outbreak can be prevented with targeted, low-tech interventions, such as isolating infected people and their contacts. But our research suggests that most opportunities for early detection and intervention are missed. In fact, we estimate that most times when Ebola jumps from wildlife to people, it is not detected at all.



Fruit bats can pass Ebola on to humans. Jeffrey Paul Wade/Shutterstock

Every Ebola outbreak starts with a “spillover event,” where a person becomes infected from an animal – a fruit bat, for example. From there, people can infect other people, and before long an outbreak can become out of control. Once an outbreak has spread to several locations, controlling it is extremely difficult, as epidemics in recent years have shown.

A critical feature of Ebola infections is that a few initial cases infect many other people, but most cases (about 65%) infect no one else. This means any isolated case – such as the first case when an Ebola spillover occurs – is probably the only case. Finding these cases is as important as finding an outbreak early because it is impossible to predict which spillover events will grow into full outbreaks. But since Ebola was first detected in 1976, only eight clusters of five cases or fewer have been detected, compared with 26 clusters of at least six cases.

Only two single-case spillover events have ever been detected (except for accidental laboratory infections), but we expect this to be the most common cluster size. The most plausible reason for this unexpected situation is that many small Ebola clusters have occurred with no one noticing.

Computer simulation

To find out how many of these small clusters have occurred, we simulated thousands of Ebola outbreaks based on published data from previous outbreaks. From these simulations, we determined how often we expect a spillover event to fizzle out early versus how often we expect it to progress into a true outbreak. This allowed us to compare the outbreak sizes we expect to see to those that have been reported. We used these comparisons to estimate detection rates of clusters of different sizes. Across different sets of assumptions, we estimated that less than half of all Ebola clusters, and less than 10% of isolated cases, are detected.

This result suggests that we miss many cases altogether. Because we estimate especially low detection rates for small clusters, it also suggests that we rarely detect outbreaks in their earliest stages.

We rarely find Ebola outbreaks while they are still easy to manage. The main reasons for this are surprisingly simple. Ebola is much rarer than other types of severe fever in the regions of sub-Saharan Africa where it tends to occur. Countries in this region have some of the weakest primary healthcare infrastructure in the world, making them ill-equipped to detect a rare cause of fever among all the common ones.

Many primary health facilities don't have enough resources to test for even the most common causes of fever, let alone Ebola. Without accurate diagnostics, they must rely on detection based on symptoms. But Ebola is so rare that a single case of severe fever, even with bleeding, is more likely to be caused by malaria, typhoid or yellow fever. Most doctors and public health workers in many regions have never seen a single Ebola case. Therefore, relying on symptoms alone to detect Ebola is unreliable.

Investment in primary healthcare

It is probably impossible to detect outbreaks reliably within the first few cases based on symptoms alone. To find and address outbreaks early, we must invest in primary healthcare and public health capacity.

It is at this local level, mostly in clinics and hospitals, that potential outbreaks are first flagged. It is also at this level, mostly through district health management teams, that measures such as quarantines can be introduced quickly enough to control an early outbreak.

This capacity is not only important for Ebola, improving local healthcare workers' ability to rapidly diagnose and treat diseases can improve outcomes. More accurately diagnosing bacterial versus viral infections, for example, can help fight growing drug resistance.

Though important, international outbreak responses are often slow, complicated, and expensive. The case of Ebola shows how these types of responses are also not well suited to intervening at the most crucial moments. Instead, it is time we invested more in the kinds of local primary capacity that can find and limit outbreaks at their source.

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