

Sample on epidemiology of Ebola from book authored as work for hire. (*Please note this material is copyrighted by the client.*)

When did the current outbreak become a crisis and where is it centered?

The current outbreak is thought to have started in December 2013 and began making international headlines in 2014. In July 2014, Doctors Without Borders said Ebola was “out of control.” The next month, WHO declared Ebola “a public health emergency of international concern.” The worst affected region is the West African countries of Liberia, Guinea and Sierra Leone. Other countries have had cases as well: Nigeria, Senegal, Mali, the United States and Spain.

What is the death toll in this outbreak?

According to CDC, Ebola has killed about 5,000 people from to March to late October 2014.

How many people have been infected in Africa?

Nearly 14,000 cases have been reported mostly in Liberia, Sierra Leone and Guinea and a handful of cases in Nigeria, Senegal, Mali, Spain and the United States from March to late October, making this the biggest outbreak on record, according to WHO. About 5,000 people have died. The CDC believes the number of actual cases is about 2-1/2 times what gets reported to WHO. The current assumption is that for every four known Ebola cases, about six more go unreported," The Washington Post said based on CDC estimates.

How does this compare to past outbreaks?

This is the deadliest by far. It is worse than all other Ebola outbreaks combined and the virus has never spread to this many countries before. The virus was discovered in 1976 and in an outbreak that year in Sudan and Democratic Republic of Congo there were 602 cases and 431 deaths – the second-biggest outbreak on record -- according to WHO. There were smaller outbreaks in Africa in 1995, 2000 and 2007.

Why is this outbreak so bad?

The severity is linked to a number of factors.

Previous outbreaks occurred mostly in rural and isolated areas of Africa, but this time cities and towns are involved. In those places, infection can spread more easily because there are a lot of people and the population is densely concentrated. Inadequate hygiene and public health systems add to the challenges.

The outbreak started in Guéckédou, a rainforest region in southeastern Guinea. Guéckédou borders Sierra Leone and Liberia. But those borders are very easy to cross and people travel in and out frequently.

Epidemiologists believe travelers in the area spread Ebola. Almost all cases involve transmission from person to person, not as a result of exposure to bats or other infected animals.

Worsening the situation, many people do not trust authorities and have covered up infections, giving the virus opportunity to spread in hiding. People took bodies home and handled them as part of funeral customs. The aid effort has sought to address those issues, for example by implementing education campaigns and setting up ways to dispose of bodies safely.

Lastly, the international response moved more slowly than the virus. It took three months for health officials to identify Ebola as the cause of the epidemic. Another five months passed before WHO declared a public health emergency, and two more months for an international humanitarian response to kick in.

Have any countries eliminated the disease?

Yes. Nigeria, which had 21 cases, was declared free of Ebola on Oct. 20, more than a month after the last confirmed case was reported there. WHO also declared an end to the outbreak in Senegal, which reported one case, on Oct. 17.

Are there any other signs of progress?

Yes. Treatment centers that had been turning patients away in Liberia were starting to have empty beds at the end of October, Doctors Without Borders reported, and far fewer people appeared to be contracting the disease than initially expected. The World Health Organization confirmed the rate of new cases was dropping.

But health authorities said it was too early to celebrate. A similar decline occurred in March when the number of cases grew slowly and the CDC pulled out experts it had sent. Then the number of cases exploded in July.

In addition, some epidemiologists said more people may be dying at home rather than being brought to hospitals. There were reports in Liberia that families refused to bring relatives to hospitals because they knew that if they died their bodies would be cremated.

There were also reports that taxis and minibuses were refusing to take passengers who were bleeding or vomiting to hospitals. Because most people do not have access to ambulances, this has been the main way Ebola patients have been transported. The result is likely more Ebola patients dying at home, resulting in fewer hospitalizations. This may also be slowing the spread of the virus to other passengers.

Epidemiologists also note that infections generally come in waves, and this could be a lull between waves

How many people could become infected?

WHO reported on Oct. 14 that the number of new Ebola cases [could reach 10,000 per week](#) by December. The CDC published a report in September that outlined a worst-case situation, in which the total number of cases could reach 1.4 million by January 2015.

The CDC's model is based on data from August and includes cases in Liberia and Sierra Leone, but not Guinea (where counts have been unreliable). It also projects further into the future and adds ranges to account for underreporting of cases. If the statistical models hold true, these rates could make Ebola the sixth deadliest communicable disease.

Can health authorities trace the spread of the disease from person to person?

Sometimes.

Some patients know with certainty how they caught the virus especially if, for example, they cared for someone with the disease.

But many times the chain of transmission is not clear. This has meant that health officials have had to do a lot of detective work to trace exposure. For example, in Nigeria, all 21 cases including 8 deaths began when Liberian government official Patrick Sawyer travelled from Liberia to Lagos, Nigeria on July 20.

Nigerian officials, who moved quickly to contain the illness, monitored 362 people in Lagos who were potentially exposed to Sawyer. One man who evaded the monitoring travelled to Port Harcourt. That man later recovered but the doctor who treated him died of Ebola. A further 529 people were monitored in Port Harcourt in case they were infected.

In the United States, the first fatality, a man named Thomas Eric Duncan who traveled from Liberia, infected two nurses who treated him. Authorities then began monitoring people who might have been exposed to the nurses by tracking their movements and activities.

So who is “patient zero” in this outbreak?

According to the CDC, reports in medical literature have sought to identify the first person infected in this outbreak because that information could offer valuable insights into how the virus is spread and controlled.

But so far no “patient zero” has been confirmed. A report in the New England Journal of Medicine said that the suspected first case was a 2-year-old child who died in Meliandou, Guinea in December 2013. It was unclear how the child caught the virus.

What is the mortality rate?

WHO says that the average mortality rate in the current Ebola outbreak is about 50 percent.

But that has varied over the course of the outbreak and at times has been reported to be as high as 70 percent to 90 percent in hard-hit African countries and especially among healthcare workers there. The death rate as a percentage of cases in which there was a definitive outcome (i.e. death or recovery) is about 71percent.

In Africa, most of the fatalities died on average just four days after they were admitted to a hospital or clinic.

It’s important to note that the quality of care has a lot to do with the outcome. In the United States, where there are a lot more resources including well-equipped hospitals and access to cutting-edge treatments, patients have fared much better. Seven have recovered, one was in treatment and one died.

Beyond the mortality rate, what other measures are important to watch?

One important number is how many other people each Ebola victim infects, and it varies by country. In hard-hit Guinea, the average is 1.7 and in Liberia 1.8, according to WHO. The agency subsequently said that it saw signs that the spread of the virus was declining in Liberia.

Some sufferers infect many people, such as the 12 mourners infected at a single funeral in Sierra Leone who died.

Another important statistic is what is called the doubling time – a measure of how long it takes for the number of cases to double. This also varies from country to country. In late September 2014, a WHO study found the doubling time in African countries ranged from just over two weeks to 30 days.