

epiTRENDS

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Ebola Update

Ebola virus disease reached the attention of many people in the United States with a telebriefing and HAN alert to public health agencies from the Centers for Disease Control and Prevention (CDC) on July 28th, 2014. An imported case with two subsequent secondary cases occurred in Texas during September-October, 2014. That October a second imported case was identified in New York City.

West Africa Outbreak

What You Need to Know about Ebola

The 2014 Ebola epidemic is the largest in history

The outbreak is affecting multiple countries in West Africa. Two imported cases, including one death, and two locally acquired cases in healthcare workers have been reported in the United States.

CDC and partners are taking precautions to prevent the further spread of Ebola within the United States.

A person infected with Ebola is not contagious until symptoms appear

The time from exposure to when signs or symptoms of the disease appear (the incubation period) is 2 to 21 days, but the average time is 8 to 10 days. Signs of Ebola include fever and symptoms like severe headache, fatigue, muscle pain, vomiting, diarrhea, stomach pain, or unexplained bleeding or bruising.

Ebola is spread through direct contact with blood and body fluids

Ebola is spread through **direct contact** (through broken skin or mucous membranes) with

- Blood and body fluids like urine, feces, saliva, vomit, sweat, and semen) of a person who is sick with Ebola.
- Objects (like needles) that have been contaminated with the blood or body fluids of a person sick with Ebola.

Ebola is **not** spread through the air, water, or food.

Protect yourself against Ebola

There is no FDA-approved vaccine available for Ebola. Experimental vaccines and treatments for Ebola are under development, but they have not yet been fully tested for safety or effectiveness.

- **DO** wash your hands often with soap and water or use an alcohol-based hand sanitizer.
- **Do NOT** touch the blood or body fluids (like urine, feces, saliva, vomit, sweat, and semen) of people who are sick.
- **Do NOT** handle items that may have come in contact with a sick person's blood or body fluids, like clothes, bedding, needles, or medical equipment.
- **Do NOT** touch the body of someone who has died of Ebola.



 Centers for Disease Control and Prevention
Office of the Director

www.cdc.gov

Humans are rarely infected with Ebola virus from wild reservoir animals such as during hunting. Person-to-person spread can then occur as the virus is shed in all bodily secretions. The World Health Organization (WHO) was first notified of an outbreak of Ebola in West Africa during March 2014. A retrospectively identified 2-year old who died in Guinea on December 2, 2013, was probably the outbreak's index case. Additional family members died in the following month. The fifth and sixth deaths were healthcare workers, a nurse and a midwife. Subsequent

transmission occurred among family members and healthcare providers as the infection spread among villages and eventually across national borders. Virologic confirmation of the presence of Ebola virus disease did not occur until March 21st, 2014, at the Institute Pasteur in Lyon, France. By that time there were 49 cases and 29 deaths officially reported.

Guinea, Liberia, and Sierra Leone have been most heavily impacted, particularly Sierra Leone, with a few cases in other countries in West Africa. As of April 8, 2015, there have been a total of 25,515 reported

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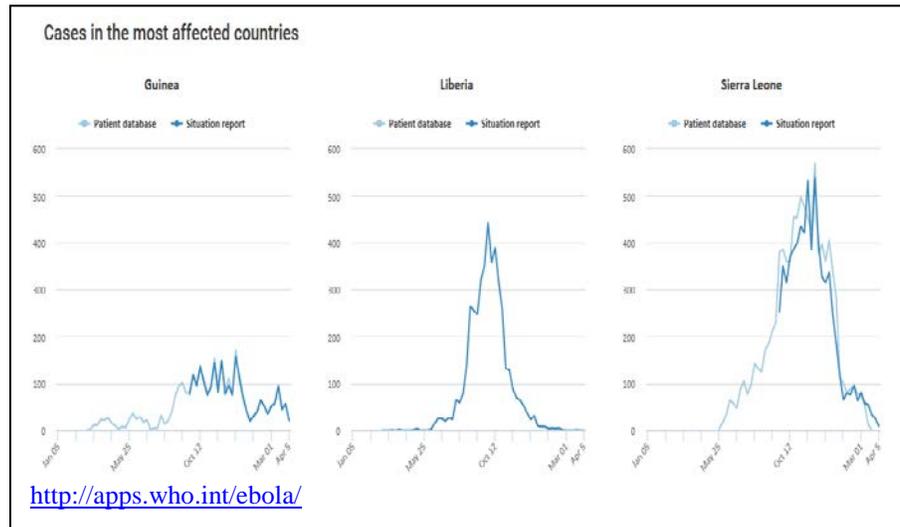
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Ebola virus disease cases (confirmed, probable, and suspected), with over 10,000 reported deaths although outcomes for many cases are unknown. Case numbers have dropped considerably since peaking during October, 2014 (see below). In the three countries there have been at least 861 infections among healthcare workers with 499 deaths (58% case fatality rate); if this rate is applied to all reported cases the actual number of deaths overall is around 14,800.



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According to data from WHO, there are similar numbers of cases among males and females. Available statistics for broad age groups show lowest rates in children and highest rates in older adults. In Sierra Leone, rates are 96/100,000 for those under 15 years of age, 241/100,000 for those aged 15 to 44 years, and 348/100,000 for those 45 years and older. This three-fold difference between older and younger age groups likely reflects exposure risks, with patient care and burials being done by adults while children are relatively protected from exposure.

In addition to case reporting, there are now surveillance systems for tracking other impacts of the West Africa Ebola outbreak. These surveillance measures include days from symptom onset to hospitalization, number of newly infected healthcare workers, number of reported unsafe burials, and number of security incidents or other refusal to cooperate with control procedures. In addition to fewer cases, improvement in these additional surveillance measures is supportive evidence that the Ebola outbreak is waning.

The three most involved countries had considerable public health and healthcare infrastructure needs before the Ebola outbreak. The World Bank's recent data for annual health expenditures per capita before the outbreak were \$32 for Guinea, \$65 for Liberia, and \$96 for Sierra Leone (US dollars) compared to \$8895 in this country. Physician coverage was also limited: Guinea had 0.1 doctors per

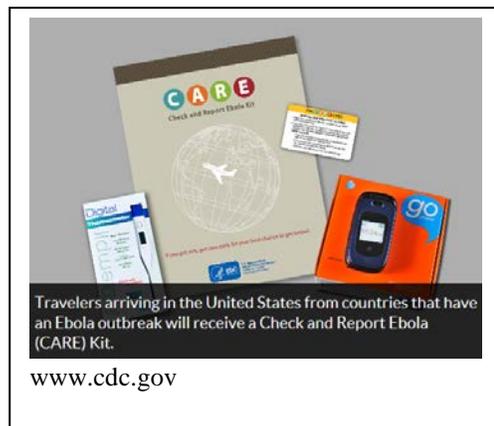
1000 population, Liberia had 0.014, and Sierra Leone 0.022 while in the United States there are 2.5 physicians per 1000 population.

Healthcare workers are at risk for exposure in Ebola treatment units as well as when caring for a patient with unrecognized Ebola virus infection, such as a child with diarrhea, a febrile person thought to have malaria, or a pregnant woman with bleeding. The loss of some healthcare workers to Ebola virus disease and the reluctance of other providers to see any symptomatic patients have exacerbated already insufficient healthcare resources. The collateral damage of this disruption has been lack of services for vaccine-preventable diseases and vaccinations, care of pediatric diarrhea, malaria treatment, and perinatal care for women and newborns. Other social disruptions include derailed economies, restrictions on travel and trade, closures of businesses and schools, and orphaned children.

United States Public Health Response

CDC is among national public health agencies that have been responding to the Ebola outbreak. CDC deployed personnel to the most affected countries to work on surveillance, contact tracing, data management, laboratory testing, and health education. Teams are also working in adjacent countries to assess preparedness. On April 9th, 2015, there were 182 CDC personnel deployed in Africa. Other technical support is provided from the CDC offices in this country.

A CDC travel warning was issued January 6th, 2015, to avoid nonessential travel to Guinea, Liberia, or Sierra Leone. Those countries do exit screening of travelers at departure including a temperature check. All travelers arriving from these countries have enhanced entry screening at five U.S. airports (New York's JFK International, Washington-Dulles, Newark, Chicago-O'Hare, and Atlanta). Level of exposure to Ebola virus is assessed as low, some, or high risk. If afebrile and asymptomatic, the person is given information about Ebola, a thermometer, and if needed a cell phone. Local or state public health agencies then monitor the incoming travelers for 21 days from last exposure. The local health jurisdictions in Washington have been conducting this supportive public health work.



At a March 31st update, CDC summarized the US entry screening experience. From October 11th, 2014 through March 24th, 2015 there have been 11,361 travelers screened for entry into the United States. From this group 272 have developed symptoms resulting in them being classified as persons under investigation (PUIs), 117 were tested, and no Ebola virus disease cases were identified. For the ill persons the top diagnoses were 33% gastroenteritis, 17% upper respiratory infections, 16% influenza, and 9% malaria. During March 16th through 22nd there were 1989 persons under monitoring in 29 states including 73 some or high-risk travelers. In Washington 191 travelers have been tracked at some point since monitoring started in October 2014. Of these, 24 travelers have been considered at some risk of exposure due to patient care activities, receiving more intensive monitoring. Only one person has been tested for Ebola in Washington, with negative results.

Future Directions

Getting to zero cases of Ebola virus infection in West Africa is the current goal. Essential public health activities are case finding, including detecting unreported burials, and tracing exposed contacts. For each case it is important to identify the source of infection. Complicating matters further, there has been sexual transmission from men who recovered from Ebola and subsequently infected a partner. Cases with unexplained routes of transmission require thorough investigation.



There is ongoing research into new diagnostic and treatment options. Patients in the United States have a considerably better outcome than those in West Africa, suggesting the effectiveness of a combination of aggressive tertiary care and investigational therapeutics such as pharmaceuticals and convalescent plasma from recovered Ebola cases. In Sierra Leone, a vaccine trial is being implemented with the focus on protecting healthcare workers.

In addition to outbreak response, the affected region in West Africa has considerable ongoing health care challenges. Reestablishing even the minimal services previously available will be needed to protect the population's health by reducing morbidity and mortality due to other conditions such as malaria, typhoid, cholera, measles, and childbirth.

In an era of rapid international travel, infectious diseases are literally only a plane-ride away. Integrated global public health and health care systems are needed to address emerging pathogens such as Ebola virus.

Resources

Emergence of Ebola in 2014: <http://www.nejm.org/doi/pdf/10.1056/NEJMoa1404505>

WHO one-year summary: <http://www.who.int/csr/disease/ebola/one-year-report/virus-origin/en/>

WHO data: <http://apps.who.int/ebola/current-situation/ebola-situation-report-1-april-2015-0>

World Bank health expenditure data:
<http://data.worldbank.org/indicator/SH.XPD.PCAP/countries/1W?display=default>

WHO physician coverage data: <http://apps.who.int/gho/data/node.main.A1444>

CDC monitoring summary (with CME and CNE available):
http://emergency.cdc.gov/coca/ppt/2015/03_31_2015_ebola_pui.pdf

Post-Ebola measles risk: <http://www.sciencemag.org/content/347/6227/1240>

Ebola vaccine trial: <http://www.cdc.gov/media/releases/2015/p0414-ebola-vaccine.html>