

Disease Along the River: A Case Study and Cholera Outbreak Game

by

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Background Handout

Read the following background information to prepare you for the game you will play and discuss in class.

In October 2010, just ten months after a devastating earthquake, the Haitian Ministry of Public Health and Population (MSPP) began receiving a significant number of reports of diarrheal illness from the Artibonite and Central Departments of Haiti. Stool samples collected from sickened patients were examined by the National Public Health Laboratory and confirmed positive for *Vibrio cholerae* (*V. cholerae*), the toxin-producing bacterium responsible for the disease, cholera. This result marked the beginning of the first cholera outbreak in Haiti in a century (1,2).

Cholera is an acute diarrheal illness that infects 3–5 million and kills 100,000–120,000 people each year. Though the majority of cholera infections are mild, approximately 20% of infected individuals will experience diarrhea, vomiting, and dehydration, resulting in shock or even death. Most patients begin experiencing cholera symptoms 2–3 days post infection, and if left untreated, cases of cholera can be fatal hours or days after the onset of symptoms. Still, nearly 80% of patients will recover if rehydration therapy is administered (3,9).

V. cholerae is primarily found in water contaminated with feces from an infected person or animal. Individuals contract cholera when they drink water or eat food contaminated with the cholera bacterium (3). *V. cholerae* may also be transmitted by infected animals, such as cattle and dogs, which are capable of carrying the *V. cholerae* without showing symptoms. Thus, humans who are exposed to infected animals are capable of contracting the illness (5). Natural disasters such as earthquakes, hurricanes and heavy rains can cause feces to be washed into rivers, lakes, or other bodies of water.

Prevention methods like hand washing, drinking only bottled or boiled water, and cooking food properly are the best ways for individuals to protect themselves from bacterial infection. There are two vaccines available for treating cholera, however they are often not used since the risk of acquiring cholera is low when preventative measures are adhered to (3). As a result, cases of cholera often occur in regions with poor sanitation or where feces are allowed to mix with water supplies.

In the aftermath of the January 2010 earthquake, which struck at a magnitude of 7.0 just west of Haiti's capital city Port-au-Prince, many Haitians had to be moved to temporary camps as their homes had been destroyed. Although attempts were made by the Centers for Disease Control and Prevention (CDC), MSPP and National Directory of Water and Sanitation (DINEPA) to test drinking water provided at the taps for infectious agents, sanitation conditions remained poor. Even prior to the earthquake, only 71% of people living in urban Haiti could access improved water and 24% had improved sanitation. Moreover, 49% of rural Haitians regularly practiced open defecation (4). The Independent Panel also claimed that thousands of Haitians utilized the Meye Tributary System and Artibonite River

for bathing, drinking, and recreation. Finally, the fact that cholera had not been seen in Haiti for nearly a century meant that much of the country's population had no previous exposure or immunity to the pathogen (6).

In response to the imminent cholera outbreak crisis, the MSPP and CDC began training 500 Haitian medical workers on how to treat and care for those infected. In addition, the MSPP produced a list of “Five Basic Protection Messages”, advising the public to drink and use only safe water, wash hands often with soap, use latrines as opposed to defecating near open water, peel fruits and vegetables, eat cooked food warm and clean kitchens and bathing areas. These health messages were then spread by means of Haitian news networks (1,2). In a report published on October 26, 2010, the World Health Organization (WHO) documented 12 cholera treatment centers established in Artibonite, Central, and Port-au-Prince (8). Despite two infectious disease surveillance systems already being used in response to the earthquake (National Sentinel Surveillance System and Internationally Displaced Persons Surveillance System), MSPP also constructed the National Cholera Surveillance System (NCSS) days after the outbreak began. The NCSS used an adapted WHO description of cholera to monitor cases of the disease, showing that just 29 days after the outbreak had started, cholera had spread to ten Departments in Haiti. As of 2012, 604,634 cases and 7,436 deaths have been attributed to the outbreak (1).

At first the cause of the 2010 outbreak was unclear, as pathogenic cholera had not been seen in Haiti for over 100 years. Three main hypotheses were proposed to explain its introduction to the environment. One view suggested that a *V. cholerae* strain present in surrounding areas, such as the Gulf of Mexico, entered Haiti on ocean currents associated with the earthquake. A second concluded that a benign strain of *V. cholerae* already present in Haiti had mutated into a pathogenic strain. Lastly, it was theorized that *V. cholerae* was introduced by an infected individual or group of individuals that had recently traveled to Haiti. A group called the Independent Panel of Experts on the Cholera Outbreak in Haiti, or simply the Independent Panel, was formed to examine the available molecular, epidemiological, and sanitation evidence in order to identify the cause of the outbreak. The Independent Panel demonstrated that the cholera outbreak had to have resulted from introduction into the environment by an individual or group, thus supporting the third major hypothesis. The Independent Panel was able to conclude that *V. cholerae* had entered the Artibonite River on or around October 17th, 2010, with the beginning of the outbreak occurring on October 20th (6).

A group of United Nations (UN) soldiers from Nepal, who had entered the country as aid workers for part of the United Nations Stabilization Mission in Haiti (MINUSTAH), were suggested as the carriers of the original *V. cholerae*. In their report, the Independent Panel did not specify a group of people and claimed that no one was directly responsible for the spread of the disease, although they did reveal that precautions at the UN camps were not adequate and would not prevent members of the MINUSTAH from transmitting the disease (6). Recent research has demonstrated that the Haitian *V. cholerae* strain responsible for the 2010 outbreak is most closely genetically related to the Nepalese *V. cholerae* strain, supporting the claim that UN workers first introduced the bacterium to Haiti (7).

References

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