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From One to the Other: Responding to Ebola Cases on Either Side of the Line

Rebecca Day Merrill, Sadie Elizabeth Ward, Marydale Cauble Oppert, and Dana Allison Schneider

African Case Studies in Public Health

Participants' Guide

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From One to the Other: Responding to Ebola Cases on Either Side of the Line

Authors: Rebecca Day Merrill[1], Sadie Elizabeth Ward[1], Marydale Cauble Oppert[1], Dana Allison Schneider[1]

[1]International Border Team, Division of Global Migration and Quarantine, U.S. Centers for Disease Control and Prevention (CDC)

Email: rdaymerrill@cdc.gov

1825 Century Blvd NE, MS E-28, Atlanta, GA 30345; Telephone: +1-404-783-4187; Fax: +1-404-498-0830

Abstract

This case study is adapted from events that occurred along the Sierra Leone and Guinea land border during the 2014–2016 Ebola epidemic in West Africa. The response activities involved Sierra Leone and Guinea officials, along with assistance from U.S. Centers for Disease Control and Prevention (CDC) and the World Health Organisation (WHO). This case study builds upon an understanding of basic surveillance systems and outbreak response activities. Through this exercise, students will understand how to incorporate communication and coordination into surveillance and response efforts with counterparts across the border in neighbouring countries. This integration is important to reduce the spread of communicable diseases between neighbouring countries. The time required to complete this case study is 2-3 hours.

How to Use the Case Study

General instructions: This case study in applied epidemiology allows students to practise skills in the classroom setting to address real-world public health problems. It is suited to reinforcing principles and skills already covered in a lecture or background reading.

Ideally, one or two instructors facilitate the case study in a classroom or conference room for up to 20 students. Traditionally, the instructor directs a participant to read aloud a paragraph or two, going around the room and giving each participant a chance to read. When a participant reads a question, the instructor guides all participants' responses by engaging in a discussion and using diagrams, when relevant. Sometimes, the instructor will split the class into groups to complete activities or to assume different sides of the discussion when answering a question. Through these teaching methods, participants learn from each other, not just from the instructors.

Audience: Residents in Field Epidemiology Training Programs (FETPs), Field Epidemiology and Laboratory Training Programs (FELTPs), and other health professionals who are interested in this topic.

Prerequisites: Participants should have received lectures or other instructions in general public health surveillance and outbreak response.

Materials needed: Flip chart or whiteboard, markers

Level of training and associated public health activity: Novice - surveillance, public health preparedness and response

Time required: 2-3 hours

Language: English

Participant's Guide

Goal of Case Study: To strengthen understanding about policies and procedures for improving and maintaining cross-border surveillance and communication.

Learning Objectives: After completion of this case study, the participants should be able to:

1. Describe the importance of cross-border surveillance and communication to support a coordinated response in a public health system
2. Define the key objectives and components of a coordinated cross-border surveillance and response system
3. Describe cross-border transmission of communicable (or infectious) diseases, including drawing a transmission-chain diagram
4. Define the tasks involved in developing and maintaining coordinated cross-border surveillance and communication during preparedness for, and response to, an event of international public health concern

Introduction

In late December 2013, an unidentified febrile illness occurred in the rural forested area of Gueckedou, Guinea; Ebola was confirmed on 22nd March, 2014 (Appendix 1). Within months of the initial case, Ebola transmission spread into Liberia and Sierra Leone through human movement between communities along and across international borders, quickly reaching the countries' capitals [1,2]. Additionally, infected or exposed travellers traveling via land and air spread Ebola into Nigeria, Senegal, and Mali.

Ebola is a rare and deadly disease caused by infection with one of the five identified Ebola virus species, found mainly in several African countries. Ebola is spread through direct contact with: the blood and body fluids of a person who is sick with, or has died from, Ebola; objects that have been contaminated with body fluids of a person who is sick with, or has died from, Ebola; infected fruit bats or primates; and contact with semen from someone who has survived Ebola [3,4]. When an individual is first sick with the disease they may be very tired and have a fever, diarrhoea, or other conditions resembling common infectious diseases such as malaria and cholera.

On 8th August, 2014, the World Health Organisation (WHO) declared the West Africa Ebola epidemic a Public Health Emergency of International Concern (PHEIC) [5]. A PHEIC is defined in the International Health Regulations (IHR), which have been adopted by 196 countries, as "an extraordinary event which is determined:

- to constitute a public health risk to other States through the international spread of disease; and
- to potentially require a coordinated international response" [6].

Throughout the outbreak, human movement between the three affected countries through official and unofficial border crossings led to continued cross-border transmission of the disease. The response to the international transmission across land borders was difficult due to language barriers, international differences in Ebola case definitions, and the lack of standard surveillance and response procedures.

To help protect against further international spread of Ebola, countries with Ebola outbreaks established health screening procedures at air, sea, and land border crossings, as well as at vehicle checkpoints inland. The purpose of the health screening was to identify travellers who appeared to be sick with Ebola or to have a history of recent exposure to the virus. The health screening procedure consisted of a brief interview or questionnaire about history of signs, symptoms, and/or exposure. Also included was a temperature measurement and visual observation of the traveller for obvious signs of illness. Some

countries with zero to few cases took further action, instituting measures such as border closures to prevent travellers from the countries with Ebola outbreaks from entering.

[Appendix 1]

Question 1. If you were a district surveillance officer during this epidemic in a district along an international border, what cross-border activities would you recommend? Explain your answers.

Question 2. List at least three potential challenges that may affect cross-border surveillance and communication between Guinea, Sierra Leone, and Liberia, or neighbouring countries in any region.

Question 3. If the region experienced a cholera outbreak instead of an Ebola outbreak, what would you do the same? What would you do differently? Explain your answers.

Part 1

During the epidemic, numerous outbreaks occurred in rural areas as a result of community members having contact with Ebola cases during travel between urban and rural areas.

In November 2014, an elderly female was in Freetown, Sierra Leone, caring for a sick person (Case A) who was later determined to have Ebola. A few days after the elderly woman returned to her home village in rural, north-western Sierra Leone, along the border with Guinea, she began showing Ebola-like symptoms (Case B) (Appendix 2). After she became sick, she was evacuated to an Ebola Treatment Centre (ETC), where she later died of Ebola.

Following Case B's death, her daughter-in-law, who had contact with Case B when she was sick, travelled to visit her sister in Katallah, Sierra Leone, another village along the border with Guinea. During the daughter-in-law's visit with her sister, she became sick (Case C) and was evacuated to an ETC where she died 2 days after her arrival; blood tests revealed she had Ebola.

After Case C's Ebola diagnosis and death, district surveillance teams travelled to Katallah, Sierra Leone, to conduct a case investigation. The surveillance team interviewed family and community members to further understand the timeline of Case C's illness, gather information on any travel she may have taken while sick, and identify people who may have come into contact with her while she was sick (referred to as a contact investigation). As a result of the case contact investigation, surveillance officers decided to quarantine (separate and restrict the movement of people exposed to a contagious disease to see if they become sick) community members, including her sister, whom they identified as contacts of Case C. The quarantine period for Ebola is 21 days after the last possible exposure. However, during additional interviews with a surveillance officer, Case C's sister denied having been exposed, and was not required to be quarantined.

Following the interviews by surveillance officers, Case C's sister began showing Ebola-like symptoms (Case D), and many family and friends secretly cared for her. The community didn't inform surveillance officers about her illness until Case D's death. At that time, before Case D's burial, the surveillance team collected a saliva swab from her body, a method used during the Ebola epidemic to provide laboratory confirmation of an Ebola diagnosis upon death. Test results on Case D's saliva swab were positive for Ebola.

[Appendix 2]

Question 4a. Why might community members be hesitant to tell surveillance officers they were contacts of an Ebola case? How might the secrecy affect the spread of the disease?

Question 4b. As a surveillance officer, what could you do to help the community feel more comfortable reporting potential cases?

Question 5. If you were on the surveillance team investigating Case C's death, what actions would you take during the investigation?

Surveillance teams continued working with communities to build trust and a better understanding about Ebola. After Case D's death, surveillance teams travelled to Katallah, Sierra Leone, where they tried to quarantine eight contacts of Case D who had cared for her while she was ill. Her brother-in-law was one of the eight identified contacts, but he fled across the border to Soriya, Guinea, to avoid being put under quarantine (Appendix 3). While in Soriya, Guinea, he (Case E) began to experience Ebola-like symptoms, died, and was buried in secret by the local community. Many community members and family and friends from outside the community attended Case E's funeral, as he was the son of a well-known businessman in the area.

One man who had travelled to Case E's funeral returned home to Pamelap, Guinea, a town in Forécariah prefecture bordering Sierra Leone. A few days after he returned he began to show signs of Ebola (Case F). When Guinean surveillance officers investigated Case F's travel history, they learned about the community death and secret burial of Case E. During the next routine cross- border meeting in Gbalamuya, Sierra Leone, local officials from both Sierra Leone and Guinea shared epidemiologic information regarding Cases E and F.

[Appendix 3]

Question 6. Given the cross-border family relationships throughout this chain of cases, describe:

a. Whom would you, as a district surveillance officer, contact across the border to conduct cross-border surveillance and coordination actions?
b. What cross-border surveillance and coordination actions might you undertake?

When Case F's younger brother heard of his illness, he travelled from Sierra Leone to Pamelap, Guinea, to help Case F while he was sick. After Case F died and was buried, his younger brother returned to Kagbaha village in Sierra Leone, along the border with Guinea (Appendix 4). On his way home, the younger brother spent time in Lokoya, Sierra Leone, with his sister. Five days after departing Lokoya and reaching his home in Kagbaha, the younger brother became sick (Case G) and was taken to the community clinic in Sierra Leone, where he died.

[Appendix 4]

Question 7. Based on what you know about the current transmission chain, what should health and surveillance officials ensure they investigate about Case G? What cross-border actions should they take?

Surveillance officers conducted thorough investigations to gather information about travel history and contacts and informed counterparts across the border. Based on the information they collected, officials quarantined 16 people in Kagbaha, Sierra Leone. Fortunately, no one in this quarantine group became sick. Back in Lokoya, Sierra Leone, Case G's sister (Case H) died after many days of illness. Officials learned she was Ebola-positive when the laboratory analysed the saliva swab taken after her death. In response, 25 people in Lokoya were quarantined. During the quarantine period, two additional cases were identified in the community. One survived (Case I) and one died (Case J). Of note, although Case J and her family were identified as contacts of Case H through contact tracing, all denied having contact with Case H while she was ill; therefore, officials did not place them under quarantine.

Question 8. If you were on the surveillance team in Sierra Leone in this district or another district along an international border, what steps would you recommend taking before another PH event occurs in the community to strengthen community surveillance and cross-border coordination?

Question 9. Using the information provided about the cases, draw a diagram of the transmission chain highlighting the cross-border events and family relationships.

Part 2

Almost a year later, in the same border areas, another cross-border scenario occurred.

In October 2015, a 31-year-old man began feeling very sick while in Conakry, Guinea, where he had been living for the previous month. After visiting a hospital in Conakry, he contacted friends and family in Freetown to update them on his condition. He requested assistance in returning home to Freetown. Two friends travelled to Conakry and hired a commercial vehicle to transport him (Traveller A) and his friends to Pamelap, Guinea, where they could pass through one of three official border crossings with Sierra Leone; from there, they could continue on to Freetown, Sierra Leone.

During the journey to Pamelap, Guinea, officials at a vehicle check point in Maferinyah, Guinea, conducted health screening on all travellers (Appendix 5), including a temperature check. During the primary health screening process, officials noted Traveller A had a fever. Officials at the check point isolated Traveller A and conducted secondary screening, which consists of asking about additional symptoms and medical history.

After the secondary screening interview, officials decided Traveller A should be referred to the local clinic in Guinea for rapid diagnostics tests (RDTs) for malaria and Ebola; each test showed a negative result. The authorities at the local clinic recommended Traveller A be transferred to a hospital in Forécariah, Guinea, for additional follow-up. Of note, no established standard operating procedure or protocol existed that explained how to handle a sick traveller who planned to travel by land to a neighbouring country.

[Appendix 5]

Question 10. Describe the benefits and challenges of looking for obvious signs of illness among travellers passing through designated vehicle check points or official points of entry.

Despite the clinic authority's recommendation, Traveller A's companions chose to travel to a medical facility in Sierra Leone via the land border crossing in Pamelap, Guinea (Appendix 6).

[Appendix 6]

Question 11. Since the sick traveller and his companions planned to continue traveling to a neighbouring country, what would be the appropriate next steps for the officials (health officials, border officials, surveillance officials) involved? Explain.

Question 12. If a health clinic receives information that a sick traveller may travel to another region, or across a border, while ill, what action, if any, would you request the health staff take? Why?

Because there was no rule in place requiring clinics to report information to areas along the expected travel route, and because the test results were negative, the clinic staff could not prevent the traveller from continuing and did not feel obligated to inform other health clinics or officials along the route about

his illness. Upon arrival in Pamelap, Guinea, the group transferred to another vehicle that could transport them across the border into Sierra Leone. At this point, Traveller A's health had worsened and he was unconscious in the vehicle. At the official border crossing between Guinea and Sierra Leone, his traveling companions presented the medical documentation from the Conakry hospital and the negative RDT results to the Guinea border security personnel.

They explained they were taking Traveller A to a hospital in Kambia, Sierra Leone, for further evaluation. The border security personnel allowed the vehicle to continue through to the Sierra Leone border security checkpoint (Appendix 7). The passengers were not required to undergo additional health screening. Similarly, Sierra Leone border security personnel permitted the vehicle to enter Sierra Leone without the passengers' undergoing health screening.

[Appendix 7]

Question 13. If you, as the district surveillance officer, learned of a traveller with negative RDT results from another country who met the case definition for Ebola, what action, if any, would you take? Why?

After leaving the official border crossing, the vehicle continued to the hospital in Kambia, where Traveller A was placed into triage. The hospital notified a Kambia District Surveillance Officer (DSO) to complete an Ebola Case Investigation Form. Because Traveller A was unconscious and unable to answer questions, the DSO interviewed one of his traveling companions. The travelling companion reported that Traveller A had no fever but was suffering from vomiting, nausea, intense fatigue and weakness, loss of appetite, difficulty breathing, and difficulty swallowing. Based on his symptoms, the DSO determined that Traveller A fit the definition of a suspected Ebola case.

Question 14. Based on Traveller A's health status and his recent travel in Guinea, the district surveillance officer (DSO) notified officials at the official Guinea-Sierra Leone point of entry and his counterparts in Guinea. What information should he relay to them?

The DSO ordered staff to transfer Traveller A from the Kambia hospital to the Kambia ETC by ambulance. Traveller A died during the transfer to the ETC, where his Ebola test result confirmed he did not have the disease.

Continued on next page →

Conclusion

The 2014-2016 Ebola epidemic was the largest in history, with more cases than all other Ebola outbreaks combined. Unique to the epidemic was the known international transmission to several countries across porous land borders. Widespread transmission occurred in multiple countries in West Africa, with the largest number of cases occurring in Guinea, Sierra Leone, and Liberia. By January 2016, when the epidemic was largely contained, more than 28,500 cases and 11,300 deaths were recorded (7, 8).

The magnitude and complexity of the epidemic highlighted the need to strengthen national and regional capacity to prevent, detect, and respond to cases faster and more efficiently. Further, the informal and formal population movement between countries presented challenges to surveillance and response efforts in border regions where there is risk of cross-border transmission. By the end of the second scenario, which occurred in October 2015, cross-border officials and public health stakeholders discussed the lessons learned at a routine cross-border meeting, including:

- When actions are taken to respond to a sick traveller from a neighbouring country, the officials should inform local counterparts in the other country.
- When needed, health screening and follow-up actions for travellers should always be completed. Results from medical check-ups at previous health screening posts should not permit a traveller to avoid screening, since screening and diagnostic methods often differ and the person may become more ill between posts.
- Health officials should inform appropriate Port Health authorities when they know of a patient sick with a communicable disease of national priority who has travelled from another country, or if the contact of a patient sick with a communicable disease of national priority plans to travel to another country.

Background Reading

WHO. Ebola virus disease. 2015. http://www.who.int/mediacentre/factsheets/fs103/en/

Acknowledgements

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Appendix

Appendix 1. Location of origin and direction of transmission of the 2014-2015 Ebola epidemic. Map produced by Geospatial Research, Analysis, and Services Program (GRASP) of the U.S. Centres for Disease Control and Prevention (CDC)/Agency for Toxic Substances and Disease Registry (ASTDR), February 2016.

Appendix 2. Location and travel of Cases A, B, C, and D. Map produced by GRASP, February 2016.

Appendix 3. Location and travel path of Cases B, C, D, E, and F. Map produced by GRASP, February 2016.

Appendix 4. Location and travel path of Cases G, H, I, and J. Map produced by GRASP, February 2016.

Appendix 5. Location and travel path of Traveller A. Map produced by GRAPS, February 2016.

Appendix 6. Location and travel path of Travel A to Guinea–Sierra Leone Border. Map produced by GRASP, February 2016.

Appendix 7. Location and travel path of Traveller A to Kambia, Sierra Leone. Map produced by GRASP, February 2016.

References

1. WHO. Origins of the 2014 Ebola epidemic. http://www.who.int/csr/disease/ebola/one-year-report/virus-origin/en/. Accessed 14 July 2016
2. WHO. 2014 West African Ebola Outbreak: Feature Map. http://www.who.int/features/ebola/storymap/en/. Accessed 14 July 2016
3. Deen GF, Knust B, Broutet N, Sesay FR, Formenty P, Ross C, *et al.* Ebola RNA Persistence in Semen of Ebola Virus Disease Survivors - Preliminary Report. *NEJM*. 2015. http://www.ncbi.nlm.nih.gov/pubmed/26465681
4. Thorson A, Formenty P, Lofthouse C, Broutet N. Systematic review of the literature on viral persistence and sexual transmission from recovered Ebola survivors: evidence and recommendations. *BMJ Open*. 2016; **6**(1): e008859. http://www.ncbi.nlm.nih.gov/pubmed/26743699
5. WHO. Statement on the 1st meeting of the IHR Emergency Committee on the 2014 Ebola outbreak in West Africa. http://who.int/mediacentre/news/statements/2014/ebola-20140808/en/. Accessed 14 July 2016
6. WHO. *International Health Regulations (2005)*. 2nd ed. 2008. Geneva. World Health Organzation