

Case study: Outbreak investigation [preceptor version]

PHN RESIDENCY FOR NEW GRADUATES

Objectives

1. Discuss the route of transmission and prevention methods for common waterborne illnesses.
2. Describe the epidemiological triad for infectious diseases.
3. Provide examples of reportable diseases.
4. Describe key assessment data collected in outbreak investigations.
5. Discuss the role of the public health nurse in community outbreaks of infectious diseases.

Case study

A nurse at a summer camp for adolescents observed an excessive number of people at the camp seeking help for diarrhea and/or vomiting during a week in late June. Normally, two or three campers per week would report to the health office with these symptoms; however, 23 campers and staff sought help in a two-day span. The nurse reported the increased incidence to the camp manager and the local health department, and the camp was closed.

1. What education should the nurse provide to campers and staff as they go home?

Answer:

- **See your health care provider with any gastrointestinal symptoms.**
- **If you are experiencing recurrent vomiting/diarrhea, drink plenty of fluids. Consider an oral rehydration solution.**
- **Wash your hands with soap and water after using the restroom.**
- **Do not swim when you have diarrhea.**
- **Do not swallow pool/lake water.**
- **Wash thoroughly with soap and water before swimming.**

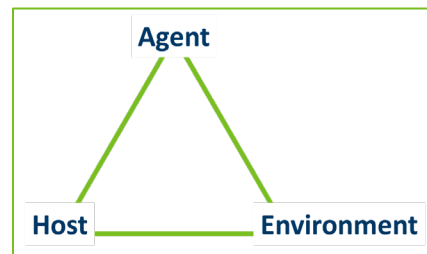
After consulting with the state health department, the local health department obtained the results of 23 stool samples from symptomatic campers/staff and tested for bacterial and viral pathogens. Fifteen of the 23 stool samples (65 percent) tested positive for *Escherichia coli* (*E. coli*). The incubation period for *E. coli*, the agent responsible for the gastroenteritis in the camp, is three to four days. After further investigation, it is suspected that the well water was contaminated; a sample of the water was analyzed.

Representatives from various state agencies investigated the outbreak. In mid-July, the department of health notified the camp that the water sample from the camp tested positive for fecal contamination.¹

¹ Adapted from Centers for Disease Control and Prevention [CDC], 2007a.

2. Is this infectious disease a communicable disease? Explain your answer.

Answer: Yes. For an infectious disease to be communicable, or contagious, there must be a portal of exit from the infected person (or animal), a means of transmission, and a portal of entry to a susceptible host. All three of these factors are present in this scenario. The portal of exit is feces, the means of transmission is the well water, and the portal of entry is through ingestion of contaminated water. Therefore, this infectious disease is communicable.



3. Are all the campers and staff at the camp susceptible hosts? Explain your answer.

Answer: Yes. In general, there are several host factors that determine whether a person is at risk for being a host for an infectious disease:

- Demographics (e.g., age, gender, occupation)
- Level of health (e.g., immune status, diet, chronic disease)
- Human behavior (e.g., diet, exercise, hygiene)
- Genetic risk factors
- Previous exposure to infectious agent

Active case finding and surveillance began after the department of health identified the *E. coli* positive well water sample on July 19. A case of gastroenteritis is defined as an illness lasting for more than 24 hours that includes three or more episodes of diarrhea, vomiting, or both. The attack had to occur in a camper or staff member after arriving or leaving the camp during the period from June 1 through July 19. The health department obtained lists of camp attendees and staff from camp managers, and conducted a retrospective cohort study by administering a telephone questionnaire to 210 out of 277 (76 percent) of individuals. The study identified 141 cases (67 percent). 102 people reported diarrhea (72 percent), 92 reported vomiting (65 percent), and 89 reported stomach cramps (63 percent).

4. What was the incidence rate among those interviewed? (Use the following formula: total number of cases divided by the total population eligible.)

Answer: Incidence rates provide information regarding severity of the outbreak. In this case study, the incidence is $141 \div 277 = 0.51$.

5. Is the agent in this summer camp outbreak, *E. coli*, a reportable disease in Minnesota?

Answer: Yes, *E. coli* is reportable in Minnesota.

You can find more information, including annual reports, about reportable diseases in Minnesota online at [Infectious Disease Reporting](#) from the Minnesota Department of Health. For more information about national reportable disease statistics, visit [Morbidity and Mortality Weekly Report \(MMWR\)](#) from the Centers for Disease Control and Prevention (CDC), choose “all reports,” and then select a particular week’s report to see national statistics for that week.

6. Did the occurrence of *E. coli* at the camp meet the definition of an outbreak? Why or why not?

Answer: Yes, a disease outbreak is the occurrence of cases of disease in excess of what would normally be expected in a defined community, geographical area, or season.

Two wells provided the camp with water. The septic tank, which held the camp’s sewage, was full and had not been maintained properly. It was believed that the large number of camp attendees

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overburdened the septic system and created a heavy demand for well water. This allowed the septic system effluent to contaminate the water that replenished the wells.

It was determined that the camp's water system should be regulated as a public water system. The camp installed a new septic system following a professional site evaluation. In the future, the camp's water system will be subject to periodic EPA testing guidelines and subsequent evaluations.

7. Discuss with your preceptor the following question: What roles might a public health nurse assume following report of a communicable disease outbreak?

Answer: In situations such as these, it often won't take long before the phone starts to ring. The general public will call to assess their own risk and will want answers. CDC's emergency risk communication motto is: "Be first, be right, be credible." If public health does not take responsibility for providing accurate information for the public, the public and others can easily misunderstand or misinterpret information.

In addition to fielding questions from the general population, public health may also be tasked with leading contact investigations. This includes proactively reaching out to potential contacts. The purpose of contact investigations is assessment, education, and referral when needed. Identifying potentially infected hosts before they can spread the infection to other susceptible hosts will reduce the magnitude of the overall outbreak.

Activity

Find your agency policy on media outreach.

Concepts covered

Epidemiology, outbreak investigation process, primary prevention, risk communication, incidence rates

Additional resources

1. Centers for Disease Control and Prevention. *A-Z of Water-Related Topics*. Online: <https://www.cdc.gov/healthywater/disease/az.html>.
2. Centers for Disease Control and Prevention. *Steps in a Foodborne Outbreak Investigation*. Online: <https://www.cdc.gov/foodsafety/outbreaks/investigating-outbreaks/investigations/>.
3. Centers for Disease Control and Prevention. *12 Steps for Prevention of Recreational Water Illness*. Online: <https://www.cdc.gov/healthywater/swimming/aquatics-professionals/twelve-steps-for-prevention-rwi.html>.

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August 2021. To obtain this information in a different format, call: 651-201-3880.