

# 8

# How is an outbreak investigated?



CDC NERD Academy



Grade level

6–12



Suggested time

75 minutes

## Overview

In this module, students learn how public health experts follow steps of an outbreak investigation and communicate their findings. Using data from a fictional, novel emerging respiratory disease (NERD) outbreak at a summer camp, students develop hypotheses, analyze data, and develop tailored communication materials for different audiences.

## Learning objectives

After this module, students should be able to

- ☀ Explain the multistep process used to investigate an outbreak
- ☀ Describe how a case definition can be used during an outbreak investigation
- ☀ Discuss how different public health experts contribute to an outbreak investigation
- ☀ Explain how a line list can be used to organize outbreak investigation data
- ☀ Apply a NERD case definition to determine confirmed cases during a NERD outbreak
- ☀ Design a communication strategy and materials for different audiences during a NERD outbreak investigation



## STEM connections & standards

**STEM connections:** Science: hypothesis generation, data analysis; English Language Arts: synthesizing information, communicating to an audience

**N**OVEL  
**E**MERGING  
**R**ESPIRATORY  
**D**ISEASE



**Problem-based skills:** Scientific design, decision making, implementing action plans, collaborative performance

**Epidemiology and Public Health Science Core Competencies:** HS-EPHS1: Epidemiologic Thinking and a Public Health Approach; HS-EPHS2: Public Health Surveillance, HS-EPHS4: Prevention Effectiveness <https://www.cdc.gov/careerpaths/k12teacherroadmap/pdfs/ephs-competencies.pdf>

**National Health Education Standards:** Standard 4: Students will demonstrate the ability to use interpersonal communication skills to enhance health and avoid or reduce health risks. Standard 8: Students will demonstrate the ability to advocate for personal, family, and community health. <https://www.cdc.gov/healthyschools/sher/standards/index.htm>

**Next Generation Science Standards:** Science & Engineering Practices: Planning and Carrying Out Investigations; Obtaining, Evaluating and Communicating Information; Constructing Explanations and Designing Solutions; Crosscutting Concepts): System and System Models; Patterns <http://www.nextgenscience.org/get-to-know>





### 1 Introducing the content (30 minutes)

Students watch the “How is an outbreak investigated?” video (12:43 minutes) to learn about the steps of an outbreak investigation. Teachers can assess student knowledge of the video content using the **Knowledge Check**. The class can further discuss the collaborative roles of different public health experts during an outbreak investigation using the **Career Spotlight**.

### 2 Activity (35 minutes)

As a class, students will complete the steps of an outbreak investigation using a NERD case study. In groups, students design communication materials using outbreak data and information for different audiences. Teachers can watch an activity demonstration video (2:10 minutes) that illustrates how to teach this activity in the classroom.

### 3 Class discussion (10 minutes)

As a class, students apply their knowledge to answer questions about outbreak investigations.



#### Vocabulary

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Analytic epidemiology, case definition, confirmed case, descriptive epidemiology, line list, outbreak.

See **Definitions**.



#### Materials

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Handouts and coloring supplies (e.g., crayons, markers, or colored pencils) or access to digital media tools.



#### Meet the outbreak team

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Learn more about the collaborative roles of different public health experts in the **Career Spotlight** and the “How is an outbreak investigated?” video.

## Teacher preparation

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- ☀ Preview videos.
- ☀ Make copies of handouts.
- ☀ Cut out **Audience Cards**.

## Videos

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- ☀ “How is an outbreak investigated?” video (12:43 minutes) for students
- ☀ Activity demonstration video (2:10 minutes) for teachers

[www.cdc.gov/scienceambassador/nerdacademy/outbreak-investigations.html](http://www.cdc.gov/scienceambassador/nerdacademy/outbreak-investigations.html)

## Handouts

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- ☀ **Knowledge Check: Outbreak** (one per student)
- ☀ **Career Spotlight: Outbreak Investigation Team** (one per student or one classroom version to display or project)
- ☀ **NERD Factsheet** (one per student)

The **NERD Factsheet** may be re-used across modules if previously distributed to students.

- ☀ **NERD Outbreak** (one per student)

The case study consists of seven sections: an overview and six parts. Each section will be handed out separately.

- ☀ **Communicating Findings** (one per student)
- ☀ **Audience Cards** (one card per group, once cut out).

## Introducing the content (30 minutes)

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### Say aloud

When an outbreak occurs, public health experts use a series of steps to guide their investigation. These steps include testing hypotheses and communicating findings. These steps help public health experts quickly and efficiently describe key details of an outbreak, determine possible causes of the outbreak, and make recommendations for prevention strategies that can reduce disease spread. During the video, you will see how different public health experts work together to investigate and solve an outbreak.

- 1 Show the “How is an outbreak investigated?” video (12:43 minutes) to students.
- 2 Hand out the **Knowledge Check: Outbreak**. Allow students 3–5 minutes to answer the questions on their own. Then, review as a class using the **Knowledge Check: Answer Key** provided.
- 3 Hand out or display the **Career Spotlight**. Discuss the collaborative roles of different public health experts during an outbreak investigation.



## Activity: Part 1 (20 minutes)

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### Say aloud

You just learned how public health experts work together during an outbreak to gather information and identify possible causes and solutions. Now, you will work together as a class to investigate a NERD outbreak at a local summer camp by following the steps of an outbreak investigation.

- 1 Hand out the **NERD Outbreak, Overview**. Review the steps of an outbreak investigation.
- 2 Hand out the **NERD Factsheet** and explain that students should review NERD symptoms and transmission to prepare for their outbreak investigation. Have students read through the factsheet on their own, highlighting or annotating information about symptoms and how NERD spreads.
- 3 Hand out **NERD Outbreak, Steps 1–3**. As a class, walk through the section of the case study and answer questions together. Hand out **NERD Outbreak, Step 4**. As a class, walk through the section of the case study and answer questions together. Continue this process until all five sections of the case study are complete. Use the **NERD Outbreak, Answer Key** to guide discussion.

For step 6, you could have students create the epi curve using the line list instead of providing it. For an added level of challenge, redefine the case definition to include only confirmed cases (i.e., positive laboratory test), then create a stacked histogram epi curve which displays confirmed and probable cases (i.e., symptoms but no confirmatory test).



## Activity: Part 2 (15 minutes)

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### Say aloud

In an outbreak investigation, you would communicate with different people about the progress of the investigation. At the end of the investigation, it is also important for you to share a summary of the outbreak and findings. The information that you share and the method you use to share it (like a news interview or through social media) may differ depending on who your audience is (like camp directors, future campers, parents, and the public).

In groups, you will be assigned an audience for this activity. You will decide which information is most relevant for your audience and the best way to share it. Then you will design a communication strategy and materials that will reach your audience and help them make informed decisions and take action to protect themselves, their families, and their communities.

- 1 Divide students into groups of 3–4. Hand out a **Communicating Findings** handout to each group. Have students read the directions.
- 2 Have each group select an **Audience Card**, then continue working through the **Communicating Findings** handout to create their communication strategy and materials.
- 3 Have a volunteer from each group share their communication strategy and materials with the class.



## Class discussion (10 minutes)

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- ☀ The steps of an outbreak often, but not always, follow a specific order. When might the steps be done in a different order?
- ☀ Why is communicating with different audiences throughout an outbreak investigation important?
- ☀ How would your communications change if and when a vaccine becomes available?



## Definitions

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**Analytic epidemiology:** The aspect of epidemiology concerned with using comparison groups to identify and measure the associations between exposures and outcomes. Used to test hypotheses about the cause (how and why) of a health problem.

**Case definition** (for the purpose of outbreak investigation): A set of uniform criteria used to determine which cases to include as part of the outbreak under investigation. The criteria identify cases in terms of who (person), where (place), when (time), and what (symptoms, laboratory-confirmed diagnosis).

**Confirmed case:** A case that is confirmed by one or more of the laboratory methods listed in the case definition.

**Descriptive epidemiology:** The aspect of epidemiology concerned with organizing and summarizing data to identify patterns among cases or in populations by person, place, and time (who, where, and when). Used to develop hypotheses about the causes of the patterns or factors that increase the risk of disease.

**Line list:** Table containing a list of people with a specific disease or exposures.

**Outbreak:** A higher number of cases than expected in a location within a certain time period.

For more vocabulary, visit:

<https://www.cdc.gov/scienceambassador/nerdacademy/glossary.html>.



## Extension ideas

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- ☀ Allow additional time for the development of a variety of communication materials (e.g., allow students to develop a slide deck for a webinar, record a video clip for the evening news).
- ☀ Have students learn more about <https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section7.html>.
- ☀ Have students read The Junior Disease Detectives: Operation Outbreak graphic novel and complete related educational activities, available at <https://www.cdc.gov/flu/resource-center/freeresources/graphic-novel/index.html>.

## CDC Resources

Introduction to Public Health (PH 101 Series)

<https://www.cdc.gov/publichealth101/public-health.html>

Principles of Epidemiology in Public Health Practice, Lesson 1: Definition of Epidemiology

<https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section1.html>

What is Epidemiology?

<https://www.cdc.gov/careerpaths/k12teacherroadmap/epidemiology.html>

Studying the Disease

<https://www.cdc.gov/coronavirus/2019-ncov/science/about-epidemiology/studying-the-disease.html>

Principles of Epidemiology in Public Health Practice, Lesson 6: Investigating an Outbreak

<https://www.cdc.gov/csels/dsepd/ss1978/lesson6/index.html>

Monitoring and Tracking the Disease

<https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/about-epidemiology/monitoring-and-tracking.html>

Identifying the Outbreak Source

<https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/about-epidemiology/identifying-source-outbreak.html>

Solve the Outbreak Web Game/Mobile App

<https://www.cdc.gov/mobile/applications/sto/web-app.html>

COVID-19 FAQ

<https://www.cdc.gov/coronavirus/2019-ncov/faq.html>

The CDC NERD Academy curriculum was developed by the Centers for Disease Control and Prevention's (CDC's) Science Ambassador Fellowship (SAF) program. Support for the curriculum is made possible through a partnership between the CDC Foundation and CDC. Videos for the curriculum were developed and produced by Osmosis.

**Disclaimer:** NERD (novel emerging respiratory disease) is a fictional disease created for this curriculum. NERD etiology, data, events, and information presented in the CDC NERD Academy curriculum are loosely based on the understanding of COVID-19 prior to a vaccine becoming available. Some details have been generalized for educational purposes.

# Knowledge Check: Outbreak



**Directions:** After watching the “How is an outbreak investigated?” video (12:43 minutes), answer the following questions.

## Steps of an Outbreak Investigation



Fill in the blank with the step of the outbreak investigation that the scenario best illustrates.

Fill in the blank	Scenario
	The team suspects that an infectious agent may be spreading through food at a local restaurant
	Ezra and Lily generate a list of possible infectious agents and gather required testing materials
	Harper writes a social media post describing the cause of the outbreak and how to prevent future outbreaks
	Ivy teaches proper food handling to the restaurant workers and then watches for reports of future problems
	Ezra uses a line list to identify the who, where, and when of the outbreak
	Lily conducts laboratory testing and confirms that E. coli bacteria is present in the samples
	The team tests restaurant foods and surfaces to see if the infectious agent is present after epidemiologic methods point to these as a possible source of the outbreak
	Pavati collects case reports from hospitals and the health department, and adds the information to Ezra's line list

- 2** Circle the details that should be included in a case definition. Circle all that apply.
- a. Person (who is getting sick?)
  - b. Place (where are people getting sick?)
  - c. Hypothesis (why this could be happening?)
  - d. Mode of transmission (how is it spreading?)
  - e. Time (when are people getting sick?)
  - f. Measure of association (what is the probability that a specific exposure is causing the outbreak?)
  - g. Clinical signs and symptoms (what health problems are infected people experiencing?)
- 3** An outbreak investigation requires many different people working together. Describe the role of three public health experts in an outbreak investigation.

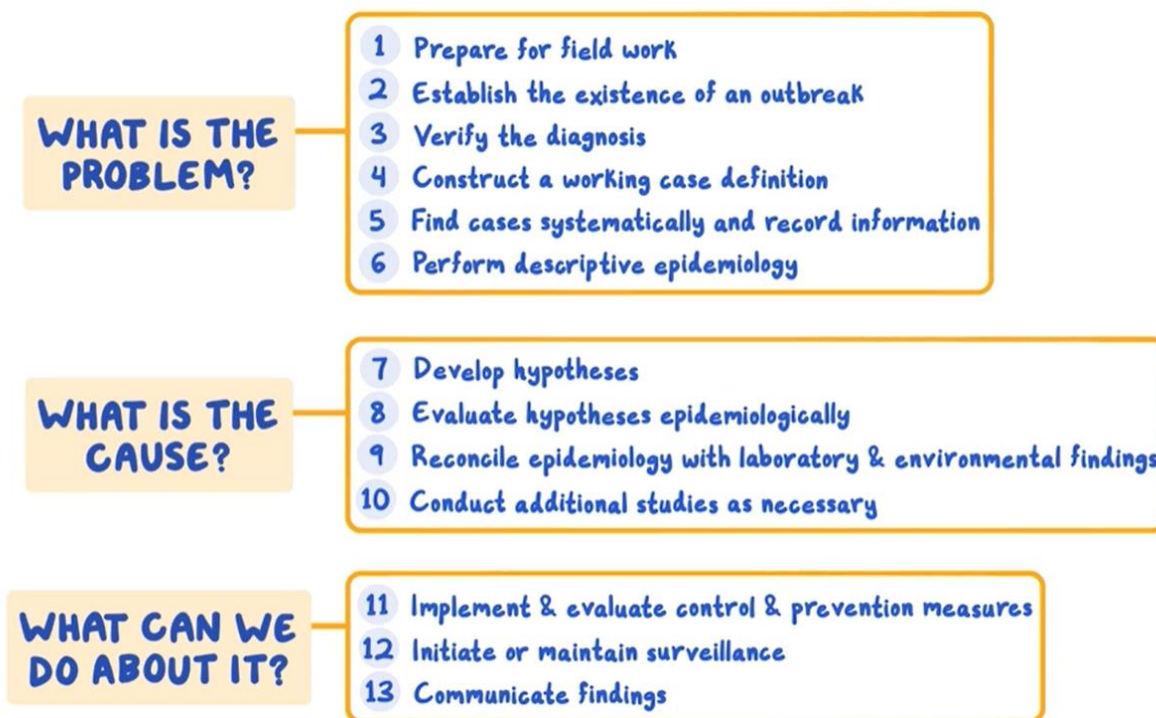


# Knowledge Check: Answer Key



**Directions:** After watching the “How is an outbreak investigated?” video (12:43 minutes), answer the following questions.

## Steps of an Outbreak Investigation



Fill in the blank with the step of the outbreak investigation that the scenario best illustrates.

Fill in the blank	Scenario
<b>7</b> Develop hypothesis	The team suspects that an infectious agent may be spreading through food at a local restaurant
<b>1</b> Prepare for field work	Ezra and Lily generate a list of possible infectious agents and gather required testing materials
<b>13</b> Communicate findings	Harper writes a social media post describing the cause of the outbreak and how to prevent future outbreaks
<b>11</b> Implement & evaluate control & prevention measures	Ivy teaches proper food handling to the restaurant workers and then watches for reports of future problems
<b>6</b> Perform descriptive epidemiology	Ezra uses a line list to identify the who, where, and when of the outbreak
<b>3</b> Verify the diagnosis	Lily conducts laboratory testing and confirms that E. coli bacteria is present in the samples
<b>9</b> Reconcile epidemiology with laboratory and environmental findings	The team tests restaurant foods and surfaces to see if the infectious agent is present after epidemiologic methods point to these as a possible source of the outbreak
<b>5</b> Find cases systematically and record information	Pavati collects case reports from hospitals and the health department, and adds the information to Ezra's line list

- 2** Circle the details that should be included in a case definition. Circle all that apply.
- a. **Person (who is getting sick?) (Correct answer)**
  - b. **Place (where are people getting sick?) (Correct answer)**
  - c. Hypothesis (why this could be happening?)
  - d. Mode of transmission (how is it spreading?)
  - e. **Time (when are people getting sick?) (Correct answer)**
  - f. Measure of association (what is the probability that a specific exposure is causing the outbreak?)
  - g. **Clinical signs and symptoms (what health problems are infected people experiencing?) (Correct answer)**

- 3** An outbreak investigation requires many different people working together. Describe the role of three public health experts in an outbreak investigation.

**Answer:** Answers will vary. Students should describe three of the following roles summarized in the Career Spotlight:

**Epidemiologists** collect and use data to identify when an outbreak is occurring. They use descriptive epidemiology to determine how disease is spreading during an outbreak by person, place, and time. They also use statistics to determine the outbreak source.

**Infection prevention specialists** use outbreak information, data, and findings to design procedures and protocols to reduce the spread of disease and prevent future outbreaks.

**Behavioral scientists** look at how people live, work, learn, pray, and play in a community. They use this information to help identify how disease spreads during an outbreak and how to design programs and strategies that can help change behaviors to reduce risk and prevent future outbreaks.

**Biostatisticians** use math and statistics to analyze outbreak data and identify patterns and trends. Biostatisticians also calculate measures of associations between an exposure and disease to help determine the outbreak source.

**Health communication specialists** communicate outbreak information, data, and findings to different audiences in a way each audience can understand. They design communication strategies and materials to increase awareness of and promote actions to reduce or prevent further disease.

**Laboratory scientists** verify diagnoses by conducting laboratory testing, such as testing for the presence of an infectious agent in a sample (e.g., nasal swab). This information is used to confirm cases, determine the cause of disease (e.g., an infectious agent), and can help determine the outbreak source.

**Public health nurses** help collect data through contact tracing, collect samples for laboratory testing, distribute health communication materials, and provide support to people who were exposed or had a case of disease throughout the outbreak.

# Career Spotlight



CDC NERD Academy



## Outbreak Team

During an outbreak investigation, public health experts work as a team. They each bring diverse backgrounds, specialized skills, and experiences that contribute to the overall goal of reducing the spread of disease.



Meet the outbreak team!

### Epidemiologists

Epidemiologists collect and use data to identify when an outbreak is occurring. They use descriptive epidemiology to determine how disease is spreading during an outbreak by person, place, and time. They also use statistics to determine the outbreak source.

### Infection prevention specialists

Infection prevention specialists use outbreak information, data, and findings to design procedures and protocols to reduce the spread of disease and prevent future outbreaks.

### Behavioral scientists

Behavioral scientists look at how people live, work, learn, pray, and play in a community. They use this information to help identify how disease spreads during an outbreak and how to design programs and strategies that can help change behaviors to reduce risk and prevent future outbreaks.

### Biostatisticians

Biostatisticians use math and statistics to analyze outbreak data and identify patterns and trends. Biostatisticians also calculate measures of associations between an exposure and disease to help determine the outbreak source.

### Health communication specialists

Health communication specialists communicate outbreak information, data, and findings to different audiences in a way each audience can understand. They design communication strategies and materials to increase awareness of and promote actions to reduce or prevent further disease.

### Laboratory scientists

Laboratory scientists verify diagnoses by conducting laboratory testing, such as testing for the presence of an infectious agent in a sample (e.g., nasal swab). This information is used to confirm cases, determine the cause of disease (e.g., an infectious agent), and can help determine the outbreak source.

### Public health nurses

Public health nurses help collect data through contact tracing, collect samples for laboratory testing, distribute health communication materials, and provide support to people who were exposed or had a case of disease throughout the outbreak.



# NERD Factsheet



CDC NERD Academy

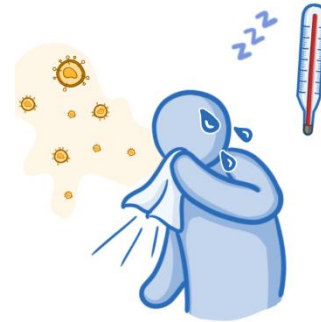
**N**OVEL  
**E**MERGING  
**R**ESPIRATORY  
**D**ISEASE

## What is NERD?

NERD is a fictional novel emerging respiratory disease caused by a virus that can spread from person to person. NERD symptoms can range from mild (or no symptoms) to severe illness and death.

### Who can get NERD?

- ☀ People of any age can get NERD, even healthy young adults and children.
- ☀ People who are older or have certain underlying medical conditions are at higher risk of getting very sick from NERD.
- ☀ Other groups may be at higher risk for getting NERD or having more severe illness.



### What are the symptoms of NERD?

Symptoms may appear 2–14 days after exposure to the virus. People with these symptoms may have NERD:

- ☀ Fever or chills
- ☀ Cough
- ☀ Shortness of breath or difficulty breathing
- ☀ Fatigue
- ☀ Muscle or body aches
- ☀ Headache
- ☀ New loss of taste or smell
- ☀ Sore throat
- ☀ Congestion or runny nose
- ☀ Nausea or vomiting
- ☀ Diarrhea

### What do I do if I have symptoms?

- ☀ Stay home except to seek medical care. Separate yourself from other people.
- ☀ Get tested. If you test positive, tell your close contacts that they may have been exposed to NERD.
- ☀ You can be with others after at least 10 days since your symptoms first appeared and at least 24 hours with no fever.

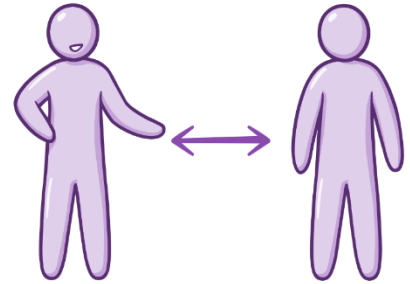
**Be aware of the signs of severe disease, including trouble breathing, pain or pressure in the chest, confusion, or trouble waking or staying awake. If someone is showing any of these signs, seek emergency medical care immediately.**



## How does NERD spread?

NERD **most commonly** spreads during direct, close contact:

- ☀ When people have direct contact with a person with NERD.
- ☀ When a person with NERD releases respiratory droplets when they cough, sneeze, sing, talk, or breathe, and these droplets are inhaled by another person who is physically near (within 6 feet).



NERD **sometimes** spreads through airborne transmission, especially indoors:

- ☀ When a person with NERD breathes heavily — such as when exercising, singing, or shouting — they can produce more respiratory droplets that can linger in the air for minutes to hours.

NERD is **less commonly** spread through contact with contaminated surfaces.

- ☀ When a person touches a surface or object with the virus on it and then touches their mouth, nose, or eyes.

## What if I have been in close contact with someone with NERD?

Close contact is defined as being within 6 feet of a NERD-positive individual for a total of 15 minutes or more.

- ☀ Separate yourself from other people. A person infected with NERD can spread the virus starting 48 hours, or 2 days, before the person feels any symptoms or tests positive.
- ☀ Watch for symptoms until 14 days after exposure.
- ☀ If you do not have symptoms, you can be with others 14 days after your last contact with someone with NERD.
- ☀ If you have symptoms, you can be with others after at least 10 days since your symptoms first appeared and at least 24 hours with no fever.
- ☀ Get tested. If you test positive and have no symptoms, you can be with others after 10 days have passed since the date you had your positive test.

## Three important ways to slow the spread

- 1 Wear a mask to protect yourself and others and stop the spread of NERD.
- 2 Stay at least 6 feet (about 2 arm lengths) from others who don't live with you.
- 3 Avoid crowds. The more people you are in contact with, the more likely you are to be exposed to NERD.

# NERD Outbreak, Overview



A state health department has requested CDC assistance with a NERD outbreak at a local summer camp.

In this activity, you will role play as part of the team working on the outbreak investigation. Begin by reviewing the steps of an outbreak investigation below and the [NERD Factsheet](#). Then, you will go through each step of an outbreak investigation as you and the team investigate the summer camp outbreak.



## Steps of an outbreak investigation

### WHAT IS THE PROBLEM?

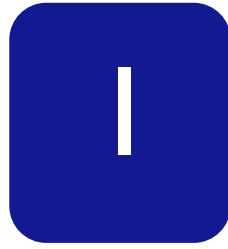
- 1 Prepare for field work
- 2 Establish the existence of an outbreak
- 3 Verify the diagnosis
- 4 Construct a working case definition
- 5 Find cases systematically and record information
- 6 Perform descriptive epidemiology

### WHAT IS THE CAUSE?

- 7 Develop hypotheses
- 8 Evaluate hypotheses epidemiologically
- 9 Reconcile epidemiology with laboratory & environmental findings
- 10 Conduct additional studies as necessary

### WHAT CAN WE DO ABOUT IT?

- 11 Implement & evaluate control & prevention measures
- 12 Initiate or maintain surveillance
- 13 Communicate findings



## NERD Outbreak, Steps 1–3

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### Step 1: Prepare for field work

Your team continues to prepare for the investigation by visiting the health department website to look at community transmission rates of NERD in the surrounding areas of the camp, and gathering all the supplies you might need, including a computer, personal protective equipment (PPE), and laboratory testing supplies.

You also review the information the camp director reported to the health department.

#### *Notes about the outbreak*

- ☀ There are 35 attendees (campers and counselors) at Camp Epi located in Camp County.
- ☀ Of the attendees, all campers were males in grades 9–11 (ages 14–16). Counselors were ages 17–24.
- ☀ Community transmission rates are high in the county where the camp is located.
- ☀ All attendees (campers and counselors) and staff were required to have a negative NERD test or proof of antibodies from NERD infection in the previous 3 months, to self-quarantine within their households for 7 days before travel, and to wear masks during travel.
- ☀ Attendees (campers and counselors) and staff traveled from 5 states to attend camp.
- ☀ All campers started camp on July 2, 2020.
- ☀ Classes and activities were held outdoors.
- ☀ Campers and counselors were not required to wear masks or stay 6 feet away (i.e., social or physical distance) from others.
- ☀ Staff always wore masks and stayed 6 feet away (i.e., social or physical distance) from attendees.
- ☀ Campers slept in yurts and with 4–8 campers in them. Counselors slept in a group, separate from the campers.
- ☀ Staff stayed in individual housing units.
- ☀ As of July 20, there are 27 attendees sick with the following symptoms: coughing, fever, and loss of taste and smell.

## Notes about NERD

Write down any relevant information about the symptoms of NERD and its spread that you learned from the **NERD Factsheet**.

### Sample answers:

- ☀ Symptoms may appear 2–14 days after exposure to the virus.
- ☀ Symptoms may include fever or chills, cough, shortness of breath or difficulty breathing, fatigue, muscle or body aches, headache, new loss of taste or smell, sore throat, congestion or runny nose, nausea or vomiting, diarrhea.
- ☀ NERD most commonly spreads during direct, close contact.
- ☀ NERD sometimes spreads through airborne transmission.
- ☀ NERD is less commonly spread through contact with contaminated surfaces.



## Step 2: Establish the existence of an outbreak

### Question

**2** Based on your notes, do you believe this is an outbreak?



## Step 3: Verify the diagnosis

### Question

**3** Do you think that NERD is the correct diagnosis? How can you be sure?



# 2

## NERD Outbreak, Step 4

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### Step 4: Construct a working case definition

You and your team decide that this is likely an outbreak of NERD. You decide to bring a laboratory scientist with you to the camp to help with laboratory testing. In the meantime, you construct a working case definition for NERD.

**4** Using the notes about the outbreak and your notes about NERD, construct a working NERD case definition for this outbreak.

<i>Part of a case definition</i>	<i>Answer</i>
<i>Person</i>	
<i>Place</i>	
<i>Time</i>	
<i>Clinical Picture</i>	

# 3

## NERD Outbreak, Step 5



### Step 5: Find cases systematically and record information

You and your team decide on a case definition. With the camp nurse, you review records from the camp health clinic and record the information on a line list.

#### Case definition

A camp attendee (ages 14–24) at Camp Epi in July 2020 who has at least three NERD symptoms **OR** a positive NERD test.

\*NERD symptoms include fever or chills, cough, shortness of breath or difficulty breathing, fatigue, muscle or body aches, headache, new loss of taste or smell, sore throat, congestion or runny nose, nausea or vomiting, diarrhea

**5** Go through the line list and decide if each attendee would count as a case of NERD using this case definition and write Y or N in the last column.

ID	Headache (Y/N)	Cough (Y/N)	Fever (Y/N)	Nausea (Y/N)	Loss of taste/ smell (Y/N)	Shortness of breath (Y/N)	Symptom onset (Date)	Tested (Y/N)	Result (POS/NEG)	Case (Y/N)
1	Y	N	N	N	Y	N	July 4	Y	POS	
2	Y	N	Y	Y	Y	N	July 5	N	N/A	

ID	Headache (Y/N)	Cough (Y/N)	Fever (Y/N)	Nausea (Y/N)	Loss of taste/ smell (Y/N)	Shortness of breath (Y/N)	Symptom onset (Date)	Tested (Y/N)	Result (POS/NEG)	Case (Y/N)
3	Y	Y	Y	N	N	N	July 9	Y	POS	
4	N	N	N	N	N	N	N/A	Y	NEG	
5	Y	Y	Y	N	Y	N	July 6	N	N/A	
6	N	N	N	N	N	N	N/A	Y	POS	
7	Y	Y	N	N	Y	N	July 7	Y	POS	
8	N	Y	Y	N	N	Y	July 11	Y	POS	
9	Y	Y	N	Y	Y	N	July 6	N	N/A	
10	N	N	N	N	N	N	N/A	N	N/A	
11	Y	Y	N	Y	N	N	July 12	N	N/A	
12	Y	N	Y	N	Y	N	July 13	Y	POS	
13	Y	Y	N	Y	Y	N	July 11	N	N/A	
14	N	Y	Y	Y	N	N	July 12	Y	POS	
15	Y	Y	N	N	N	N	July 12	Y	POS	
16	N	N	N	N	N	N	N/A	Y	NEG	
17	Y	Y	N	Y	N	N	July 13	Y	POS	
18	Y	N	Y	N	Y	N	July 13	N	N/A	
19	Y	Y	Y	N	N	Y	July 13	N	N/A	

ID	Headache (Y/N)	Cough (Y/N)	Fever (Y/N)	Nausea (Y/N)	Loss of taste/ smell (Y/N)	Shortness of breath (Y/N)	Symptom onset (Date)	Tested (Y/N)	Result (POS/NEG)	Case (Y/N)
20	N	N	N	N	N	N	N/A	Y	POS	
21	N	Y	Y	N	N	Y	July 14	Y	POS	
22	Y	Y	N	N	Y	N	July 14	Y	POS	
23	N	N	N	N	N	N	N/A	Y	NEG	
24	N	N	N	N	N	N	N/A	Y	NEG	
25	Y	Y	Y	N	N	N	July 14	Y	POS	
26	Y	N	Y	N	Y	N	July 14	Y	POS	
27	N	N	N	N	N	N	N/A	N	N/A	
28	Y	Y	Y	N	N	N	July 14	Y	POS	
29	Y	N	N	N	Y	N	July 15	Y	POS	
30	Y	Y	N	Y	Y	N	July 14	N	N/A	
31	N	Y	Y	N	Y	N	July 16	Y	POS	
32	Y	Y	Y	Y	N	N	July 16	N	N/A	
33	Y	Y	N	Y	N	N	July 17	Y	POS	
34	N	N	N	N	N	N	N/A	Y	NEG	
35	N	N	N	N	N	N	N/A	Y	NEG	

Data adapted from <https://www.cdc.gov/mmwr/volumes/69/wr/mm6943a4.htm>, accessed April 2021.

*Question*

**6** How many attendees meet the case definition for a case of NERD?

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*Question*

**7** Did you find any additional cases by testing attendees?

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# 4

## NERD Outbreak, Step 6–8



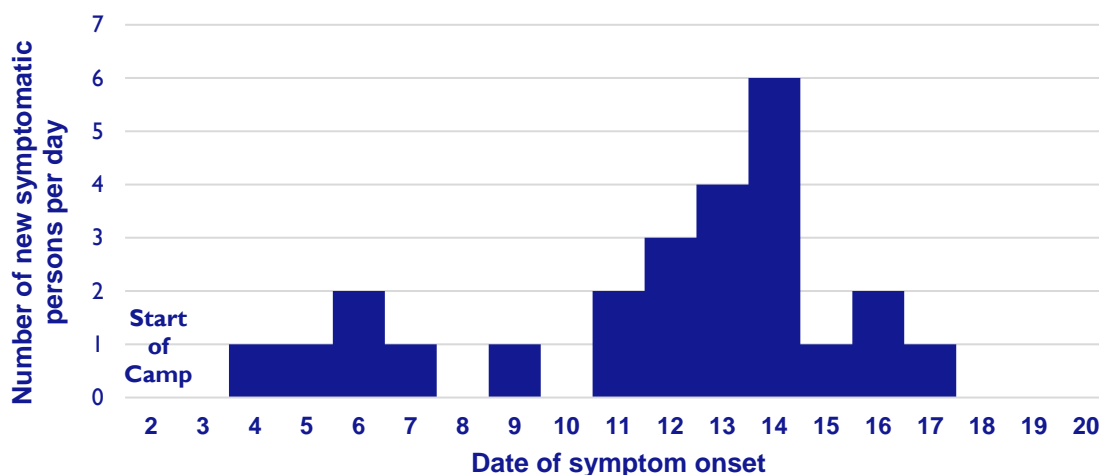
### Step 6: Perform descriptive epidemiology

You review the data. There are 27 cases of NERD that meet the case definition. Twenty-five attendees had at least three NERD symptoms. There were also two asymptomatic cases.

Using the line list data, a biostatistician and epidemiologist on the team create an epi curve to better visualize the data by onset of illness. Initial cases started showing symptoms between July 4–7 with an increase in cases from July 11–14. They excluded the two asymptomatic cases from the epi curve because they did not have symptoms. They note that the camp started on July 2.

### NERD Outbreak epi curve

Dates of symptom onset of NERD cases at a local summer camp, July 2–20



\*There were two additional cases that tested positive for NERD but were asymptomatic (i.e., did not have symptoms).



## Step 7: Develop hypotheses

### Question

- 8 Using the line list and epi curve, develop a hypothesis about the spread of NERD in this outbreak.



## Step 8: Evaluate hypotheses epidemiologically

The next step is to collect more information about each case. You decide to develop a survey for all attendees (campers and counselors) to complete.

### Question

- 9 Write down 5 questions in the boxes below that you will use to collect data that you will later analyze to see if the data support or do not support your hypothesis.

1	
2	
3	
4	
5	

# 5

## NERD Outbreak, Steps 9–12

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You ask the public health nurse from the health department to help you collect responses to your survey questions. She interviews the all campers and counselors and shares the following notes.

### Notes about the outbreak

- ☀ 3 campers reported having a previous NERD infection before attending camp and were not part of this outbreak.
  - ☀ There was at least one sick camper in every yurt.
  - ☀ Camper #2 was one of the first attendees to report symptoms. Although they tested negative before attending camp, a family member tested positive on July 3.
    - Camper #2 shared a yurt with Campers #6, #9, #11, #13 and #8. Campers #9, #11, #13 and #8 reported having NERD symptoms during this outbreak.
    - All 6 yurt-mates were also in close contact with at least one other camper.
- 



### Step 9: Reconcile epidemiology with laboratory and environmental findings

The laboratory scientist works with the health department to offer laboratory testing for NERD to all campers, counselors, and staff. Results show no additional positive tests. No other campers, counselors, or staff developed symptoms after July 20.

### Question

- I 0** Based on this information, how did this outbreak likely begin?
-





## Step 10: Conduct additional studies as necessary

### Question

- 11** Do you need to conduct additional studies to collect additional data to support or not support your hypothesis? Explain.



## Step 11: Implement and evaluate control and prevention measures

With the support of the health department, the camp director decides to isolate any sick attendees and quarantine everyone else for 14 days. All campers are scheduled to travel home on August 11.

The next camp is scheduled to start on August 15. The camp director, counselors, and staff want to know if they can safely reopen the camp. The infection prevention specialist, the behavioral scientist, and the rest of your team meet to discuss some prevention strategies that they can put into place.

### Question

- 12** What advice do you give them?



## Step 12: Initiate or maintain surveillance

NERD is a reportable and nationally notifiable disease. So, NERD data are being collected at the local, state, and national level using passive surveillance systems. This means NERD data are collected through regular reporting by health institutions (e.g., hospitals, doctors' offices) to health authorities (e.g., state or local health departments) and then to CDC.

You and your team consider if you should set up an additional surveillance system for the camp or county.

### *Question*

**13** What do you decide?

# 6

## NERD Outbreak, Step 13

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### Step 13: Communicate findings

Led by the health communication specialist, your team prepares and delivers a report to local public health experts and the CDC.

#### Question

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- 14** What were the overall findings of this outbreak investigation? What did we learn about how NERD spread and what could be done to reduce the spread of disease?

#### Question

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- 15** Who would benefit from this information?
-

# NERD Outbreak, Overview: Answer Key



A state health department has requested CDC assistance with a NERD outbreak at a local summer camp.

In this activity, you will role play as part of the team working on the outbreak investigation. Begin by reviewing the steps of an outbreak investigation below and the [NERD Factsheet](#). Then, you will go through each step of an outbreak investigation as you and the team investigate the summer camp outbreak.



## Steps of an outbreak investigation

### WHAT IS THE PROBLEM?

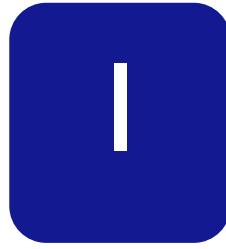
- 1 Prepare for field work
- 2 Establish the existence of an outbreak
- 3 Verify the diagnosis
- 4 Construct a working case definition
- 5 Find cases systematically and record information
- 6 Perform descriptive epidemiology

### WHAT IS THE CAUSE?

- 7 Develop hypotheses
- 8 Evaluate hypotheses epidemiologically
- 9 Reconcile epidemiology with laboratory & environmental findings
- 10 Conduct additional studies as necessary

### WHAT CAN WE DO ABOUT IT?

- 11 Implement & evaluate control & prevention measures
- 12 Initiate or maintain surveillance
- 13 Communicate findings



## NERD Outbreak, Steps 1–3: Answer Key

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### Step 1: Prepare for field work

Your team continues to prepare for the investigation by visiting the health department website to look at community transmission rates of NERD in the surrounding areas of the camp, and gathering all the supplies you might need, including a computer, personal protective equipment (PPE), and laboratory testing supplies.

You also review the information the camp director reported to the health department.

#### Notes about the outbreak

- ☀ There are 35 attendees (campers and counselors) at Camp Epi located in Camp County.
- ☀ Of the attendees, all campers were males in grades 9–11 (ages 14–16). Counselors were ages 17–24.
- ☀ Community transmission rates are high in the county where the camp is located.
- ☀ All attendees (campers and counselors) and staff were required to have a negative NERD test or proof of antibodies from NERD infection in the previous 3 months, to self-quarantine within their households for 7 days before travel, and to wear masks during travel.
- ☀ Attendees (campers and counselors) and staff traveled from 5 states to attend camp.
- ☀ All campers started camp on July 2, 2020.
- ☀ Classes and activities were held outdoors.
- ☀ Campers and counselors were not required to wear masks or stay 6 feet away (i.e., social or physical distance) from others.
- ☀ Staff always wore masks and stayed 6 feet away (i.e., social or physical distance) from attendees.
- ☀ Campers slept in yurts and with 4–8 campers in them. Counselors slept in a group, separate from the campers.
- ☀ Staff stayed in individual housing units.
- ☀ As of July 20, there are 27 attendees sick with the following symptoms: coughing, fever, and loss of taste and smell.

## Notes about NERD

Write down any relevant information about the symptoms of NERD and its spread that you learned from the **NERD Factsheet**.

### Sample answers:

- ☀ Symptoms may appear 2–14 days after exposure to the virus.
- ☀ Symptoms may include fever or chills, cough, shortness of breath or difficulty breathing, fatigue, muscle or body aches, headache, new loss of taste or smell, sore throat, congestion or runny nose, nausea or vomiting, diarrhea.
- ☀ NERD most commonly spreads during direct, close contact.
- ☀ NERD sometimes spreads through airborne transmission.
- ☀ NERD is less commonly spread through contact with contaminated surfaces.



## Step 2: Establish the existence of an outbreak

### Question

**2** Based on your notes, do you believe this is an outbreak?

**Answer:** Yes, this is an outbreak. Although the exact number of expected cases is not provided, 27/35 attendees or 77% of the attendees are sick, which can be interpreted as more than expected. Because all campers, counselors, and staff recently had a negative NERD test, it also appears to be spreading at the camp.



## Step 3: Verify the diagnosis

### Question

**3** Do you think that NERD is the correct diagnosis? How can you be sure?

**Answer:** Yes, it is likely NERD. The community transmission rates are high in the county where the camp is located and the symptoms are consistent with NERD. Although coughing and fever are symptoms of many diseases, the loss of taste and smell is more unique to NERD. To confirm the diagnosis, laboratory testing must be done.

# 2

## NERD Outbreak, Step 4: Answer Key



### Step 4: Construct a working case definition

You and your team decide that this is likely an outbreak of NERD. You decide to bring a laboratory scientist with you to the camp to help with laboratory testing. In the meantime, you construct a working case definition for NERD.

- Using the notes about the outbreak and your notes about NERD, construct a working NERD case definition for this outbreak.

Part of a case definition	Answer
Person	Answer: Camp attendees ages 14–24 (campers and counselors)
Place	Answer: Attending Camp Epi located in Camp County
Time	Answer: July 2, 2020–July 20, 2020
Clinical Picture	Answer: At least three NERD symptoms including fever or chills, cough, shortness of breath or difficulty breathing, fatigue, muscle or body aches, headache, new loss of taste or smell, sore throat, congestion or runny nose, nausea or vomiting, diarrhea OR a positive NERD test

# 3

## NERD Outbreak, Step 5: Answer Key



### Step 5: Find cases systematically and record information

You and your team decide on a case definition. With the camp nurse, you review records from the camp health clinic and record the information on a line list.

#### Case definition

A camp attendee (ages 14–24) at Camp Epi in July 2020 who has at least three NERD symptoms **OR** a positive NERD test.

\*NERD symptoms include fever or chills, cough, shortness of breath or difficulty breathing, fatigue, muscle or body aches, headache, new loss of taste or smell, sore throat, congestion or runny nose, nausea or vomiting, diarrhea

**5** Go through the line list and decide if each attendee would count as a case of NERD using this case definition and write Y or N in the last column.

ID	Headache (Y/N)	Cough (Y/N)	Fever (Y/N)	Nausea (Y/N)	Loss of taste/ smell (Y/N)	Shortness of breath (Y/N)	Symptom onset (Date)	Tested (Y/N)	Result (POS/NEG)	Case (Y/N)
1	Y	N	N	N	Y	N	July 4	Y	POS	Y
2	Y	N	Y	Y	Y	N	July 5	N	N/A	Y



ID	Headache (Y/N)	Cough (Y/N)	Fever (Y/N)	Nausea (Y/N)	Loss of taste/ smell (Y/N)	Shortness of breath (Y/N)	Symptom onset (Date)	Tested (Y/N)	Result (POS/NEG)	Case (Y/N)
3	Y	Y	Y	N	N	N	July 9	Y	POS	Y
4	N	N	N	N	N	N	N/A	Y	NEG	N
5	Y	Y	Y	N	Y	N	July 6	N	N/A	Y
6	N	N	N	N	N	N	N/A	Y	POS	Y
7	Y	Y	N	N	Y	N	July 7	Y	POS	Y
8	N	Y	Y	N	N	Y	July 11	Y	POS	Y
9	Y	Y	N	Y	Y	N	July 6	N	N/A	Y
10	N	N	N	N	N	N	N/A	N	N/A	N
11	Y	Y	N	Y	N	N	July 12	N	N/A	Y
12	Y	N	Y	N	Y	N	July 13	Y	POS	Y
13	Y	Y	N	Y	Y	N	July 11	N	N/A	Y
14	N	Y	Y	Y	N	N	July 12	Y	POS	Y
15	Y	Y	N	N	N	N	July 12	Y	POS	Y
16	N	N	N	N	N	N	N/A	Y	NEG	N
17	Y	Y	N	Y	N	N	July 13	Y	POS	Y
18	Y	N	Y	N	Y	N	July 13	N	N/A	Y
19	Y	Y	Y	N	N	Y	July 13	N	N/A	Y

ID	Headache (Y/N)	Cough (Y/N)	Fever (Y/N)	Nausea (Y/N)	Loss of taste/ smell (Y/N)	Shortness of breath (Y/N)	Symptom onset (Date)	Tested (Y/N)	Result (POS/NEG)	Case (Y/N)
20	N	N	N	N	N	N	N/A	Y	POS	Y
21	N	Y	Y	N	N	Y	July 14	Y	POS	Y
22	Y	Y	N	N	Y	N	July 14	Y	POS	Y
23	N	N	N	N	N	N	N/A	Y	NEG	N
24	N	N	N	N	N	N	N/A	Y	NEG	N
25	Y	Y	Y	N	N	N	July 14	Y	POS	Y
26	Y	N	Y	N	Y	N	July 14	Y	POS	Y
27	N	N	N	N	N	N	N/A	N	N/A	N
28	Y	Y	Y	N	N	N	July 14	Y	POS	Y
29	Y	N	N	N	Y	N	July 15	Y	POS	Y
30	Y	Y	N	Y	Y	N	July 14	N	N/A	Y
31	N	Y	Y	N	Y	N	July 16	Y	POS	Y
32	Y	Y	Y	Y	N	N	July 16	N	N/A	Y
33	Y	Y	N	Y	N	N	July 17	Y	POS	Y
34	N	N	N	N	N	N	N/A	Y	NEG	N
35	N	N	N	N	N	N	N/A	Y	NEG	N

Data adapted from <https://www.cdc.gov/mmwr/volumes/69/wr/mm6943a4.htm>, accessed April 2021.

## Question

**6** How many attendees meet the case definition for a case of NERD?

**Answer:** There are 27 cases that meet the case definition. There are 16 laboratory-confirmed cases with a NERD positive test with at least three symptoms, 2 laboratory-confirmed cases with a NERD positive test with no symptoms, and 9 cases with at least three symptoms without a NERD positive test.

## Question

**7** Did you find any additional cases by testing attendees?

**Answer:** Yes, there are 2 asymptomatic cases (i.e., case #6 and #20). These cases were laboratory confirmed with a NERD positive test but did not report symptoms.

# 4

## NERD Outbreak, Step 6–8: Answer Key



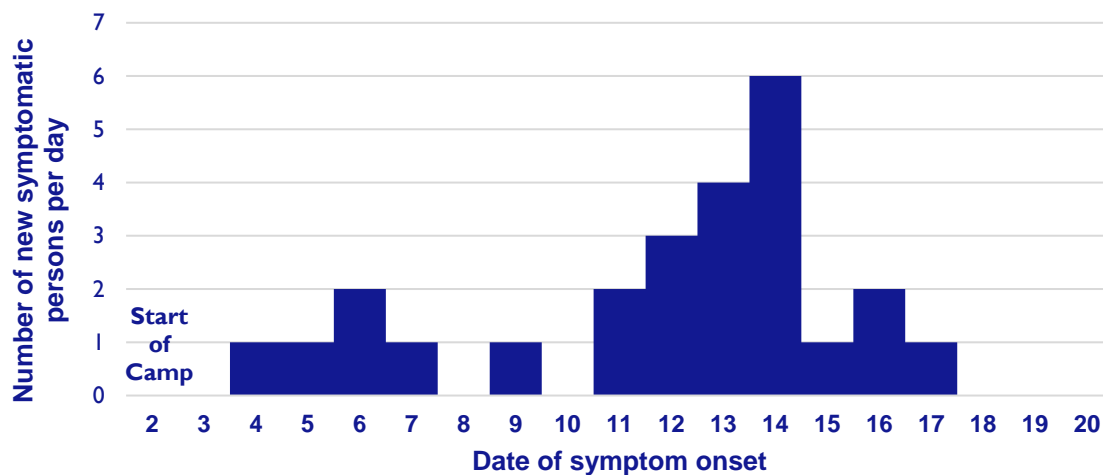
### Step 6: Perform descriptive epidemiology

You review the data. There are 27 cases of NERD that meet the case definition. Twenty-five attendees had at least three NERD symptoms. There were also two asymptomatic cases.

Using the line list data, a biostatistician and epidemiologist on the team create an epi curve to better visualize the data by onset of illness. Initial cases started showing symptoms between July 4–7 with an increase in cases from July 11–14. They excluded the two asymptomatic cases from the epi curve because they did not have symptoms. They note that the camp started on July 2.

### NERD Outbreak epi curve

Dates of symptom onset of NERD cases at a local summer camp, July 2–20



\*There were two additional cases that tested positive for NERD but were asymptomatic (i.e., did not have symptoms).



## Step 7: Develop hypotheses

### Question

- 8** Using the line list and epi curve, develop a hypothesis about the spread of NERD in this outbreak.

**Answer:** Answers will vary. Student answers should suggest that one or several attendees were infected before coming to the camp and infected others or that one or several attendees came in close contact with someone outside of the camp while camp was in session. Student answers should also suggest that NERD may have spread because campers and counselors were not required to wear masks or stay 6 feet away (i.e., social or physical distance) from others, and 4–8 campers slept in each yurt.



## Step 8: Evaluate hypotheses epidemiologically

The next step is to collect more information about each case. You decide to develop a survey for all attendees (campers and counselors) to complete.

### Question

- 9** Write down 5 questions in the boxes below that you will use to collect data that you will later analyze to see if the data support or do not support your hypothesis.

**Answer:** Answers will vary. Students should consider questions that might be asked during a case investigation or contact tracing, such as when and where they came in close contact with other attendees. Examples questions could ask about where they slept or what events they attended (e.g., bonfire, swimming, archery).

Question #	Your question
1	
2	
3	
4	
5	

# 5

## NERD Outbreak, Steps 9–12: Answer Key

You ask the public health nurse from the health department to help you collect responses to your survey questions. She interviews the all campers and counselors and shares the following notes.

### Notes about the outbreak

- ☀ 3 campers reported having a previous NERD infection before attending camp and were not part of this outbreak.
- ☀ There was at least one sick camper in every yurt.
- ☀ Camper #2 was one of the first attendees to report symptoms. Although they tested negative before attending camp, a family member tested positive on July 3.
  - Camper #2 shared a yurt with Campers #6, #9, #11, #13 and #8. Campers #9, #11, #13 and #8 reported having NERD symptoms during this outbreak.
  - All 6 yurt-mates were also in close contact with at least one other camper.



### Step 9: Reconcile epidemiology with laboratory and environmental findings

The laboratory scientist works with the health department to offer laboratory testing for NERD to all campers, counselors, and staff. Results show no additional positive tests. No other campers, counselors, or staff developed symptoms after July 20.

### Question

**I 0** Based on this information, how did this outbreak likely begin?

**Answer:** The likelihood exists that camper #2 was infected with NERD before attending camp but did not start showing symptoms until after arrival. Also, it is likely that camper #2 transmitted NERD to the other campers who shared the same yurt. Then, those campers likely transmitted NERD to other campers with whom they had close contact.



## Step 10: Conduct additional studies as necessary

### Question

- I I** Do you need to conduct additional studies to collect additional data to support or not support your hypothesis? Explain.

**Answer:** Answers will vary. Students should explain whether the data provided is sufficient to support or not support their hypothesis from question 7 (e.g., the hypothesis that NERD may have spread because campers and counselors were not required to wear masks or stay 6 feet away — i.e., social or physical distance — from others, and 4–8 campers slept in each yurt is supported by the fact that four campers reported symptoms after sharing a yurt with Camper #2).

If no additional studies are needed, students should explain why their data is sufficient to support their hypothesis.

If additional studies are needed, they should explain why they need more information (e.g., the hypothesis that one or several attendees were infected before coming to the camp and infected others may need the additional study of interviewing additional family members of the campers).



## Step 11: Implement and evaluate control and prevention measures

**With the support of the health department, the camp director decides to isolate any sick attendees and quarantine everyone else for 14 days. All campers are scheduled to travel home on August 11.**

**The next camp is scheduled to start on August 15. The camp director, counselors, and staff want to know if they can safely reopen the camp. The infection prevention specialist, the behavioral scientist, and the rest of your team meet to discuss some prevention strategies that they can put into place.**

### Question

- I 2** What advice do you give them?

**Answer:** Answers will vary. Answers should focus on prevention strategies, such as creating a prevention plan that includes a strict 14-day prearrival quarantine, prearrival and postarrival testing and symptom screening, keeping campers and counselors in cohorts or stable groupings that do not mix for 14 days after arrival, physical distancing, mask use, enhanced hygiene and disinfection of the camp facilities, maximize the camp programming held outdoors, and increasing ventilation in indoor spaces, including yurts.



## Step 12: Initiate or maintain surveillance

NERD is a reportable and nationally notifiable disease. So, NERD data are being collected at the local, state, and national level using passive surveillance systems. This means NERD data are collected through regular reporting by health institutions (e.g., hospitals, doctors' offices) to health authorities (e.g., state or local health departments) and then to CDC.

You and your team consider if you should set up an additional surveillance system for the camp or county.

### Question

**13** What do you decide?

**Answer:** Answers will vary. Answers could include a suggestion to set up an active surveillance system at the camp for the August cohort of students with regular laboratory testing to identify NERD cases. The county may want to set up syndromic surveillance to identify potential NERD hotspots. The health department may want to notify hospitals, pediatricians, clinicians, and other care providers (e.g., possibly schools and other youth group organizers) to keep an eye out for illness in young people in the areas from where students have traveled.



# 6

## NERD Outbreak, Step 13: Answer Key

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### Step 13: Communicate findings

Led by the health communication specialist, your team prepares and delivers a report to local public health experts and the CDC.

#### Question

- 14** What were the overall findings of this outbreak investigation? What did we learn about how NERD spread and what could be done to reduce the spread of disease?

**Answer:** Answers will vary. Answers should include how NERD was spread at the camp and the limitations of prearrival testing. Answers should also include how enhanced prevention strategies might reduce disease spread (e.g., a 14-day prearrival quarantine, prearrival and postarrival testing and symptom screening, cohorting or stable grouping of campers for 14 days after arrival, stay 6 feet away — i.e., social or physical distance — from others, mask use, enhanced hygiene and disinfection, and maximal outdoor programming). If and when a vaccine becomes available, any communications should also encourage all who are able to get vaccinated.

#### Question

- 15** Who would benefit from this information?

**Answer:** Answers will vary. Answers should include the health department and other public health agencies; parents, guardians, or caretakers deciding to send their children to camp; program staff, teachers, and educators who work with children in school, sports, or club activities; healthcare providers, and any organizations who work with the affected people (e.g., YMCA or churches).

# Communicating Findings

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Consider what information from this outbreak might be helpful to share with other audiences like camp directors, future campers, parents, and the public, and the best ways to share this information. It will be important to understand each audience to tailor messages that will help them clearly understand their risk and what actions they can take to protect themselves, their families, and their communities, and the best

way to share the information through different channels, including the news and social media.

Your team has been given an Audience Card designating with whom you will share information about the outbreak. First you will design your communication strategy by choosing a communication channel that will reach your audience and selecting key facts and actionable recommendations that are most relevant to your audience at this time. Then, you will create communication materials.

## Communication Strategy

Use the outline below to plan your communication strategy (how the message will be delivered) and select what information you will use for your communication materials (what is being delivered).

### *Communication strategy outline*

#### *Communication channel*

(e.g., phone call, video conference, email, text messaging, social media, or TV/radio news outlet, publication/graphics)

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#### *Essential outbreak information*

(e.g., when it started, where it occurred, and who is at risk, what we know and don't know, what is being done to learn more, where to go to learn more)

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#### *Prevention recommendations & strategies*

(e.g., stable grouping, physical distancing, mask use, enhanced hygiene and disinfection)

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## Communication materials

Design the communication materials (what is being delivered) that you plan to share using the channel your group selected. These materials may include the text of an email, a script for a phone call, a graphic and text for social media, or a storyboard for a segment on the evening news.

Remember to use audience-appropriate language and communicate the key facts and actionable recommendations that are most relevant to your audience at this time.

*Communication materials*

# Audience Cards

## Summer camp directors



Adults in charge of running summer camps



Role: Design a camp experience that builds community (e.g., team building activities, dining, or sleeping accommodations) while practicing prevention measures to reduce the spread of NERD.

## News media outlets



People reporting local and state news (newspaper, TV, or radio)



Role: Report findings of NERD summer camp outbreak to the community and include recommendations to reduce transmission.



## Parent or guardians of campers



Parents, grandparents, or other caretakers



Role: Prepare their campers to have a safe summer camp experience by promoting behaviors that minimize the risk for transmission.

## Health department



Experts working at the local health department



Role: Control and prevent similar outbreaks in the community by providing science-based recommendations for prevention.

### Campers aged 14–16 years



Older children attending camp



Role: Reduce the likelihood of infection or disease spread while still participating in summer camp activities.

### Healthcare providers



Local doctors, nurses, hospital administrators, or pediatricians



Role: Provide recommendations to patients and their families and prepare for possible increase in cases during summer camp season.



### Camp counselors



High school and college students aged 17–24 working as counselors with the campers



Role: Facilitate a camp experience that builds community (e.g., team building activities, dining, and sleeping accommodations) while reinforcing prevention measures to reduce the spread of NERD among campers and staff.

### Campers aged 6–12 years



Younger children attending nearby camps



Role: Reduce the likelihood of infection or disease spread while still participating in summer camp activities.