6 Why do laboratory testing?

CDC NERD Academy

Grade level: 6–12

Suggested time: 75 minutes

Overview

In this module, students learn how laboratory testing data are used to track the spread of disease. By simulating antigen laboratory tests for a fictional, novel emerging respiratory disease (NERD), students make recommendations for a group of exposed students. Students will calculate NERD incidence at a local university and recommend ways the university can help reduce the spread of NERD.

Learning objectives

After this module, students should be able to

- Explain the different purposes of diagnostic and screening testing
- Describe the differences among polymerase chain reaction (PCR), antigen, and antibody tests
- Calculate incidence and explain how it can be used to identify public health problems
- Simulate antigen testing and interpret results to calculate NERD incidence
- Analyze results of simulated laboratory testing to make public health decisions

STEM connections & standards

STEM connections: Chemistry: antigen testing; Mathematics: fractions, percentages

Problem-based skills: Identifying trends, decision making

Epidemiology and Public Health Science Core Competencies: HS-EPHS1: Epidemiologic Thinking and a Public Health Approach; HS-EPHS 2: Public Health Surveillance
https://www.cdc.gov/careerpaths/k12teacherroadmap/pdfs/ephs-competencies.pdf

National Health Education Standards: Standard 3: Students will demonstrate the ability to access valid information, products, and services to enhance health.
https://www.cdc.gov/healthyschools/sher/standards/index.htm

Next Generation Science Standards: Science & Engineering Practice(s): Analyzing and Interpreting Data; Crosscutting Concept(s): Structure and Function
https://www.nextgenscience.org/get-to-know

Timeline

1 Introducing the content (30 minutes)

Students watch the "Why do laboratory testing?" video (11:34 minutes) to learn about laboratory testing. Teachers can assess student knowledge of the video content using the **Knowledge Check: Laboratory Testing**. The class can further discuss the role of a laboratory scientist using the **Career Spotlight.**

2 Activity (35 minutes)

In groups, students conduct simulated NERD antigen tests. They analyze test results to provide self-quarantine and self-isolation recommendations. Students will then calculate NERD incidence at the university and use their findings to recommend ways the university can help reduce the spread of NERD. Teachers can watch an activity demonstration video (4:24 minutes) that illustrates how to teach this activity in the classroom.

3 Class discussion (10 minutes)

As a class, students apply their new knowledge to answer questions about laboratory testing.

Vocabulary

Antibody, antibody test, antigen, antigen test, diagnostic testing, incidence, PCR (polymerase chain reaction), screening testing, self-isolation, self-quarantine, vaccine.

See **Definitions**.

Materials

White crayon or wax, 32 disposable cups or test tubes, green food dye, water, forceps or tweezers for each station, paper towels, and a water container.

Meet Lily, a laboratory scientist

Learn more about a laboratory scientist's role in the **Career Spotlight** and the "Why do laboratory testing?" video.

Teacher preparation

- Preview videos.
- Make copies of handouts and cut out **Test Subject Identification Cards**.
- Create a classroom version of the **NERD Lab Results** sheet (e.g., re-create on whiteboard or large poster or prepare to project the image).
- Prepare 32 antigen test strips for each class section.
    a. Print out **Antigen Test Strips** on office or copy paper.
    b. Color the control line on each test strip with white wax or white crayon. The appearance of this white line after submerging the strip during simulated laboratory testing will indicate the test is working.

> If you want to emphasize the importance of the control, do not mark the control line for one of the test strips. This will facilitate a discussion about what to do when a laboratory test fails.

    c. Color the NERD Infection line on test strips that will give a positive test result with white wax or crayon. These include strips 004, 010, 014, 019, 022, 030 and the positive demonstration (Demo +) strip. The appearance of this white line after submerging the strip during simulated laboratory testing will indicate a positive test result for genetic material (i.e., current infection).
- Prepare one set of 32 sample cups or test tubes.
    d. Prepare enough water in a container to fill 32 sample cups or test tubes so the inserted test strip will get wet just past the control line when dipped. Before pouring into cups or tubes, add green food dye to the water to represent nasal swab fluid. The more concentrated the dye, the easier it will be for students to see the test results appear. You can experiment to determine the best concentration for your test strip paper.
    e. Fill 32 cups or test tubes with enough green colored water so that the inserted test strip will get wet just past the control line when dipped.
    f. Label each cup or test tube of green water with a test subject identification number, starting with 001 and ending with 032.

> Labeled cups or test tubes and colored water can be set aside and reused in subsequent class sections. Test strips cannot be reused so a new set will be needed for each class.

- Prepare testing stations.
    a. Divide the 32 test subjects (labeled cups or test tubes) equally among stations. Place test subject identification cards, prepared test strips, and sample cups or test tubes at each station. Place forceps or tweezers and paper towels at each station.

Make copies of the **NERD Factsheet** (one per group) or an enlarged classroom version.

> The **NERD Factsheet** is not required for this lesson but may be useful as a reference.

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

Videos

- "Why do laboratory testing?" video (11:34 minutes) for students
- Activity demonstration video (4:24 minutes) for teachers

www.cdc.gov/scienceambassador/nerdacademy/virus-testing.html

Handouts

- **Knowledge Check: Laboratory Testing** (one per student)
- **Career Spotlight: Laboratory Scientist** (one per student or one classroom copy)
- **NERD Laboratory Testing Guide** (one per group)
- **NERD Lab Results** sheet (one per student)
- **Test Subject Identification Cards** (divide equally among groups)
- **Calculating NERD Incidence: Part 1** sheet (one per student)
- **Calculating NERD Incidence: Part 2** sheet (one per student)

Introducing the content (30 minutes)

Say aloud

Laboratory testing is used by medical professionals to help diagnose disease and can be used by public health experts to help identify potential public health problems in a community. During this video, you will learn about the different types of tests that laboratory scientists conduct to identify current infections. You'll learn how public health experts use lab test results to calculate the incidence of disease, or the number of new cases in a population over a specific time period. Calculating incidence helps public health experts make science-based recommendations to the public to reduce the spread of disease. You will also learn how laboratory scientists test to determine if a person's immune system has developed antibodies from a past infection or from receiving a vaccine.

1. Show the "Why do laboratory testing?" video (11:34 minutes) to students.
2. Hand out the **Knowledge Check: Laboratory Testing**. 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 role of a laboratory scientist.

Activity: Part 1 (20 minutes)

Say aloud

Now that you have a better understanding of how laboratory testing works, you will simulate laboratory testing and make recommendations to reduce the spread of the NERD virus on a local university campus. Your class will be conducting screening testing using samples from a group of students living together in an off-campus apartment building who were all exposed to NERD at a recent gathering. You will use the results of this screening testing to determine if these students are currently infected with the NERD virus. Together, you will analyze data from all 32 students — the test subjects — and make recommendations for self-isolation or self-quarantine.

1. Hand out a **NERD Laboratory Testing Guide** to each group.

> The test students are going to simulate is similar to the types of self-tests used in school and home environments. It does not require specific personnel qualifications to perform the test because it is CLIA-waived. Clinical Laboratory Improvement Amendments of 1988 (CLIA)-waived tests include test systems cleared by the U.S. Food and Drug Administration (FDA) for home use and those tests approved for waiver under the CLIA criteria. Learn more about CLIA-waived tests at **https://www.cdc.gov/labquality/waived-tests.html**.

> The antigen test simulation in this activity requires visual interpretation. However, there are other accessible testing options for students with a visual disability. While other students are performing the lab activity, consider having students with a visual disability research accessible antigen testing options for COVID-19 or pregnancy tests. Have the students share a summary of their findings with the class.

2. Demonstrate how to dip the **Antigen Test Strips** into the corresponding sample cup or test tube. Explain that each test strip represents one test subject.
    a. Use forceps or tweezers to carefully grasp one demonstration test strip by the end where the test subject identification number is written.
    b. Dip the test strip into the green water until the inserted test strip is wet just past the control line for approximately 5 seconds. Depending on your water dye concentration, adjust the submersion time, as needed.
    c. Remove the test strip and lay it flat on the paper towel.
    d. Read the test strip within 5 seconds using the **NERD Laboratory Testing Guide** as a reference.
    e. Demonstrate using both the positive (Demo +) and negative (Demo -) demonstration strips provided. Show students how to read the results for each test.

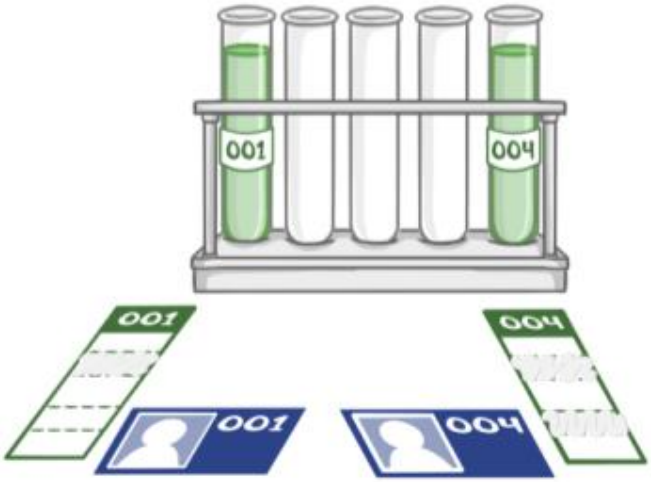
3 Divide students evenly among testing stations. Instruct students to complete antigen tests for their assigned test subjects. Have students record the results of each (positive or negative) on the **Test Subject Identification Cards**. Then, explain that they should use these results to recommend self-isolation or self-quarantine. Hand out or display the **NERD Factsheet** for additional reference.

4 Instruct students to clean up their testing station before continuing.

5 Hand out **NERD Lab Results** to each student. Display a large classroom version of the **NERD Lab Results**.

6 Have each group share their lab testing results and recommendations from their **Test Subject Identification Cards** while you or a designated student fill out the classroom version of the **NERD Lab Results**. Confirm class consensus on the proposed recommendations as results are shared.

7 Have students record class data on their individual **NERD Lab Results** sheet.



Activity: Part 2 (15 minutes)

Say aloud

Now that you have identified the students living in the off-campus apartment building who have been infected and made public health recommendations for them, the university wants to track how much NERD is occurring among all its students. This will help identify groups that might be at higher risk of getting the illness. As you saw in the video, public health experts use diagnostic and screening results to calculate incidence. Incidence refers to the number of new cases of a disease in a population during a specific time period. You will now calculate NERD incidence for the university. You will compare the incidence numbers for different groups of people to assess if certain groups have a higher risk of disease. Based on your findings you will make recommendations on prevention strategies to protect students and reduce the spread of NERD.

1. Hand out **Calculating NERD Incidence: Part 1** to each student. Read the overview and review the formulas for how to calculate incidence.

   To review how to calculate NERD incidence with an example calculation, use the first three rows in Table 1 provided in the Calculating NERD Incidence (Whole University) section of the handout. These calculations have been done for students.

2. Instruct students to work in pairs to complete the Calculating NERD Incidence (Whole University) section of the handout. They will need to calculate NERD incidence at the university in week 3, and complete Table 1. Review calculations and discussion questions 1 and 2 together as a class. Use the **Part 1: Answer Key** as a guide.

3. Instruct students to work in pairs to complete the Calculating NERD Incidence (Clusters) section of the handout. They will need to calculate NERD incidence for university students living off campus in an apartment and on campus in a dorm, and complete Table 2. Review calculations and discussion questions 3–6 together as a class. Use the **Part 1: Answer Key** as a guide.

4. Hand out a **Calculating NERD Incidence: Part 2** sheet to each student. As a class, read the scenario and review Table 1. Complete discussion questions 1–3 together as a class. Use the **Part 2: Answer Key** as a guide.

$$\frac{\text{Total number of new cases in a specific time period}}{\text{Total size of the population at risk for same time period}} = \text{INCIDENCE (percentage or proportion)}$$

Class discussion (10 minutes)

- How does calculating incidence help public health experts understand spread of disease and identify groups at higher or lower risk in a given population?
- What is the public health effect of conducting regular screening tests in a high-risk population?
- How might the introduction of a vaccine affect laboratory testing results and frequency?
- How do public health experts use data from laboratory testing to guide public health decisions and policies?

Definitions

Antibody: A protein found in the blood that is produced in response to foreign substances (e.g., bacteria or viruses) invading the body. Antibodies protect the body from disease by binding to these organisms and destroying them.

Antibody test: A type of laboratory test that looks for antibodies produced by the body's immune system soon after being infected or vaccinated.

Antigen: A molecule usually found on the surface or produced by an infectious agent and that stimulates the production of a specific antibody.

Antigen test: A type of laboratory test that looks for antigens from infectious agents which indicate a current infection. This test can be used for diagnostic or screening purposes.

Diagnostic testing: Laboratory tests conducted for the purpose of helping diagnose a current disease in a person with signs and symptoms of disease.

Incidence: The number of new cases, or people who tested positive for a disease, in a population over a specific period of time.

PCR (polymerase chain reaction) test: A type of laboratory test that looks for genetic material such as DNA or RNA from an infectious agent, which indicates a current infection. This test can be used for diagnostic or screening purposes.

Screening testing: Laboratory tests conducted for the purpose of identifying a disease or other health state in a person who does not currently have signs or symptoms of disease.

Self-isolation: The practice used to keep a person who is currently infected with an infectious agent (such as a virus) away from others during their infectious period to prevent transmission of an infectious disease.

Self-quarantine: The practice used to keep a person who may have been exposed to an infectious agent (such as a virus) away from others while they monitor themselves for signs of illness during their potential infectious period to prevent possible transmission of an infectious disease.

Vaccine: A product that stimulates a person's immune system to produce immunity to a specific disease, protecting the person from that disease.

For more vocabulary, visit: **https://www.cdc.gov/scienceambassador/nerdacademy/glossary.html**.

Extension ideas

- Have students compare incidence by sex and by age using the information provided on the test subject identification cards. Have them use this information to make tailored recommendations for additional prevention strategies.
- Describe the structure of antibodies and antigens and their role in the immune system response to further define how PCR, antigen, and antibody tests work.
- Learn more about the four major structural proteins in SARS-CoV-2 (or other virus): spike, envelope, membrane, and nucleocapsid.
- Discuss test sensitivity and specificity, including the likelihood of false negatives and false positives based on test type. Reference: **https://www.cdc.gov/coronavirus/2019-ncov/lab/resources/antigen-tests-guidelines.html**.
- Use the CDC COVID Tracker to review COVID incidence by state, county, or population. Reference: **https://covid.cdc.gov/covid-data-tracker/#cases_casesper100klast7days**.
- Explore Emergency Use Authorization (EUA) for laboratory testing. Reference: **https://www.fda.gov/medical-devices/coronavirus-disease-2019-covid-19-emergency-use-authorizations-medical-devices/in-vitro-diagnostics-euas**.
- Discuss key regulatory concepts involved in laboratory testing, such as the Clinical Laboratory Improvement Act and Amendments (CLIA) regulations and waivers. Reference: **https://www.cdc.gov/clia/about.html** and **https://www.cdc.gov/labquality/waived-tests.html**. See how these regulations apply to point-of-care and rapid tests for COVID-19, and self-tests used in school and home environments. Reference: **https://www.cdc.gov/coronavirus/2019-ncov/lab/point-of-care-testing.html** and **https://www.cdc.gov/coronavirus/2019-ncov/testing/self-testing.html**.
- Research monoclonal antibodies as treatment for viral diseases. Monoclonal antibodies are laboratory-made proteins that mimic the immune system's ability to fight off harmful pathogens such as viruses. Reference: **https://www.covid19treatmentguidelines.nih.gov/anti-sars-cov-2-antibody-products/anti-sars-cov-2-monoclonal-antibodies/**.
- Review recommended immunizations and schedules. Reference: **https://www.cdc.gov/vaccines/schedules/** and **https://www.cdc.gov/vaccines/vpd/vaccines-diseases.html**.
- Compare and contrast natural and acquired immunity and discuss how, depending on the infectious agent, both offer protection that can wane over time making individuals susceptible to reinfection. For COVID-19, study results suggest that full vaccination provides additional protection against reinfection and that booster vaccine doses after the minimum recommended interval after primary series completion increases protection. Reference: **https://www.cdc.gov/mmwr/volumes/70/wr/mm7032e1.htm** and **https://www.cdc.gov/mmwr/volumes/70/wr/mm7050e2.htm**.
- Create predictive graphs concerning the introduction of a vaccine and how it might affect the laboratory testing results for a population, both current infections (antigen or PCR test) and widespread immunity (antibody test).

CDC Resources

COVID-19 Testing Overview
https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/testing.html

Test for Current Infection
https://www.cdc.gov/coronavirus/2019-ncov/testing/diagnostic-testing.html

Test for Past Infection:
https://www.cdc.gov/coronavirus/2019-ncov/testing/serology-overview.html

Overview of Testing for SARS-CoV-2 (COVID-19)
https://www.cdc.gov/coronavirus/2019-ncov/hcp/testing-overview.html

Interim Guidance for Antigen Testing for SARS-CoV-2
https://www.cdc.gov/coronavirus/2019-ncov/lab/resources/antigen-tests-guidelines.html

Interim Guidelines for COVID-19 Antibody Testing
https://www.cdc.gov/coronavirus/2019-ncov/lab/resources/antibody-tests-guidelines.html

Fact Sheet for Patients Regarding Testing
https://www.cdc.gov/coronavirus/2019-ncov/downloads/Factsheet-for-Patients-2019-nCoV.pdf

Legal Authorities for Isolation and Quarantine
https://www.cdc.gov/quarantine/aboutlawsregulationsquarantineisolation.html

How Do I Find a COVID-19 Vaccine or Booster?
https://www.cdc.gov/coronavirus/2019-ncov/vaccines/How-Do-I-Get-a-COVID-19-Vaccine.html

Interim Clinical Considerations for Use of COVID-19 Vaccines Currently Approved or Authorized in the United States
https://www.cdc.gov/vaccines/covid-19/clinical-considerations/covid-19-vaccines-us.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: Laboratory Testing

Directions: After viewing the "Why do laboratory testing?" video (11:34 minutes), answer the following questions.

1 Determine if the following statements about laboratory testing are true or false.

True	False

Fill in the blank	Example
	Laboratory testing is used to help diagnose the presence of an infectious agent.
	The purpose of diagnostic testing is to find people infected with an infectious agent even if they do not feel sick.
	A negative test means the infectious agent is not present.
	The purpose of a screening test is to find out if a person has been infected with an infectious agent even if they do not feel sick.
	Public health experts monitor laboratory test results to identify potential public health problems in a community.

2 Match the type of test to the examples provided. More than one test type can apply.

Antibody	Antigen	PCR

Fill in the blank	Example
	Used to determine prior exposure to an infectious agent
	Ability to detect infection is good, with or without symptoms, but it could take 1-2 days to get results
	Can be used to see if person has protection from a previous infection or vaccination
	Looks for molecules found on the surface of or produced by an infectious agent
	Looks for proteins made by the immune system to fight an infectious agent
	Ability to detect infection is not as good (especially without symptoms), but results are fast, often 15-30 minutes
	Looks for genetic material from an infectious agent
	Detects a current infection

Knowledge Check: Answer Key

Directions: After viewing the "Why do laboratory testing?" video (11:34 minutes), answer the following questions.

1 Determine if the following statements about laboratory testing are true or false.

True	False

Fill in the blank	Example
True	Laboratory testing is used to help diagnose the presence of an infectious agent.
False	The purpose of diagnostic testing is to find people infected with an infectious agent even if they do not feel sick.
False	A negative test means the infectious agent is not present.
True	The purpose of a screening test is to find out if a person has been infected with an infectious agent even if they do not feel sick.
True	Public health experts monitor laboratory test results to identify potential public health problems in a community.

2 Match the type of test to the examples provided. More than one test type can apply.

Antibody	Antigen	PCR

Fill in the blank	Example
Antibody	Used to determine prior exposure to an infectious agent
PCR	Ability to detect infection is good, with or without symptoms, but it could take 1-2 days to get results
Antibody	Can be used to see if person has protection from a previous infection or vaccination
Antigen	Looks for molecules found on the surface of or produced by an infectious agent
Antibody	Looks for proteins made by the immune system to fight an infectious agent
Antigen	Ability to detect infection is not as good (especially without symptoms), but results are fast, often 15-30 minutes
PCR	Looks for genetic material from an infectious agent
Antigen and PCR	Detects a current infection

Career Spotlight

CDC NERD Academy

Laboratory Scientist

A laboratory scientist uses laboratory equipment to analyze samples and substances. They can help collect and safely ship samples, perform laboratory testing, and interpret testing results. Laboratory scientists might also help develop and test new types of diagnostic and screening tests, often leading to new technology and more rapid and accurate results. They are committed to maintaining a safe and effective work environment and to generating accurate results in a timely fashion.

**Meet Lily,
a laboratory scientist**

Who do they work with?

Laboratory scientists often collaborate with medical doctors and public health experts.

Where do they work?

Laboratory scientists can work in different laboratories, such as clinical laboratories that are part of healthcare facilities, reference laboratories that perform diagnostic testing on samples it receives, and public health laboratories. Public health laboratories perform some diagnostic testing, reference testing, and disease surveillance and can focus on a wide range of topic areas, including bacteriology, virology, parasitology, toxicology, chronic disease, genetic testing, and newborn screening. Depending on the situation, they may work on a bench top or in a Biological Safety Level 4 “Hot Zone” Lab with maximum containment.

What skills do they use?

Laboratory scientists have skills in critical thinking, teamwork, management, attention to detail, and safety. Working in teams or independently, they manage time efficiently, carefully follow protocols, and problem solve as needed. Good motor skills such as eye-hand coordination are needed to perform technical laboratory procedures and protocols. Good data management and analysis skills are important for organizing and interpreting testing results.

What qualifications do they need?

Laboratory scientists often have at least a bachelor’s degree with a major in medical technology or in one of the life sciences. It’s helpful for them to have knowledge of molecular biology and microbiology techniques. There are also some opportunities for people with high school or associate degrees to work in testing laboratories.

NERD Factsheet

CDC NERD Academy

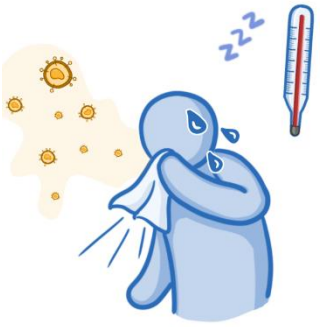
NOVEL EMERGING RESPIRATORY DISEASE

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

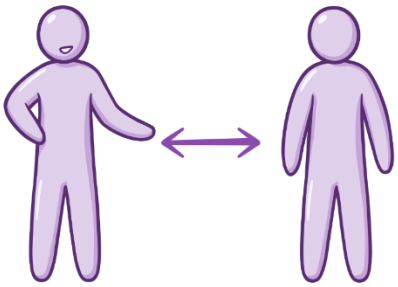
What do I do if I have symptoms?

- 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

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

NERD Laboratory Testing Guide

A NERD outbreak has been reported at a local university campus. Most students live in campus housing, however, there have been reports of several large gatherings held off campus.

As part of the outbreak investigation team, you have been asked to help screen students living at one of the off-campus apartments (Apartment Building #12, coded as Apt #12) that held a large gathering that resulted in several NERD cases according to the investigation team. All students living in Apt #12 attended this gathering and therefore may have been in contact with a known NERD case. You will use laboratory testing to determine if any students living in Apt #12 are currently infected with the NERD virus. Each student living in Apt #12 has already provided a sample and completed a Test Subject Identification Card.

What is an antigen test?

A type of laboratory test that looks for antigens from infectious agents which indicate a current infection. This test can be used for diagnostic or screening purposes. Antigen tests are generally cost effective, fast, and accessible.

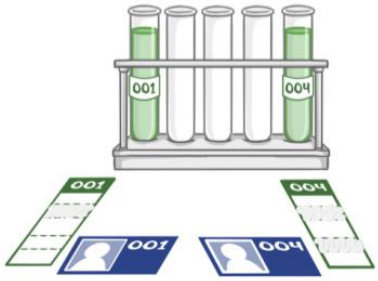
A **positive antigen test** will indicate if a test subject is currently infected with the NERD virus.

A **negative antigen test** will indicate virus is not detected in the sample. This could mean the test subject is not infected with NERD virus or the virus has not replicated enough to be detectable by this type of test.

Although antigen testing is cost-effective, fast, and accessible, this type of test can sometimes be less sensitive, meaning sometimes a person who received a negative test may be infected with the virus, but it was not detected by the test. Antigen tests are most sensitive when used on people who have signs and symptoms of NERD but can also be helpful for identifying people infected with NERD but not showing signs and symptoms of the disease. A more sensitive PCR test may be necessary to confirm the presence of NERD virus in some cases.

Laboratory Testing

For each test subject, you will conduct an antigen test on the nasal sample (green solution) to screen for presence of the NERD virus. Your teacher will demonstrate how to conduct the antigen test and read the results.



Testing instructions

1. Use forceps or tweezers to grab a test strip where the test subject ID is written.
2. Carefully dip the test strip into the green solution in the cup or tube with the matching ID until the inserted test strip is wet just past the control line for approximately 5 seconds.
3. Remove the test strip and lay it flat on the paper towel.
4. Within 5 seconds, read the test strip.
5. Record the result on the corresponding **Test Subject Identification Card**.

How to read the NERD Antigen Test Strip results

#	**Case ID number**
Control	**If a white line appears, the test is working. If a white line does not appear, the test is not working properly.**
NERD Infection	**If a white line appears, the test is positive. If a white line does not appear, the test is negative.**

Making Recommendations

You will use the antigen test results to help the outbreak investigation team make a recommendation for each person living in the off-campus apartment building (Apt #12). You will record the recommendation on the **Test Subject Identification Card**.

Recommendation for positive test

Persons with a positive antigen test should self-isolate.

Self-isolation separates a person who is currently infected with the virus away from others during their infectious period to prevent transmission of an infectious disease. Anyone infected with NERD should separate from others, stay in a specific "sick room" or area, and use a separate bathroom, if available, for 10 days (See the **NERD Factsheet**). They should monitor their health and seek medical care if needed.

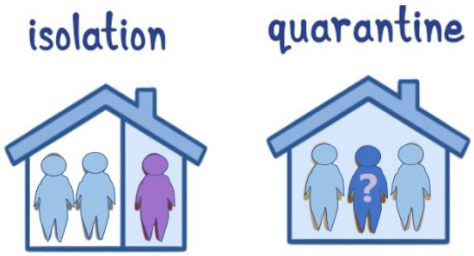
Students in self-isolation should not attend in-person classes, but should attend virtual classes, as much as their health allows.

Recommendation for negative test

Any person with a negative antigen test should self-quarantine if they have been in close contact with someone who has a positive antigen test. If someone with a negative result later starts showing symptoms, a more sensitive PCR test should be given to confirm the presence of NERD virus.

Self-quarantine separates someone who might have been exposed to an infectious agent away from others while they monitor themselves for signs of illness during their potential infectious period to prevent possible transmission of an infectious disease. Anyone potentially exposed to NERD should separate from others for 14 days (See the **NERD Factsheet**).

Students in self-quarantine should not attend in-person classes but should attend virtual classes.



Test Subject Identification Cards

#001

Age 21
Sex Female
Test Result
- ❑ Positive
- ❑ Negative

Recommendation (If applicable)
- ❑ Self-isolation
- ❑ Self-quarantine

#002

Age 20
Sex Male
Test Result
- ❑ Positive
- ❑ Negative

Recommendation (If applicable)
- ❑ Self-isolation
- ❑ Self-quarantine

#003

Age 19
Sex Male
Test Result
- ❑ Positive
- ❑ Negative

Recommendation (If applicable)
- ❑ Self-isolation
- ❑ Self-quarantine

#004

Age 22
Sex Female
Test Result
- ❑ Positive
- ❑ Negative

Recommendation (If applicable)
- ❑ Self-isolation
- ❑ Self-quarantine

#005

Age 19
Sex Male
Test Result
- ❑ Positive
- ❑ Negative

Recommendation (If applicable)
- ❑ Self-isolation
- ❑ Self-quarantine

#006

Age 19
Sex Female
Test Result
- ❑ Positive
- ❑ Negative

Recommendation (If applicable)
- ❑ Self-isolation
- ❑ Self-quarantine

#007

Age 21
Sex Male
Test Result

- ❑ Positive
- ❑ Negative

Recommendation (If applicable)

- ❑ Self-isolation
- ❑ Self-quarantine

#008

Age 22
Sex Male
Test Result

- ❑ Positive
- ❑ Negative

Recommendation (If applicable)

- ❑ Self-isolation
- ❑ Self-quarantine

#009

Age 21
Sex Female
Test Result

- ❑ Positive
- ❑ Negative

Recommendation (If applicable)

- ❑ Self-isolation
- ❑ Self-quarantine

#010

Age 20
Sex Male
Test Result

- ❑ Positive
- ❑ Negative

Recommendation (If applicable)

- ❑ Self-isolation
- ❑ Self-quarantine

#011

Age 22
Sex Female
Test Result

- ❑ Positive
- ❑ Negative

Recommendation (If applicable)

- ❑ Self-isolation
- ❑ Self-quarantine

#012

Age 22
Sex Male
Test Result

- ❑ Positive
- ❑ Negative

Recommendation (If applicable)

- ❑ Self-isolation
- ❑ Self-quarantine

#013

Age 19
Sex Female
Test Result

❑ Positive
❑ Negative

Recommendation (If applicable)

❑ Self-isolation
❑ Self-quarantine

#014

Age 20
Sex Female
Test Result

❑ Positive
❑ Negative

Recommendation (If applicable)

❑ Self-isolation
❑ Self-quarantine

#015

Age 22
Sex Female
Test Result

❑ Positive
❑ Negative

Recommendation (If applicable)

❑ Self-isolation
❑ Self-quarantine

#016

Age 23
Sex Male
Test Result

❑ Positive
❑ Negative

Recommendation (If applicable)

❑ Self-isolation
❑ Self-quarantine

#017

Age 21
Sex Male
Test Result

❑ Positive
❑ Negative

Recommendation (If applicable)

❑ Self-isolation
❑ Self-quarantine

#018

Age 20
Sex Male
Test Result

❑ Positive
❑ Negative

Recommendation (If applicable)

❑ Self-isolation
❑ Self-quarantine

#019

Age 19
Sex Female
Test Result

❑ Positive
❑ Negative

Recommendation (if applicable)

❑ Self-isolation
❑ Self-quarantine

#020

Age 19
Sex Male
Test Result

❑ Positive
❑ Negative

Recommendation (If applicable)

❑ Self-isolation
❑ Self-quarantine

#021

Age 21
Sex Male
Test Result

❑ Positive
❑ Negative

Recommendation (If applicable)

❑ Self-isolation
❑ Self-quarantine

#022

Age 22
Sex Male
Test Result

❑ Positive
❑ Negative

Recommendation (If applicable)

❑ Self-isolation
❑ Self-quarantine

#023

Age 21
Sex Female
Test Result

❑ Positive
❑ Negative

Recommendation (If applicable)

❑ Self-isolation
❑ Self-quarantine

#024

Age 22
Sex Female
Test Result

❑ Positive
❑ Negative

Recommendation (If applicable)

❑ Self-isolation
❑ Self-quarantine

#025

Age 23
Sex Male
Test Result

- ❑ Positive
- ❑ Negative

Recommendation (If applicable)

- ❑ Self-isolation
- ❑ Self-quarantine

#026

Age 20
Sex Male
Test Result

- ❑ Positive
- ❑ Negative

Recommendation (If applicable)

- ❑ Self-isolation
- ❑ Self-quarantine

#027

Age 22
Sex Male
Test Result

- ❑ Positive
- ❑ Negative

Recommendation (If applicable)

- ❑ Self-isolation
- ❑ Self-quarantine

#028

Age 22
Sex Female
Test Result

- ❑ Positive
- ❑ Negative

Recommendation (If applicable)

- ❑ Self-isolation
- ❑ Self-quarantine

#029

Age 20
Sex Male
Test Result

- ❑ Positive
- ❑ Negative

Recommendation (If applicable)

- ❑ Self-isolation
- ❑ Self-quarantine

#030

Age 20
Sex Female
Test Result

- ❑ Positive
- ❑ Negative

Recommendation (If applicable)

- ❑ Self-isolation
- ❑ Self-quarantine

#031

Age 22
Sex Female
Test Result

- ❑ Positive
- ❑ Negative

Recommendation (If applicable)

- ❑ Self-isolation
- ❑ Self-quarantine

#032

Age 23
Sex Female
Test Result

- ❑ Positive
- ❑ Negative

Recommendation (If applicable)

- ❑ Self-isolation
- ❑ Self-quarantine

Antigen Test Strips

Strip	Control line	Test line
Demo	Control	NERD Infection
Demo +	Control	NERD Infection
001	Control	NERD Infection
002	Control	NERD Infection
003	Control	NERD Infection
004	Control	NERD Infection
005	Control	NERD infection
006	Control	NERD infection
007	Control	NERD infection
008	Control	NERD Infection
009	Control	NERD Infection
010	Control	NERD Infection
011	Control	NERD Infection
012	Control	NERD Infection
013	Control	NERD Infection
014	Control	NERD infection
015	Control	NERD infection
016	Control	NERD infection

017	018	019	020	021	022	023	024
Control	Control	Control	Control	Control	Control	Control	Control
NERD Infection	NERD Infection	NERD Infection	NERD Infection	NERD Infection	NERD Infection	NERD infection	NERD infection

025	026	027	028	029	030	031	032
Control	Control	Control	Control	Control	Control	Control	Control
NERD Infection	NERD Infection	NERD Infection	NERD Infection	NERD Infection	NERD Infection	NERD infection	NERD infection

NERD Lab Results

Directions: Record demographic information and results for each test subject as they are shared by the class in the table below. When all the results are recorded, you should agree upon a recommendation for self-isolation or self-quarantine. See the **NERD Laboratory Testing Guide**.

Table 1. Antigen test results and recommendations for students living in Apartment Building #12 (Apt #12).

Test Subject Number	Age	Self-reported sex (Male, Female)	Positive Test Result (Yes, No)	Recommendation (Self-isolation, Self-quarantine)
001				
002				
003				
004				
005				
006				
007				
008				
009				
010				
011				
012				
013				
014				
015				
016				

Test Subject Number	Age	Self-reported sex (Male, Female)	Positive Test Result (Yes, No)	Recommendation (Self-isolation, Self-quarantine)
017				
018				
019				
020				
021				
022				
023				
024				
025				
026				
027				
028				
029				
030				
031				
032				

NERD Lab Results: Answer Key

Directions: Record demographic information and results for each test subject as they are shared by the class in the table below. When all the results are recorded, you should agree upon a recommendation for self-isolation or self-quarantine. See the **NERD Laboratory Testing Guide**.

Answer: Answer are provided in the table below.

Table 1. Antigen test results and recommendations for students living in Apartment Building #12 (Apt #12).

Test Subject Number	Age	Self-reported sex (Male, Female)	Positive Test Result (Yes, No)	Recommendation (Self-isolation, Self-quarantine)
001	21	Female	No	Self-quarantine
002	20	Male	No	Self-quarantine
003	19	Male	No	Self-quarantine
004	22	Female	Yes	Self-isolation
005	19	Male	No	Self-quarantine
006	19	Female	No	Self-quarantine
007	21	Male	No	Self-quarantine
008	22	Male	No	Self-quarantine
009	21	Female	No	Self-quarantine
010	20	Male	Yes	Self-isolation
011	22	Female	No	Self-quarantine
012	22	Male	No	Self-quarantine
013	19	Female	No	Self-quarantine
014	20	Female	Yes	Self-isolation
015	22	Female	No	Self-quarantine
016	23	Male	No	Self-quarantine

Test Subject Number	Age	Self-reported sex (Male, Female)	Positive Test Result (Yes, No)	Recommendation (Self-isolation, Self-quarantine)
017	21	Male	No	Self-quarantine
018	20	Male	No	Self-quarantine
019	19	Female	Yes	Self-isolation
020	19	Male	No	Self-quarantine
021	21	Male	No	Self-quarantine
022	22	Male	Yes	Self-isolation
023	21	Female	No	Self-quarantine
024	22	Female	No	Self-quarantine
025	23	Male	No	Self-quarantine
026	20	Male	No	Self-quarantine
027	22	Male	No	Self-quarantine
028	22	Female	No	Self-quarantine
029	20	Male	No	Self-quarantine
030	20	Female	Yes	Self-isolation
031	22	Female	No	Self-quarantine
032	23	Female	No	Self-quarantine

Calculating NERD Incidence: Part 1

The university decided to continue their screening strategy of testing all students on a weekly basis. Prior to coming to the university, all students who returned to campus had to have a negative laboratory test.

How do I calculate NERD incidence?

To calculate NERD incidence, divide the number of new NERD cases by the size of the population at risk. Remember: if a student previously tested positive for NERD, they are not considered at risk for getting NERD for the next 30 days. These students should be subtracted from the population at risk as shown in Table 1 below. Incidence can be shown as a percent of new cases in the population or as a proportion per unit of population.

As a percent

To calculate NERD incidence as a percent (i.e., the percent of the population who are new cases):

$$\text{Incidence \%} = \frac{\text{number of NERD positive tests}}{\text{population at risk}} \times 100$$

Per unit of population

To calculate NERD incidence per unit of population (e.g., per 1,000 students):

$$\text{Incidence per 1,000 population} = \frac{\text{number of NERD positive tests}}{\text{population at risk}} \times 1{,}000$$

Calculating NERD Incidence (Whole University)

Directions: Calculate NERD incidence for all students attending the whole university during week 3. Express your answers as a percentage and as per 1,000 students. Complete Table 1.

Table 1. NERD incidence among a large sample of students attending university (n = 12,000) before arriving to campus and during the first 3 weeks at the university.

Time period	# of new NERD infections	# of prior NERD infections	Population at risk	Incidence %	Incidence per 1,000 population
Prearrival	33	0	12,000	0.28%	2.8 per 1,000 students
Week 1 (students return to campus)	1	33	11,967	0.0084%	0.084 per 1,000 students
Week 2 (in-person classes begin)	55	34	11,966	0.46%	4.6 per 1,000 students
Week 3	376	89	11,911		

Data adapted from **https://www.cdc.gov/mmwr/volumes/70/wr/mm7004a3.htm**, accessed May 2021.

Show your work

Incidence % =

Incidence per 1,000 population =

Discussion questions

1. Compare the NERD incidence before the return to school, week 1, and week 2. What observations do you have looking at this data?

2. Interpret the NERD incidence for week 3. What observations do you have looking at this data in comparison to the previous data? What additional information would help you better understand this outbreak?

Calculating NERD Incidence (Clusters)

Directions: Because several off-campus gatherings were reported, you decide to compare the test results for the off-campus apartment (Apt #12) with the test results from an on-campus dorm (Dorm K). Use your NERD positive results from Part 1 and the numbers given for Dorm K to calculate the NERD incidence during week 3. Record your answers in Table 2.

Table 2: NERD incidence among clusters of NERD cases during week 3.

Location	# of new NERD infections	# of prior NERD infections	Population at risk	Incidence percentage	Incidence per 1,000 population
Among students living in an off-campus apartment (Apt #12)		0			
Among students living in on-campus dorm (Dorm K)	8	0	360 students		

Show your work

Off-campus apartment building (Apt #12)

Incidence %

Incidence per 1,000 population =

On-campus dorm (Dorm K)

Incidence % =

Incidence per 1,000 population =

Discussion questions

3 The university used testing to identify current cases and requested testing of all students 7–10 days before returning to campus. However, they did not collect information on cases that may have occurred in the weeks before returning to school. How might the university collect this information and how would it affect the incidence calculations?

4 Why might the university choose antigen testing in some situations and PCR testing in other situations?

5 Although the university promoted the use of general prevention measures (e.g., proper mask wearing, social distancing, reduced class size, no large gatherings), there was a NERD outbreak during week 3. Compare the incidence of the whole university and the two clusters of cases (Apt #12 and Dorm K). What might this suggest about the outbreak based on where students live and what factors might have contributed to any differences?

6 What are some other general prevention strategies the university could use to reduce the spread of NERD among students living in off-campus housing? What strategies could be used to reduce the spread of NERD among students living in on-campus dorms?

Part 1: Answer Key

The university decided to continue their screening strategy of testing all students on a weekly basis. Prior to coming to the university, all students who returned to campus had to have a negative laboratory test.

How do I calculate NERD incidence?

To calculate NERD incidence, divide the number of new NERD cases by the size of the population at risk. Remember: if a student previously tested positive for NERD, they are not considered at risk for getting NERD for the next 30 days. These students should be subtracted from the population at risk as shown in Table 1 below. Incidence can be shown as a percent of new cases in the population or as a proportion per unit of population.

As a percent

To calculate NERD incidence as a percent (i.e., the percent of the population who are new cases):

$$\text{Incidence \%} = \frac{\text{number of NERD positive tests}}{\text{population at risk}} \times 100$$

Per unit of population

To calculate NERD incidence per unit of population (e.g., per 1,000 students):

$$\text{Incidence per 1,000 population} = \frac{\text{number of NERD positive tests}}{\text{population at risk}} \times 1{,}000$$

Calculating NERD Incidence (Whole University)

Directions: Calculate NERD incidence for all students attending the whole university during week 3. Express your answers as a percentage and as per 1,000 students. Complete Table 1.

Table 1. NERD incidence among a large sample of students attending university (n = 12,000) before arriving to campus and during the first 3 weeks at the university.

Time period	# of new NERD infections	# of prior NERD infections	Population at risk	Incidence %	Incidence per 1,000 population
Prearrival	33	0	12,000	0.28%	2.8 per 1,000 students
Week 1 (students return to campus)	1	33	11,967	0.0084%	0.084 per 1,000 students
Week 2 (in-person classes begin)	55	34	11,966	0.46%	4.6 per 1,000 students
Week 3	376	89	11,911	**Answer:** 3.2%	**Answer:** 32 per 1,000 students

Data adapted from **https://www.cdc.gov/mmwr/volumes/70/wr/mm7004a3.htm**, accessed May 2021.

Show your work

Answer:

$$\text{Incidence \%} = \frac{376}{11{,}911} \times 100 = 3.2\%$$

$$\text{Incidence per 1,000 population} = \frac{376}{11{,}911} \times 1{,}000 = 32 \text{ per } 1{,}000 \text{ students}$$

Discussion questions

1. Compare the NERD incidence before the return to school, week 1, and week 2. What observations do you have looking at this data?

   Answer: Answers will vary. Answer might include that there were some students who were sick before they arrived at school or that during the first two weeks there were not many cases of NERD. There were more cases in week 2 than in week 1.

2. Interpret the NERD incidence for week 3. What observations do you have looking at this data in comparison to the previous data? What additional information would help you better understand this outbreak?

   Answer: Incidence increased in week 3. Students might want to find out more about who is sick, where sick students have been, their behaviors or attendance at large gatherings, and more about their living situations.

Calculating NERD Incidence (Clusters)

Directions: Because several off-campus gatherings were reported, you decide to compare the test results for the off-campus apartment (Apt #12) with the test results from an on-campus dorm (Dorm K). Use your NERD positive results from Part 1 and the numbers given for Dorm K to calculate the NERD incidence during week 3. Record your answers in Table 2.

Table 2: NERD incidence among clusters of NERD cases during week 3.

Location	# of new NERD infections	# of prior NERD infections	Population at risk	Incidence percentage	Incidence per 1,000 population
Among students living in an off-campus apartment (Apt #12)	**Answer:** 6	**0**	**Answer:** 32	**Answer:** 18.8%	**Answer:** 188 per 1,000 students
Among students living in on-campus dorm (Dorm K)	**8**	**0**	**360 students**	**Answer:** 2.2%	**Answer:** 22 per 1,000 students

Show your work

Off-campus apartment building (Apt #12)

Answer:

$$\text{Incidence \%} = \frac{6}{32} \times 100 = 18.8\%$$

$$\text{Incidence per 1,000 population} = \frac{6}{32} \times 1{,}000 = 188 \text{ per } 1{,}000 \text{ students}$$

On-campus dorm (Dorm K)

Answer:

$$\text{Incidence \%} = \frac{8}{360} \times 100 = 2.2\%$$

$$\text{Incidence per 1,000 population} = \frac{8}{360} \times 1{,}000 = 22 \text{ per } 1{,}000 \text{ students}$$

Discussion questions

3 The university used testing to identify current cases and requested testing of all students 7–10 days before returning to campus. However, they did not collect information on cases that may have occurred in the weeks before returning to school. How might the university collect this information and how would it affect the incidence calculations?

Answer: To collect information about prior cases of NERD, the university might consider asking for students to voluntarily self-report dates of a prior case of NERD or offer antibody testing. This information can be used to better estimate the population at risk. Students who previously tested positive for NERD in the last 30 days and students who test positive for antibodies are not considered at risk for becoming infected with or spreading NERD.

4 Why might the university choose antigen testing in some situations and PCR testing in other situations?

Answer: Antigen tests are useful when laboratory testing needs to be cost-effective, fast, and accessible, like implementing a regular, frequent testing strategy in a group of students or rapid testing of attendees before a football or baseball game. PCR tests cost more but are more sensitive in confirming current NERD infection. Both types of testing are useful to help understand outbreaks.

5 Although the university promoted the use of general prevention measures (e.g., proper mask wearing, social distancing, reduced class size, no large gatherings), there was a NERD outbreak during week 3. Compare the incidence of the whole university and the two clusters of cases (Apt #12 and Dorm K). What might this suggest about the outbreak based on where students live and what factors might have contributed to any differences?

Answer: The incidence of NERD among persons living in Apt #12 (188 per 1,000 students) is higher than the whole university (32 per 1,000 students) and Dorm K (22 per 1,000 students). This might suggest that something is going on in off-campus housing. Answers suggest that in off-campus housing, the university is not able to enforce general prevention strategies (e.g., proper mask wearing, social distancing, reduced class size, and no large gatherings) or implement the same level and frequency of cleaning and disinfecting protocols as in on-campus dorms.

6 What are some other general prevention strategies the university could use to reduce the spread of NERD among students living in off-campus housing? What strategies could be used to reduce the spread of NERD among students living in on-campus dorms?

Answer: Answers will vary. For all students, example prevention strategies can include switching to virtual classes or grouping students based on their living location (i.e., cohorting or podding). For students living in off-campus housing, example prevention strategies can include limiting gatherings where social distancing cannot be maintained, getting tested regularly for NERD, and limiting access to on-campus buildings. For on-campus dorms, example prevention strategies can include limiting access to dorms for non-residents, limiting access to dorm floors to floor residents to reduce mixing within dorms, and reducing capacity of dining halls. If a vaccine for NERD becomes available, the university can offer vaccination on-site or at local vaccination sites through partnerships and providing information and educational resources about the importance of vaccination and the benefits, safety, side effects, and safety of the vaccines.

Calculating NERD Incidence: Part 2

During week 3, the university switched from in-person to virtual classes. They also implemented a series of on-campus prevention strategies during week 3 and week 4, such as reducing the need for students living off-campus to come on campus, closing staff offices, and closing indoor recreational facilities and dining halls. There was also a campus-wide initiative, led by resident advisors, to limit interactions in dorms. These included keeping gatherings small and among the same groups or pods of friends living on the same floor, enforcing proper mask use and social distancing in the halls and community spaces, and increasing access to hand sanitizer. In addition, the university offered weekly antigen testing and set up dorms for isolation and quarantine, as needed. The university provided you with the following information in Table 3.

Table 3. NERD incidence among a large sample of students attending university (n = 12,000) during the first 5 weeks of returning to campus.

Time period	# new NERD infections	# of prior NERD infections	Population at risk	Incidence percentage	Incidence per 1,000 population
Before arrival to university	33	0	12,000 students	0.28%	2.8 per 1,000 students
Week 1 (students return to campus)	1	33	11,967 students	0.0084%	0.084 per 1,000 students
Week 2 (in-person classes begin)	55	34	11,966 students	0.46%	4.6 per 1,000 students
Week 3 (switch to virtual classes)	376	89	11,911 students	3.2%	32 per 1,000 students
Week 4 (campus-wide prevention strategies)	160	465	11,535 students	1.4%	14 per 1,000 students
Week 5	34	625	11,375 students	0.30%	3.0 per 1,000 students
Week 6	44	659	11,341 students	0.39%	3.9 per 1,000 students
Week 7	35	703	11,297 students	0.31%	3.1 per 1,000 students

Data adapted from **https://www.cdc.gov/mmwr/volumes/70/wr/mm7004a3.htm**, accessed May 2021.

Discussion Questions

1. Considering that NERD has an incubation period of 2–14 days before students would test positive for any infection, do you think the enhanced implementation of campus-wide prevention strategies during week 4 and week 5 helped reduce spread of NERD?

2. At what point do you think the university should resume in-person classes?

3. Do you think the university should continue its current laboratory testing strategy or make changes to its current strategy? Explain.

Part 2: Answer Key

During week 3, the university switched from in-person to virtual classes. They also implemented a series of on-campus prevention strategies during week 3 and week 4, such as reducing the need for students living off-campus to come on campus, closing staff offices, and closing indoor recreational facilities and dining halls. There was also a campus-wide initiative, led by resident advisors, to limit interactions in dorms. These included keeping gatherings small and among the same groups or pods of friends living on the same floor, enforcing proper mask use and social distancing in the halls and community spaces, and increasing access to hand sanitizer. In addition, the university offered weekly antigen testing and set up dorms for isolation and quarantine, as needed. The university provided you with the following information in Table 3.

Table 3. NERD incidence among a large sample of students attending university (n = 12,000) during the first 5 weeks of returning to campus.

Time period	# new NERD infections	# of prior NERD infections	Population at risk	Incidence percentage	Incidence per 1,000 population
Before arrival to university	33	0	12,000 students	0.28%	2.8 per 1,000 students
Week 1 (students return to campus)	1	33	11,967 students	0.0084%	0.084 per 1,000 students
Week 2 (in-person classes begin)	55	34	11,966 students	0.46%	4.6 per 1,000 students
Week 3 (switch to virtual classes)	376	89	11,911 students	3.2%	32 per 1,000 students
Week 4 (campus-wide prevention strategies)	160	465	11,535 students	1.4%	14 per 1,000 students
Week 5	34	625	11,375 students	0.30%	3.0 per 1,000 students
Week 6	44	659	11,341 students	0.39%	3.9 per 1,000 students
Week 7	35	703	11,297 students	0.31%	3.1 per 1,000 students

Data adapted from **https://www.cdc.gov/mmwr/volumes/70/wr/mm7004a3.htm**, accessed May 2021.

Discussion questions

1. Considering that NERD has an incubation period of 2–14 days before students would test positive for any infection, do you think the enhanced implementation of campus-wide prevention strategies during week 4 and week 5 helped reduce spread of NERD?

   Answer: Answers will vary. Students might describe the drop in incidence by more than half from week 3 to 4. Week 5 incidence is lower still and closer to the prearrival numbers.

2. At what point do you think the university should resume in-person classes?

   Answer: Answers will vary but could include during week 5, 6, or 7. Students should provide justification for their choice.

3. Do you think the university should continue its current laboratory testing strategy or make changes to its current strategy? Explain.

   Answer: Answers will vary. Students will likely advocate for regular, mandatory testing of all students and staff, or at least those living in off-campus housing. Alternatively, students might propose intermittent testing until incidence begins to rise, then mandatory, more widespread testing.