4 Where do public health data come from?

CDC NERD Academy

Grade level: 6–12

Suggested time: 75 minutes

Overview

In this module, students learn how public health experts collect, analyze, and interpret data for surveillance purposes and how these data can be essential for making decisions to control or reduce the spread of disease. Using surveillance data on a fictional, novel emerging respiratory disease (NERD), students create graphs and area maps to identify patterns and draw conclusions about disease spread.

Learning objectives

After this module, students should be able to

- Describe the purpose of public health surveillance
- Compare active, passive, and syndromic surveillance
- Explain a case definition and how it is used to determine what information is collected
- Identify key information to be collected in the surveillance of NERD
- Visually display surveillance data using a bar graph and an area map
- Identify patterns in data to draw conclusions about the distribution of NERD by age and geographic location over time

STEM connections & standards

STEM connections: Math: graphing; Social studies: U.S. geography

Problem-based skills: Identifying trends, scientific design, collaborative performance

Epidemiology and Public Health Science Core Competencies: HS-EPH2: Public Health Surveillance **https://www.cdc.gov/careerpaths/k12teacherroadmap/pdfs/ephs-competencies.pdf**

National Health Education Standards: Standard 2: Students will analyze the influence of family, peers, culture, media, technology, and other factors on health behaviors. 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): Planning and Carrying Out Investigations; Analyzing and Interpreting Data; Crosscutting Concept(s): System and System Models; Patterns **http://www.nextgenscience.org/get-to-know**

Timeline

1 Introducing the content (30 minutes)

Students watch the "Where do public health data come from?" video (12:30 minutes) to learn about public health surveillance. Teachers can assess student knowledge of the video content using the **Knowledge Check**. The class can further discuss the role of a biostatistician using the **Career Spotlight**.

2 Activity (35 minutes)

In cooperative learning groups, students identify key information to collect on NERD and visually represent provided surveillance data using bar graphs and area maps. Student groups analyze visuals to look for patterns in the spread of disease. Teachers can watch an activity demonstration video (2:48 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 surveillance.

Vocabulary

Active surveillance, case definition, demographic information, passive surveillance, public health surveillance, syndromic surveillance.

See **Definitions**.

Materials

Handouts, tape, and coloring supplies (e.g., crayons, markers, colored pencils).

For students with a visual disability, incorporate a tactile element. Consider push pins on a corkboard, using wax covered yarn, or gluing string on top of the graphs.

Meet Bella, a biostatistician

Learn more about a biostatistician's role in the **Career Spotlight** and the "Where do public health data come from?" video.

Teacher preparation

- Preview videos.
- Make copies of handouts.
- Create free wall or board space to display the **NERD Bar Graph** and **NERD Area Map** for each group.

Videos

- "Where do public health data come from?" video (12:30 minutes) for students
- Activity demonstration video (2:48 minutes) for teachers

www.cdc.gov/scienceambassador/nerdacademy/data-collection.html

Handouts

- **Knowledge Check: Surveillance** (one per student)
- **Career Spotlight: Biostatistician** (one per student or one classroom copy)
- **NERD Factsheet** (one per student)

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

- **Surveillance System Design** (one per student)
- **NERD Surveillance Data** (one month per group, at least two copies per group)
- **NERD Bar Graph** (one per group)
- **NERD Area Map** (one per group)

> This type of thematic map is also called a choropleth map

Introducing the content (30 minutes)

Say aloud

Public health surveillance is the ongoing collection of public health data. These data are analyzed and interpreted to help understand, control, or prevent infectious and chronic diseases and other health conditions, such as injuries. During this video, you will learn how public health data can be collected using three types of surveillance systems. You will also learn how biostatisticians analyze surveillance data to help other public health experts (e.g., epidemiologists) identify and monitor outbreaks and use this information to make evidence-based decisions.

1. Show the "Where do public health data come from?" video (12:30 minutes) to students.
2. Hand out the **Knowledge Check: Surveillance**. 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 biostatistician.

Activity: Part 1 (10 minutes)

Say aloud

You just learned how surveillance data are collected and analyzed in public health. Now you will read about a novel emerging respiratory disease (NERD) and think about a case definition that can be used to help you collect data. You will also think about how to design a surveillance system and what key information you want to capture concerning a current NERD outbreak in your community. Keep in mind a good surveillance system needs to capture timely and accurate information on the current event. It also should be flexible and easy to use by multiple people.

1 Divide students into groups of 3 or 4.

> These groups will continue to work together during **Activity: Part 2**, which provides data sets for 8 groups of students. See note for **Activity: Part 2** to adapt groups for smaller or larger classes.

2 Hand out the **Surveillance System Design** handout and the **NERD Factsheet** for students' reference. Allow students 4–5 minutes to answer questions.

3 Ask for students to share answers aloud. Keep track of a master list on the board. Discuss characteristics of a good surveillance system.

Some characteristics of a good surveillance system

Characteristic	Description
Timeliness	Data are available rapidly enough for appropriate action to occur.
Representativeness	Data accurately portray the population, place, and time of the health event.
Sensitivity	The system detects most of the cases of the condition of interest and is able to detect outbreaks or unexpected increases in the number of cases.
Specificity	Noncases are identified and excluded.
Flexibility	Changes in information needs or operating conditions can be accommodated without needing a lot more time, resources, and funds.
Quality	Data are complete and valid.
Simplicity	Data collection, data entry and data analysis are easy to use, and the system does not require much in the way of upkeep.
Stability	Methods being used to obtain and manage the data are reliable.
Validity	Data are measuring what they were intended to measure.

Activity: Part 2 (25 minutes)

Say aloud

Some NERD surveillance data are already collected for you. Each group will get one month's worth of NERD data to analyze. As a group, you will create a bar graph to look at age distribution and an area map to look at distribution of NERD across states. Then, we will look at all the data visually as a class to see if there are any patterns or conclusions we can make about the spread of NERD over time. When comparing data among groups of people, it is important that the data are represented the same way. We will all use the same types of visualizations and color keys to help us compare data and identify differences over time.

1. Hand out the **NERD Surveillance Data** sheets. Provide one month of data per group and each group should get at least two copies of each month's sheet.

> This activity is based on 8 groups of 3 or 4 students. It can be modified for smaller classes by using fewer months or for larger classes by having more than one group assigned to the same month.

2. Hand out a **NERD Bar Graph** to each group.

> For the **NERD Bar Graph**, you can eliminate the axis labels or provide blank graph paper to make it more challenging. A software program can also be used to create a digital bar graph.

3. Hand out the **NERD Area Map** to each group. Assign colors or patterns for each incidence range and display the key for all students to see. Colors or patterns should range from lightest (for lowest incidence) to darkest (for highest incidence). It is important each group uses the same colors or patterns because groups will be comparing maps at the conclusion of the activity.

Sample Color Key

Color	Color name	Incidence
	White	0–5 cases per 100,000 persons
	Yellow	6–10 cases per 100,000 persons
	Orange	11–25 cases per 100,000 persons
	Red	26–50 cases per 100,000 persons
	Purple	51–100 cases per 100,000 persons
	Black	100+ cases per 100,000 persons

> A series of patterns could be used instead or in addition to colors for colorblindness modification.

4 Have each group use their assigned **NERD Surveillance Data** to complete the **NERD Bar Graph** and **NERD Area Map** for their assigned month. Point out that the provided numbers represent an incidence rate of number of cases per 100,000 persons per month. Use the **NERD Bar Graph: Answer Key** and **NERD Area Map: Answer Key** to review answers.

> For the **NERD Area Map**, to reduce the time needed to complete the map, you can encourage students to divide the map into regions so multiple students can work on it at the same time. This can easily be accomplished by physically cutting the map into sections, having students color the regions, then taping the regions back together.

> For students with visual disabilities, consider modifying the activity to include tactile elements to build or review the graphs. This could include the use of push pins on a cork board, wax covered yarn, or building blocks.

5 Have each group post their **NERD Bar Graph** and **NERD Area Map** on the board in chronological order by month.

6 As a class, look for patterns in data over the months, including trends in age over time and trends in geographic location over time, respectively.

> In the **NERD Bar Graph: Answer Key** and the **NERD Area Map: Answer Key**, bar graphs and area maps for each assigned month are provided (April–November 2020), respectively. Bar graphs and area maps for three additional months (March 2020, December 2020, and January 2021) are also provided for teacher reference.

Class discussion (10 minutes)

- What is the purpose of public health surveillance?
- What information can public health surveillance provide to epidemiologists?
- Why is it important to look at data in different ways (e.g., by age groups, months, geographic areas)?
- Why are the numbers in the visualizations we created today represented as a proportion (i.e., per 100,000 persons) instead of total case numbers?
- Why might a biostatistician present data using different graphics, like a bar graph or area map, to show data? What other sorts of ways could data be visualized? What are the pros and cons of different visuals?

Definitions

Active surveillance: The collection of disease data that occurs when public health agencies contact health care providers, laboratories, hospitals, the population, and others to seek information about health conditions.

Case definition: A set of uniform criteria used to define a case or instance of disease for public health surveillance.

Demographic information: Personal characteristics of a person or group (e.g., age, sex, gender identity, race/ethnicity, residence, occupation). Used in descriptive epidemiology to characterize patients or populations.

Passive surveillance: The collection of disease data that occurs through regular reporting by health institutions (e.g., hospitals, doctors' offices) to health authorities (e.g., state or local health departments).

Public health surveillance: The ongoing systematic collection, analysis, and interpretation of disease data, essential to the planning, implementation, and evaluation of strategies to prevent disease and promote health.

Syndromic surveillance: The collection of data on syndromes (i.e., set of symptoms that are consistently associated with the disease) rather than a diagnosed infection or disease. Syndromic surveillance can be an active or passive system and is often done automatically (e.g., through electronic reporting).

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

Extension ideas

- Use CDC's COVID Data Tracker online (**https://covid.cdc.gov/covid-data-tracker/#datatracker-home**) to find demographic data for your state. Have students use this data to graph data by age group, race/ethnicity, sex, or other demographic information.
- Find other data visuals on CDC's COVID-19 website (**https://www.cdc.gov/coronavirus/2019-ncov/index.html**). Discuss how CDC uses different visuals for different information.
- Use CDC's website (**https://www.cdc.gov**) to have students find surveillance data on a nationally notifiable disease of their choice and create data visuals to display the information that they find. A list of these diseases can be found via the National Notifiable Diseases Surveillance System (NNDSS) at **https://www.cdc.gov/nndss/index.html**.

CDC Resources

Principles of Epidemiology in Public Health Practice, Lesson 5: Public Health Surveillance, Sections 1 & 2
https://www.cdc.gov/csels/dsepd/ss1978/lesson5/index.html

Coronavirus Disease 2019 (COVID-19) 2020 Interim Case Definition, Approved August 5, 2020
https://ndc.services.cdc.gov/conditions/coronavirus-disease-2019-covid-19/

COVID-19 Monitoring and Tracking
https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/about-epidemiology/monitoring-and-tracking.html

COVID-19 Surveillance FAQ
https://www.cdc.gov/coronavirus/2019-ncov/covid-data/faq-surveillance.html

COVID-19 Surveillance Worksheet-Annotated
https://www.cdc.gov/ncird/surveillance/downloads/COVID-19-Surveillance-Worksheet-annotated-508.pdf

MMWR: Race, Ethnicity and Age Trends in Persons Who Died from COVID-19 — United States, May–August 2020
https://www.cdc.gov/mmwr/volumes/69/wr/mm6942e1.htm

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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 as of early Spring 2021 prior to a vaccine becoming available. Some details have been generalized for educational purposes.

Knowledge Check: Surveillance

Directions: After watching the "Where do public health data come from?" video (12:30 minutes), answer the following questions.

1 Determine if the following statements about public health surveillance are true or false.

True	False

Fill in the blank	Example
	Public health surveillance is a single random collection of health data.
	Public health surveillance data are collected from multiple sources.
	Public health surveillance is primarily used to keep the public informed of disease trends.
	Public health officials use surveillance to plan and carry out public health actions.
	Public health surveillance involves ongoing analysis and interpretation of health data.

2 Match the form of surveillance with the example provided.

Active	Passive	Syndromic

Fill in the blank	Example
	2 cases of measles in the last month were reported by a pediatrician's office to the state health department.
	After several bike accidents in the area, the health department began monthly surveys to collect data on helmet use and accidents.
	4 local pharmacies ordered more antidiarrheal medication last month than they usually order in four months.
	One case of rabies in dogs is reported in one week by a veterinarian office to the local health department.
	The local health department analyzed visit data from a local hospital and found 7 people were admitted for acute respiratory problems.
	The local health department calls school nurses each Monday and asks for the number of children and staff absent due to influenza-like illness the preceding week.
	A high amount of student absences have occurred due to fever and cough at the local high school over the last two weeks.
	A local health department requests that area laboratories report all cases of drug-resistant *Staphylococcus* infections.

Knowledge Check: Answer Key

Directions: After watching the "Where do public health data come from?" video (12:30 minutes), answer the following questions.

1 Determine if the following statements about public health surveillance are true or false.

True	False

Fill in the blank	Example
False	Public health surveillance is a single random collection of health data.
True	Public health surveillance data are collected from multiple sources.
False	Public health surveillance is primarily used to keep the public informed of disease trends.
True	Public health officials use surveillance to plan and carry out public health actions.
True	Public health surveillance involves ongoing analysis and interpretation of health data.

2 Match the form of surveillance with the example provided.

Active	Passive	Syndromic

Fill in the blank	Example
Passive	2 cases of measles in the last month were reported by a pediatrician's office to the state health department.
Active	After several bike accidents in the area, the health department began monthly surveys to collect data on helmet use and accidents.
Syndromic	4 local pharmacies ordered more antidiarrheal medication last month than they usually order in four months.
Passive	One case of rabies in dogs is reported in one week by a veterinarian office to the local health department.
Syndromic	The local health department analyzed visit data from a local hospital and found 7 people were admitted for acute respiratory problems.
Active	The local health department calls school nurses each Monday and asks for the number of children and staff absent due to influenza-like illness the preceding week.
Syndromic	A high amount of student absences have occurred due to fever and cough at the local high school over the last two weeks.
Active	A local health department requests that area laboratories report all cases of drug-resistant *Staphylococcus* infections.

Career Spotlight

CDC NERD Academy

Biostatistician

Biostatisticians provide consultation on data collection methods and analyze data to help answer health-related questions. They often use mathematics and statistical computer software programs to analyze large data sets and present findings. They prepare scientific reports using graphs and tables designed to make the data easier to understand. They also discuss limitations of analyses to prevent misconceptions about the data.

Meet Bella, a biostatistician

Who do they work with?

Biostatisticians often collaborate with epidemiologists and behavioral scientists to design and complete studies and evaluate public health programs and initiatives.

Where do they work?

Biostatisticians work in pharmaceutical companies, educational institutions, and research facilities. They also work in local and state health departments, and in federal and international public health agencies, including the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO).

What skills do they use?

Biostatisticians use their strong math skills, critical-thinking skills and problem-solving skills to draw meaningful conclusions from data. They also need experience with computer programming and statistical software. They must also be able to communicate technical information verbally and in writing to technical and non-technical audiences.

What qualifications do they need?

Biostatisticians often have a bachelor's, master's, or doctoral-level degree in statistics, biostatistics, or a related field. It's helpful for them to have knowledge of analyses used in epidemiology to describe a disease in terms of person, place, and time (descriptive epidemiology) and of methods to study why and how a disease is

NERD Factsheet

CDC NERD Academy

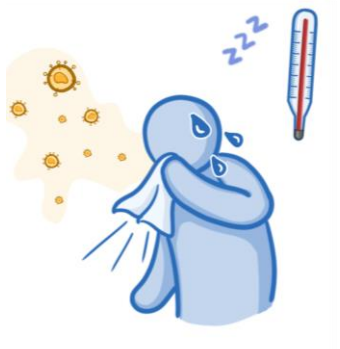
NOVEL EMERGING RESPIRATORY DISEASE

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

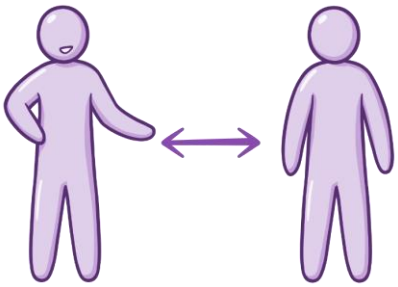
What do I do if I have symptoms?

- 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

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.

Surveillance System Design

Directions: An outbreak of a novel emerging respiratory disease (NERD) is occurring in your community. To help public health officials track NERD and identify strategies to reduce its spread, your team is asked to set up a surveillance system to collect and analyze data. First, review the **NERD Factsheet**. Then, answer the following questions.

1. What is a possible NERD case definition you can use for your surveillance system and how will it help determine what information is collected?

2. Will your surveillance system use passive, syndromic, or active surveillance? Explain the difference and why you chose that type.

3. How do you plan on collecting surveillance data? Provide as many details as possible.

4. What data will you collect? Be specific as to what type of demographic and clinical data you will collect.

5. What are some benefits of your surveillance system? What challenges might you face?

Surveillance System Design: Answer Key

Directions: An outbreak of a novel emerging respiratory disease (NERD) is occurring in your community. To help public health officials track NERD and identify strategies to reduce its spread, your team is asked to set up a surveillance system to collect and analyze data. First, review the **NERD Factsheet**. Then, answer the following questions.

1 What is a possible NERD case definition you can use for your surveillance system and how will it help determine what information is collected?

Answer: Answers will vary. A good case definition will include clinical criteria, confirmatory laboratory test, and may include an epidemiologic link to help public health officials classify and count cases consistently across reporting jurisdictions. A good case definition will help to define when an instance of disease should be counted as a case.

For example:

- Clinical criteria: In the absence of another diagnosis, has at least two of the following symptoms (fever or chills, headache, fatigue, or muscle of body aches) or any one of the following symptoms (loss of sense of smell and/or taste, shortness of breath, or difficulty breathing).
- Laboratory criteria: Confirmed positive laboratory test for NERD infectious agent.
- Epidemiologic linkage: In the past 14 days, has been in close contact with a confirmed or probable case of NERD.

2 Will your surveillance system use passive, syndromic, or active surveillance? Explain the difference and why you chose that type.

Answer: Answers will vary. A key characteristic of passive surveillance systems is that laboratories, healthcare providers, or others regularly *report cases* to the local health department. A key characteristic of active surveillance systems is that local health departments *initiate the collection* of information from laboratories, healthcare providers, or others. A key characteristic of syndromic surveillance systems is that information is collected automatically and involves a set of signs and symptoms that are linked and consistently associated with a disease.

3 How do you plan on collecting surveillance data? Provide as many details as possible.

Answer: Answers will vary. In general, passive surveillance data are collected by reviewing reports received from laboratories, healthcare providers, or others. Active surveillance is collected by actively calling or going to laboratories, healthcare providers, or others. Syndromic surveillance uses automated systems that look at medical (or other) records.

4 What data will you collect? Be specific as to what type of demographic and clinical data you will collect.

Answer: Answers will vary but may include: date of birth, age, race or ethnic group, type of residence, occupation, travel history, possible exposure, date of symptom onset, signs and symptoms, test results, hospitalized (yes or no), treatment. (See COVID-19 Surveillance Worksheet-Annotated in ***Resources*** for examples).

5 What are some benefits of your surveillance system? What challenges might you face?

Answer: Answers may vary. Passive surveillance is effective because it casts a wide net and can be more easily conducted on an ongoing basis. It is useful for routine surveillance activities. However, it may result in underreporting and incomplete data. Syndromic surveillance can alert public health staff several days before a problem is detected through passive surveillance. Syndromic surveillance is convenient, but the data gathered from these systems are not as detailed as passive or active surveillance. Active surveillance is used to investigate diseases with a high risk to the public's health, but it can be resource intensive. Data collected through active surveillance generally provides more accurate and complete information than passive surveillance.

April

Total number of NERD cases per 100,000 people, by age group

Age group (years)	Cases
0–13	14
14–17	30
18–24	102
25–44	165
45–79	189
80+	350

Average # of new NERD cases each day per 100,000, by state

State	Cases	State	Cases	State	Cases
Alabama (AL)	4	Louisiana (LA)	17	Ohio (OH)	4
Alaska (AK)	1	Maine (ME)	2	Oklahoma (OK)	2
Arizona (AZ)	3	Maryland (MD)	10	Oregon (OR)	1
Arkansas (AR)	3	Massachusetts (MA)	25	Pennsylvania (PA)	10
California (CA)	3	Michigan (MI)	11	Rhode Island (RI)	23
Colorado (CO)	7	Minnesota (MN)	2	South Carolina (SC)	3
Connecticut (CT)	22	Mississippi (MS)	6	South Dakota (SD)	8
Delaware (DE)	14	Missouri (MO)	3	Tennessee (TN)	4
Florida (FL)	4	Montana (MT)	1	Texas (TX)	3
Georgia (GA)	6	Nebraska (NE)	5	Utah (UT)	4
Hawaii (HI)	1	Nevada (NV)	4	Vermont (VT)	3
Idaho (ID)	3	New Hampshire (NH)	4	Virginia (VA)	5
Illinois (IL)	11	New Jersey (NJ)	37	Washington (WA)	5
Indiana (IN)	7	New Mexico (NM)	4	West Virginia (WV)	2
Iowa (IA)	6	New York (NY)	85	Wisconsin (WI)	3
Kansas (KS)	4	North Carolina (NC)	3	Wyoming (WY)	3
Kentucky (KY)	3	North Dakota (ND)	4		

May

Total number of NERD cases per 100,000 people, by age group

Age group (years)	Cases
0–13	40
14–17	75
18–24	177
25–44	214
45–79	183
80+	334

Average # of new NERD cases each day per 100,000, by state

State	Cases	State	Cases	State	Cases
Alabama (AL)	7	Louisiana (LA)	8	Ohio (OH)	5
Alaska (AK)	0	Maine (ME)	3	Oklahoma (OK)	3
Arizona (AZ)	5	Maryland (MD)	16	Oregon (OR)	1
Arkansas (AR)	4	Massachusetts (MA)	18	Pennsylvania (PA)	7
California (CA)	5	Michigan (MI)	6	Rhode Island (RI)	21
Colorado (CO)	6	Minnesota (MN)	11	South Carolina (SC)	4
Connecticut (CT)	14	Mississippi (MS)	9	South Dakota (SD)	9
Delaware (DE)	17	Missouri (MO)	3	Tennessee (TN)	6
Florida (FL)	3	Montana (MT)	0	Texas (TX)	4
Georgia (GA)	6	Nebraska (NE)	17	Utah (UT)	5
Hawaii (HI)	0	Nevada (NV)	4	Vermont (VT)	1
Idaho (ID)	2	New Hampshire (NH)	6	Virginia (VA)	11
Illinois (IL)	18	New Jersey (NJ)	17	Washington (WA)	3
Indiana (IN)	8	New Mexico (NM)	7	West Virginia (WV)	2
Iowa (IA)	13	New York (NY)	35	Wisconsin (WI)	6
Kansas (KS)	7	North Carolina (NC)	5	Wyoming (WY)	2
Kentucky (KY)	4	North Dakota (ND)	7		

June

Total number of NERD cases per 100,000 people, by age group

Age group (years)	Cases
0–13	83
14–17	150
18–24	391
25–44	376
45–79	290
80+	414

Average # of new NERD cases each day per 100,000, by state

State	Cases	State	Cases	State	Cases
Alabama (AL)	13	Louisiana (LA)	12	Ohio (OH)	4
Alaska (AK)	2	Maine (ME)	2	Oklahoma (OK)	5
Arizona (AZ)	24	Maryland (MD)	9	Oregon (OR)	3
Arkansas (AR)	14	Massachusetts (MA)	6	Pennsylvania (PA)	4
California (CA)	9	Michigan (MI)	5	Rhode Island (RI)	7
Colorado (CO)	4	Minnesota (MN)	7	South Carolina (SC)	15
Connecticut (CT)	4	Mississippi (MS)	12	South Dakota (SD)	7
Delaware (DE)	7	Missouri (MO)	4	Tennessee (TN)	9
Florida (FL)	12	Montana (MT)	1	Texas (TX)	10
Georgia (GA)	10	Nebraska (NE)	9	Utah (UT)	12
Hawaii (HI)	1	Nevada (NV)	9	Vermont (VT)	1
Idaho (ID)	5	New Hampshire (NH)	3	Virginia (VA)	7
Illinois (IL)	7	New Jersey (NJ))	5	Washington (WA)	5
Indiana (IN)	6	New Mexico (NM)	7	West Virginia (WV)	2
Iowa (IA)	10	New York (NY)	16	Wisconsin (WI)	8
Kansas (KS)	5	North Carolina (NC)	11	Wyoming (WY)	3
Kentucky (KY)	4	North Dakota (ND)	4		

July

Total number of NERD cases per 100,000 people, by age group

Age group (years)	Cases
0–13	136
14–17	286
18–24	644
25–44	511
45–79	334
80+	286

Average # of new NERD cases each day per 100,000, by state

State	Cases	State	Cases	State	Cases
Alabama (AL)	31	Louisiana (LA)	39	Ohio (OH)	10
Alaska (AK)	8	Maine (ME)	2	Oklahoma (OK)	19
Arizona (AZ)	43	Maryland (MD)	10	Oregon (OR)	7
Arkansas (AR)	22	Massachusetts (MA)	4	Pennsylvania (PA)	6
California (CA)	21	Michigan (MI)	6	Rhode Island (RI)	6
Colorado (CO)	7	Minnesota (MN)	10	South Carolina (SC)	34
Connecticut (CT)	3	Mississippi (MS)	32	South Dakota (SD)	7
Delaware (DE)	12	Missouri (MO)	13	Tennessee (TN)	28
Florida (FL)	46	Montana (MT)	8	Texas (TX)	28
Georgia (GA)	31	Nebraska (NE)	11	Utah (UT)	19
Hawaii (HI)	2	Nevada (NV)	30	Vermont (VT)	1
Idaho (ID)	25	New Hampshire (NH)	2	Virginia (VA)	10
Illinois (IL)	8	New Jersey (NJ)	4	Washington (WA)	10
Indiana (IN)	9	New Mexico (NM)	13	West Virginia (WV)	6
Iowa (IA)	15	New York (NY)	7	Wisconsin (WI)	13
Kansas (KS)	14	North Carolina (NC)	17	Wyoming (WY)	7
Kentucky (KY)	10	North Dakota (ND)	12		

August

Total number of NERD cases per 100,000 people, by age group

Age group (years)	Cases
0–13	122
14–17	259
18–24	572
25–44	399
45–79	299
80+	295

Average # of new NERD cases each day per 100,000, by state

State	Cases	State	Cases	State	Cases
Alabama (AL)	26	Louisiana (LA)	25	Ohio (OH)	9
Alaska (AK)	10	Maine (ME)	1	Oklahoma (OK)	21
Arizona (AZ)	15	Maryland (MD)	11	Oregon (OR)	7
Arkansas (AR)	21	Massachusetts (MA)	6	Pennsylvania (PA)	5
California (CA)	18	Michigan (MI)	7	Rhode Island (RI)	9
Colorado (CO)	6	Minnesota (MN)	12	South Carolina (SC)	21
Connecticut (CT)	3	Mississippi (MS)	28	South Dakota (SD)	14
Delaware (DE)	9	Missouri (MO)	19	Tennessee (TN)	25
Florida (FL)	26	Montana (MT)	10	Texas (TX)	23
Georgia (GA)	29	Nebraska (NE)	14	Utah (UT)	12
Hawaii (HI)	14	Nevada (NV)	24	Vermont (VT)	1
Idaho (ID)	22	New Hampshire (NH)	2	Virginia (VA)	12
Illinois (IL)	14	New Jersey (NJ)	4	Washington (WA)	8
Indiana (IN)	13	New Mexico (NM)	8	West Virginia (WV)	7
Iowa (IA)	19	New York (NY)	6	Wisconsin (WI)	14
Kansas (KS)	16	North Carolina (NC)	15	Wyoming (WY)	7
Kentucky (KY)	13	North Dakota (ND)	22		

September

Total number of NERD cases per 100,000 people, by age group

Age group (years)	Cases
0–13	111
14–17	259
18–24	686
25–44	359
45–79	288
80+	307

Average # of new NERD cases each day per 100,000, by state

State	Cases	State	Cases	State	Cases
Alabama (AL)	20	Louisiana (LA)	14	Ohio (OH)	9
Alaska (AK)	11	Maine (ME)	2	Oklahoma (OK)	25
Arizona (AZ)	8	Maryland (MD)	9	Oregon (OR)	5
Arkansas (AR)	24	Massachusetts (MA)	5	Pennsylvania (PA)	6
California (CA)	9	Michigan (MI)	8	Rhode Island (RI)	9
Colorado (CO)	7	Minnesota (MN)	14	South Carolina (SC)	17
Connecticut (CT)	4	Mississippi (MS)	17	South Dakota (SD)	33
Delaware (DE)	11	Missouri (MO)	23	Tennessee (TN)	20
Florida (FL)	13	Montana (MT)	16	Texas (TX)	15
Georgia (GA)	18	Nebraska (NE)	18	Utah (UT)	19
Hawaii (HI)	10	Nevada (NV)	12	Vermont (VT)	1
Idaho (ID)	17	New Hampshire (NH)	2	Virginia (VA)	11
Illinois (IL)	16	New Jersey (NJ)	5	Washington (WA)	6
Indiana (IN)	13	New Mexico (NM)	6	West Virginia (WV)	10
Iowa (IA)	26	New York (NY)	8	Wisconsin (WI)	25
Kansas (KS)	19	North Carolina (NC)	13	Wyoming (WY)	11
Kentucky (KY)	15	North Dakota (ND)	43		

October

Total number of NERD cases per 100,000 people, by age group

Age group (years)	Cases
0–13	182
14–17	394
18–24	722
25–44	558
45–79	461
80+	455

Average # of new NERD cases each day per 100,000, by state

State	Cases	State	Cases	State	Cases
Alabama (AL)	24	Louisiana (LA)	13	Ohio (OH)	15
Alaska (AK)	29	Maine (ME)	3	Oklahoma (OK)	29
Arizona (AZ)	11	Maryland (MD)	10	Oregon (OR)	8
Arkansas (AR)	29	Massachusetts (MA)	10	Pennsylvania (PA)	11
California (CA)	9	Michigan (MI)	17	Rhode Island (RI)	23
Colorado (CO)	18	Minnesota (MN)	25	South Carolina (SC)	18
Connecticut (CT)	11	Mississippi (MS)	23	South Dakota (SD)	76
Delaware (DE)	14	Missouri (MO)	28	Tennessee (TN)	29
Florida (FL)	13	Montana (MT)	54	Texas (TX)	16
Georgia (GA)	15	Nebraska (NE)	38	Utah (UT)	39
Hawaii (HI)	6	Nevada (NV)	20	Vermont (VT)	2
Idaho (ID)	38	New Hampshire (NH)	6	Virginia (VA)	12
Illinois (IL)	27	New Jersey (NJ)	13	Washington (WA)	8
Indiana (IN)	25	New Mexico (NM)	23	West Virginia (WV)	14
Iowa (IA)	35	New York (NY)	16	Wisconsin (WI)	56
Kansas (KS)	26	North Carolina (NC)	18	Wyoming (WY)	37
Kentucky (KY)	25	North Dakota (ND)	86		

November

Total number of NERD cases per 100,000 people, by age group

Age group (years)	Cases
0–13	390
14–17	847
18–24	1,311
25–44	1,150
45–79	904
80+	851

Average # of new NERD cases each day per 100,000, by state

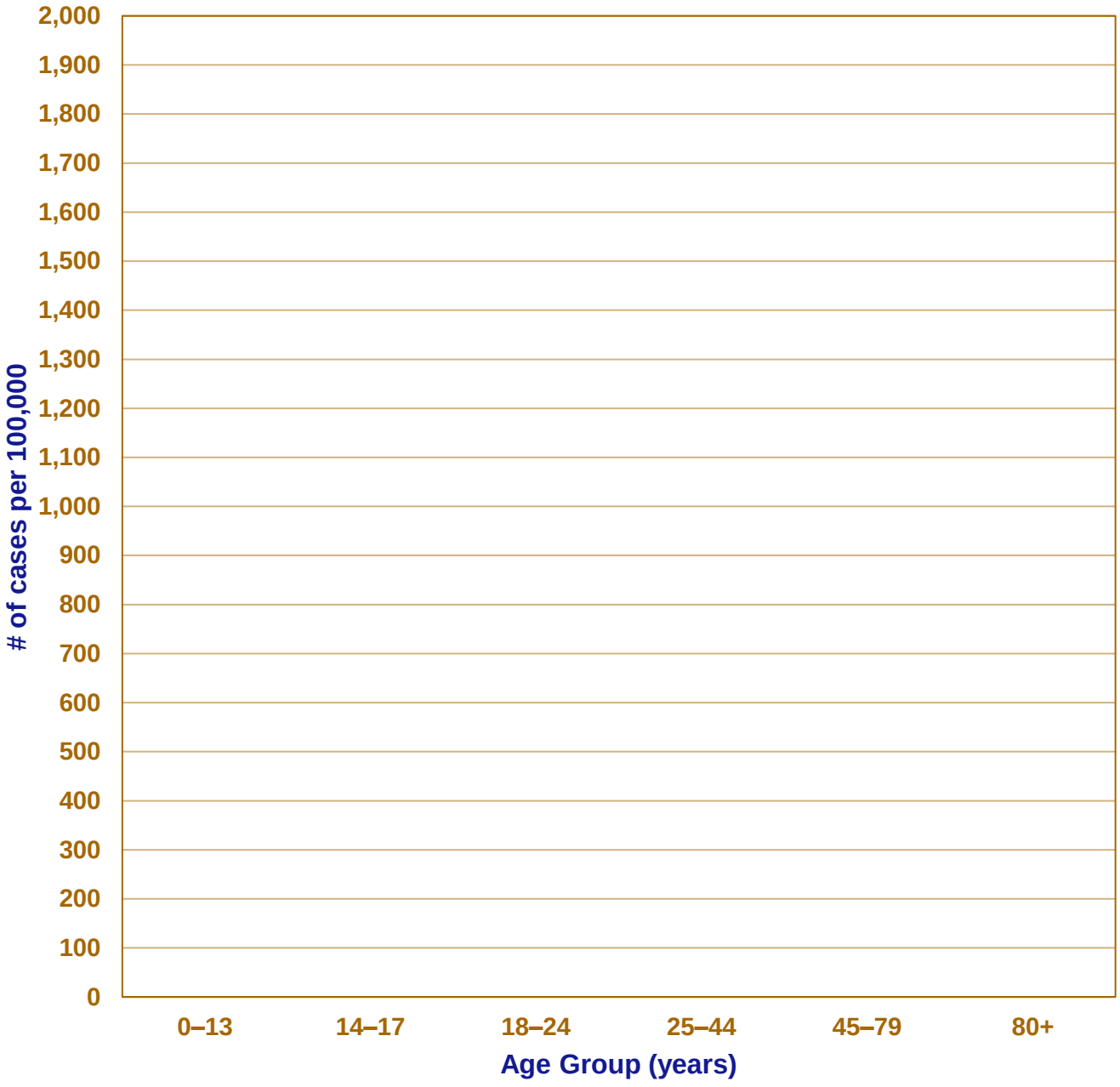
State	Cases	State	Cases	State	Cases
Alabama (AL)	38	Louisiana (LA)	31	Ohio (OH)	54
Alaska (AK)	70	Maine (ME)	12	Oklahoma (OK)	56
Arizona (AZ)	35	Maryland (MD)	28	Oregon (OR)	22
Arkansas (AR)	49	Massachusetts (MA)	29	Pennsylvania (PA)	37
California (CA)	22	Michigan (MI)	60	Rhode Island (RI)	68
Colorado (CO)	69	Minnesota (MN)	94	South Carolina (SC)	27
Connecticut (CT)	40	Mississippi (MS)	36	South Dakota (SD)	134
Delaware (DE)	34	Missouri (MO)	61	Tennessee (TN)	51
Florida (FL)	28	Montana (MT)	93	Texas (TX)	46
Georgia (GA)	26	Nebraska (NE)	98	Utah (UT)	83
Hawaii (HI)	6	Nevada (NV)	52	Vermont (VT)	10
Idaho (ID)	68	New Hampshire (NH)	22	Virginia (VA)	21
Illinois (IL)	81	New Jersey (NJ)	41	Washington (WA)	23
Indiana (IN)	76	New Mexico (NM)	76	West Virginia (WV)	41
Iowa (IA)	109	New York (NY)	44	Wisconsin (WI)	102
Kansas (KS)	79	North Carolina (NC)	28	Wyoming (WY)	112
Kentucky (KY)	52	North Dakota (ND)	159		

NERD Bar Graph

Directions: Using the NERD Surveillance Data for your assigned month, create a bar graph that shows the distribution of NERD cases by age group.

Total number of NERD cases per 100,000 people

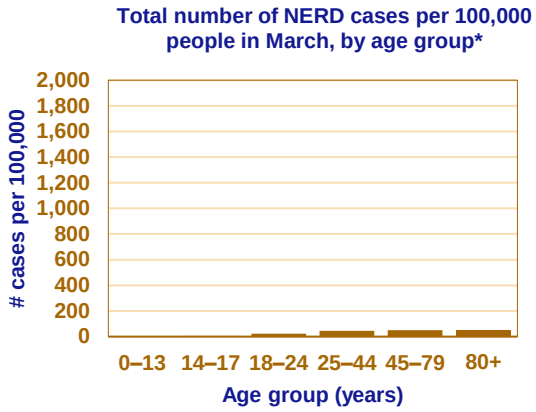
in _____ (month), by age group



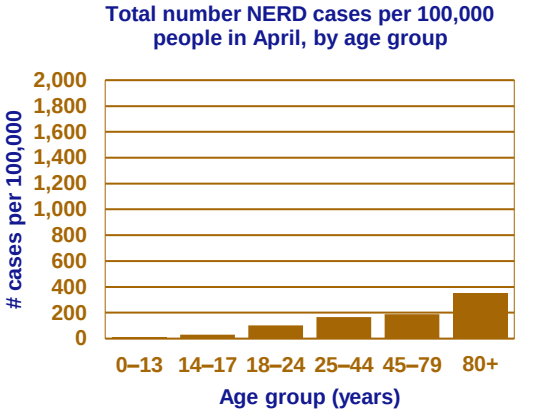
NERD Bar Graph: Answer Key

Answer: Bar graphs for each assigned month are provided (April–November 2020). Three additional months (March 2020, December 2020, and January 2021) are provided for reference.

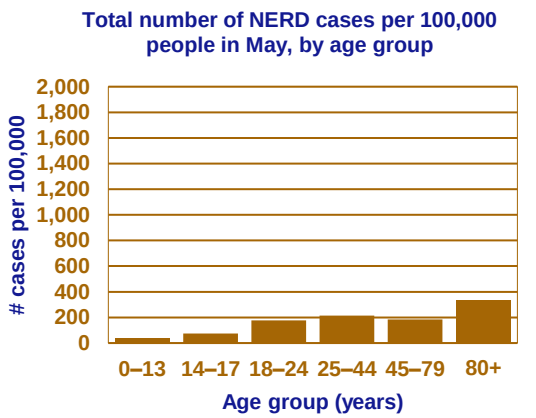
March



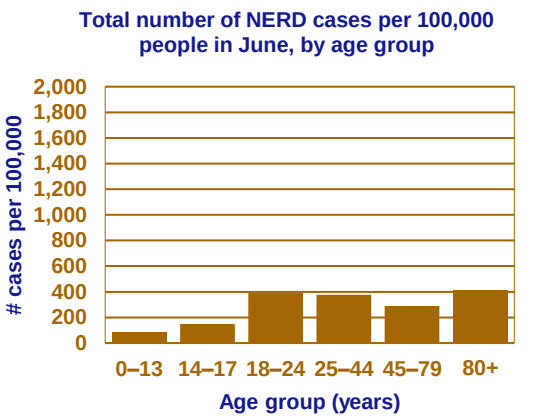
April



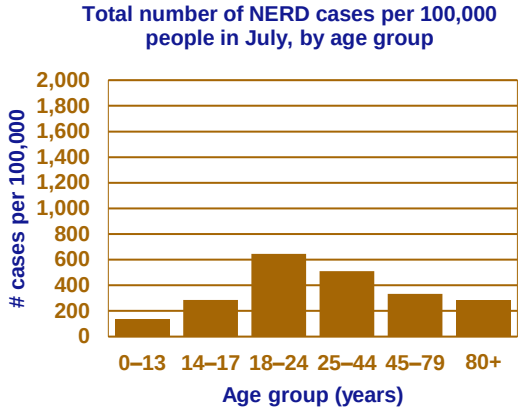
May



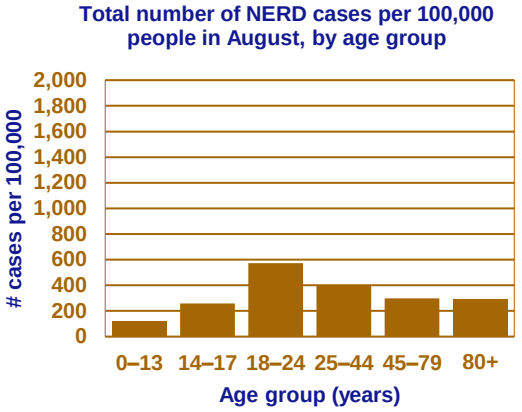
June



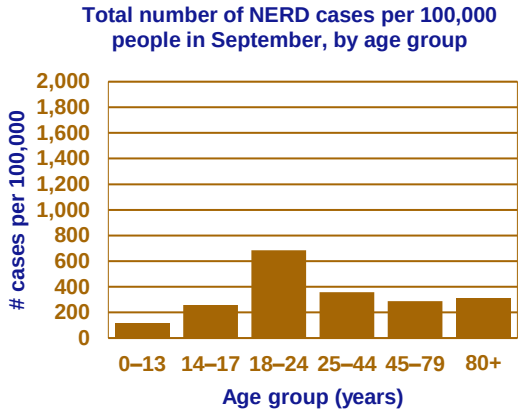
July



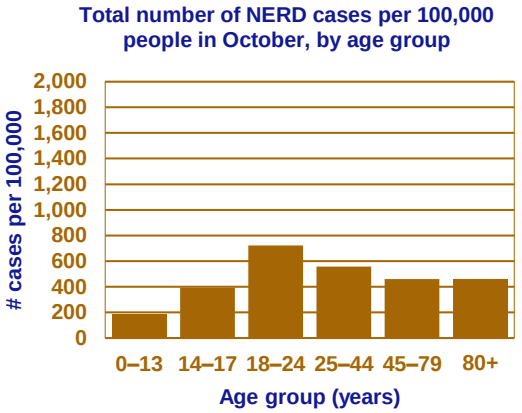
August



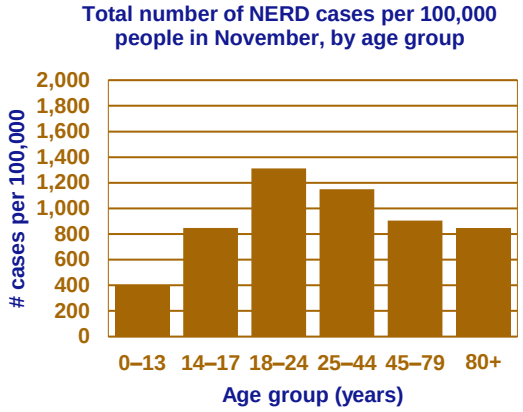
September



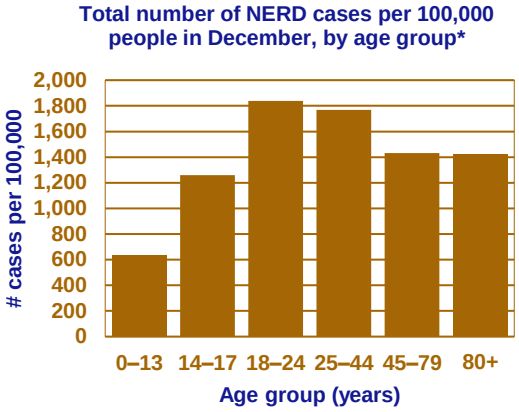
October



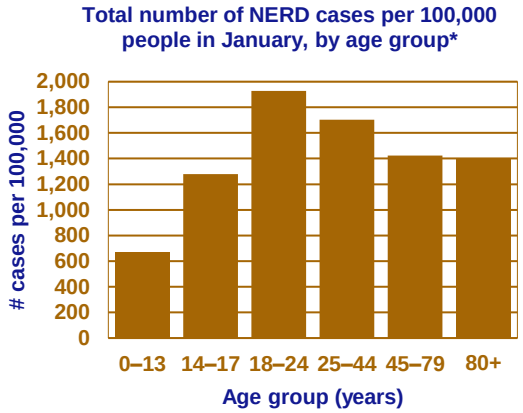
November



December



January

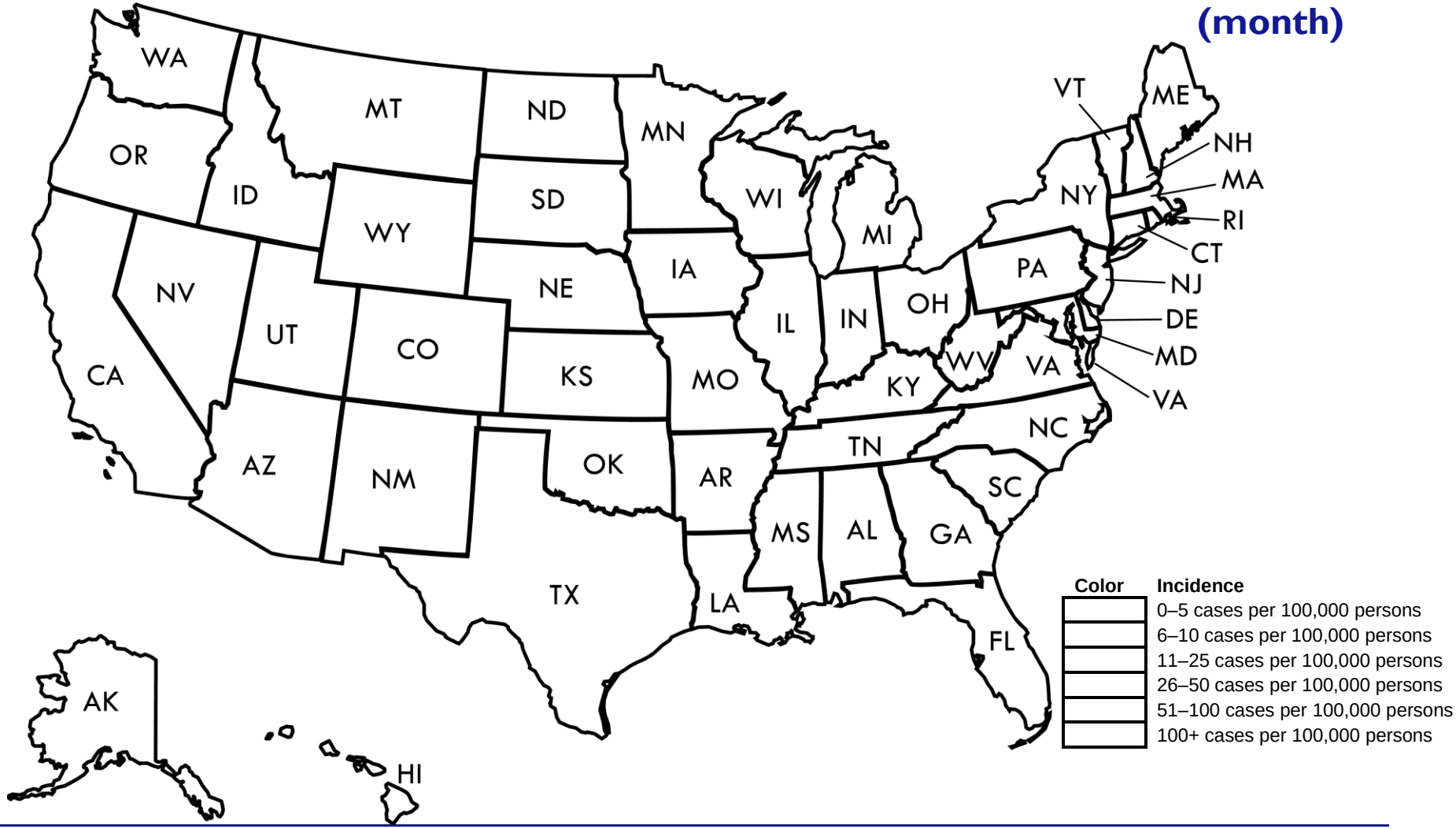


All data sourced from **https://covid.cdc.gov/covid-data-tracker/#trends_totalandratecases**, accessed February 2021.

NERD Area Map

Directions: Use the NERD surveillance data for your assigned month to create an area map to show distribution of NERD cases by location. Your teacher will assign each incidence range a color or pattern that you will need to follow.

Average number of new daily NERD cases per 100,000 people, _____ (month)



NERD Area Map: Answer Key

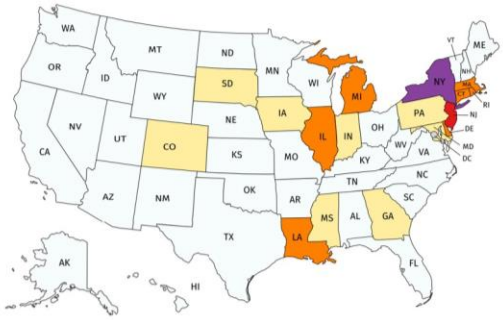
Answer: Area maps for each assigned month are provided (April–November 2020). Three additional months (March 2020, December 2020, and January 2021) are provided for reference.

Color Key

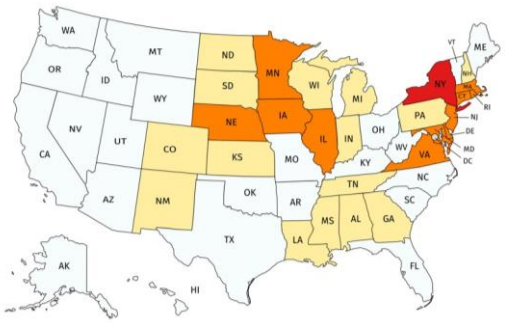
Color	Color name	Incidence
	White	0–5 cases per 100,000 persons
	Yellow	6–10 cases per 100,000 persons
	Orange	11–25 cases per 100,000 persons
	Red	26–50 cases per 100,000 persons
	Purple	51–100 cases per 100,000 persons
	Black	100+ cases per 100,000 persons

March

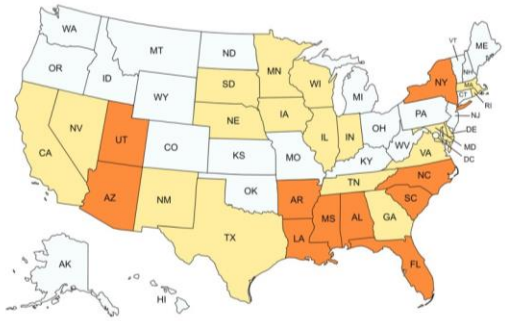
April



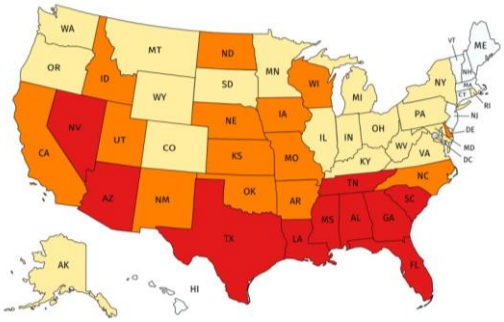
May



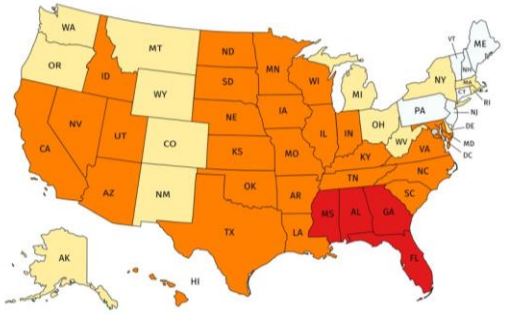
June



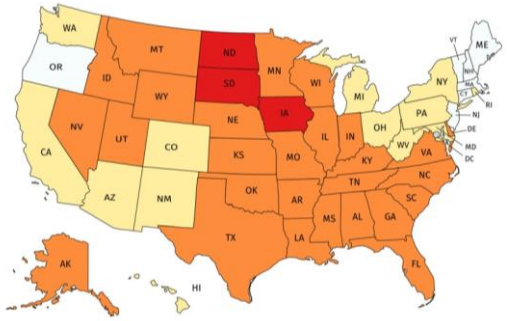
July



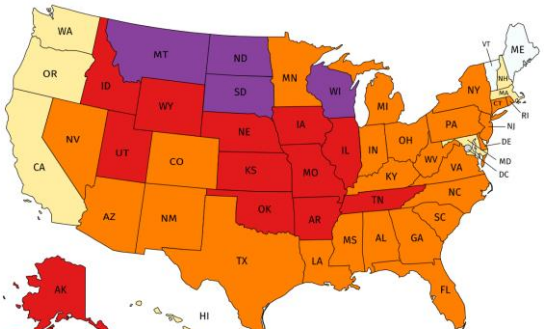
August



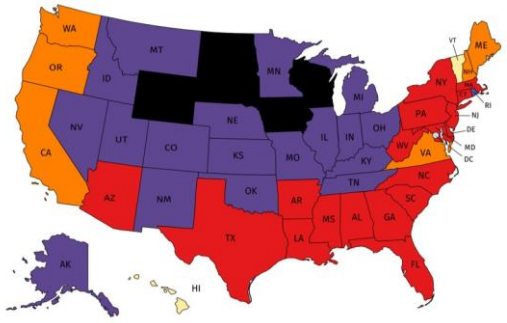
September



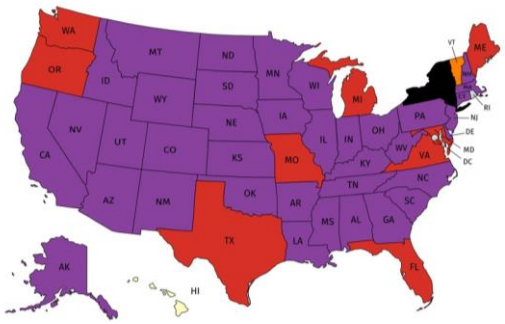
October



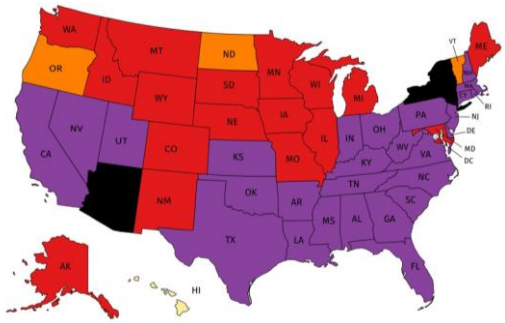
November



December



January



All data sourced from **https://covid.cdc.gov/covid-data-tracker/#trends_totalandratecases**, accessed February 2021.

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