



Contact Tracing

Public health **surveillance** is the ongoing, systematic collection, analysis, interpretation, and dissemination of health data to help guide public health decision making and action. **Contact tracing** is one method of conducting surveillance and allows scientists to gather data about infections and how they may spread.

Terms to Know

Asymptomatic	patients who are infected with a disease who do not show symptoms
Close contact	anyone who was close to a person who is infected with a virus and is therefore at higher risk of becoming infected themselves
Contact tracing	the process of identifying people who have recently been in contact with someone diagnosed with an infectious disease
Index case	the earliest known or suspected case of disease infection in an outbreak
Quarantine	placing people with confirmed or suspected infection in isolation to prevent the spread of infectious disease
Surveillance	collecting/analyzing data about a disease to monitor trends and outbreaks
Symptomatic	patients who are infected with a disease and are showing symptoms
Transmission	transferring a disease from one individual to another

What is Contact Tracing?

Contact tracing is the process of identifying people who have recently been in contact with someone diagnosed with an infectious disease. Once a person tests positive for a disease, they will be asked to list the people they have been in contact with and the places they visited during the period in which they were contagious. The patient's contacts will be notified by the health department or by contact tracers who will explain what precautions they need to take and for how long. This may include a **quarantine** period during which the person should avoid contact with others. During the disease's incubation period, contact tracers will continue to check on the **close contacts** to see if they have developed symptoms or tested positive for the disease.



Think About It

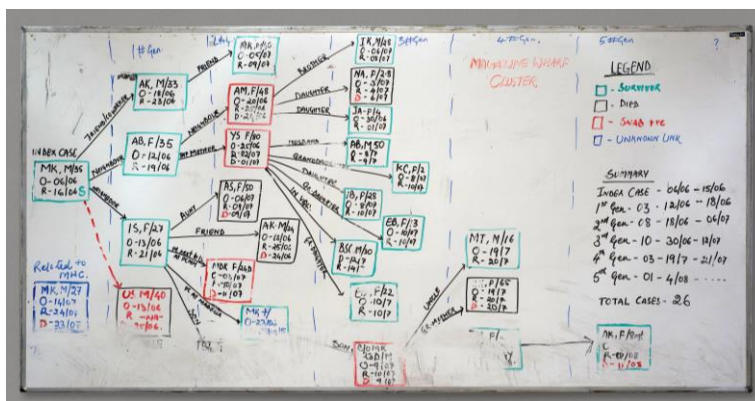
1. What experiences have you had with **contact tracing** in your community?
2. What difficulties do you think contact tracers might have when attempting to contact people after a disease diagnosis?
3. Why might quarantining after a disease exposure be difficult for some people?



Contact Tracing and the Centers for Disease Control and Prevention (CDC)

Contact tracing is the process of quickly identifying, assessing, and managing people who have been exposed to a disease to prevent additional **transmission**. **Contact tracing** has been used by CDC and its partners as part of successful strategies to help stop disease epidemics like smallpox, Ebola, and now the COVID-19 pandemic.

Smallpox was eradicated globally in 1980 using a strategy called ring vaccination. In this strategy, the **close contacts** of confirmed smallpox patients were vaccinated first, then the contacts of those contacts. This way, everyone who had been, or could have been, exposed to a patient with smallpox received the vaccine. **Close contacts** included household family members, people who spent 3+ hours with the patient, and people who were within 6 feet of a patient with a rash. **Close contacts** were vaccinated and monitored for fever and other symptoms daily for 14-18 days.



During the **2014-16 Ebola outbreak in West Africa**, the RITE (Rapid Isolation and Treatment of Ebola) team members **used contact tracing** to identify new Ebola cases quickly and to isolate patients as soon as they showed symptoms. This increased patients' chances of survival and prevented spread to others. Even one missed contact could mean Ebola would continue to spread, because sick people need care from others.

Neil Vora, a CDC responder, said of his time working in Liberia, "We would follow ambulances that were called to pick up patients with suspected Ebola cases. We would keep our distance and observe how they collected patients and would make corrections to any lapse in infection control. As soon as the ambulance left, we would start the **contact tracing** investigation."

Satish Pillai, a CDC medical officer in Liberia, worked with RITE to help health systems that were not prepared for an influx of Ebola cases and had limited knowledge of the virus and its symptoms. "Cases of Ebola in Liberia were showing up in remote areas. In many instances, someone who contracted Ebola in the capital city of Monrovia brought it back to their community," said Satish. "This led to sustained **transmission** of the virus that was hard to stop because it was so difficult to reach these communities." **Contact tracing** in rural communities was particularly essential because they lacked treatment facilities. RITE teams not only worked on active case finding and **contact tracing**, but also identified the basic sanitation and food needs.

Today, **contact tracing** is being used to fight COVID-19 globally. In addition to masks, social distancing, hand washing, and vaccination, **contact tracing** is another tool we can use to stop the spread of COVID-19. Because COVID-19 often has **asymptomatic** carriers, **contact tracing** is especially important. By identifying and isolating cases of COVID-19 in communities before they can spread to others, we can prevent new infections.



Think About It

1. What are some reasons why **contact tracing** is more difficult in remote areas?
2. If contact tracers miss one **close contact**, what are possible consequences?
3. What skills do you think contact tracers need most?



From the Expert:

Contact tracing has been an important tool for epidemiologists who are trying to stop a disease outbreak in its tracks. Watch the video linked below for more information about how **contact tracing** was used to help stop the 2014-16 Ebola outbreak in West Africa. CDC activated its Emergency Operations Center in July 2014 to help coordinate technical assistance and disease control activities with partners. CDC personnel deployed to West Africa to assist with response efforts, including **surveillance**, **contact tracing**, data management, laboratory testing, and health education. CDC staff also provided support with logistics, staffing, communication, analytics, and management. https://youtu.be/f0Q0yA_j2U

Call to Action

In order to understand **contact tracing**, it is essential that people know its purpose and how it is performed. You can help people by following these three steps:



1. Conduct a disease transmission experiment. In this experiment, you will analyze disease test results and draw a map to identify the **index cases** for a disease outbreak. By using **contact tracing**, you should be able to trace this outbreak back to its source.



2. Plan a contact tracing interview. Conducting **contact tracing** interviews is a skill that requires a lot of knowledge and preparation. Given some background information on a person who has recently tested positive for COVID-19, come up with an interview plan.



3. Share your findings. One of the ways CDC communicates information is through social media. Your demonstrations can help CDC communicate the work they have done and are doing to improve contact tracing of COVID-19 cases.



Why Participate? A Message from CDC

Contact tracing is a fundamental tool for stopping disease outbreaks. One barrier that public health officials experience is an inability to reach positive cases by phone. The majority of Americans are reluctant to answer phone calls from unknown numbers due to the abundance of scam and spam phone calls. Those who can be reached are often unwilling to share information about the places and people they have visited due to privacy concerns. Convincing people with COVID-19 to **quarantine** for 14 days can also be a challenge for financial or social reasons. In order to conduct effective **contact tracing**, health officials must engage people in all three activities: speaking, sharing, and quarantining. By exploring **contact tracing** further and sharing your expertise with others, you can change attitudes and open minds about engaging with public health officials to help stop the spread of COVID-19.



Think About It

1. During the 2014-16 Ebola outbreak, how did CDC help with **contact tracing**?
2. Why do you think the first 2-3 days after infection is the critical window for **contact tracing** to occur?
3. How are schools in the United States using **contact tracing** to keep students safe?



Engineering Design Process Overview

The engineering design process allows engineers to develop and test solutions to problems. You can use the process to observe **contact tracing** and then practice by interviewing a case study patient.

Define the problem

Describe the problem you are trying to solve. There are several questions you could use to guide your investigation:

- How does **contact tracing** stop the spread of a disease?
- What information should be collected during **contact tracing**?
- How can **contact tracing** identify **index cases**?

Do background research

Find information about the problem.

- <https://www.cdc.gov/coronavirus/2019-ncov/if-you-are-sick/steps-when-sick.html>
- <https://www.cdc.gov/coronavirus/2019-ncov/faq.html#Contact-Tracing>

Specify requirements

Determine what your solution needs to have to succeed.

- What information do you need to gather from this patient?
- What information do you need to give to this patient?

Brainstorm, choose and develop solutions

For each part of your interview, ask yourself the following:

- What else do you need to know about this patient?
- What advice do you have for this patient?
- What special considerations does this patient's situation require?

Build a prototype

Write your initial questions.

- Using the patient's contact form, write a draft of the **contact tracing** interview questions that you will use.

Test and redesign

Test the interview questions you wrote.

- Role play the conversation with someone else to see how effective your interview questions were. Edit and rewrite.

Communicate results

Sharing the information you collect is key!

- Share your information using social media with the CDC accounts listed.



Conduct a Disease Transmission Experiment

In this activity, you will be modeling disease **transmission** using baking soda or vinegar to represent a disease. Starting with one infected person, you will observe how the disease spreads through a population and conduct **contact tracing** to identify **index cases**. You will identify infected individuals using a color-changing pH indicator. To complete this activity, you will need the following:

Tools of the Trade

Water
Baking soda or vinegar
12 disposable bathroom cups, 3 oz. (or other small cups/containers)
permanent marker
pH Indicator (see note and recipes below)

What are pH indicators?

Some substances naturally change color with changes in pH. These pH indicators are useful for estimating the pH of a solution based on its color. Any color change you observe indicates a substance that is not pure water. You can purchase indicators locally from aquarium or pool stores or get them online. You can also easily make your own from certain food items – see the two recipes you can use here! Whatever you choose, you'll only need a few drops of indicator for each cup.

Try these natural pH indicator recipes!

Red Cabbage Juice

Put a handful of red cabbage into a blender with about 2 cups of water. Blend until cabbage is fully blended. Strain using a fine mesh strainer or coffee filter. Collect the juice to use as your pH indicator.

If you do not have a blender, you can also chop cabbage and boil it for ~15 minutes. Strain out the leaves and cool to use the juice as an indicator.

Blueberry Juice

Mash a handful of blueberries with a spoon or potato masher. Add a little water and boil for 5-10 minutes to extract color. Strain the mixture using a fine mesh strainer or coffee filter and use the juice as your pH indicator.

Instructions

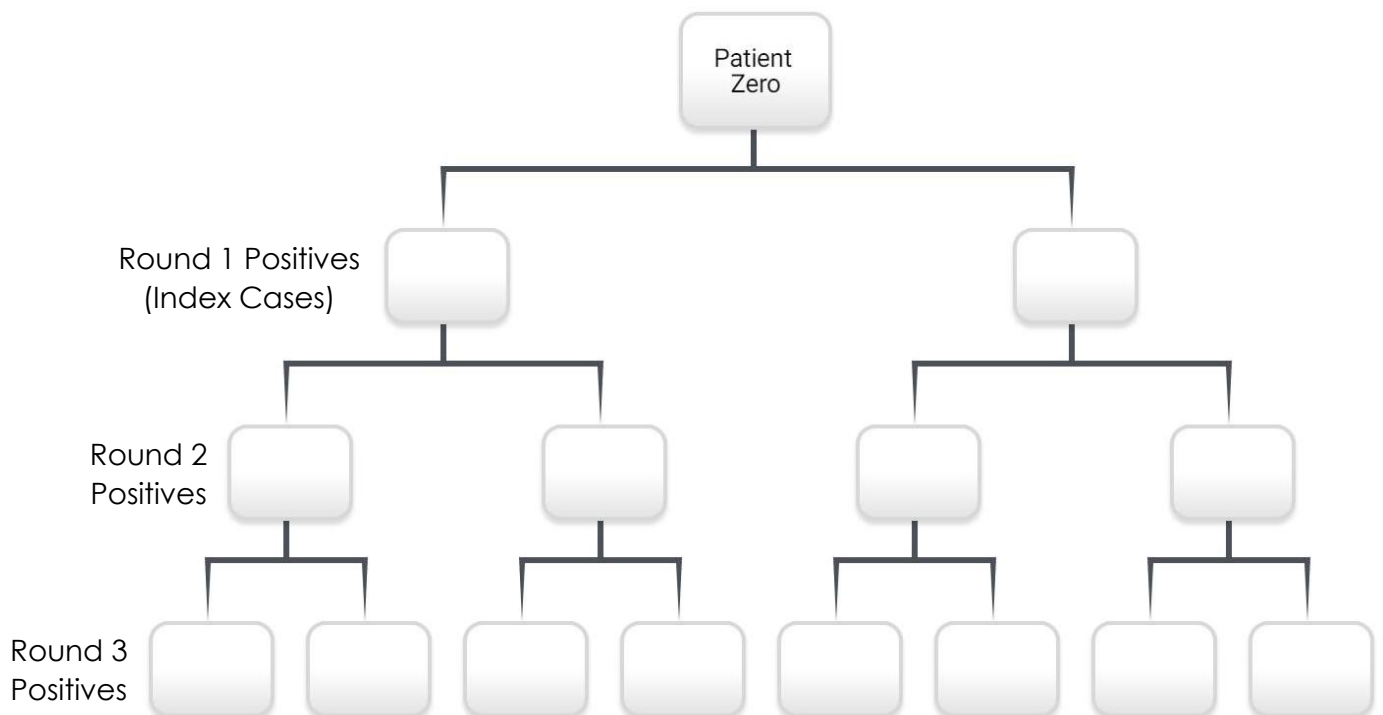
1. Fill 11 cups about $\frac{1}{3}$ full of water. In the 12th cup, add your disease – either the baking soda or vinegar. If using baking soda, fill $\frac{1}{3}$ full of water, add about $\frac{1}{2}$ teaspoon baking soda, and stir until well dissolved. If using vinegar, fill cup $\frac{1}{3}$ full with vinegar.
2. Mix up the cups so that you do not know which cup contains the disease mixture.
3. Number your cups from 1-12 using a permanent marker. If you are using a container that is not disposable, use masking tape or another method to number them.
4. *Round 1:* Group your cups into 6 random pairs. Pour each pair of cups into each other and mix back and forth 2-3 times. Then divide the mixture again by putting half of the solution back in each cup. Record the pairings in the chart on the top of the next page.
5. *Round 2:* Mix up your cups and make new partners. **Do not repeat any groups from round 1.** Mix your liquids, divide back in half, and record the pairings.
6. *Round 3:* Mix up your cups and make new partners. **Do not repeat any groups from round 1 or 2.** Mix your liquids, divide back in half, and record the pairings.

7. Add a few drops of your pH indicator to each cup. If a color change occurs, your cup has tested positive for the disease we are studying. Record your results in the chart on the next page.

<p>Person 1</p> <p>Round 1: ____</p> <p>Round 2: ____</p> <p>Round 3: ____</p> <p>+ OR -</p>	<p>Person 2</p> <p>Round 1: ____</p> <p>Round 2: ____</p> <p>Round 3: ____</p> <p>+ OR -</p>	<p>Person 3</p> <p>Round 1: ____</p> <p>Round 2: ____</p> <p>Round 3: ____</p> <p>+ OR -</p>	<p>Person 4</p> <p>Round 1: ____</p> <p>Round 2: ____</p> <p>Round 3: ____</p> <p>+ OR -</p>	<p>Person 5</p> <p>Round 1: ____</p> <p>Round 2: ____</p> <p>Round 3: ____</p> <p>+ OR -</p>	<p>Person 6</p> <p>Round 1: ____</p> <p>Round 2: ____</p> <p>Round 3: ____</p> <p>+ OR -</p>
<p>Person 7</p> <p>Round 1: ____</p> <p>Round 2: ____</p> <p>Round 3: ____</p> <p>+ OR -</p>	<p>Person 8</p> <p>Round 1: ____</p> <p>Round 2: ____</p> <p>Round 3: ____</p> <p>+ OR -</p>	<p>Person 9</p> <p>Round 1: ____</p> <p>Round 2: ____</p> <p>Round 3: ____</p> <p>+ OR -</p>	<p>Person 10</p> <p>Round 1: ____</p> <p>Round 2: ____</p> <p>Round 3: ____</p> <p>+ OR -</p>	<p>Person 11</p> <p>Round 1: ____</p> <p>Round 2: ____</p> <p>Round 3: ____</p> <p>+ OR -</p>	<p>Person 12</p> <p>Round 1: ____</p> <p>Round 2: ____</p> <p>Round 3: ____</p> <p>+ OR -</p>

Use the results of your activity to identify your initial **index cases**. Due to the limitations of this experiment, you will not be able to find a single initial **index case**, but you should be able to narrow it down to 2 individuals.

- Stuck? Cut out the 12 person cards and move them around to help you better visualize it.
- Start by writing your positive pairs in the bottom row and work your way up to the top.





Plan a Contact Tracing Interview

Case investigation and **contact tracing**, a core disease control measure employed by local and state health department personnel for decades, are key strategies for preventing further spread of COVID-19. Immediate action is needed. Communities must scale up and train a large workforce and work collaboratively across public and private agencies to stop the **transmission** of COVID-19. Case investigation and **contact tracing** are specialized skills. To be done effectively, they require people with the training, supervision, and access to social and medical support for patients and contacts. Your task is to plan a **contact tracing** interview with a patient who has recently been diagnosed with COVID-19.

Background information

David is a 42-year-old man who started feeling ill on July 13 and tested positive for COVID-19 on July 14. He is married with three kids (ages 4, 12, and 19) and lives with his wife (age 46) and mother-in-law (age 71). His 4-year-old daughter attends daycare during the week. His 12-year-old son is out of school for the summer and spends most days playing at friends' houses. His 19-year-old daughter is in college and is taking summer classes while living in a dorm on campus. His wife works full time in an office building but has just returned from a trip visiting relatives in another state. His mother-in-law lives with them and has some health problems, including diabetes and chronic congestive heart failure. She frequently attends events at the local senior center down the road from their house. While he generally works from home, he occasionally has to go into the office to meet with co-workers in person.

When David got tested, they gave him a flier containing a form that asked him to consider all of his activities for the previous 10 days. They informed him that a contact tracer from the local health department will be following up to ask him further questions about his activities and to determine if he has any **close contacts** who need to be notified and possibly tested. David's form responses are included on the next pages of this document.

Conduct an Interview

Use David's form responses to plan your phone interview with him. Here are the general steps to conducting an interview with a patient:

1. Introduce yourself to the patient and explain the purpose of your call
2. Collect demographic information from patient
3. Assess patient's overall health and COVID-19 symptoms and provide self-care information
4. Develop a plan to monitor patient's health and respond to changes in health status
5. Review isolation procedures and provide resources
6. Identify **close contacts** and routes of exposure
7. Prompt for questions and provide contact information

More detailed interview tips including sample questions, sentence starters, and advice for creating open channels of communication are available here: <https://www.cdc.gov/coronavirus/2019-ncov/php/contact-tracing/case-investigator-guide.html>

David received this flier when he tested positive for COVID-19 and added information to page 2 to help him answer his contact tracer's questions over the phone.

3 Key Steps to Take While Waiting for Your COVID-19 Test Result

To help stop the spread of COVID-19, take these **3 key steps NOW** while waiting for your test results:

1 Stay home and monitor your health.

Stay home and monitor your health to help protect your friends, family, and others from possibly getting COVID-19 from you.

Stay home and away from others:

- If possible, stay away from others, especially people who are at higher risk for getting very sick from COVID-19, such as older adults and people with other medical conditions.
- If you have been in [contact](#) with someone with COVID-19, stay home and away from others for 14 days after your last [contact](#) with that person. Follow the recommendations of your local public health department if you need to quarantine.
- If you have a fever, cough or other symptoms of COVID-19, stay home and away from others (except to get medical care).



Monitor your health:

- Watch for fever, cough, shortness of breath, or other symptoms of COVID-19. Remember, symptoms may appear 2–14 days after exposure to COVID-19 and can include:
 - Fever or chills
 - Cough
 - Shortness of breath or difficulty breathing
 - Tiredness
 - Muscle or body aches
 - Headache
 - New loss of taste or smell
 - Sore throat
 - Congestion or runny nose
 - Nausea or vomiting
 - Diarrhea



2 Think about the people you have recently been around.

If you are diagnosed with COVID-19, a public health worker may call you to check on your health, discuss who you have been around, and ask where you spent time while you may have been able to spread COVID-19 to others. While you wait for your COVID-19 test result, think about everyone you have been around recently. This will be important information to give health workers if your test is positive.

Complete the information on the back of this page to help you remember everyone you have been around.

3 Answer the phone call from the health department.

If a public health worker calls you, answer the call to help slow the spread of COVID-19 in your community.

- Discussions with health department staff are **confidential**. This means that your personal and medical information will be kept private and only shared with those who may need to know, like your health care provider.
- Your name will not be shared with those you came in [contact](#) with. The health department will only notify people you were in close [contact](#) with (within 6 feet for more than 15 minutes) that they might have been exposed to COVID-19.



cdc.gov/coronavirus

Think About The People You Have Recently Been Around

If you test positive and are diagnosed with COVID-19, someone from the health department may call to check-in on your health, discuss who you have been around, and ask where you spent time while you may have been able to spread COVID-19 to others. This form can help you think about people you have recently been around so you will be ready if a public health worker calls you.

Things to think about. Have you:

- Gone to work or school?
- Gotten together with others (eaten out at a restaurant, gone out for drinks, exercised with others or gone to a gym, had friends or family over to your house, volunteered, gone to a party, pool, or park)?
- Gone to a store in person (e.g., grocery store, mall)?
- Gone to in-person appointments (e.g., salon, barber, doctor's or dentist's office)?
- Ridden in a car with others (e.g., rideshare) or taken public transportation?
- Been inside a church, synagogue, mosque or other places of worship?



Who lives with you?

Hannah (wife - 46)
 Brandon (son - 12)
 Isabelle (daughter - 4)
 Iris (mother-in-law - 71)

David's Responses



Who have you been around (less than 6 feet for a total of 15 minutes or more) in the last 10 days? (You may have more people to list than the space provided. If so, write on the front of this sheet or a separate piece of paper.)

Name	Phone Number	Date you last saw them	Where you last saw them
Vega Family	555-4625	July 5	Backyard Barbecue
Blackmore Family	555-7412	July 5	Backyard Barbecue
Prince Family	555-2289	July 5	Backyard Barbecue
Burriss Family	555-1147	July 5	Backyard Barbecue
Dave	555-7788	July 7	Downtown Multiplex
Carolyn	555-1549	July 8	Work
Dr. Bautista	555-7387	July 8	Westside Animal Hospital
Arnav & Saniya	555-9234	July 10	Dinner at Burrito Depot
Tyreece	555-7841	July 10	Dinner at Burrito Depot
Jocelyn	555-1432	July 13	Visited College Dorm

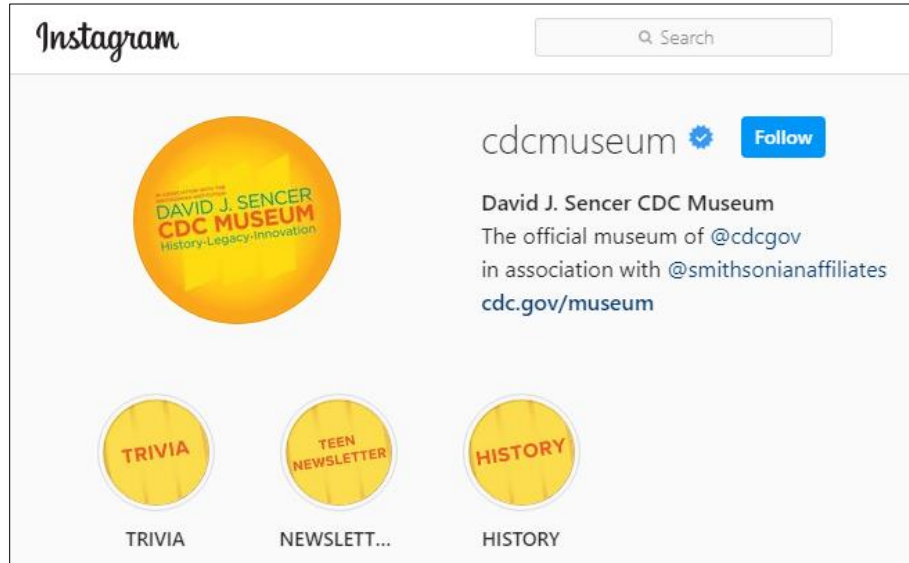
What have you done in the last 10 days with other people?

Activity	Location	Date
Barbecue	Our backyard	July 5
Movie	Downtown Multiplex	July 7
Vet Appointment for Whiskers	Westside Animal Hospital	July 8
Picked up Hannah from Airport	International Airport	July 9
Grocery Shopping	Food N Stuff	July 10
Dinner with Friends	Burrito Depot	July 10
Church Service and Picnic	Bellview Church	July 11
Brandon's Soccer Game	Shady Pines Park	July 12
Renewed Driver's License	Dept of Driver Services	July 13



Share Your Findings

The David J. Sencer CDC Museum uses award-winning exhibits and innovative programming to educate visitors about the value of public health and presents the rich heritage and vast accomplishments of CDC. Your findings could be a valuable contribution! Share your findings with the CDC Museum on Instagram using **@CDCmuseum**.





Reflections

Now that you have completed this investigation, think about what you learned from your research and experiments. Answer the questions below.

1. What is the main goal of **contact tracing**?

2. How does **contact tracing** slow the spread of a disease?

3. In your two **contact tracing** activities, what did you find challenging? What were some key understandings that you gained?

4. Why is **contact tracing** often more important for **asymptomatic** cases of a disease compared to **symptomatic** cases?

5. Which do you think is more important: an individual's right to withhold their private health information (individualism) or the public health department's ability to monitor disease in a community (collectivism)?

6. Molecular evidence from DNA, RNA, or proteins is used to study outbreaks. How could sequences from different strains of a virus help scientists trace the path of an infection?
