🖊️ COVID-19 Vaccination – Student Instructions

Build a Model for Population Immunity

Population immunity means that enough people in a community are protected from getting a disease because they've already had the disease or because they've been vaccinated. **Population immunity** makes it hard for a disease to spread from person to person. It even protects those who cannot be vaccinated, like newborns or people who are allergic to a vaccine. The percentage of people who need to have protection to achieve **population immunity** varies by disease. We are still learning how many people have to be vaccinated against COVID-19 before the population can be considered protected.

1. Print out the vaccine tiles and gameboard on pages 3 & 4 of this document. If you don't have printer access, any double-sided objects (ex: coins, buttons, game pieces) or two different colors of objects will also work (ex: colored paper, building blocks, beads). A checkerboard or chess board works well as a background for this activity.
2. Cut out all 64 of the vaccine tiles.

Round 1: 50% of the Population is Vaccinated

1. For Round 1, we will assume that 50% of the population is fully vaccinated. On your gameboard, randomly lay out 32 tiles with the vaccine syringe showing. This represents 32 people who are vaccinated. Lay out the other 32 tiles with the vaccine syringe facing down to represent 32 people who are unvaccinated. Make sure you are using a random distribution of vaccines, not a clump.
2. Uh-oh! A disease outbreak has occurred. Let's see what happens to our population. Remove one of the unvaccinated tiles somewhere near the middle of the board. This missing tile represents a person who has been infected.
3. In this game, any unvaccinated tile that is directly touching an infected tile will also be infected. Remove any unvaccinated tiles touching the top, bottom, left, or right of the infected tile. No diagonal tiles should be removed.
4. Continue spreading the disease and removing tiles until it can no longer spread.
5. Count your results and record them in the data table.
   a. How many people were infected?
   b. Of the uninfected people, how many were not vaccinated? This is a measure of the **population immunity** in a community.
6. Repeat the experiment 2 more times to see how your results compare.
7. Calculate the average % infected and % of unvaccinated people who were NOT infected.

Round 2: 75% of the Population is Vaccinated

1. For Round 2, we will assume 75% of the population is vaccinated. Reset your board so that 48 tiles are showing the vaccine syringe and 16 are not. This represents 48 vaccinated people and 16 unvaccinated people.
2. Choose an unvaccinated person near the middle of the board and start a new epidemic, following the same rules as before for transmission and removal of tiles.
3. Count your results and record them in the data table.
4. Repeat the experiment 2 more times to see how your results compare. Calculate averages.

In this game, the disease has a **reproduction value** (R_0) of 4 because each infected person would infect 4 other people on average without vaccines. When factors like immunity from vaccination/prior infection or other factors like masks and social distancing are added in, the reproduction rate decreases. This value is known as the effective reproduction value (R_t). When R_t is less than 1, case numbers will decrease. When it is greater than 1, they increase.
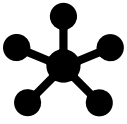
Publish Your Vaccine Story

COVID-19 has affected all of us in some way. We all want to get back to some sort of normal as quickly as possible, and vaccines are a path to that. Sometimes we get overwhelmed by the sheer magnitude of the COVID-19 pandemic, and it's easy to forget that real people are being affected.

Decide how you want to share your story. You can make a website, video, digital book, social media post, or any other format that you feel comfortable using. The key feature is to make it personal. This is not about a pandemic that affects the whole world. It's just about you and your story.

1. Tell your COVID-19 story.
   How has this pandemic affected you personally? What are the mental, physical, and social effects that you have experienced firsthand?
2. Describe how the vaccine has impacted you.
   What does the vaccine mean to you? How has the vaccine changed things? Have your family members been vaccinated? Have you?
3. Convince others to get vaccinated.
   Why is it important to you that others get vaccinated? Keep it hopeful and positive!

Share your story with people you know. Have vaccine conversations with friends, family members, classmates, and others in your life who are unvaccinated. Here are some helpful resources:

- Information about COVID-19 vaccines from CDC:
  https://www.cdc.gov/coronavirus/2019-ncov/vaccines/index.html
- Tips from CDC for talking to others about COVID-19 vaccinations:
  https://youtu.be/1Mf3ZWmK1wM
- How do we know that COVID-19 vaccines are safe?
  https://youtu.be/7bBmQaX2k4w
- Locating a COVID-19 vaccination site:
  https://www.vaccines.gov/
- Myths and facts about COVID-19 vaccines
  https://www.cdc.gov/coronavirus/2019-ncov/vaccines/facts.html
- Examples of vaccination campaigns:
  https://youtu.be/oH6dCTtgxbY
  https://youtu.be/_JB8IEPqd1o
 https://youtu.be/a7Zz4SxhhvA

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 results could be a valuable contribution! Share your demonstration with the CDC Museum on Instagram using **@CDCmuseum**.

The National Center for Emerging and Zoonotic Infectious Diseases (NCEZID) works to protect people at home and around the world from emerging and zoonotic (diseases that can spread from animals to people) infections ranging from A to Z—anthrax to Zika. We are living in an interconnected world where an outbreak of infectious disease is just a plane ride away. Connect with them on Twitter **@CDC_NCEZID**.

Tip: To make these tiles easier to see against the gameboard, print this page on colored paper.
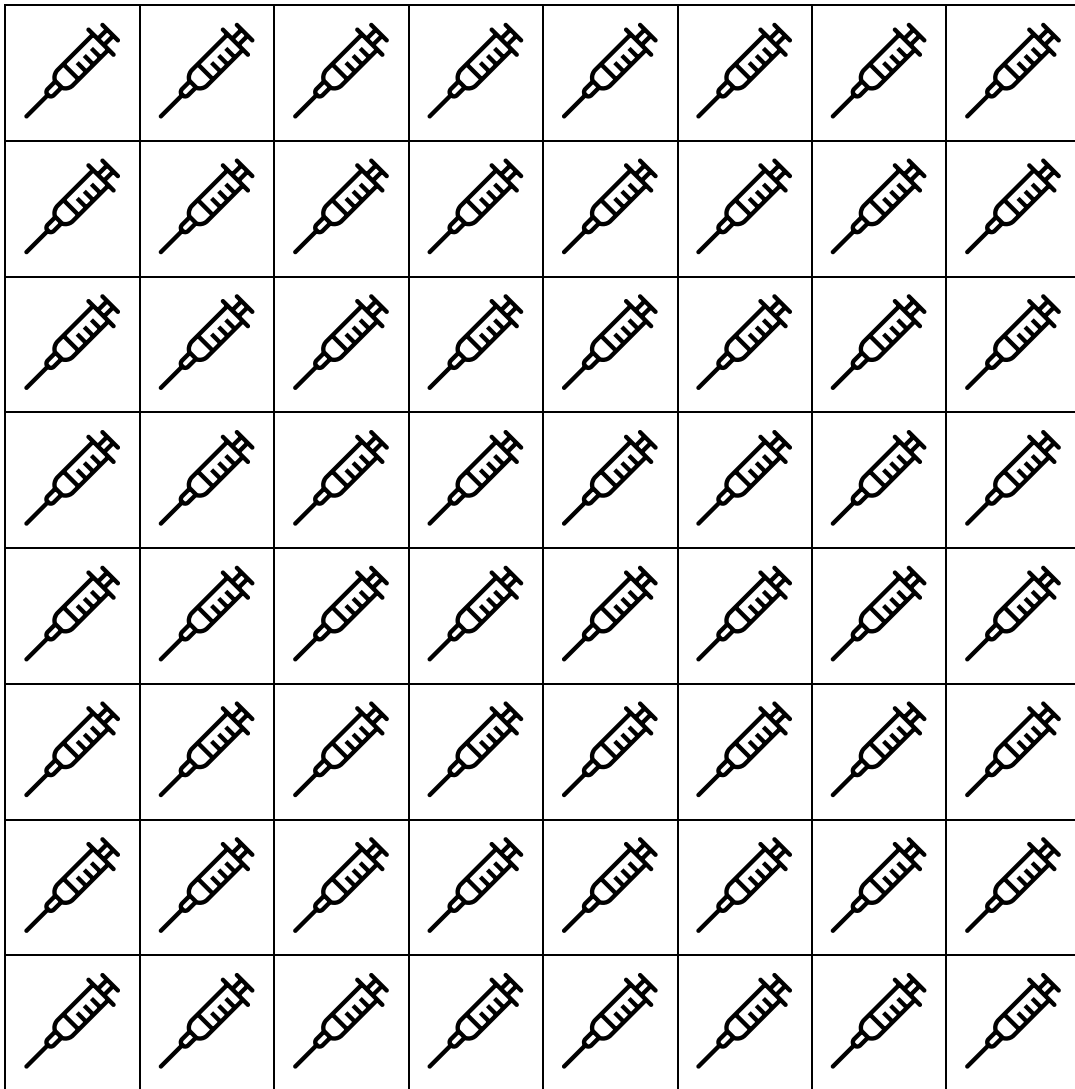
Population Immunity Gameboard