SCIENCE WORLD

At-Home Activities

HERD IMMUNITY GAME

SCIENCE WORLD

1455 Quebec Street
Vancouver, BC
Canada V6A 3Z7

scienceworld.ca

In this activity you will explore how herd immunity works. You will be a virus and try to infect as many people as you can. Two colours of LEGO bricks will play the part of the population (some vaccinated, some not). You (the virus) will randomly grab LEGO bricks from a box to see how often you infect an unvaccinated person or come up against someone who is vaccinated. (If you don't have LEGO bricks, you can substitute something else that you have in two colours.)

VOCABULARY LIST

Pathogen: Any organism that causes some sort of disease in the body. One example is SARS-CoV-2, the virus that causes the disease called COVID-19.

Vaccine: A substance injected into the human body to help teach the immune system to recognize and fight a threat (such as COVID-19).

Vaccinated: A person is vaccinated if they have received a substance to stimulate their immune system to fight a certain disease.

Herd Immunity (also known as community immunity): When enough people in a population are immune to a pathogen (through exposure or vaccination), this can protect others from getting infected.

BACKGROUND SCIENCE:

Getting vaccinated is a great way to protect yourself and others. If enough people in a population are vaccinated then the pathogen/infectious disease will not be able to spread to other people as successfully. This can lower the number of people who can get infected by the disease. This is known as herd immunity (enough people in your "herd" are immune).

Herd immunity is especially important for people who are unable to get vaccinated such as those allergic to the vaccine, the immunocompromised (have a weakened immune system), newborns and children that are not yet old enough to get vaccinated.

For the polio virus, the percentage of people that need to be vaccinated to reach herd immunity status is 80%. In other words, if 80% of the population are vaccinated, polio is unable to spread through the population and the unvaccinated 20% will be well protected. For COVID-19, which is still quite a new disease, we don't yet know what percentage of the population needs to be vaccinated to reach herd immunity.

Currently, a booster for COVID-19 is being administered to Canadians, about 6 months after their second shot. These booster shots are another dose of the vaccine that will help to lengthen the amount of time and the strength with which a person is protected from COVID-19.

Some vaccines, such as the vaccine for influenza, also known as the flu, require people to be vaccinated each year, as new strains continue to emerge and mutate rapidly.

FUN FACT:

Smallpox is the only human disease to have been eradicated (removed) from the world. This was because of a worldwide vaccination program.

MATERIALS:

- About 100 LEGO bricks (2 different colours - we used red and blue)
- A box (that can fit all the bricks inside)
- Cloth to cover top of box

NOTE

This activity represents a situation where the vaccine entirely prevents people from getting the disease and passing it on. The reality is a bit more complicated – a vaccinated person is not 100% protected from the disease, but is well protected against severe disease and hospitalization.

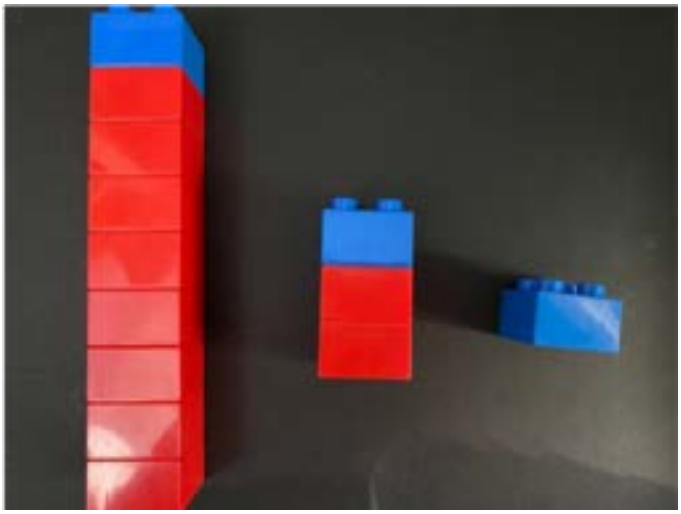
WHAT TO DO:

Game 1: 20% Vaccinated

Let's see how many people you can infect when only 20% of your community (or "herd") are vaccinated!

- Count out 50 LEGO bricks – 10 blue (representing 20% vaccinated people), and 40 red (representing 80% unvaccinated people)
- Mix up the colours and place in a box.
- Cover box with a cloth so you can't see inside (no peeking!)
- Put your hand in and pull out LEGO bricks, one at a time.
- Build a tower as you play.
- Stop when you hit a vaccinated (blue) one.
- Keep pulling LEGO bricks and stop again when you get another vaccinated (blue) one.
- Do this one more time, for a total of 3 times.
- With your adult, take an average of how many unvaccinated (red) ones you pulled out before pulling a vaccinated (blue) one. You can do this by adding up all the red ones and dividing by 3.

This is how many unvaccinated people you infected before hitting a vaccinated person and stopping the chain!



Game 2: 50% Vaccinated

Let's see how many people you can infect when 50% of your community (or "herd") are vaccinated!

- Count out 50 LEGO bricks– 25 blue (50% vaccinated) and 25 red (50% unvaccinated).
- Play the game as above, building a tower and stopping each time you hit a vaccinated (blue) one.
- Repeat 2 more times.
- With your adult, take an average of how many unvaccinated (red) ones you pulled out before pulling a vaccinated (blue) one. You can do this by adding up all the red you pulled, and dividing by 3

How many people did you infect this time? More or less than when only 20% were vaccinated?

Game 3: 80% Vaccinated

Let's see how many people you can infect when 80% of your community are vaccinated!

- Count out 50 LEGO bricks – 40 blue (80% vaccinated) and 10 red (10% unvaccinated).
- Play the game a third time, building a tower and stopping each time you hit a vaccinated (blue) one.
- Repeat 2 more times.
- With your adult, take an average of how many unvaccinated (red) ones you pulled out before pulling a vaccinated (blue) one. You can do this by adding up all the red ones you pulled, and dividing by 3.

How many people did you infect this time, when 80% of the population is vaccinated?

WONDERINGS:

1. In which scenario did you "infect" (pick up) the most people (red LEGO bricks)? *Why do you think this happened?*
2. What do you think happens to a pathogen if it is not able to infect any more people?
3. Why did the instructions suggest you repeat each scenario three times? *Once you think you have an idea, read below for an explanation.*

The Importance of Repeated Trials

Scientists often repeat the same experiment many times before making a conclusion. This helps to make sure that their findings aren't the result of a mistake or a random event. Each time a scientist repeats the same experiment, we call this a "trial". The conclusions from an experiment with many trials are more reliable.

You repeated each stage of the game three times to compare your results and make them more reliable.