The More the Merrier?
Crowds and Disease Transmission

OVERVIEW
Students use powdered drink mix in plastic cups to simulate disease transmission in different size crowds.

LEARNING OBJECTIVES
Students will create a model that shows disease transmission in various sized crowds and use their model to explain how social distancing and avoidance of large gatherings can help slow the spread of certain infectious diseases.

SCIENCE, HEALTH AND MATH SKILLS
- Observing
- Comparing
- Measuring
- Interpreting

NGSS SCIENCE AND ENGINEERING PRACTICES
- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations

TIME
- One class period

MATERIALS FOR SCIENCE INVESTIGATION
- 25 similar, small objects (such as marbles, similar size pebbles, pennies)
- 2 packages of powdered drink mix
- 4 clear, similar size containers (such as plastic food storage, jars with lids, etc)
- 2 white paper towels, folded to fit into 2 of the containers
- Spray bottle filled with plain water
- The More the Merrier Task Card (for students)

SET UP AND TEACHING TIPS
This activity can be conducted as a demonstration by you, the teacher, or by each student either in the classroom or at home.
PROCEDURE

■ ENGAGE

1. Ask students, What is “social distancing”? Accept all answers.

2. Explain that public health officials advise people to avoid large gatherings. Why do you think it is important to not attend large events during a pandemic? How does limiting the capacity at sports stadiums or movie theaters help slow the spread of certain diseases? Give students time to respond.

3. Inform students that while we cannot see the virus moving among people, we can use a model to represent disease transmission in different size crowds.

■ EXPLORE

4. If you, the teacher, are doing this as a demonstration, proceed with the steps below. If students are conducting this investigation, refer to “The More the Merrier Task Card” and review the steps with them.

5. Empty 1 package of powdered drink mix into a clean, clear container and add in 5 of the small objects (pennies, marbles, and similar size pebbles work well!). Close the lid and shake the container for 20 seconds.

6. Carefully remove the lid and use tongs to transfer each object to a clean container lined with a paper towel. Secure the lid to this container and shake for 20 seconds. After shaking, discard the small objects, leaving only the paper towel in the container.

7. Repeat Step 5 & 6, this time placing 20 small objects into the container with the drink mix.

8. Use the spray bottle containing water to spray the paper towel in each of the 2 containers 10 times.

9. After the demonstration, or student investigations, compare the results from the 2 containers.

10. Ask the students: What differences do you observe between the 2 containers? What accounts for the differences observed?

11. How can this model be used to explain why it is critical to avoid large gatherings during a pandemic?

■ EXTEND

12. What further questions do you have that we could test using this same model to answer your questions? Further probe student questions to narrow in on specific variables and what each represents in the model - for example, What would happen if we used less powdered drink mix? Or, What would we expect to happen if we used larger containers or more small objects?

When transmission of the disease is high in a community, large gatherings should be avoided to lessen the chances of encountering droplets from an infected individual. It is important to remind people if they do gather to wear masks, to not share objects, to maintain a distance of at least 6 feet apart, and to limit the number of persons.
THE SCIENCE

The virus that causes COVID-19 mainly spreads through droplet transmission. These droplets are released by an infected person, whether they show symptoms or not, when that person breathes, talks, coughs, or sneezes. When one of these droplets encounters another person, that individual can become infected as well. The more people you come into contact with, the higher your chances are of contracting the virus. When transmission of the disease is high in a community, large gatherings should be avoided to lessen the chances of encountering droplets from an infected individual. Other factors that increase the risk of becoming infected at a large gathering include the duration of time spent in contact with people at the gathering, the distance between people at the gathering, not wearing masks, sharing of objects, and the number of infected persons at a gathering. It is important to remind people if they do gather to wear masks, to not share objects, to maintain a distance of at least 6 feet apart, and to limit the number of persons at the gathering.

In the model created in this activity, the powdered drink mix represents the infection – the darker the resulting color of the paper towel, the more the disease has spread. The small objects represent the number of people in attendance. This model simplifies what happens in real life, because it is not just the number of infected people at a gathering that explains the likelihood of transmission of the virus that causes COVID-19. Other factors, such as not wearing masks and the distance between people also affect transmission of the virus.

RESOURCES

COVID HEALTHY ACTIONS, COMMUNITY KNOWLEDGE AND SCIENCE

A SCIENCE-BASED CURRICULUM FOR THE COVID-19 PANDEMIC

We are grateful to Laura and John Arnold and other community donors for their generous support, which enabled development of the COVID HACKS curriculum materials. We also thank the many scientists, educators and physicians from Baylor College of Medicine (BCM) who provided content, feedback and technical reviews.

The information contained in this publication is for educational purposes only and should in no way be taken to be the provision or practice of medical, nursing or professional healthcare advice or services. The information should not be considered complete and should not be used in place of a visit, call, consultation or advice of a physician or other health care provider. Call or see a physician or other health care provider promptly for any health care-related questions.

The activities described in the various components of the curriculum are intended for students under direct supervision of adults. The authors, Baylor College of Medicine (BCM) and any sponsors cannot be responsible for any accidents or injuries that may result from conduct of the activities, from not specifically following directions, or from ignoring cautions contained in the text.

The opinions, findings and conclusions expressed in this publication are solely those of the authors and do not necessarily reflect the views of BCM, image contributors or sponsors. Photographs or images used throughout project related materials, whether copyrighted or in the public domain, require contacting original sources to obtain permission to use images outside of this publication. The authors, contributors, and editorial staff have made every effort to contact copyright holders to obtain permission to reproduce copyrighted images. However, if any permissions have been inadvertently overlooked, the authors will be pleased to make all necessary and reasonable arrangements.

• Author: Katherine Harris
• Web and Design Director: Travis Kelleher
• Copy Editor: Lollie Garay
• Graphic Designer: Jose Chavero Rivera
• Technical Reviewers: Stacey Rose, Jennifer Anne Whitaker
• Project Director and Series Editor: Nancy Moreno

No part of this guide may be reproduced by any mechanical, photographic or electronic process, or in the form of an audio recording; nor may it be stored in a retrieval system, transmitted, or otherwise copied for public or private use without prior written permission of Baylor College of Medicine. Black-line masters, student pages and slides reproduced for classroom use are excepted.

© 2020 Baylor College of Medicine. All rights reserved.