A CITIZEN SCIENCE Face Mask Experiment

Educational Campaign and Modules to Promote *Coronavirus Safety* in Communities and Schools

COVID-19 is a viral disease primarily spread through oral and nasal fluids or droplets. COVID-19 most seriously affects the elderly and those already sick, causing shortness of breath, fever, coughing, muscle pains and systemic inflammation that can lead to hospitalization.

COVID spreads from person-to-person via saliva and nasal microdroplets. Because of this, health experts recommend keeping a 6-foot (1.8 m) distance from other people, limiting exposure to groups, washing hands and wearing face covers. Since medical masks are scarce in some places, many people use face coverings such as scarves and handkerchiefs. **The main function of face coverings** or generic masks is not to filter the air one breathes, but **to limit the spread of saliva and nasal droplets that we naturally produce and spread when talking, sneezing, and coughing**.

This eductional campaign has been prepared to help communities learn about droplets and test the usefulness of face coverings. In **four short home experiments** you can quantify and observe how wearing face masks can reduce the spread of droplets to help keep family and friends safe.

This module is based on laboratory studies conducted in a university medical research center. For more information, see:

https://doi.org/10.3389/fmed.2020.00260

Textile Masks and Surface Covers—A Spray Simulation Method and a "Universal Droplet Reduction Model" Against Respiratory Pandemics. Rodriguez-Palacios A, Cominelli F, Basson AR, Pizarro TT, and Ilic S. (2020) Front. Med. 7:260. doi: 10.3389/fmed.2020.00260

https://doi.org/10.3389/fmed.2020.00504

Germ-Free Mice Under Two-Layer Textiles are Fully Protected From Bacteria in Sprayed Microdorplets: A Functional in-vivo Test Strategy of Facemasks and Filtration Materials. Rodriguez-Palacios A, Conger M, and Cominelli F. (2020) Front. Med. 7:504. doi: 10.3389/fmed.2020.00504

When using this international collaboration module please mention, if possible those two studies, the module, & use this **Citation**:

A Citizen Science Facemask Experiment and Educational Modules to Increase Coronavirus Safety in Communities and Schools. Eichler SE, Hopperton AP, Alava JJ, Pereira A, Ahmed R, Kozlakidis Z, Ilic S and Rodriguez-Palacios A (2020) Front. Med. 7:486. doi: 10.3389/fmed.2020.00486

https://doi.org/10.3389/fmed.2020.00486

This Educational Module provides an introduction to the importance of droplets and the value of face covers in preventing the spread of respiratory germs.

With a series of four home experiments you will quantify how face covers help to control respiratory diseases that are transmitted by oral and nasal droplets we produce when we talk, sneeze, or cough.

Experiment 1-How far can sprayed liquid droplets travel?

Experiment 2- How well does a cloth barrier stop sprayed droplets?

Experiment 3- How many germ-carrying droplets can cross two layers of cloth?

Experiment 4- How many germs come out of my mouth as I speak?

...You may share your results and see results from othes here: https://bit.ly/facemaskchallengedata The shared data is anonymous! No personal information is collected!

This Module is also available in **other languages** (*e.g.*, **Spanish**, **French**, **Portuguese**) in the **Citation** and at https://bit.ly/facemaskchallenge

If you are a teacher and would like to let us know you that you are implementing the module in your school/class: https://forms.gle/Sg36k3HceMos1Xpb8

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International collaboration of scientists & educators from

School of Medicine Case Western Reserve University · University Hospitals · Kent State University · LMIC International Agency for Research on Cancer/WHO · The Ohio State University College of Education and Human Ecology · BCNet · University at Albany State University of New York · Universidade Federal do Pará · The University of British Columbia

INTRODUCTION TO CITIZEN SCIENCE ACTIVITY

Citizen Scientists will make simulations with clouds of sprayed droplets using safe household liquids. The project consists of simple home experiments using a spray bottle. Four experiments are described – you can complete one or all of them, using basic food ingredients, kitchen supplies, and a few recycled objects as listed. These activities will consist of measuring how many drops of a sprayed liquid can pass through face cover material, and how far liquid droplets can travel from a simulated sneeze.

Citizen Scientists will learn first-hand about how microdroplets can cause contamination, how face covers work and learn the importance of using a face cover during a pandemic. If you choose to share your data – you will be part of a global science project to help understand diseases and disease prevention – a real Citizen Scientist! And share your results (https://bit.ly/facemaskchallengedata)!

Audience: Recommended for Teachers & Parents of students with 3rd grade reading or above.
Suitable for all ages, with supervision as needed.

Basic materials

- 2 cups of dark colored liquid (cooled black coffee, sports drink, grape juice, cola).
- 1 spray bottle.
- 28 pieces letter size white or grid paper.
- Measuring tape or ruler.
- 1 empty cereal box.
- Cloth /textile (at least 10"x10") (it may get stained!) such as a towel, pillowcase, t-shirt, scarf, bandana, handkerchief, cloth napkin, etc.
- Masking tape.
- Paper towels for cleanup.
- *Optional*: grid paper (see printable or draw your own*).

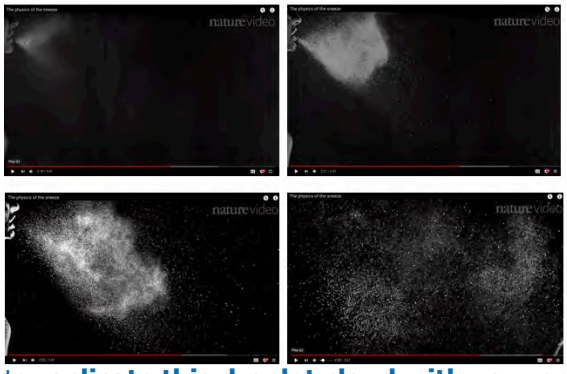
Materials for Gelatin Germ Growth plates
(advanced, prepare ahead)

- 1 empty cereal box.
- 6-10 shallow clean containers (such as jar lid, tuna can) or *foil* cupcake liners.
- 1 teaspoon sugar.
- 1 cube *beef* broth bouillon.
- 2 packs of ¼ oz. plain (red-colored) gelatin
- 1 cup of water.
- Microwave and 12 oz. glass container, or pot with lid to use on stovetop.
- Clear zip-lock bag.
- Clean face cover (must cover nose and mouth).

https://www.instructables.com/id/Homemade-Nutrient-Agar/

Watch this Nature Video: **The Physics of the Sneeze**, (May 2016, YouTube) to help you understand fluid dynamics.

In preparation for experiments, observe a slow motion sneeze (minute 2:00):
https://youtu.be/bFxgVkslD-k?t=107



Try to **replicate this droplet cloud with your spray bottle** settings!

EXPERIMENT 1
How far can sprayed liquid droplets travel?

Core Concept: Clouds of sprayed droplets contain multiple droplet sizes: Macro (large, visible) and Micro (small, hard to see) droplets.

Degree of Difficulty: Easy.

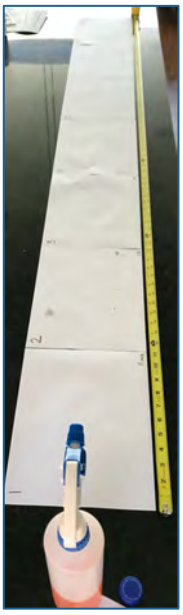
New Discovery: Large droplets can travel farther than smaller droplets in a simulated "sneeze".

Learning Objective: Test how far droplets from a simulated infectious spray scenario can spread.

Duration: 20 minutes.

Materials

- 1 spray bottle.
- Enough dark soda, cold coffee, or sports drink to fill a spray bottle halfway.
- 21 pieces of letter sized white or grid paper.
- A large empty space on a table or washable floor
- Pen or pencil.



Procedure:

Part A - **Spray Bottle <u>Flat</u> on Floor**:

1. Place 7 pieces of paper aligned on the floor long end to end, number them 1-7 (1 is nearest the spray bottle, 7 is farthest, as shown in diagram/photo).
2. Fill up a spray bottle with any kind of dark, safe liquid such as coffee, grape juice and or cola. Test your spray bottle over a sink and set the spray bottle so that it produces a fine mist with medium sized droplets (see video on page 2 as guide). Once this spray pattern is set do not change it.
3. Position the spray bottle in front of the first paper and aim the spray bottle towards the center of the paper while the bottom of the spray bottle is sitting flat on the floor.
4. Give one complete spray. Wait 30 seconds for droplets to complete their trip, then observe stains on the paper.
5. Record your findings in **Table 1** below (answer questions for '**FLAT** Bottle' on next page, then proceed to **Part B**).

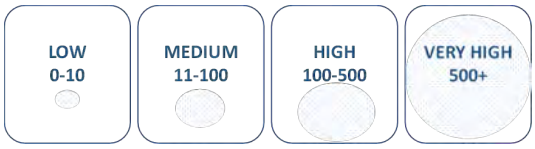
EXPERIMENT 1, continued

Part B - **Spray Bottle at <u>Different Angles</u>**

1. Start a new experiment by replacing and renumbering the papers just like in Part A.
2. Using the same spray bottle as in Part A, angle the spray bottle with the nozzle ***up*** (to about 10 degrees) using a pencil propped under the bottle. Record your findings in **Table 1** below (see questions for '**Angle UP**', then proceed to next step.
3. Start a new experiment by replacing and renumbering the papers just like in Part A.
4. Complete one full spray. Repeat this same procedure but with the spray bottle angled ***down***, again using a pencil to prop the bottle. Record your findings in **Table 1** below (see questions for '**Angle DOWN**').
5. **You finished Experiment 1!** Go to Table 1 and **share your results online**.

Answer the following Questions in Table 1 below, for each spray experiment

Q1.1 *How would you rate the number of droplets contaminating the third paper*? (see chart below)



Q1.2 *What bottle position (flat, angled up, or angled down) had the farthest droplets? by how much?*_____

Q1.3 *Were the farthest away droplets large or small?*_____

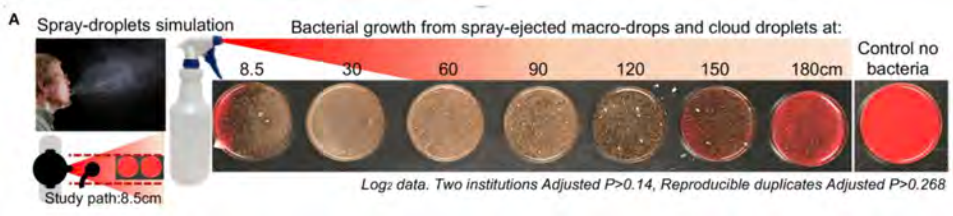
Table 1. Enter below the Results of Experiment 1.

Bottle Position	***Paper farthest from spray bottle that show droplets (1-7)?***	***Droplet contamination of paper #3 (low, medium, high, very high)?***
FLAT **Bottle**		
Angled UP		
Angled DOWN		

Share your results online at: https://bit.ly/facemaskchallengedata or scan the QR code below

Take Home Message #FaceMaskChallenge Experiment 1:

- Oral and nasal microdroplets travel pretty far from our mouths!
- If we sneeze with our face upward, droplets spread even farther!
- **Try looking down when you sneeze or cough!**



For teachers: This figure above and the scientific details of **Experiments 1 to 3** are described in https://doi.org/10.3389/fmed.2020.00260

Experiment 2
How well does a cloth cover stop sprayed droplets?

Core Concept: Cloth can stop the spread of sprayed liquid droplets).

Degree of Difficulty: Easy.

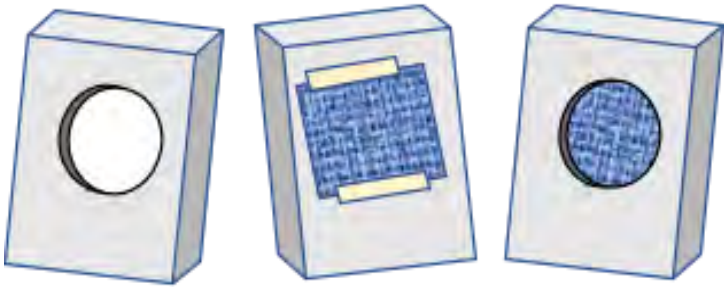
New Discovery: A single layer of household cloth (cotton t-shirt) reduces the distance of droplet travel by >90%.

Learning Objective: The goal of the experiment is to determine how many macroscopic (visible) droplets get past a face cover and reach a surface.

Duration: 30 minutes.

Materials

- 1 spray bottle.
- Enough dark soda, cold coffee, or sports drink to fill a spray bottle halfway.
- 14 pieces of letter-sized white paper.
- A large empty space on a table or washable floor.
- 1 empty cereal box.
- Scrap cloth/textile about 10" x 10".
- Scissors.
- Silverware, a soup can, or other objects to be used as weights.



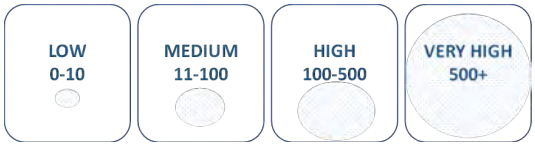
Procedure:

1. Cut 2 approximately 4" diameter windows (or 8X10cm) on both sides of the box, approximately 4 inches from table/floor surface as shown in the pictures above so that the spray bottle nozzle will be at the level of the holes when placed flat on the ground. If the bottle is too tall, slide the box and sheet to edge of table as shown.
2. Tape a single layer of cloth / textile over one of the windows. Or place the fabric you would like to test inside the box covering 'window' as shown in the photo.
3. Secure the box in upright position by placing heavy objects such as utensils, soup can, or other inside.
4. Place 7 pieces of paper on the floor or table long end to end, number them 1-7 as in **Experiment 1** (1 is nearest the spray bottle).
5. Place the box directly in front of paper 1 with no space in between and set the spray bottle flat with the nozzle pointed to spray through the box and through the cloth. If the bottle is too large just angle the bottle so the stream is as close to horizontal as possible.
6. Give one complete spray. Remember to wait 30 seconds to let droplets fall. Observe the spray pattern and answer the questions below. Save the cereal box for use in **Experiment 3**.

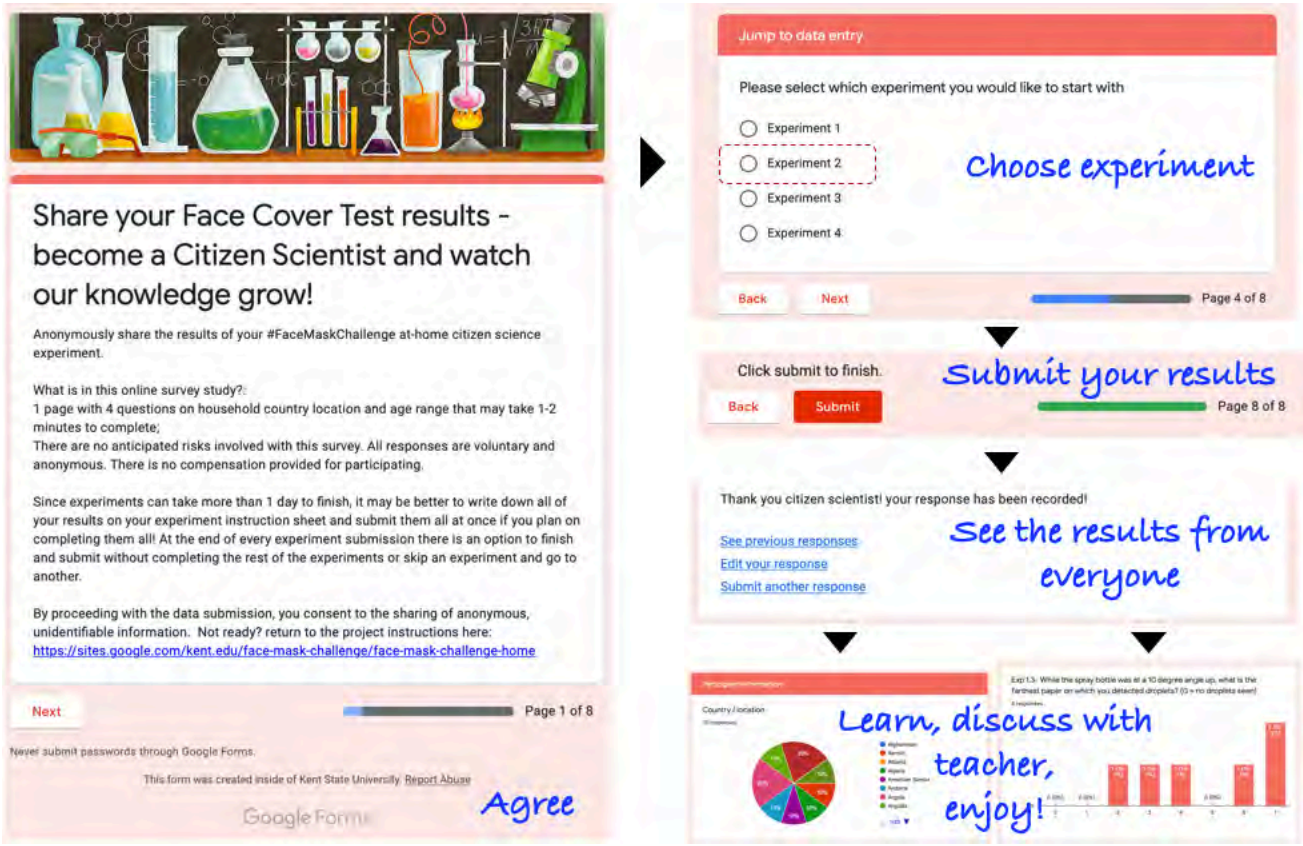
EXPERIMENT 2, continued

Answer the following Questions

*Q2.1 What was the farthest paper from the spray bottle on which you could see droplet stains?*_____
*Q2.2 How would you rate the number of droplets on the third paper?*_____



Share your results online at: https://bit.ly/facemaskchallengedata



or scan the QR code below

Take Home Message #FaceMaskChallenge Experiment 2:

- Microdroplet spray is reduced by a cloth barrier
- Most macro-droplets are contained by the face cover
- Some droplets get through and land on surfaces so…. **make sure to wash your hands, face covers and avoid touching objects to prevent the spread of illness!**

EXPERIMENT 3
How many germ-carrying droplets can cross cloth?

Core Concept: Sprayed microdroplets may transport bacteria and viruses far from the source.

Degree of Difficulty: Moderate. Hot liquids.

New Discovery: A face mask decreases the transport of droplets carrying bacteria and viruses by >98%.

Learning Objective: By using a spray bottle filled with a "germ solution" (diluted yogurt, soil) and catching the germs on gelatin growth plates, the goal of the experiment is to determine how many macroscopic and microscopic droplets containing germs can cross a face cover (1-layer vs. 2-layers).

Duration: 48-72 hours.

Germ growth plates and materials

(advanced, prepare 1 day ahead)

- *1* spray bottle.
- 1 oz. yogurt, soil, or other cultured food to make a germ-simulating solution.
- 2 empty cereal boxes (reuse box from **Experiment 2**).
- 6 shallow plastic containers at least 2-inch diameter, or *foil* cupcake liners.
- 1 tsp sugar.
- 1 cube beef bouillon (chicken is ok).
- 2 pack plain gelatin, ¼ ounce each.
- 1 cup water.
- Microwave and a 12 oz. glass container, or pot with lid to use on stovetop.
- Clear zip-lock bags.
- Clean face cover.

https://www.instructables.com/id/Homemade-Nutrient-Agar/

You can also purchase ready-to-use culture plates online, where available (e.g., Amazon, Columbia Blood Agar, 5% sheep blood, or tryptic soy agar)

Procedure:

Part A. *The day before* - Prepare the gelatin germ growth plates:

1. Mix 1 cup of water, 1 teaspoon sugar, and 1 beef broth bouillon cube in a microwaveable measuring container in the microwave for 2 minutes. Stir well when done, then heat for 2 more minutes. Leave the mixture inside the microwave to cool about 5 minutes.
2. Alternatively, over medium-low heat bring the water, sugar and bouillon to a low boil while stirring, boil for at least 2 minute. Cover with a tight-fitting lid and turn off heat. Allow the mixture to cool for several minutes.
3. **Put on your face cover and re-wash your hands** to avoid contaminating your plates!
4. Slowly add 2 packets of gelatin powder while stirring.
5. Then **carefully** pour the mixture into shallow round containers (for example, well-cleaned, recycled yogurt container lids) or *foil* cupcake tins about ½" (1cm) deep. You should get at least 6 growth plates. Immediately place poured gelatin plates in a covered container or plastic bag and leave unsealed to allow moisture to escape.
6. Place in a cool location to solidify overnight [a cool oven works well]. Plates must be cool prior to testing. **DO NOT touch the prepared gelatin with your fingers (this could contaminate them!).** Prepare at least 4 gelatin growth plates for Part D. You may want 2 extra plates for each additional type of cloth you want to test. You may wish to prepare 2 more plates for Experiment 4 below. Store in a sealed zip-top bag until use.

EXPERIMENT 3, continued

Part B. Prepare a germ solution:

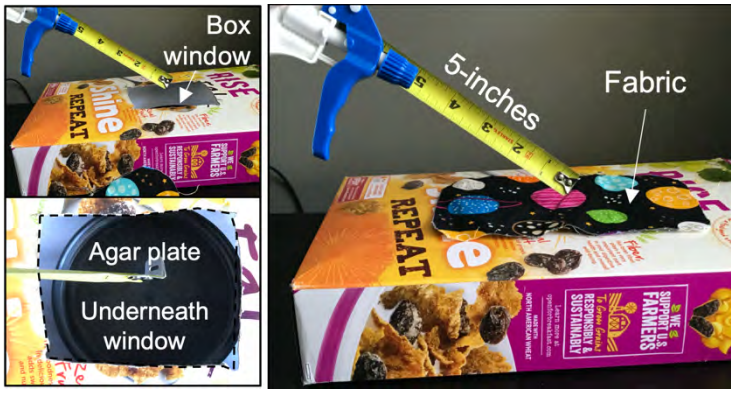
1. Add approximately 1 oz. (about 2 tablespoons) of yogurt or soil to about ½ cup warm water and gently mix until dissolved.
2. Put this solution into a clean spray bottle labelled "GERMS." Your solution contains harmless germs that will serve as living indicators to show how a face cloth prevents microscopic drops from spreading after a sneeze.

Part C. Prepare the test boxes:

1. Use the cereal box with windows from Experiment 2. Remove the cloth from the previous experiment and set aside.
2. Prepare a covered container ready to put the gelatin growth plates in, after they are sprayed, such as an uncut cereal box. Alternatively, a large zip-top bag over a clean plastic storage container can be used. This will be your germ-growing container.

Part D. The Experiment (to compare 1-layer vs. 2-layers):

1. While conducting the experiment **wear a FACE COVER** so you do not accidentally contaminate the plates. **DO NOT touch the prepared gelatin with your fingers** (this could contaminate them!).
2. Prepare 4 **gelatin growth plates** to test the effectiveness of cloth face covers. Label the plates as #0: (no cover), #1: (1-layer), #2: (2-layers), and #3: (the face cover you have been using). You will test 2 layers of cloth first.
3. Fold a piece of cloth in half. Cover the box window with **2 layers of cloth** – use masking tape to help keep it in place.
4. Turn the box flat so that the cloth-covered window is facing up. Place plate #2 in the box, under the covered window.
5. From about 5 inches away from the cloth, at about a 45 degree angle, spray TWICE into the window. Wait 30 seconds for microdroplets to land, then carefully slide the plate out of the test box into the germ growing box- be sure not to touch the gelatin!
6. Remove the cloth from the box. Wipe the test box with tissue and dispose of the tissue but save the box for the rest of the experiment.
7. **Repeat steps 2 – 6** using
   a. 1 layer of cloth (plate #1).
   b. your own face cover (plate #3).
   c. no cover (plate #0).
8. Close the germ growing container. Leave it in a warm place where it can stay undisturbed but observed for a few days (on top of the refrigerator works well).



9. Dispose of the box, used cloth, and tissues carefully. Clean the working area and wash your hands thoroughly!
10. Check the gelatin plates after **24-48 hours**. Remember to **wear your cleaned face cover and wash your hands before checking the plates**. Count the number of spots (colony forming units or **CFUs**) that have formed on each plate. If possible, leave the plates in container during observation. Do NOT touch the surface of the plates! You can use the same box for **Experiment 4**.

EXPERIMENT 3, continued

Finish:

1. Record your data in the table below.
2. Wash your hands after observing the plates.
3. Repeat the observation after 48 hours. Record the number of Colony forming units (CFU).
4. Dispose of the germ plates in the trash, wash the area thoroughly and finally re-wash your hands.

Share your data: enter the results of Column G in the form here:
https://docs.google.com/forms/d/e/1FAIpQLSd9cV7HQzxr49MsC-icHCzxIOnlhX2z7e7iza3cJ-NGzJaFRw/viewform

Table 2. Enter below the results of Experiment 3.
CFU: number of colonies on the agar

	A	B	C	D	E	F	G
Plate	CFU at 0 hour	CFU at 24 hours	CFU at 48 hours	Diameter of plate in cm	Radius of plate (one half of column D) in cm	Area of plate = pi x r^2= (3.14 x radius x radius) in cm^2	**CFU/cm^2 (column C divided by column F)**
0	0						____=Baseline G
1	0						
2	0						
3	0						

Answer the following Questions

Q3.1 *What did you observe?*

Q3.2 *Was one layer of cloth effective in preventing germ transfer?*

Q3.3 *Were two layers of cloth equally or more effective than one layer?*

Q3.4 *Can one or two layers of cloth contain all the germs produced by sneezing?*

Q3.5 *Was your face cover better than no cover at preventing germ transfer?*

Share your results online at: https://bit.ly/facemaskchallengedata or scan the QR code below

Take Home Message #FaceMaskChallenge Experiment 3:

- One layer of cloth should help contain germs, but it is not the best
- Two layers of cloth are even better!
- Even with two layers of cloth not every single droplet is trapped in the face covering **so it is very important to wash your hands and practice good hygiene!**
- Since germs in microdroplets are trapped in your face **cover it is important you regularly wash your face covering!**

EXPERIMENT 4
How many germs come out of my mouth as I speak?

Core Concept: We all produce microdroplets containing germs while we speak.

Degree of Difficulty: Moderate.

New Discovery: A face cover stops our saliva droplets from contaminating the environment.

Learning Objective: By speaking with or without a face mask and catching the germs on gelatin growth plates, the goal of the experiment is to determine how effectively cloth barriers prevent the spread of oral droplets.

Duration: 48-72 hours.

Materials (advanced, prepare 1 day ahead)

- 2 gelatin germ growth plates (See Experiment 3).
- 1 empty cereal box for incubating germ growth plates.
- Cloth face mask or covering with 2 layers of textile that cover both nose and mouth.
- Or piece of preferred fabric.

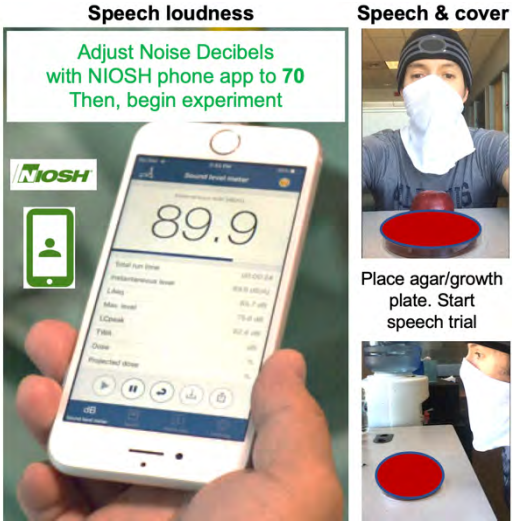
Procedure:

Part A. ***The day before*** - Prepare gelatin germ (or purchase agar) plates – see **Experiment 3** Part A.

Part B. The Experiment (to determine how many droplets we produce when we speak out loud)**:**

1. Download the free CDC Noise App to a smart phone, open it, and adjust laoudness of speech to 70 decibels.
2. Label 2 gelatin growth plates as "#4 openspeech" and "#5 coveredspeech".
3. Prepare a covered container ready to put the plates in after being sprayed. An uncut cereal box would be best. Alternatively, a large zip-top bag over a clean plastic storage container can be used. This will be your incubation container.
4. Sit at a table and place a gelatin growth platemarked "#4 openspeech" on the table about 8 inches away from your mouth.
5. Take a sip of water and read the following passage slowly and clearly as if you were speaking to someone across the room (~70 decibels at arm's length):

"I am a citizen scientist. I am going to read this out loud as an experiment to test the importance of face covers. I want to see how many droplets of saliva I produce that contaminate the environment as I count from 1 to 100. […count out loud to 100]. Thank you and best wishes for good health!"



6. Carefully transfer the #openspeech plate to the incubation container.
7. **Cover your face and nose with double layer of cloth**.
8. Sit at a table and place a gelatin growth plate marked "#5 coveredspeech" on the table about 8" away from your mouth.
9. **Repeat** the speech at step 4, above and carefully transfer the #5 coveredspeech plate to the incubation container.
10. Close the incubation container. Leave it in a warm place where it can stay undisturbed but observed for about 2 days (on top of the refrigerator works well).
11. Check the germ plates after 24 hours. Remember to **wear your cleaned face cover and wash your hands before checking the plates**. Count the number of spots (colony forming units or CFUs) that have formed on each plate.

EXPERIMENT 4, continued

Finish:

1. Record your data in the table below.
2. Wash your hands after observing the plates.
3. Repeat the observation after 48 hours. Record the CFU counts.
4. Dispose of the germ plates and the growing box in the trash, wash the area thoroughly and finally re-wash your hands.
5. Share your data: enter the results of Column G in the form here: https://bit.ly/facemaskchallengedata

Table 3. Enter below the Results of Experiment 4

	A	B	C	D	E	F	G
Plate	CFU at 0 hour	CFU at 24 hours	CFU at 48 hours	Diameter of plate in cm	Radius of plate (one half of column D) in cm	Area of plate = pi x r^2= (3.14 x radius x radius) in cm^2	**CFU/cm^2 (column C divided by column F)**
4	0						____=Baseline G
5	0						

Answer the following Questions

*Q4.1 What did you observe?*_____

*Q4.2 Was a two-layer face cover effective at preventing germ spread?*_____

*Q4.3 Did the cloth contain all the germs?*_____

*Q4.4 What other hygiene is necessary for effective germ spread?*_____

Share results online here: https://bit.ly/facemaskchallengedata or scan the QR code below

Take Home Message #FaceMaskChallenge Experiment 4:

- We spread a lot of invisible germs simply by talking – keep this in mind when you are practicing social distancing
- A part of the solution to COVID or other infections spread by droplet is to wear a face cover and practice careful handwashing and hygiene. Spread the word! Print and post reminder signs:

https://figshare.com/articles/Door_Signs_to_Promote_Public_Droplet_Safety_Amidst_COVID-19/12202808/1

For teachers: The phone App shown in the figure in page 10 and the scientific details of **Experiment 4** are described in https://doi.org/10.3389/fmed.2020.00504

Additional resources

Glossary

Aerosol: a substance that can travel through the air with no liquid. A tiny portion of a human sneeze becomes aerosol.
Colony forming unit (CFU): an estimate of the number of viable (reproducing) bacteria in a sample; a cluster of reproducing bacteria that is large enough to see with an unaided eye.
Droplet: a substance carried in a tiny volume of liquid in which surface tension defines the shape. Most of a human sneeze is droplets.
Epidemic: widespread occurrence of an infectious disease in a community.
Face mask or face cover: any piece of cloth placed over the mouth and nose to prevent spread of respiratory infections.
Medical or surgical mask: personal protective equipment meeting specific manufacturing standards; reduces the spread of infections among healthcare workers and patients.
Pandemic: infectious disease that is prevalent across many communities.
Virus: a particle as small as 20 nanometers that can enter and infect cells. Viruses multiply inside their host's cells using the host's cellular material. Thousands of new virus particules erupt from the cell and escape to new hosts by way of cell fluid.

Links to other resources

Face Mask Challenge Citizen Science module (website)
https://sites.google.com/kent.edu/face-mask-challenge/face-mask-challenge-home
Encyclopedia Britannica: COVID-19 https://www.britannica.com/explore/savingearth/covid-19/
The Scale of Things – Nanoscales https://www.nano.gov/nanotech-101/what/nano-size
Face Mask Challenge Citizen Science Data sharing form
https://docs.google.com/forms/d/e/1FAIpQLSd9cV7HQzxr49MsC-icHCzxIOnlhX2z7e7iza3cJ-NGzJaFRw/viewform
Printable Door sign reminders to encourage wearing face masks
https://figshare.com/articles/Door_Signs_to_Promote_Public_Droplet_Safety_Amidst_COVID-19/12202808/1
NIOSH Sound Level Meter App: https://www.cdc.gov/niosh/topics/noise/app.html

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Cartoonist: Maddie Rosemark

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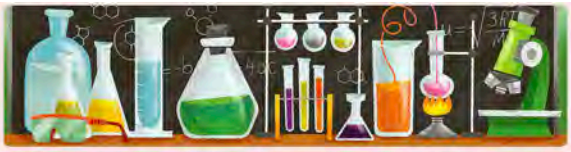
Translations: Juan Jose Alava, Diana M. Rodriguez, Diego A. Pulido, Zisis Kozlakidis, Antonio Jr. Pereira, Alex Rodriguez-P & Maissa Zeghidi.

Versions in four additional languages (Spanish, English, French, Portuguese)are part of the initial submission and are linked via https://sites.google.com/kent.edu/face-mask-challenge/face-mask-challenge-home

Contact us if you wish to provide a comment or translation. A GitHub repository has been created for direct archive of post-publication contributions made by the community. Alex Rodriguez-Palacios. Assistant Professor, School of Medicine: axr503@case.edu



Share your Face Cover Test results - become a Citizen Scientist and watch our knowledge grow!

Anonymously share the results of your #FaceMaskChallenge at-home citizen science experiment.

What is in this online survey study?:
1 page with 4 questions on household country location and age range that may take 1-2 minutes to complete;
There are no anticipated risks involved with this survey. All responses are voluntary and anonymous. There is no compensation provided for participating.

Since experiments can take more than 1 day to finish, it may be better to write down all of your results on your experiment instruction sheet and submit them all at once if you plan on completing them all! At the end of every experiment submission there is an option to finish and submit without completing the rest of the experiments or skip an experiment and go to another.

By proceeding with the data submission, you consent to the sharing of anonymous, unidentifiable information. Not ready? return to the project instructions here:
https://sites.google.com/kent.edu/face-mask-challenge/face-mask-challenge-home

Next

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Share your Face Cover Test results - become a Citizen Scientist and watch our knowledge grow!

* Required

Participant information

#FaceCoverChallenge

Clicking the 'YES, I Agree' option indicates that you have read the above information, voluntarily agree to participate, and that you are 18 years of age or older. If you do not wish to participate, please click, "NO, I do not wish to participate in the data submission", or simply close this window. If you agree to participate you will be automatically directed to the data submission form. *

- ◯ Yes, I agree to participate and volunteer information. (click NEXT to proceed)
- ◯ No, I do not wish to participate. (click NEXT to exit)

Is this your first FaceCoverChallenge data submission? *

Choose

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Share your Face Cover Test results - become a Citizen Scientist and watch our knowledge grow!

* Required

Participant information

We want to learn about the Citizen Scientists! please tell us about yourself then continue to enter anonymous results from your own Face Cover Challenge

Country / location *

Choose

How old are you – the Scientist? *

Your answer

About how many years old is the oldest person in your home? (If you live alone answer the same as the youngest person in your home) *

Your answer

What is the education grade level of the Citizen Scientist?

Choose

Share your Face Cover Test results - become a Citizen Scientist and watch our knowledge grow!

Jump to data entry

Please select which experiment you would like to start with

- (●) Experiment 1
- ( ) Experiment 2
- ( ) Experiment 3
- ( ) Experiment 4

Clear selection

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Experiment 1 -How far can droplets travel?

Exp.1.1 While the spray bottle was flat what is the farthest paper on which you detected droplets? (0 = no droplets seen)

	0	1	2	3	4	5	6	7	
Closest to Spray Bottle	○	○	○	○	○	○	○	○	Furthest from Spray Bottle

Exp.1.2 - While the spray bottle was flat how would you describe the amount of droplets contaminating the third paper?

- ( ) Low (0-10)
- ( ) Medium (11-100)
- ( ) High (100-500)
- ( ) Very High (500+)

Exp.1.3- While the spray bottle was at a 10 degree angle up, what is the farthest paper on which you detected droplets? (0 = no droplets seen)

	0	1	2	3	4	5	6	7	
Closest to Spray Bottle	○	○	○	○	○	○	○	○	Furthest From Spray Bottle

Exp.1.4 - While the spray bottle was angled 10 degrees angled up how would you describe the amount of droplets contaminating the third paper?

- ◯ Low (0-10)
- ◯ Medium (11-100)
- ◯ High (100-500)
- ◯ Very High (500+)

Exp.1.5 - While the spray bottle was at a 10 degree angle down what is the farthest paper on which you detected droplets? (0 = no droplets seen)

	0	1	2	3	4	5	6	7	
Closest to Spray Bottle	◯	◯	◯	◯	◯	◯	◯	◯	Furthest from spray bottle

Exp.1.6 - While the spray bottle was 10 degrees angled down how would you describe the amount of droplets contaminating the third paper?

- ◯ Low (0-10)
- ◯ Medium (11-100)
- ◯ High (100-500)
- ◯ Very High (500+)

Exp.1.7 - What bottle position had the furthest spray?

- ◯ Bottle flat
- ◯ Bottle angled 10 degrees up
- ◯ Bottle angled 10 degrees down
- ◯ Other:

Would you like to go on to another experiment or finish and submit?

- ◉ Experiment 2
- ◯ Experiment 3
- ◯ Experiment 4
- ◯ Finish and Submit

Clear selection

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Experiment 2 - How well does a cloth / textile barrier stop droplets?

Exp.2.1 - What type of cloth / textile barrier did you use? (you may select multiple options)

- [ ] Cotton
- [ ] Polyester
- [ ] Cotton / poly mix
- [ ] Silk
- [ ] wool
- [ ] Towel
- [ ] synthetic fiber
- [ ] T-shirt
- [ ] Scarf
- [ ] Other:

Exp.2.2 - WITH TEXTILE BARRIER: What is the farthest paper away from the spray source on which you detected droplets? (0 = no droplets seen)

	0	1	2	3	4	5	6	7	
closest to the spray bottle	○	○	○	○	○	○	○	○	furthest from the spray bottle

Exp.2.3 - WITH TEXTILE BARRIER: How would you describe the number of droplets contaminating the third paper?

- ○ Low (0-10)
- ○ Medium (11-100)
- ○ High (100-500)
- ○ Very High (500+)

Would you like to go on to another experiment or finish and submit?

- ○ Experiment 1
- ◉ Experiment 3
- ○ Experiment 4
- ○ Finish and Submit

Clear selection

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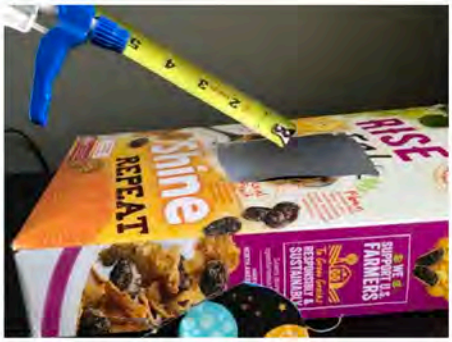
Experiment 3 - How many germs cross a cloth / textile barrier?

Exp.3- PLATE 0 NO CLOTH / TEXTILE COVER (column G: colonies / cm2)



Your answer

Exp.3 - PLATE 1 WITH 1 LAYER OF TEXTILE COVER (column G: colonies / cm2)

Your answer

Exp.3- PLATE 2 WITH 2 LAYERS OF TEXTILE COVER (column G: colonies / cm2)

Your answer

Exp.3 - PLATE 3 with your own TEXTILE FACE COVER (column G: colonies / cm2)

Your answer

Would you like to go on to another experiment or finish and submit?

- ○ Experiment 1
- ○ Experiment 2
- ◉ Experiment 4
- ○ Finish and Submit

Clear selection

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Experiment 4 - How many germs come out of my mouth as I speak?

Exp.4 - PLATE 4, NO TEXTILE COVER: Uncovered speech (column G: colonies / cm2)

Your answer

Exp.4 - PLATE 5, WITH TEXTILE FACE COVER: Covered speech (column G: colonies / cm2)

Your answer

Would you like to go back to another experiment or finish and submit?

- ○ Experiment 1
- ○ Experiment 2
- ○ Experiment 4
- ◉ Submit and Finish

Clear selection

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Click submit to finish.

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COLLECTIVE RESULTS

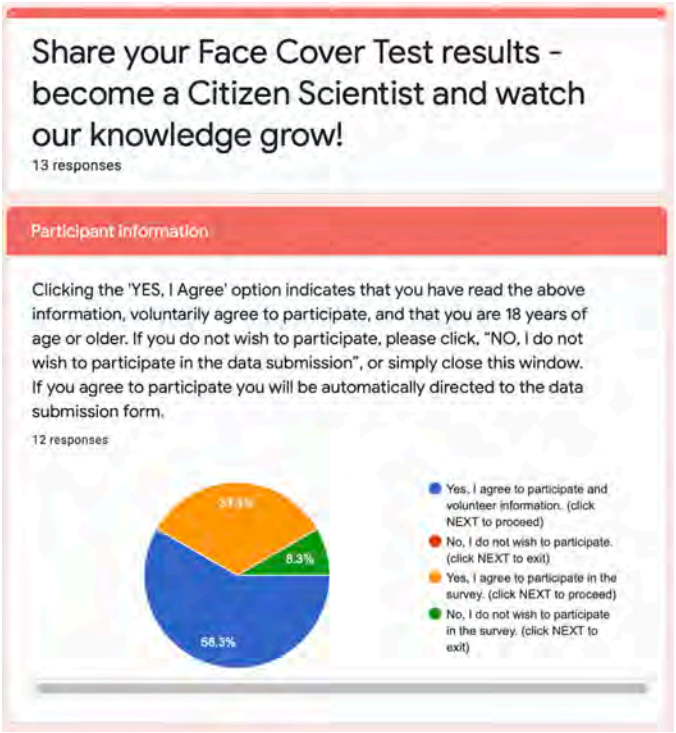
(below is a mock series or random responses for illustration)
Please only enter real results so we all could see the real findings.
If some results do not resemble your data, discuss with a teacher.
And ask/read the real laboratory experiment results that were obtained in a Medical Research Center.
Original studies are published here:

https://doi.org/10.3389/fmed.2020.00260 https://doi.org/10.3389/fmed.2020.00504

Textile Masks and Surface Covers—A Spray Simulation Method and a "Universal Droplet Reduction Model" Against Respiratory Pandemics. Rodriguez-Palacios A, Cominelli F, Basson AR, Pizarro TT, and Ilic S. (2020) Front. Med. 7:260. doi: 10.3389/fmed.2020.00260

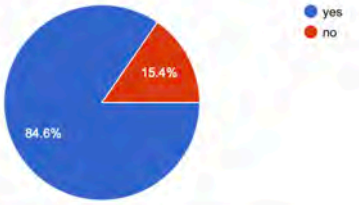
Germ-Free Mice Under Two-Layer Textiles are Fully Protected From Bacteria in Sprayed Microdorplets: A Functional in-vivo Test Strategy of Facemasks and Filtration Materials. Rodriguez-Palacios A, Conger M, and Cominelli F. (2020) Front. Med. 7:504. doi: 10.3389/fmed.2020.00504

A Citizen Science Facemask Experiment and Educational Modules to Increase Coronavirus Safety in Communities and Schools. Eichler SE, Hopperton AP, Alava JJ, Pereira A, Ahmed R, Kozlakidis Z, Ilic S and Rodriguez-Palacios A (2020) Front. Med. 7:486. doi: 10.3389/fmed.2020.00486
https://doi.org/10.3389/fmed.2020.00486



Is this your first FaceCoverChallenge data submission?

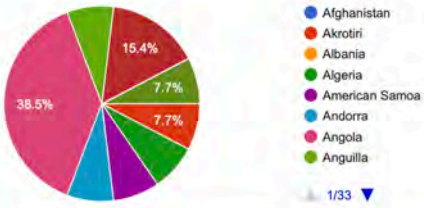
13 responses



Participant information

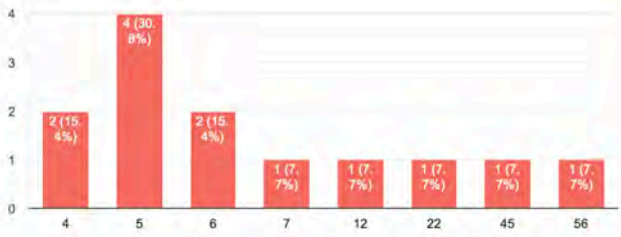
Country / location

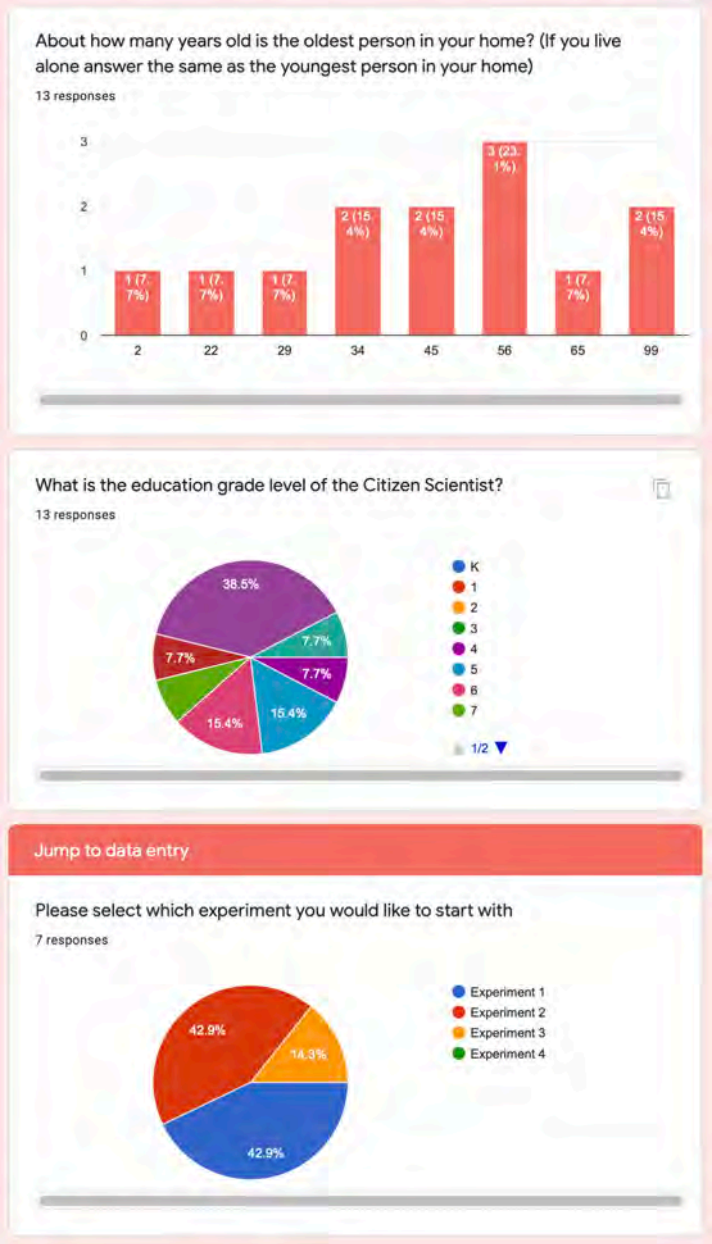
13 responses



How old are you - the Scientist?

13 responses





See remaining results in response form link https://docs.google.com/forms/d/e/1FAIpQLSd9cV7HQzxr49MsC-icHCzxIOnlhX2z7e7iza3cJ-NGzJaFRw/viewform