**Data Analysis: Face Masks**

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Learning Target: I can use evidence to explain effectiveness of different measures used to reduce the transmission of a virus.

Question: Why does the Center for Disease Control (CDC) recommend the use of face masks in public areas where social distancing is not possible?

Claim: The [CDC](https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/masks-protect-you-and-me.html) (Center for Disease Control) states that cloth face coverings will help prevent people who have COVID-19 from spreading the virus to others.

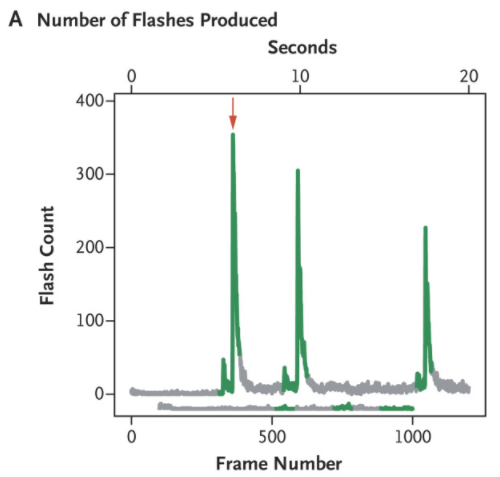
1. **Describe how the evidence from each experiment below supports the CDC claim.**

**Experiment 1** ([N Engl J Med](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7179962/). 2020 Apr 15. Visualizing Speech-Generated Oral Fluid Droplets with Laser Light Scattering)

In this experiment, a man speaks the words “Stay Healthy” into a closed box.  As exhaled droplets pass a laser light, the droplets show up as flashes and a computer counts them.  After doing this 3 times, he repeats the experiment but covers his mouth with a slightly damp cloth.

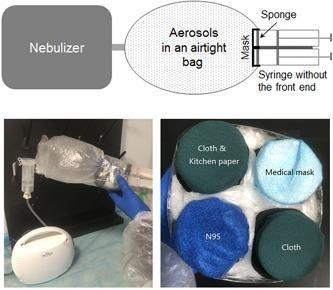
a) Video data from the experiment: <https://www.nejm.org/doi/full/10.1056/NEJMc2007800>

Evidence:

b) The graph shows the flash count each of the 3 times the man spoke. Peaks indicate spoken words with no cloth. The number of flashes was highest (arrow) when the “th” sound in the word “healthy” was pronounced. The lower line on the graph shows the results when the speaker’s mouth was covered with a cloth. 

Evidence:

**Experiment 2** ([J Med Virology](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7228401/). 2020 Mar 25. Potential utilities of mask‐wearing and instant hand hygiene for fighting SARS‐CoV‐2 Qing‐Xia Ma College of Veterinary Medicine, Qingdao Agricultural University, Qingdao, China)

c) In this experiment, a device was created to mimic human breathing through a mask.  Avian flu virus particles were dissolved in water and “nebulized” to 3-5 micrometers in size. These passed into one of 4 syringes, each covered with a different mask material.  One layer of polyester cloth was used as a control group. The syringes brought in air by moving the plunger in/out 100 times.  This modeled standing next to someone who was very contagious for several minutes.  Any virus that passed the mask was caught in a sponge, which was then tested for amount of virus using a PCR test.  

**Table 1.** Percentage of Avian Influenza Virus blocked by masks

|  |  |
| --- | --- |
|  | **Percentage blocked** (95% Confidence Interval) |
| N95 mask | **99.98%** (99.98%‐99.99%) |
| Medical mask | **97.14%** (94.36%‐98.55%) |
| Homemade mask | **95.15%** (90.97%‐97.39%)  (made with 1 layer cloth and a 4 layer paper towel) |

Evidence:

1. **Write a CER paragraph that supports the CDC claim. Restate the claim, list the key evidence, and explain how the evidence supports the claim.**

CDC Claim:

Evidence:

Reasoning:

**Extension Activity: The Math Behind Masks**

Face masks reduce the transmission of a virus by helping to protect both the wearer and the people around them. Widespread mask use could stop the spread of Covid-19. You will explore an interactive website that demonstrates the “Multiplicative Power of Masks” to answer the following questions.

1. Go to the website: <https://aatishb.com/maskmath/>

* Watch the video “Why Masks Work BETTER Than You Think”
* Skim through the interactive essay and explore what happens when you change the simulation settings

1. Scroll to the section titled “How To Stop An Epidemic” (about ¾ of the page down). Find the simulation titled “How Masks Reduce R0.” R0 is the average number of people that a contagious person will infect. For Covid-19, R0 is about 2.5.
   1. Why must R0 be less than 1 to slow the spread of Covid-19?
   2. Set R0 to 2.5. Assuming that masks are properly fitted, approximately what percentage of people need to wear masks to reduce R0 to 1? You can use Table 1 in Experiment 1 from the previous activity as a reference for mask effectiveness.
2. Go to the next simulation titled “How Masks Reduce Infections.” Let’s assume that 75% of people wore masks that were 50% effective.
   1. Would Covid-19 be eradicated?
   2. Now let’s assume that those same people also practiced social distancing. How would this affect R0?
3. Based on what you have learned about masks, what steps can you take to slow the spread of Covid-19?
4. Why does wearing masks need to be a collective action?