# How to choose the best mask to protect the ones you love

**Project #15**

# Problem

Covid is very contagious. Contagious means it spreads very quickly and easy . Covid is airborne and spread by coughs and sneezes. It maters because  it killed world wide millions of people! This can save every one if you wear a appropriate  mask that won’t let covid through!!!

# Purpose

The purpose of my project is to test the hypothesis some mask work better then others at not letting sarscov2 through.

# Facts about covid

•The sarscov-2 virus is very contagious!!! Sarvscov 2 is the virus that causes the disease covid. Some people who get it  get very sick others don’t get sick at all. It Is hard to control from spreading.

•One thing people can do is wear a mask . Masks can prevent the virus from becoming airborne .

•Masks are made up of different  materials not all materials have same spacing  . They may not all prevent the spread of sarscov-2.

# Facts about covid

- Sarscov2 is 120 nanometers . That’s super small!!!
- You need a electron microscope to see it .
- I can't do a test with live virus so I will model spit droplets with visible glitter particles (that were different sizes).
- This experiment is important to make sure people are wearing appropriate masks.

# The metric system & My project

| Length | Length in nanometers |
|---|---|
| 1 kilometer | 1,000,000,000,000 |
| 1 meter | 1,000,000,000 |
| 1 centimeter | 10,000,000 |
| 1 millimeter | 1,000,000 |
| 1 micrometer | 1000 |
| 1 nanometers | 1 |

# The metric system & My project

| Particle | Size |
|---|---|
| Me! (height) | 1,422,400,000 nm |
| Large glitter particle | 200 micrometers (200,000 nanometers) |
| Medium glitter particle | 100 micrometers (100,000 nanometers) |
| Small glitter particle | 10-50 micrometers (10,000-50,000 nanometers) |
| Sarscov2 | 120 nanometers |
| water | 0.27 nanometers |
| Carbon dioxide | 0.33 nanometers |
| oxygen | 0.12 nanometers |

# Hypothesis

- My Hypothesis is that surgical +kn95 masks are the best at protecting us from covid. Because they have very small holes that lets air through but not bigger things.
- I think the Bandana is the worst. Because it has huge holes in it.

# Materials

- milk jugs
- Chicken stand
- Scissors
- Lovie
- Glitter
  - big 200 micrometers
  - medium 100 micrometers
  - small 10 to 50 micrometers
- Rubber Bands
- Pencil
- Masks
  - Bandana
  - Cloth –single layer
  - Cloth – double layer
  - kn95
  - Surgical
  - Filter for cloth mask
- Face shield
- Spray bottle
- Water
- Baking soda
- Basin, white
- ¼ Teaspoon
- 1 tablespoon
- Camera
- litmus paper
- Plastic page protector

# Mask Types

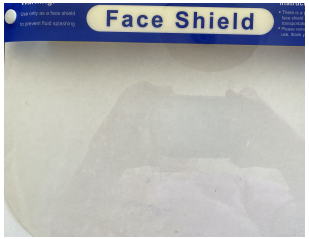
Bandana

cloth - double layer

cloth - single layer

cloth - double + filter

Faceshield




KN95


Surgical

# Procedure - part 1

1) Cut off the bottom of the milk jug

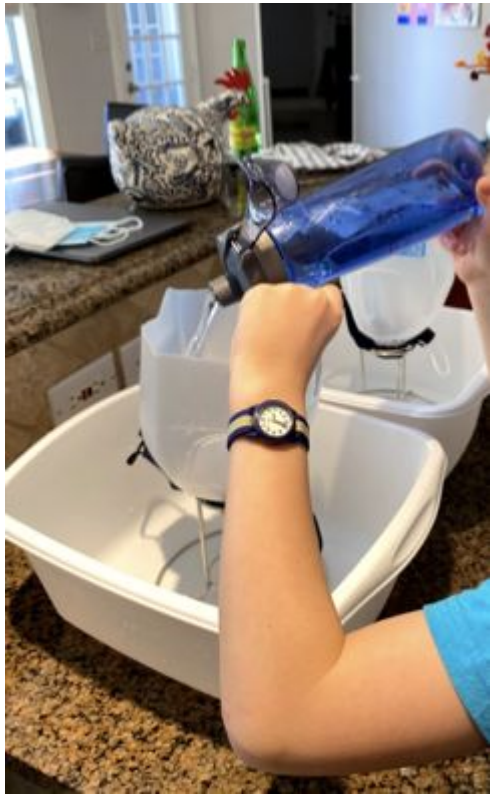
2) throw the cap in the trash

3) put a mask on the small opening  of the jug and connect it with  3 rubber bands.

4 ) put ¼ teaspoon (1.23 ml) of glitter + 1000 ml water into the milk jug  dump the water +slowly hold milk jug

5 ) set a timer . Count the glitter glitter particles in the tub after all the water emptied or 3 hours pasted

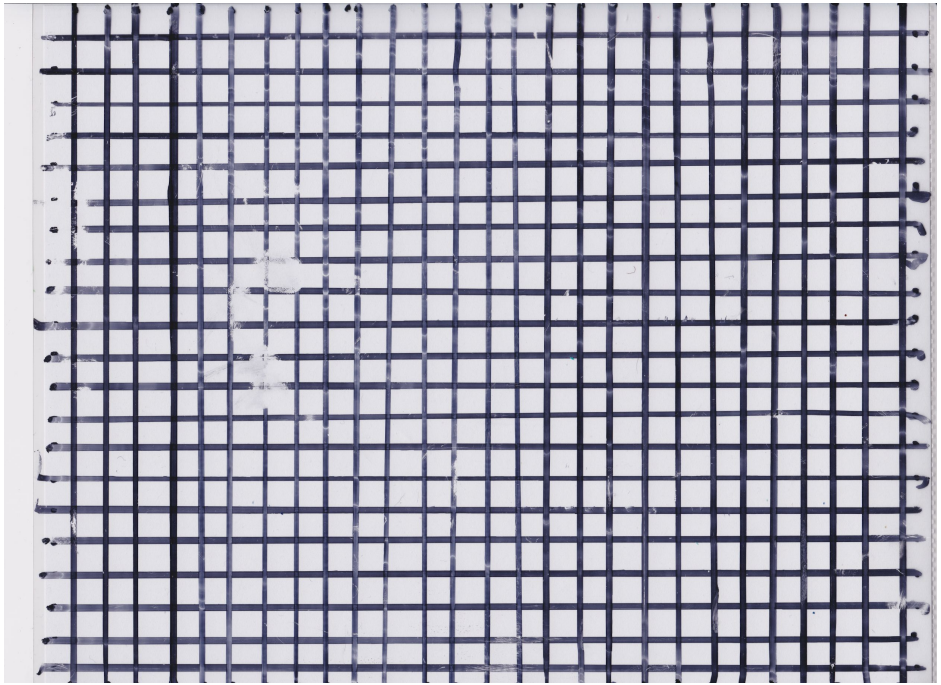
6 ) repeat the process with each mask all three glitter sizes .

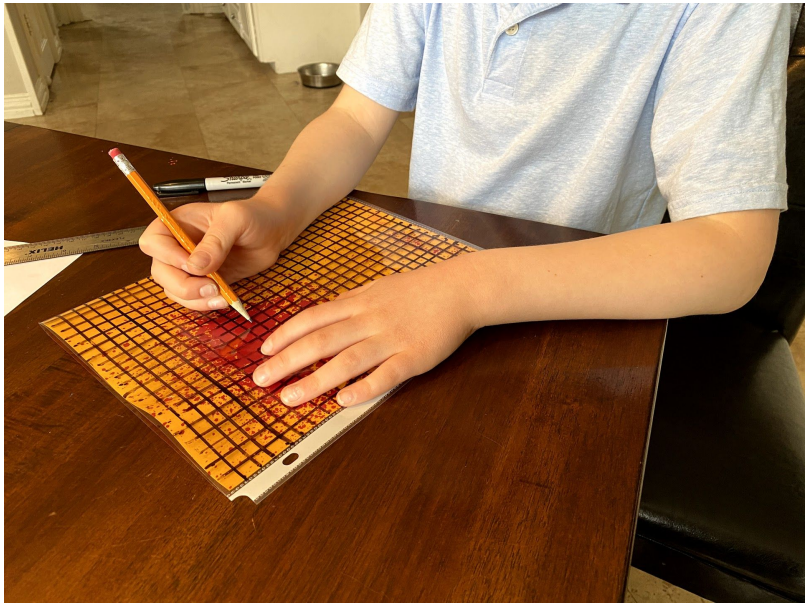


# Procedure - part 2

1) mark off 0 feet, ½ foot (0.15 meters), 1 foot (0.3 meters), 3 feet (0.9 meters), and 6 feet (1.8 meters) on a wall
2) Hung up litmus paper
3) mix 1 tablespoon (14.8 ml) of baking soda with 1000 ml water in a spray bottle on a chimpanzee or big lovie  with 2 rubber bands
4) place a mask on the chimpanzee
5) spray from each distance.  change the litmus paper each time
6) repeat with each mask .
7) I counted how many 1 cm by 1 cm squares were red there is on the litmus paper inside the grid for each distance and mask .
*Important - litmus paper turns red when sprayed with baking soda water

# Counting Grid





# Procedure - part 3

| Ranking Rules | Most effective (score 0) | Somewhat Effective (score of 1) | Not effective (score 2) |
|---|---|---|---|
| **Distance** | No spray | 0-1 foot | 3-6 feet |
| **Small Glitter Filtration Amount** | None seen | small amount | large amount |

- I scored the masks by most effective, somewhat effective, and not effective.
- I chose the small glitter because it is smaller because it is closest to the size of sarscov2.
- I chose the 3-6 feet as not effective because that is the distance that kids are being separated from the others at school.

# Data

| Amount of glitter particles filtered | | | |
|---|---|---|---|
| **Mask Type** | **Large (200 micrometer)** | **Medium (100 micrometers)** | **Small (10-50 micrometers)** |
| Bandana | 12 | too many to count | too many to count |
| Cloth - double layer | 24 | 43 | tiny amount |
| Cloth - single layer | 10 | too many to count | too many to count |
| Cloth double layer + filter | 34 | 33 | tiny amount |
| Faceshield | too many to count | too many to count | too many to count |
| KN95 | 7 | 11 | 0 |
| KN95 + surgical | 11 | 10 | 0 |
| Nothing | too many to count | too many to count | too many to count |
| Surgical | 0 | 16 | 0 |
| Surgical + cloth double layer | 3 | 26 | 0 |

# Observations

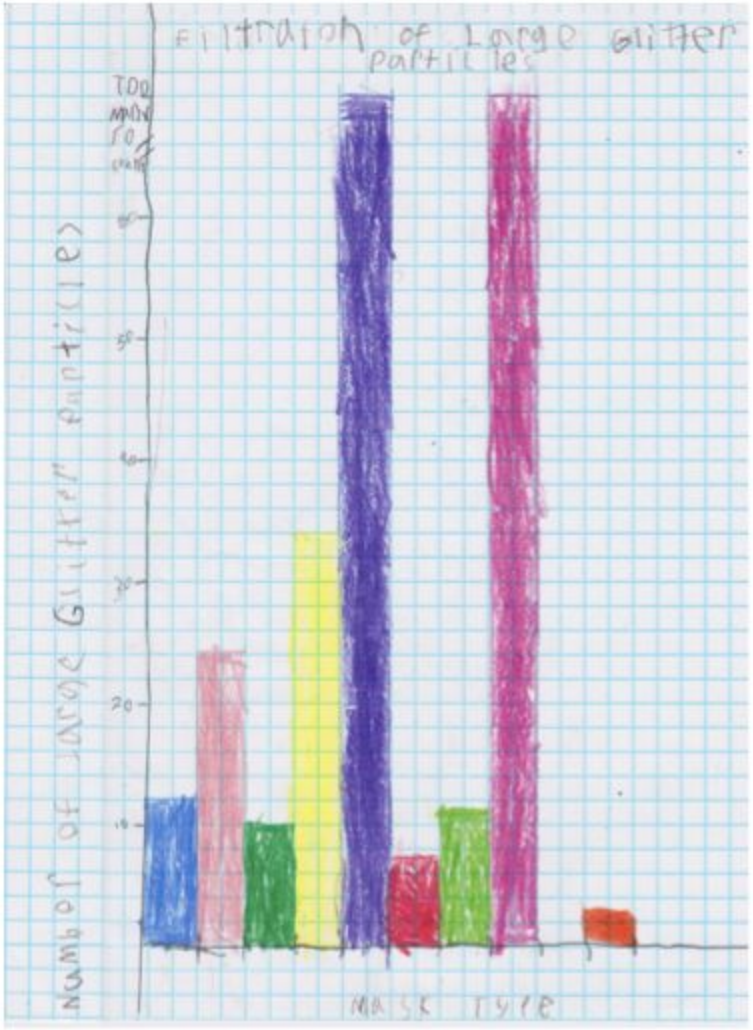
- Part 1
  - Water did not dribble through the masks at the same speed.
  - Water was coming out through the side where the mask (especially the kn95s) where it was attached to the milk jug by rubber bands.

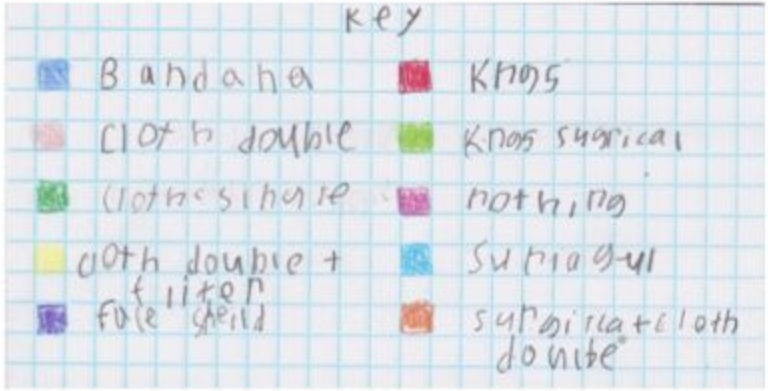
- Part 2
  - When I sprayed baking soda water using the spray bottle behind the face shield water sprayed on the side of the wall and on my feet!

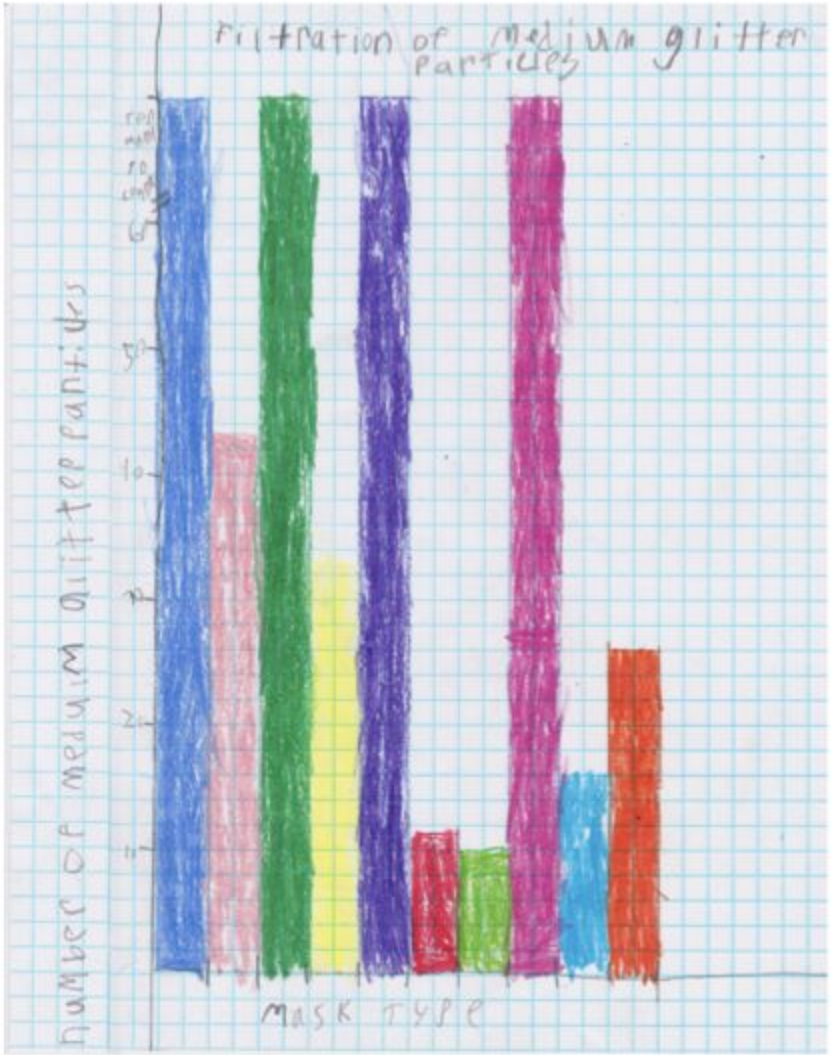
# Data

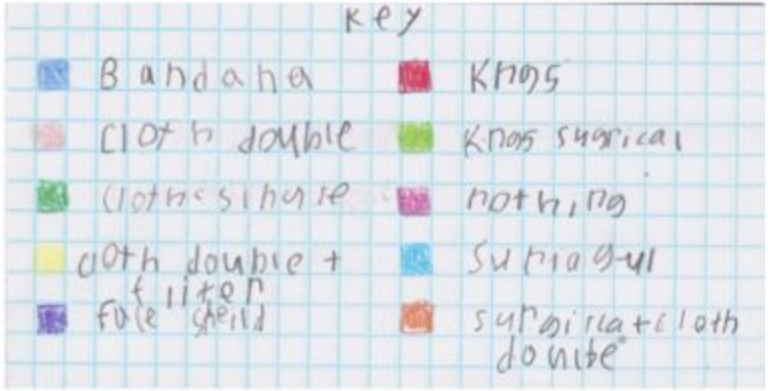
| Splatter Amount (# of cm's squared at least 1/2 filled) | | | | | |
|---|---|---|---|---|---|
| **Mask Type** | **0 feet** | **0.5 feet** | **1 foot** | **3 feet** | **6 feet** |
| **Bandana** | 3 | 87 | 14 | 3 | 0 |
| **Cloth - double layer** | 2 | 0 | 1 | 0 | 0 |
| **Cloth - single layer** | 40 | 47 | 16 | 3 | 2 |
| **Cloth double layer + filter** | 0 | 0 | 0 | 0 | 0 |
| **Faceshield** | 38 | 110 | 19 | 0 | 0 |
| **KN95** | 0 | 0 | 0 | 0 | 0 |
| **KN95 + surgical** | 0 | 0 | 0 | 0 | 0 |
| **Nothing** | 19 | 29 | 138 | 5 | 6 |
| **Surgical** | 0 | 0 | 0 | 0 | 0 |
| **Surgical + cloth double layer** | 0 | 0 | 0 | 0 | 0 |

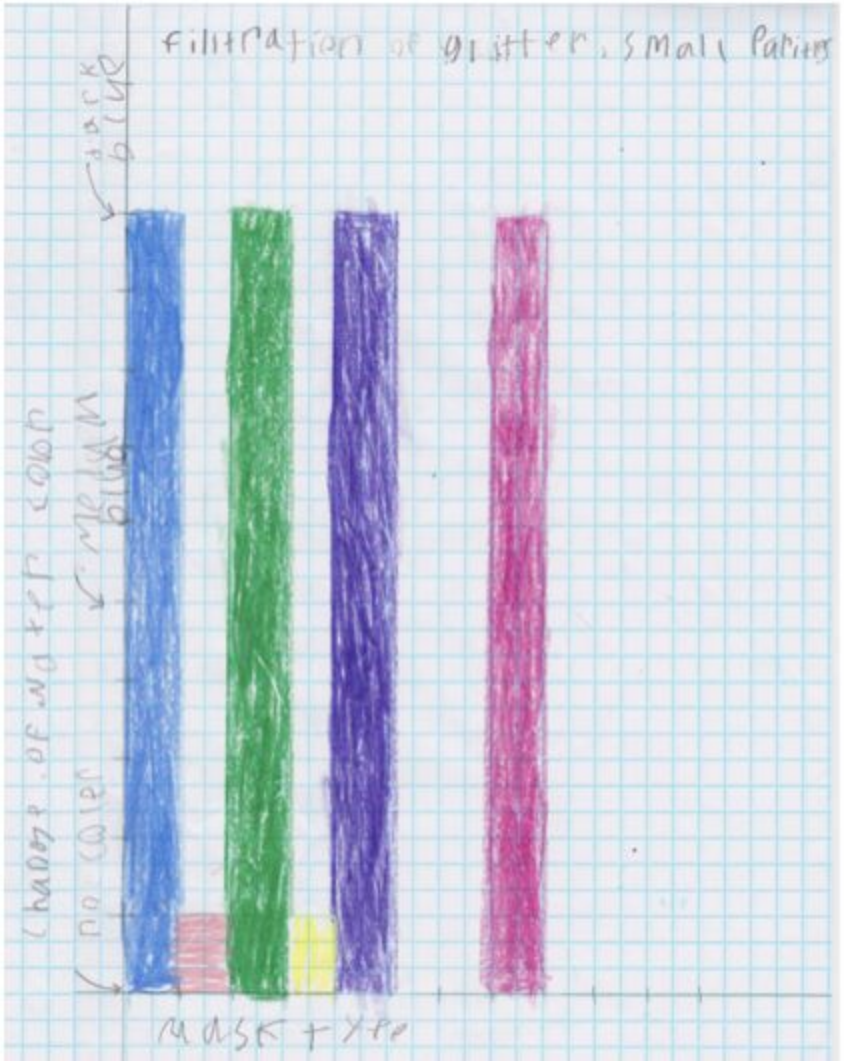
# Results

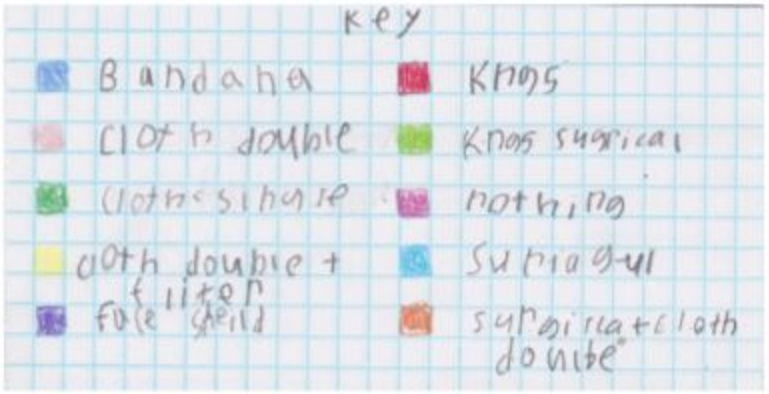

Filtration of Large Glitter particles
Number of large Glitter particles
MASK TYPE

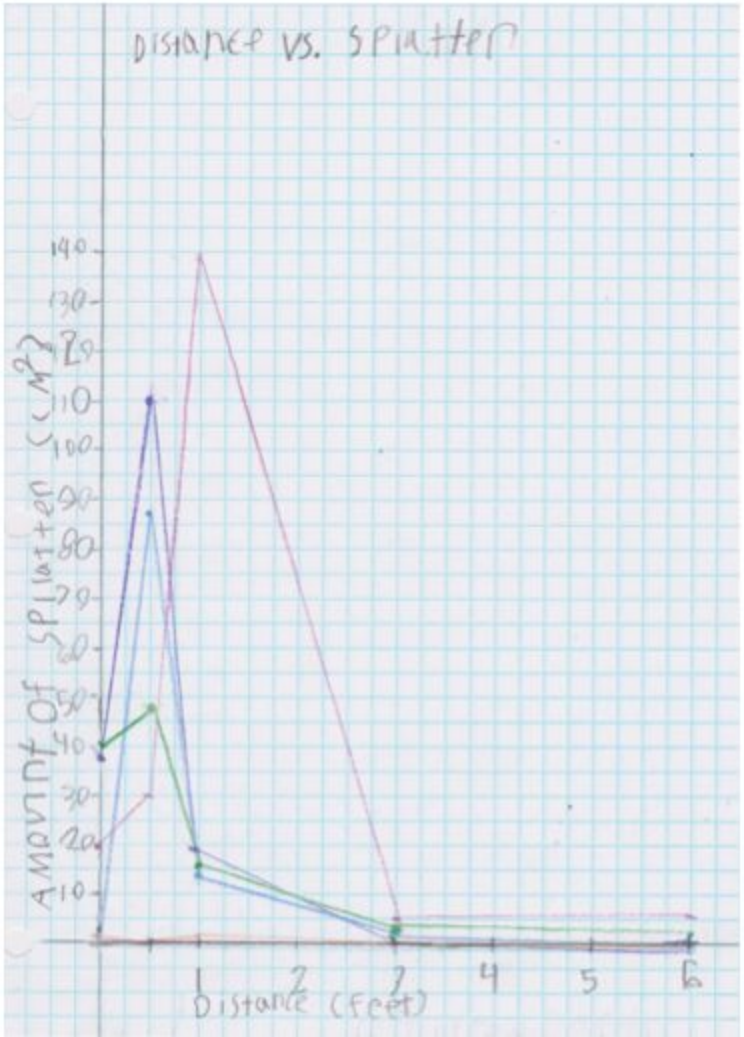

Key
Bandana
Cloth double
Cloth single
cloth double + filter
Face shield
Knos
Knos surgical
nothing
surgical
surgical + cloth double

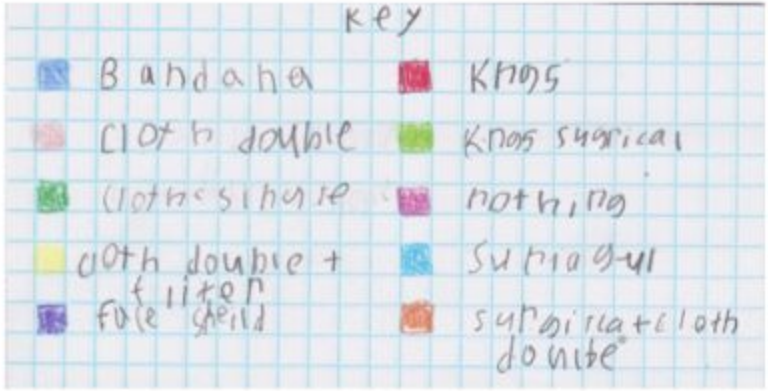

Filtration of medium glitter particles
number of medium glitter particles
mask type


key
Bandana
cloth double
cloth single
cloth double + filter
fole shield
knos
knos surgical
nothing
surgical
surgical + cloth double


filtration of glitter, small particles
Change of water colour
no colour
black
mask type


key
Bandana
cloth double
clothes single
cloth double + filter
folded
knots
knots surgical
nothing
surgical
surgical + cloth double


Distance vs. Splatter
Amount of Splatter (cm^2)
140
130
120
110
100
90
80
70
60
50
40
30
20
10
1
2
3
4
5
6
Distance (Feet)


Key
Bandana
Cloth double
Clothes shirt
cloth double + filter
Face shield
Knos
Knos surgical
nothing
Surgical
surgical + cloth double

# Effectiveness of masks

| | Filtration score | Distance Score | Overall score | Overall ranking (best =1, worst= 5) |
|---|---|---|---|---|
| **Bandana** | 2 | 2 | 4 | 5 |
| **Cloth - double layer** | 1 | 1 | 2 | 3 |
| **Cloth - single layer** | 2 | 2 | 4 | 5 |
| **Cloth double layer + filter** | 1 | 0 | 1 | 2 |
| **Faceshield** | 2 | 1 | 3 | 4 |
| **KN95** | 0 | 0 | 0 | 1 |
| **KN95 + surgical** | 0 | 0 | 0 | 1 |
| **Nothing** | 2 | 2 | 4 | 5 |
| **Surgical** | 0 | 0 | 0 | 1 |
| **Surgical + cloth double layer** | 0 | 0 | 0 | 1 |

| Ranking Rules | Most effective (score 0) | Somewhat Effective (score of 1) | Not effective (score 2) |
|---|---|---|---|
| **Distance** | No spray | 0-1 foot | 3-6 feet |
| **Small Glitter Filtration Amount** | None seen | small amount | large amount |

# Conclusions

- KN95, surgical, surgical + KN95, and surgical + double layer cloth were the best at preventing spray from escaping and letting glitter through.
- Single layer cloth, bandana, and no face mask were the worst at blocking the glitter or the spray.
- Double layer mask and double layer mask + filter are okay not perfect letting glitter through or spray through.
- Distance matters because some masks let the spray through

# Strengths & Weakness

Strength:

I tested many different types of masks that are commonly worn to protect us from sarscov2.

Weakness:

I did not test real sarscov2 so my conclusions might not be correct.

# Real World Application

- I will share this projet with friends and family and ask dad to post it on twitter

- If I was able to give Mathews Elementary a recommendation it would be this -  wear these masks KN95, surgical, surgical + KN95, and surgical + double layer cloth and stay 6 feet or 3 feet apart.

# Further Questions

I would like to try this experiment with model covid with glitter and figure out how why and how to prevent the spread by figure out why does covid slip throw otter masks better than otters. (Explain what you mean)

# Bibliography


- https://www.unitconverters.net/
- https://news.llu.edu/health-wellness/infectious-disease-physician-breaks-down-coronavirus-mask-myths
- https://news.umich.edu/new-video-website-explain-coronavirus-for-kids/
- https://kidshealth.org/en/kids/coronavirus-kids.html?WT.ac=p-ra
- https://kidshealth.org/en/kids/face-masks.html?WT.ac=k-ra
- https://www.healthgrades.com/right-care/coronavirus/9-types-of-masks-and-how-effective-they-are
- https://youtu.be/IC3AcItKc3U

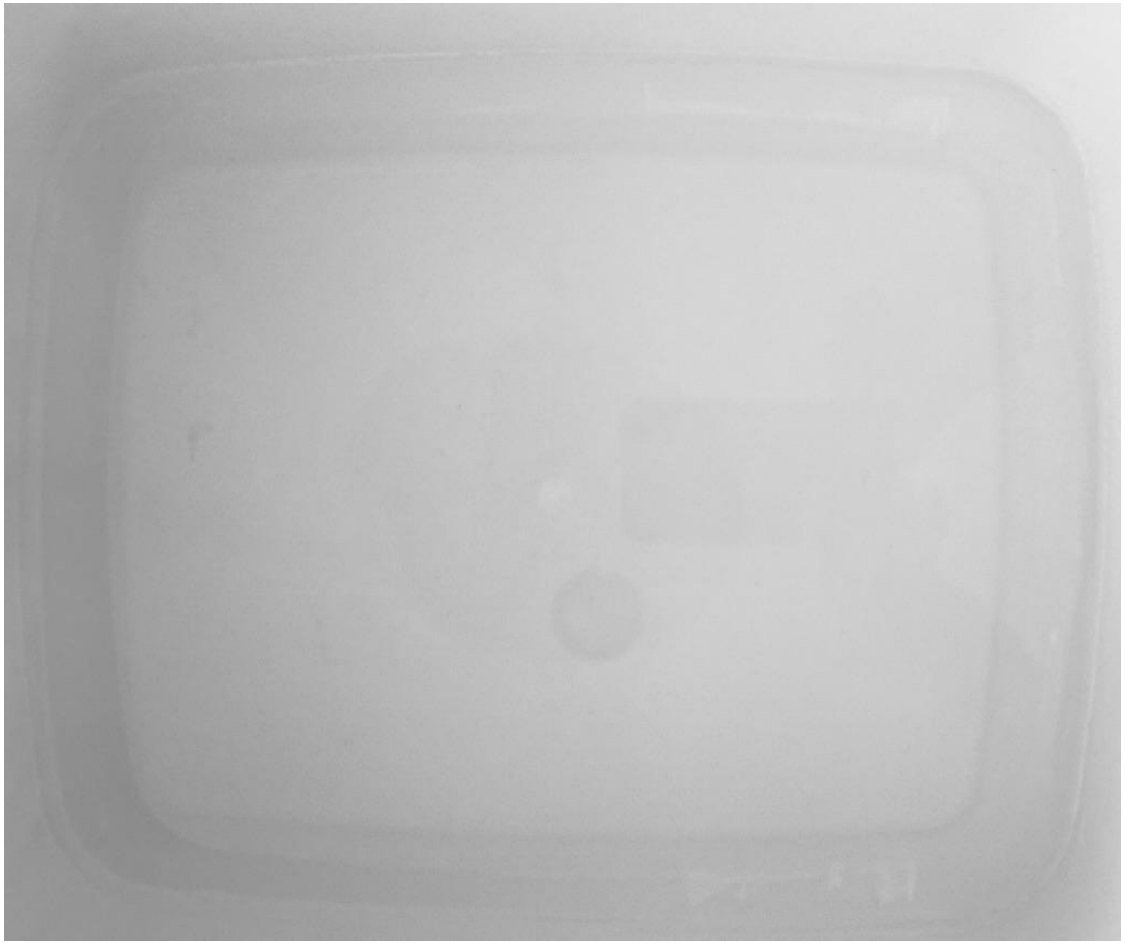
# Lab Notebook

# Large Glitter Filtration Data

BANDANA

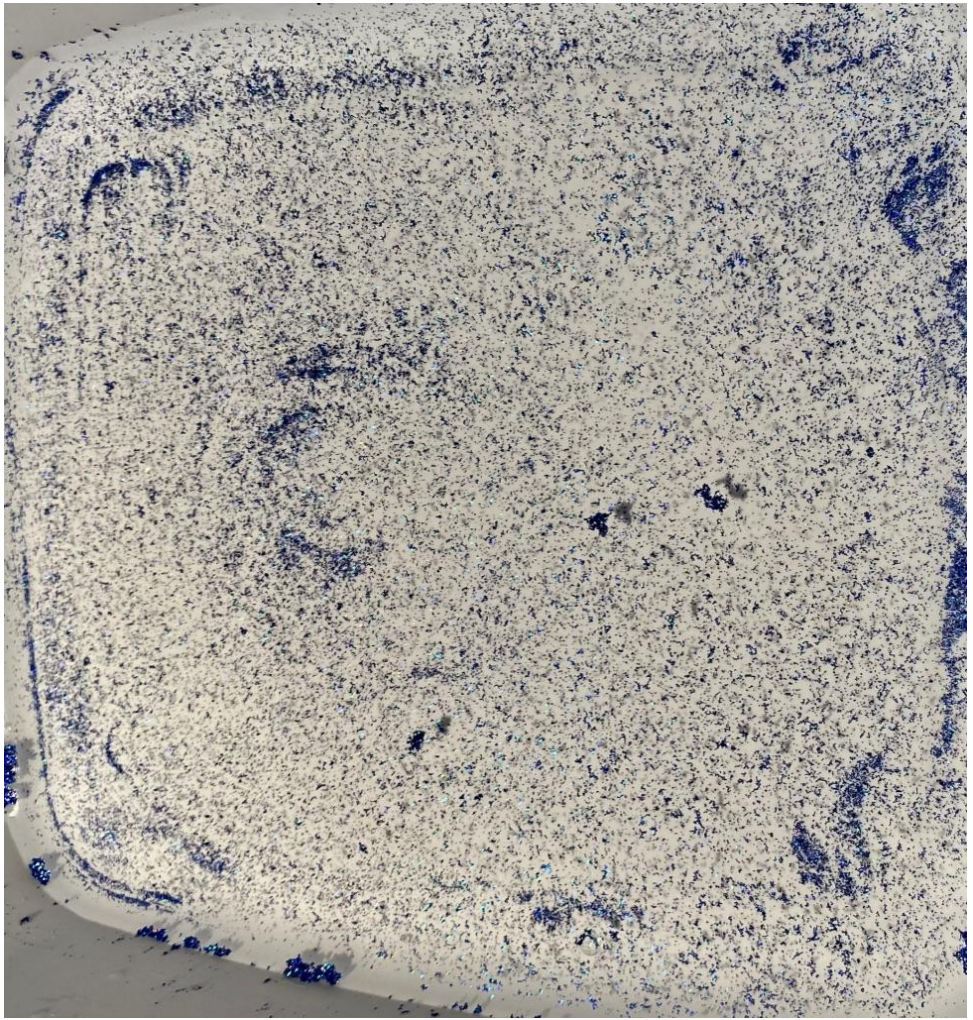
Cloth mask - double

# Cloth - single

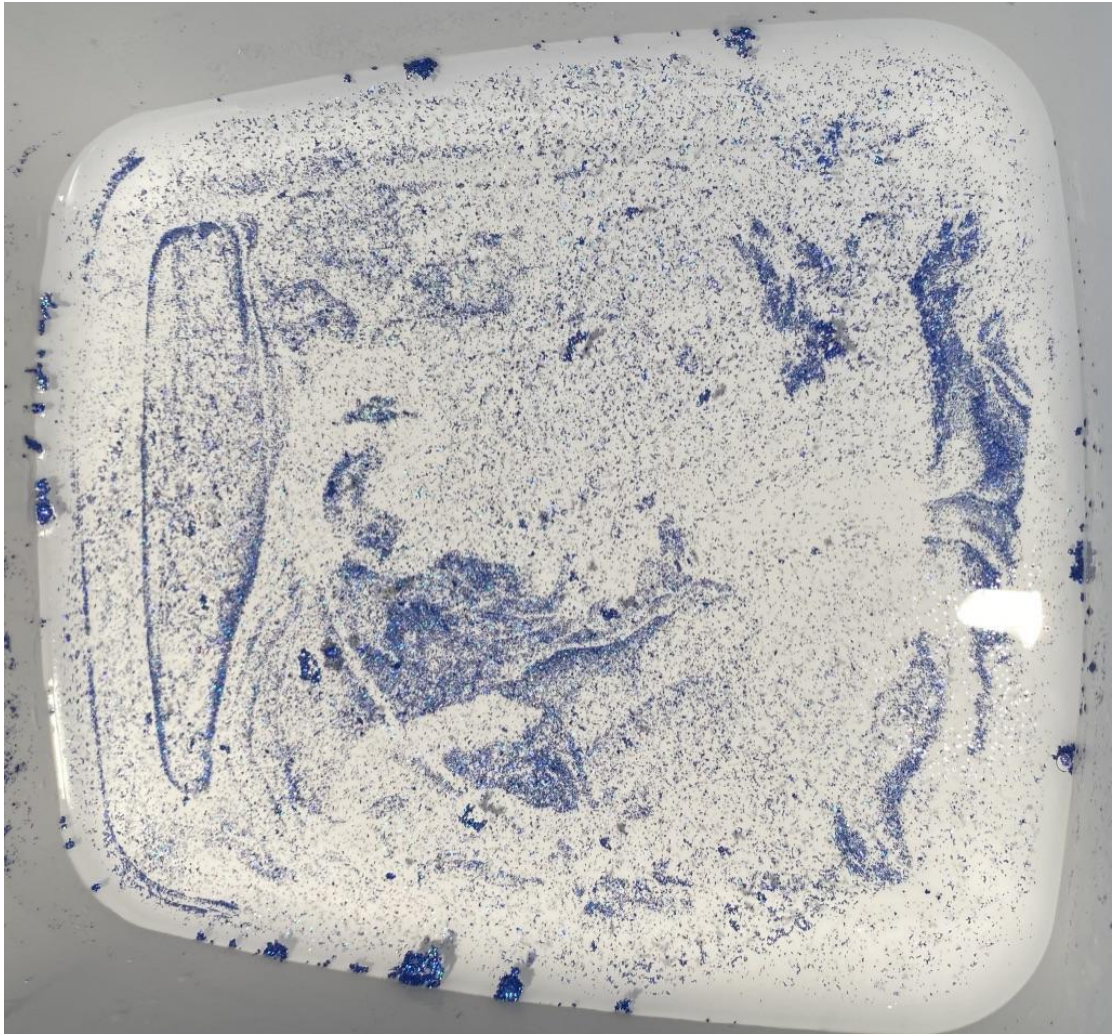


Cloth mask - double + filter

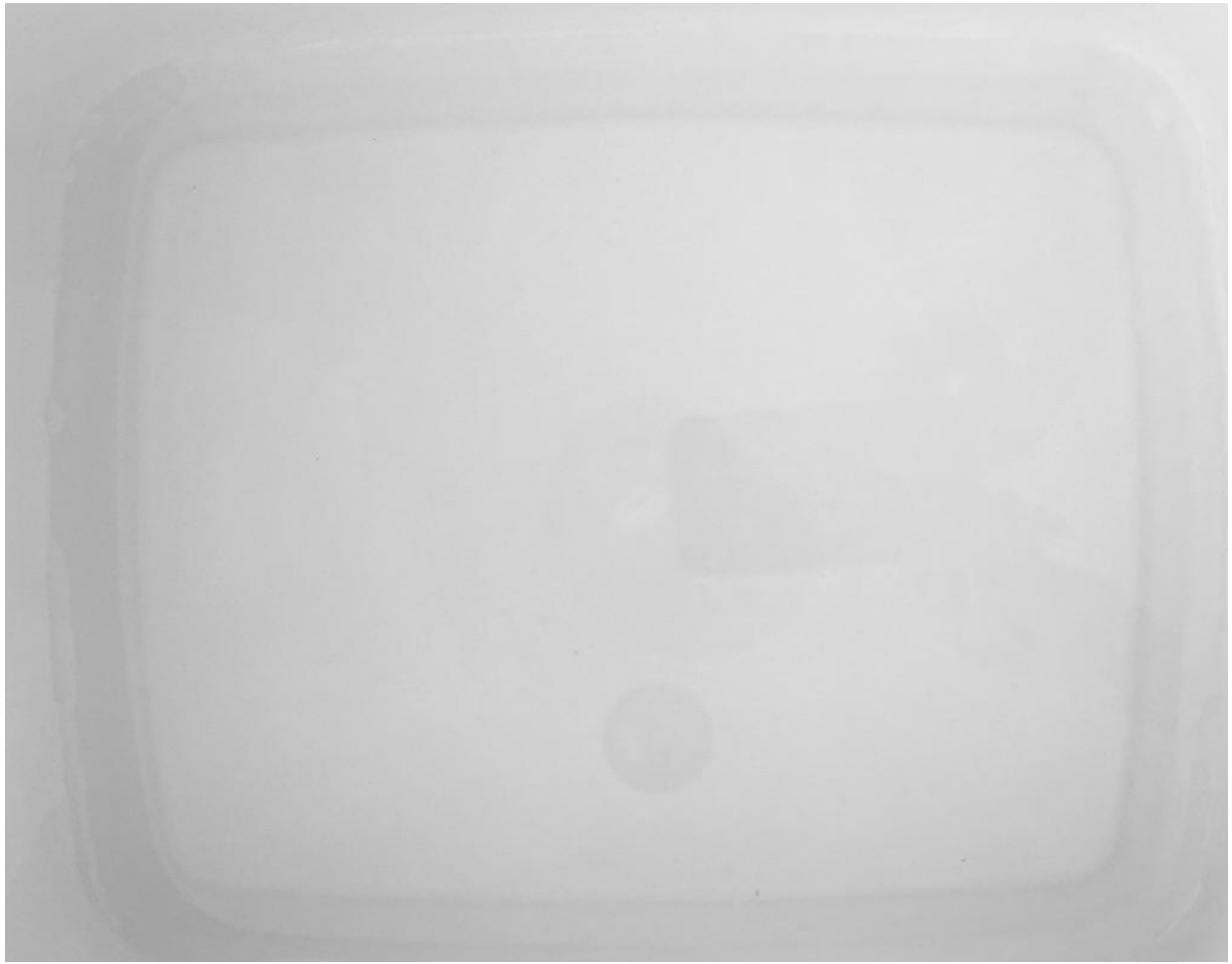
NOTHING



# Faceshield



KN95



KN95 + SURGICAL

SURGICAL

Surgical + double layer cloth

# Medium Glitter Glitter Filtration Data

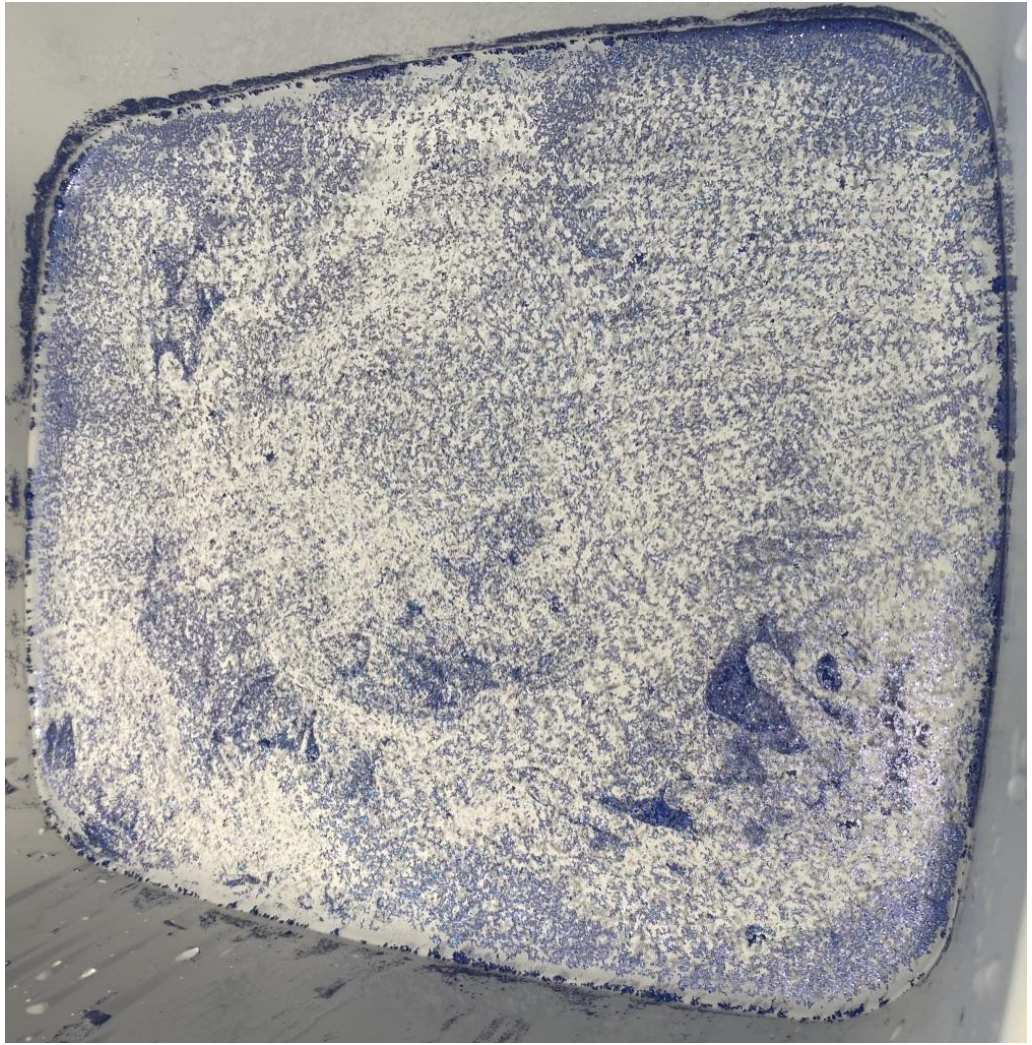
BANDANA

**Cloth mask - double**

Cloth - single

Cloth mask - double + filter

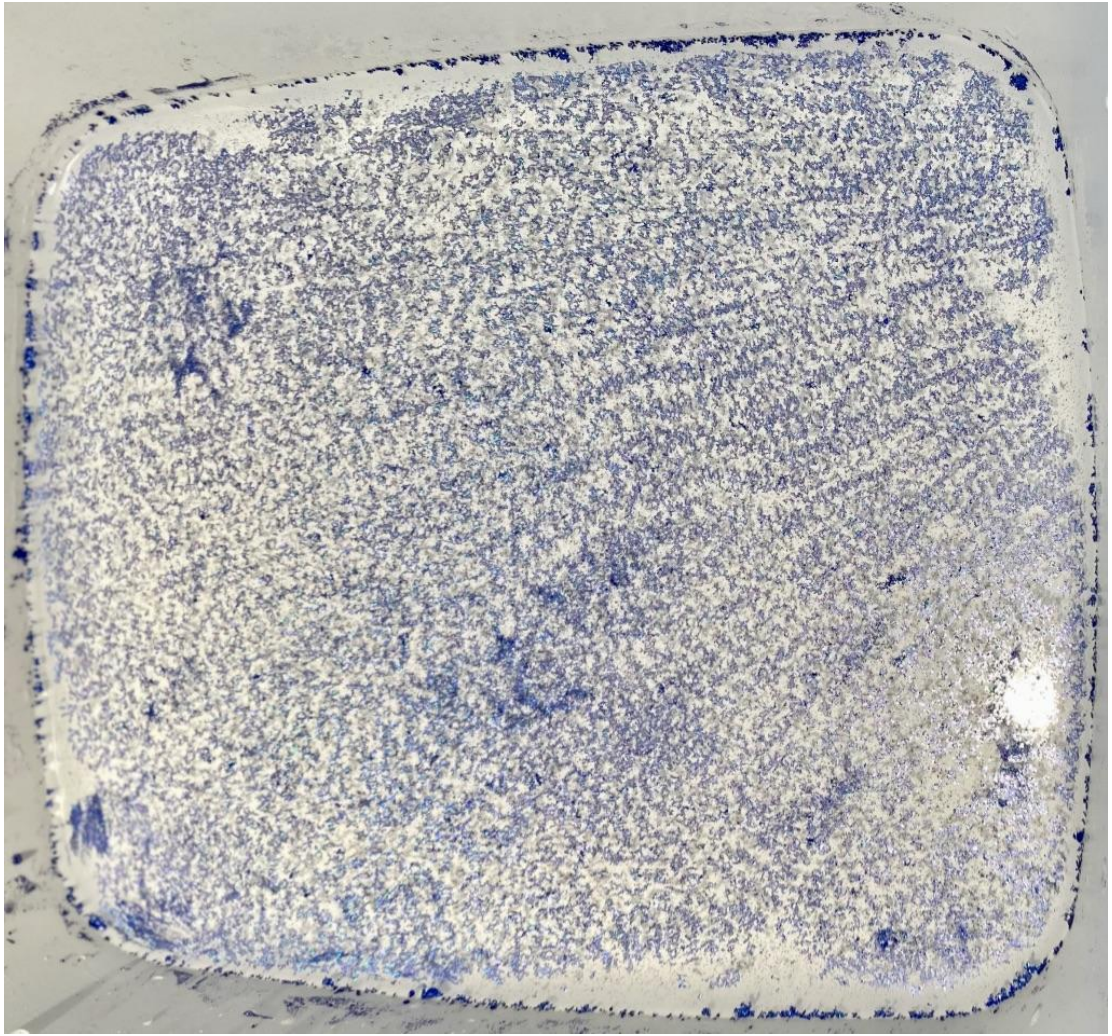
# Faceshield



KN95

KN95 + SURGICAL

NOTHING

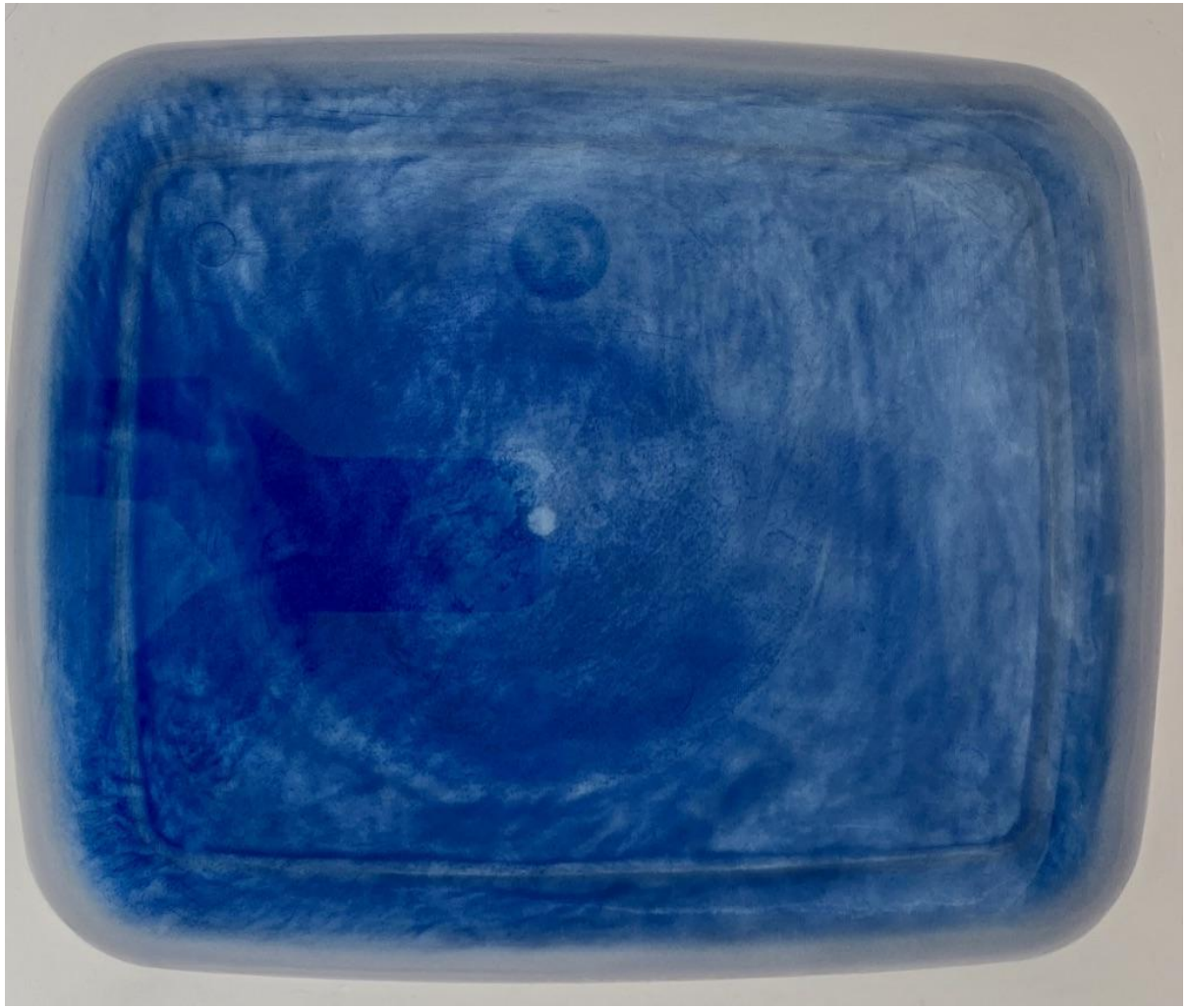


SURGICAL

Surgical + double layer cloth

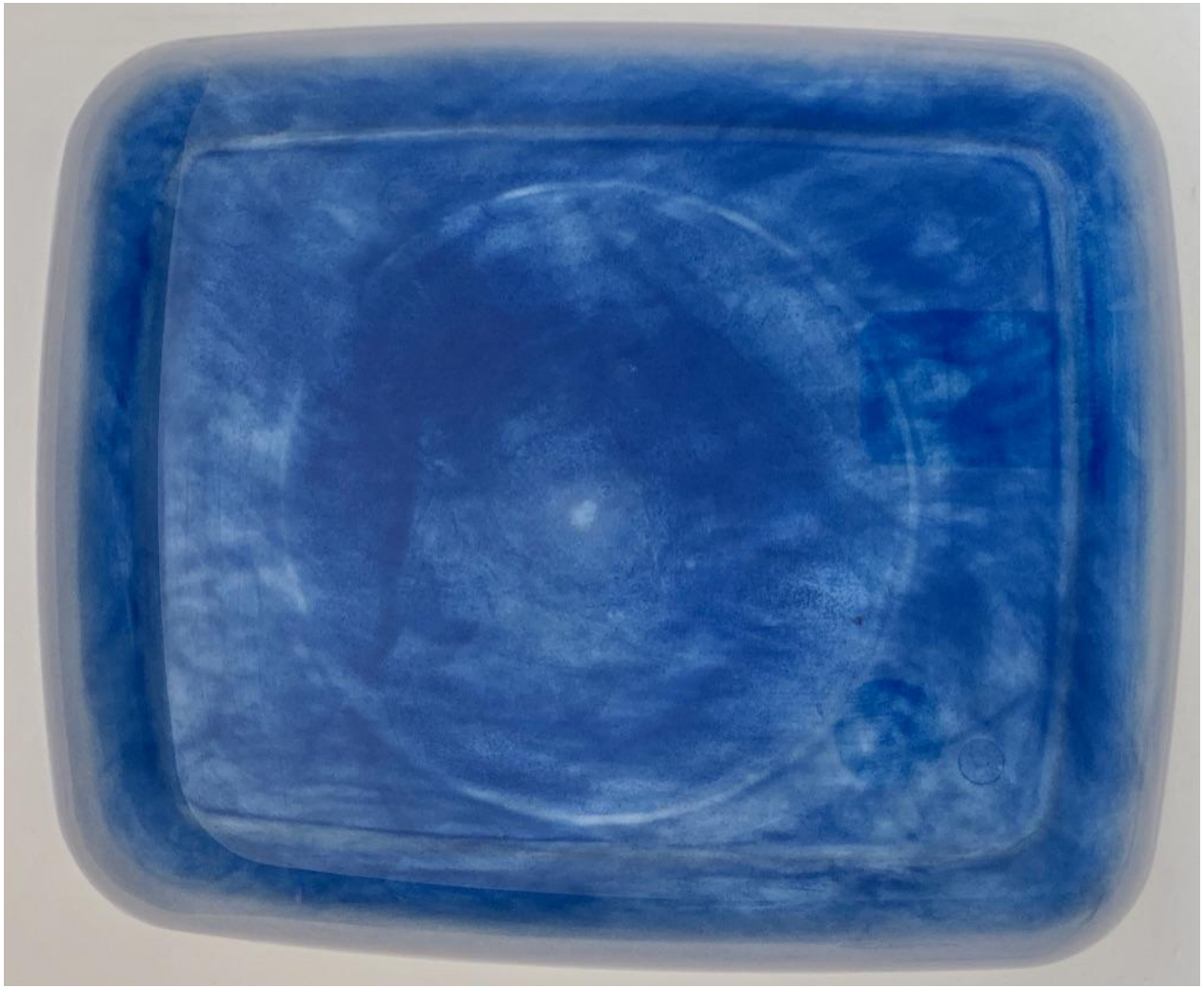
# Small Glitter Glitter Filtration Data

BANDANA



**Cloth mask - double**

Cloth - single



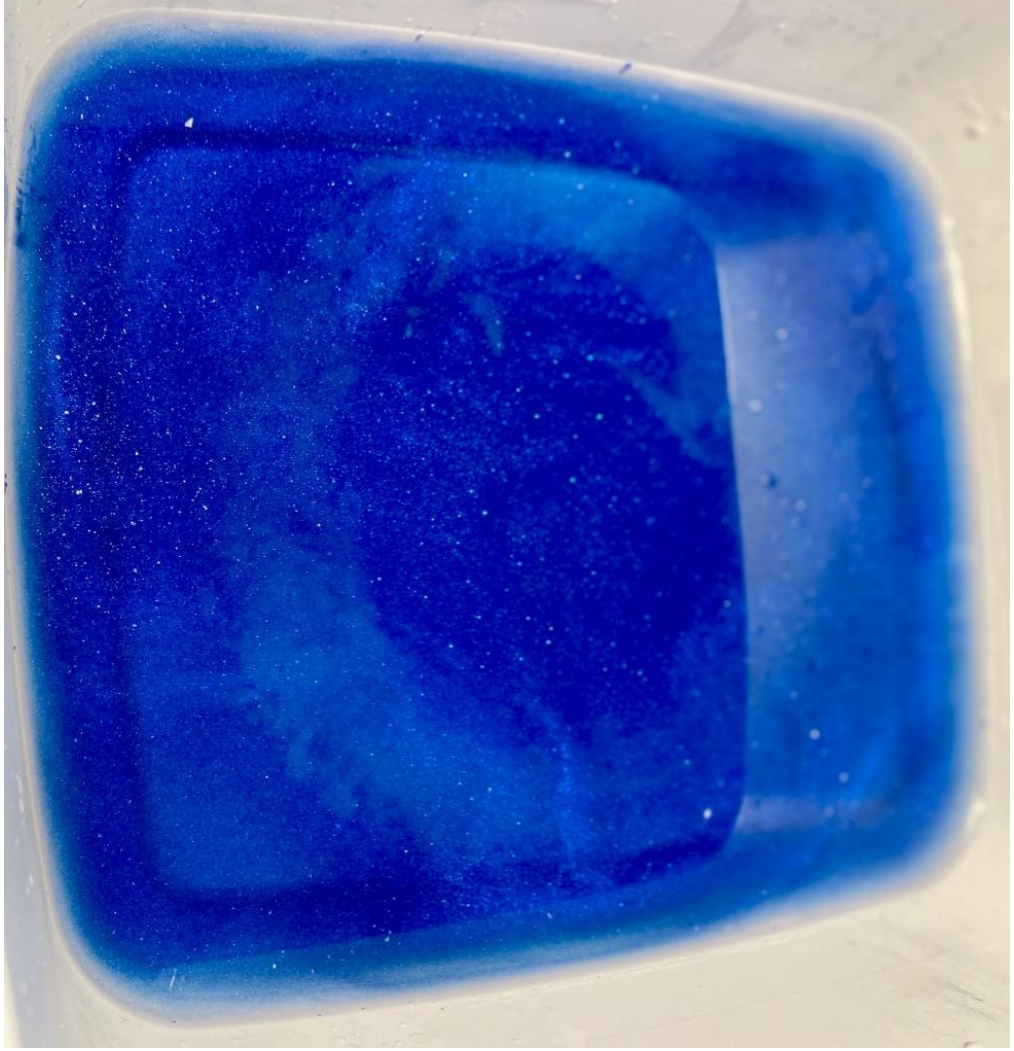
Cloth mask - double + filter

Faceshield

KN95

KN95 +
SURGICAL

NOTHING

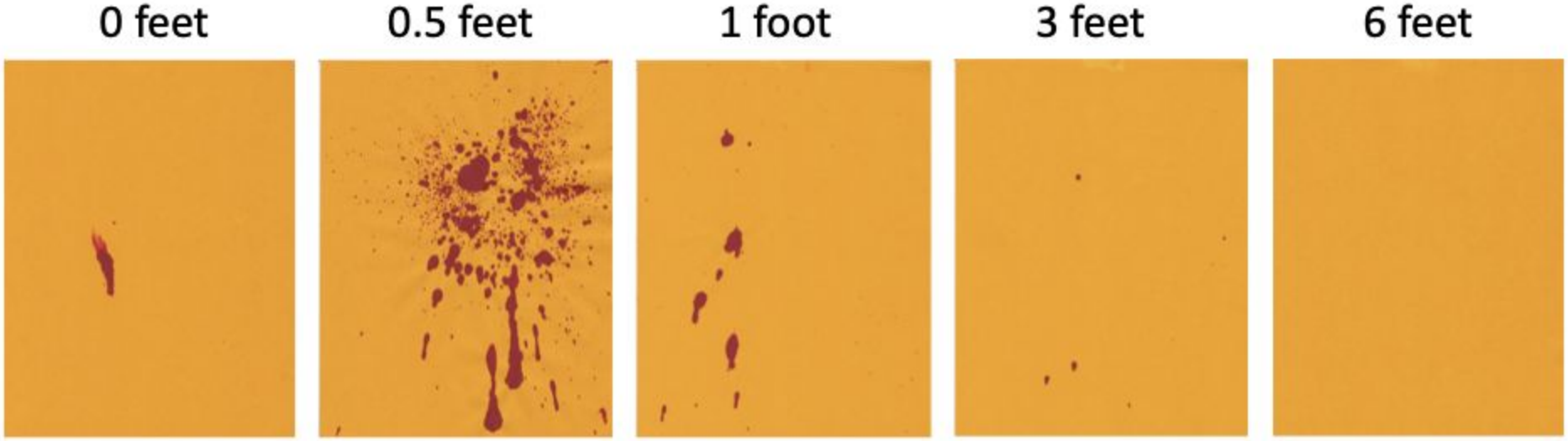


SURGICAL

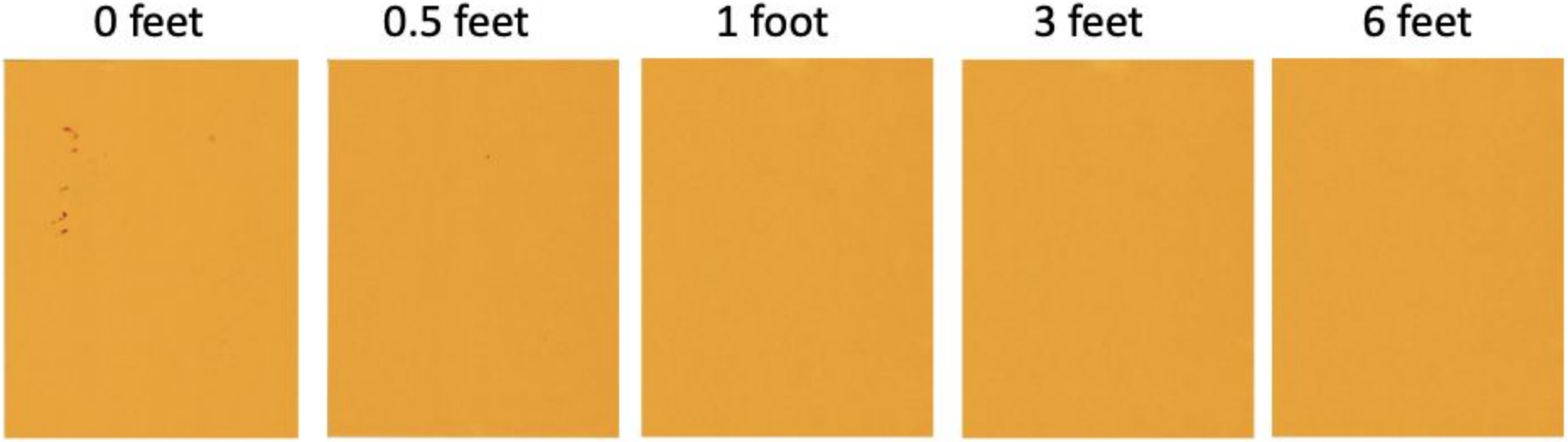
Surgical + double layer cloth

# Baking Soda spray on litmus paper data

# Bandana



# Cloth mask - double



# Cloth - single

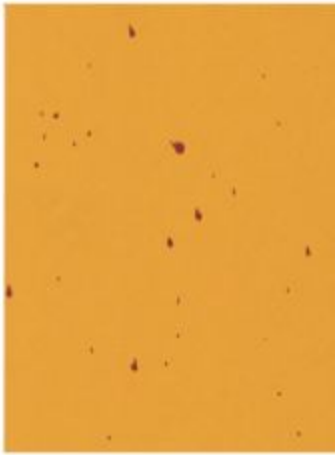
0 feet

0.5 feet

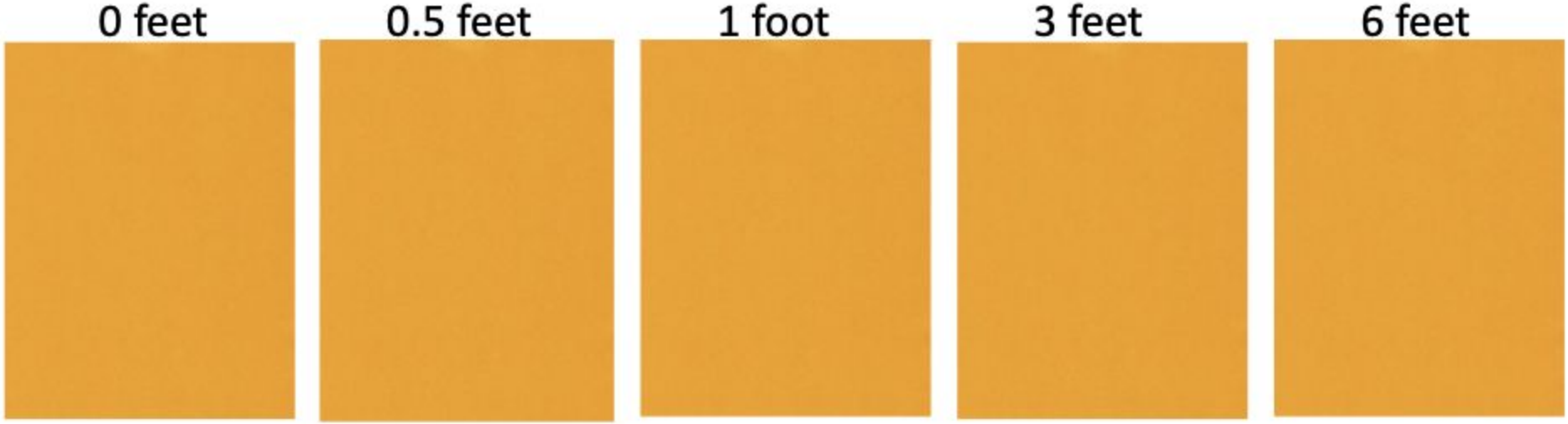
1 foot

3 feet

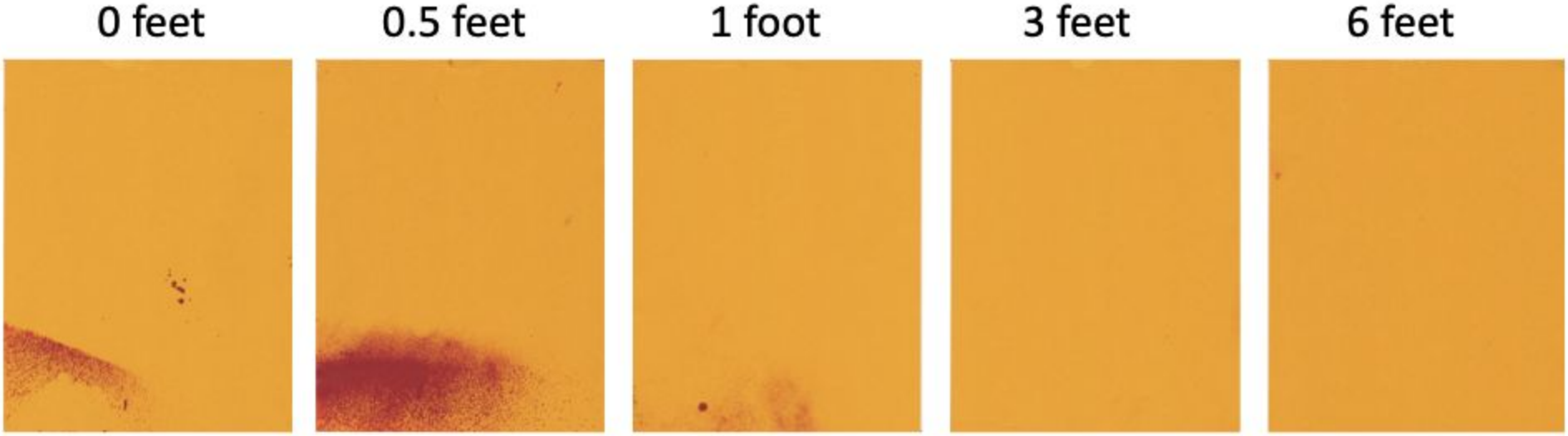
6 feet



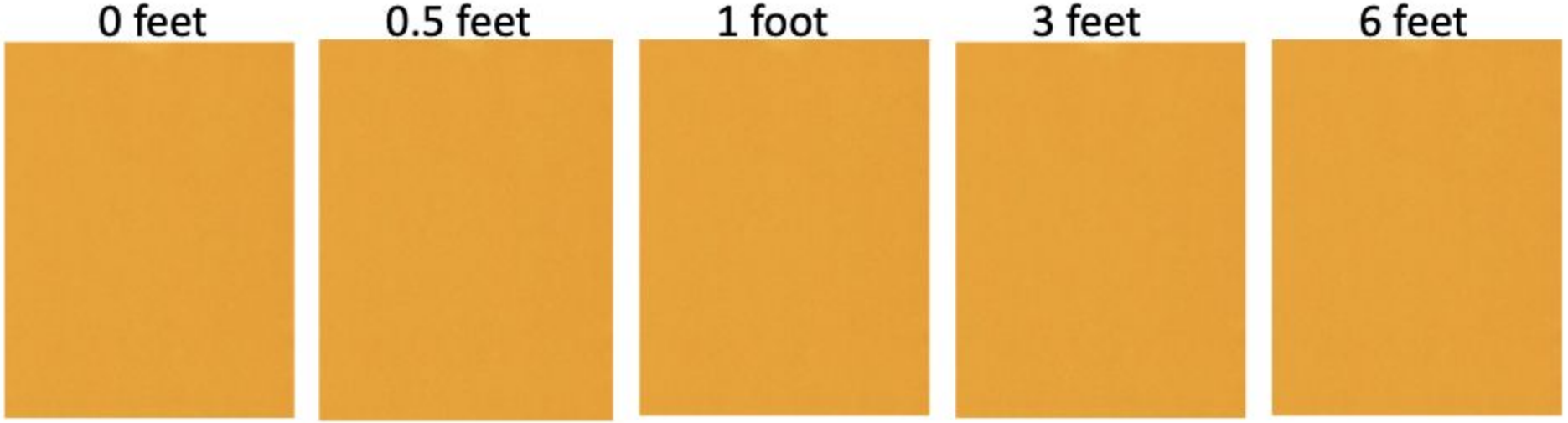
# Cloth mask - double + filter



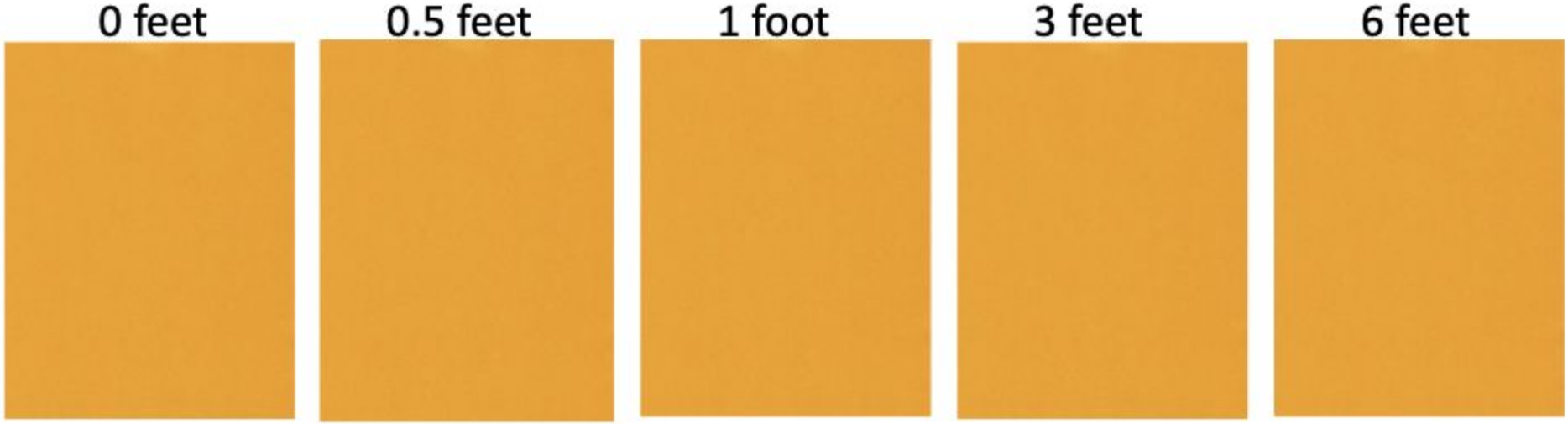
# Faceshield



# kn95



Kn95 +
surgical

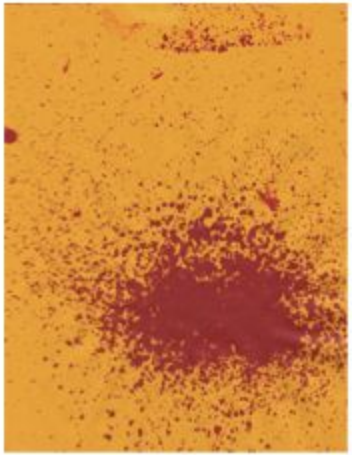


# nothing

0 feet

0.5 feet

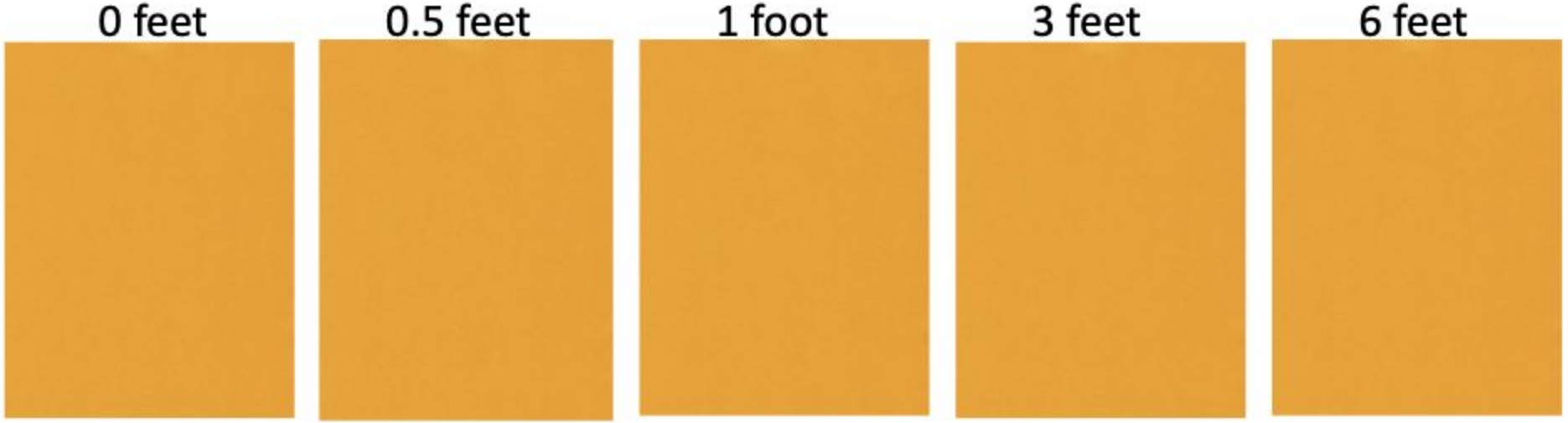
1 foot



3 feet

6 feet

# surgical



# Surgical + double layer cloth