



# How Washing A Mask Affects Its Fabric Density

Shaptarshi Z. Momo, Emily Cha



# Introduction/Background Research

The SARS-CoV-2 pandemic saw a large increase of the use of masks worldwide. While surgical masks are more effective, the production rate simply can't keep up with the demand. This has led to health organizations and government agencies to advise the general public to use cloth masks. After contacting both the MLHU and the federal government, we realized that because non-medical masks weren't things of great significance on a global scale in the past, there is very little research done to test the longevity of it. This experiment looks at just that. How does frequent mask washing affect its density?

As mentioned in the previous slide, there was little to no research done on the longevity of masks. However, most research done on the fabrics themselves indicate that there won't be a significant enough change to report within the time frame of this experiment.

# Hypothesis/Variables

Our hypothesis is that the thread counts won't change significantly. If it does, the cotton-polyester blend will be closest in density to its original thread count. Cotton and polyester should be second and third respectively, with polyester-spandex close behind at fourth. Silk will be second least dense compared to its original thread count and rayon will be the least dense.

Independent variable: blend of fabric used

Dependant variable: thread count after each wash

Controlled variables: temperature of the water used for washing, washing procedure, size and shape of masks

# Materials/Procedure

➤ Masks of different fabric blends with a layer of polypropylene filter in it

- 100% Cotton
- 100% Polyester
- 100% Rayon
- 100% Silk
- 95% Polyester 5% Spandex
- 55% Cotton 45% Polyester

➤ Microscope

➤ Water

➤ Laundry detergent

➤ Thermometer

➤ Bucket

➤ Timer

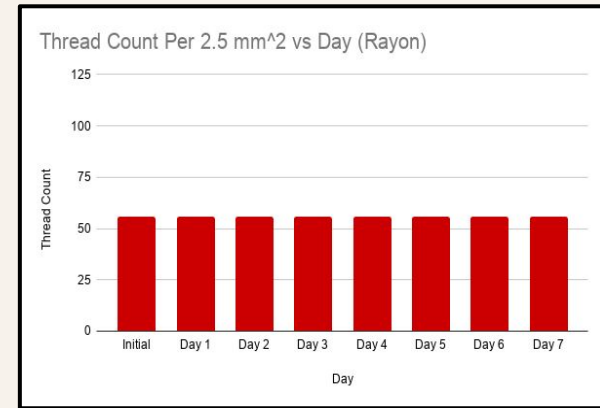
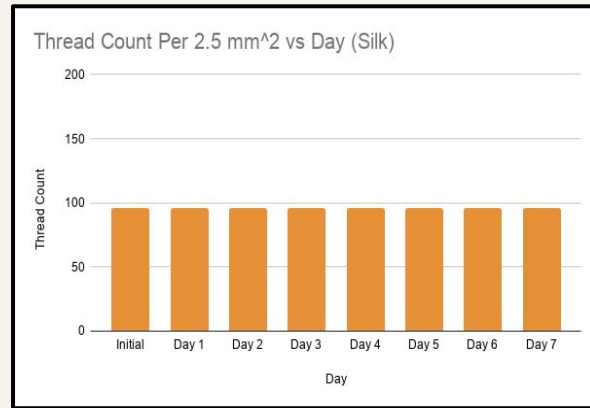
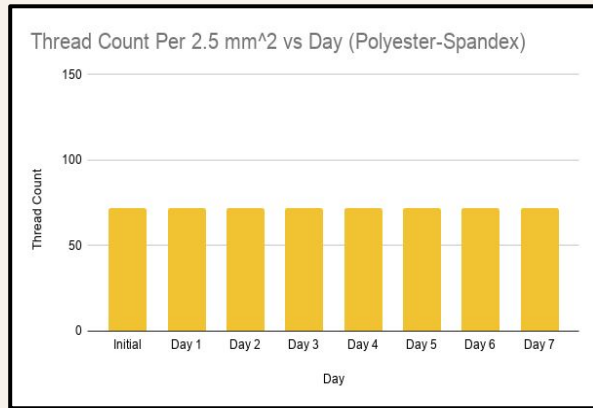
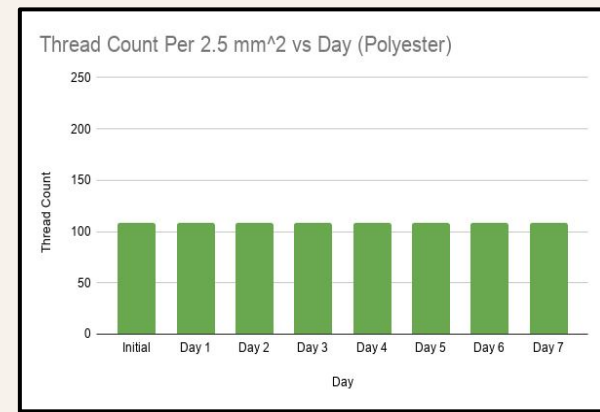
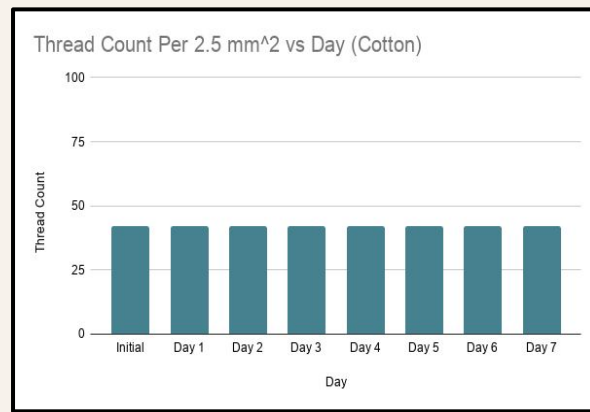
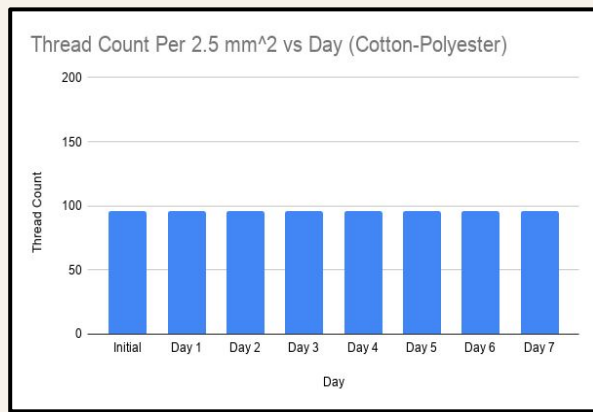
➤ Paper with 2.5 mm<sup>2</sup> square cut in it

1. Measure thread count of 2.5mm<sup>2</sup> of each type of mask using paper with square cut in it and a microscope.
2. Soak mask in 20 cups of 20°C water and 1 tbsp generic laundry detergent for 5 mins.
3. Scrub it ten times and squeeze it three times before transferring to bucket of 20°C clean water for 2 mins.
4. Rise in 20°C water with a flow rate of 3 litre/min and squeeze 3 times to get rid of excess water. Hang to dry for 12 hours.
5. Measure thread count of 2.5mm<sup>2</sup> of each mask.
6. Leave masks for another 12 hours.
7. Repeat steps 2-6 for the desired amount of time.

# Overall Results\*

Mask Type:	Thread Count per unit (Initial)	Thread Count per unit (Day 7)
Cotton-Polyester	96	96
Cotton	42	42
Polyester	96	96
Polyester-Spandex	72	72
Silk	96	96
Rayon	56	56

*\*More details can be found in the report.*



*Figures showing the average thread count over the course of washing for 1 week for all masks.*

# Discussion

There was no visible change detected throughout the week at this scale. All the masks remained consistent and the thread counts were equal through the entire week of experimentation. This means that according to the results of this experiment, non-medical masks regardless of the fabric blend could be used for a long time as long as they are washed properly.



# Conclusion

In conclusion, this experiment supported our hypothesis. There was no visible or microscopic changes with any of the masks. Washing a mask everyday for a week doesn't affect its thread count in any way.

If this experiment were to be repeated, here are our suggestions:

- Do the experiment longer (wash everyday for a longer period of time)
- Test the change in more ways
  - Aerosol dispersion (water droplets)
  - Solid objects passing through
  - Light
- Use more types of fabrics
- Incorporate the variable of usage
- Change the controlled variables

To summarize, further tests with more resources and time will lead to more findings and better understanding of the outcome



# Citations

- Noguchi, Y. (2020, March 05). Not enough face masks are made in america to deal with coronavirus. Retrieved March 2, 2021, from <https://www.npr.org/sections/health-shots/2020/03/05/811387424/face-masks-not-enough-are-made-in-america-to-deal-with-coronavirus>
- Canada, P. (2021, February 11). Government of Canada. Retrieved March 1, 2021, from <https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/prevention-risks/about-non-medical-masks-face-coverings.html>
- Rusciano, A., About Author: Alex Rusciano Alex Rusciano is a writing coordinator for OSF HealthCare, Rusciano, A., & Alex Rusciano is a writing coordinator for OSF HealthCare. (2021, February 26). 5 things to consider when picking a mask. Retrieved March 2, 2021, from <https://www.osfhealthcare.org/blog/5-things-to-consider-when-picking-a-mask/>
- Parlin, A., Stratton, S., Culley, T., & Guerra, P. (2020, September 18). A laboratory-based study examining the properties of silk fabric to evaluate its potential as a protective barrier for personal protective equipment and as a functional material for face coverings during the COVID-19 pandemic. Retrieved March 3, 2021, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7500605/>
- Warnock, M., Davis, K., Wolf, D., & Gbur, E. (1970, January 01). [PDF] biodegradation of THREE Cellulosic fabrics in Soil: Semantic Scholar. Retrieved March 2, 2021, from <https://www.semanticscholar.org/paper/Biodegradation-of-Three-Cellulosic-Fabrics-in-Soil-Warnock-Davis/4fe5ebfdb75bcbe84202b8fd5fab95b384f827f0?p2df>
- These are the best fabrics to use for your cloth masks, according to researchers. (2020, April 27). Retrieved March 2, 2021, from <https://www.forbes.com/sites/allisongasparini/2020/04/27/how-effective-are-cloth-face-masks-anyway-here-are-the-fabrics-which-filter-out-air-borne-particles-best/?sh=432211f633ce>
- Canada, P. (2021, February 10). Government of Canada. Retrieved March 1, 2021, from <https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/prevention-risks/sew-no-sew-instructions-non-medical-masks-face-coverings.html>
- Choosing the best water temperature for your laundry. (n.d.). Retrieved March 3, 2021, from <https://bundleorganics.com/blogs/boulder-clean/choosing-the-best-water-temperature-for-your-laundry>