



# **In the Absence of N95 Masks, Multi-Layered Face Masks with Proper Fit Offer Protection Against Omicron Variant**



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## Texas Tech researchers author study using new standardized mask filtration testing to evaluate effectiveness of alternative facial coverings.

### Pitch

As the Omicron variant surges, the Centers for Disease Control and Prevention (CDC) is expected to issue more robust mask guidelines to help curb COVID-19 transmission. During personal protective equipment (PPE) shortages, it has been necessary for people to utilize materials already at their disposal to craft their own face masks.

Seshadri Ramkumar, a professor of chemical countermeasures and advanced materials in Texas Tech University's Department of Environmental Toxicology, has co-authored a study utilizing standardized methods to evaluate common household fabrics as alternative materials for barrier face coverings. Olukayode James Ayodeji, a PhD candidate in the Department of Environmental Toxicology, conducted the standardized tests measuring the filtration efficiency (FE) of different facial coverings.



*Seshadri Ramkumar*

Using mask filtration testing standards developed by the American Society for Testing and Materials (ASTM), Ramkumar and his team compared the performance of popular ready-made facial coverings, such as bandanas and neck gaiters, to alternative household materials including denim, cotton shirts, bedding and towels. Both categories of materials were measured against



While a material's ability to filter out viral particles is paramount, breathability is an equally important consideration, Ramkumar said. Unfortunately, testing revealed an inverse relationship between filtration efficiency (FE) and breathability – for instance, while denim showed the highest FE, it also had the lowest breathability of all the household fabrics, rendering it unsuitable for face mask production. Ramkumar and his team took both parameters of FE and breathability into equal account when evaluating a material's overall performance.



*Olukayode James Ayodeji*

According to their study, the most effective ready-made facial coverings on the market are Velcro masks with carbon filters and surgical masks, while the least effective are fashion face masks, single-layer face coverings, neck gaiters and bandanas.

The highest-performing household materials were thick cotton shirts and towels, indicating that multi-layered cotton facial coverings with proper fit are the most effective homemade mask alternative because they offer a measure of protection against viral particles without compromising breathability.

A combinatorial approach involving both a facial covering and a surgical mask with good fit would offer the wearer better protection against particle inhalation, Ramkumar said.

## Expert

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- Face coverings protect the wearer and others against severe respiratory diseases, with R95 and N95 masks offering the highest level of protection.
- PPE shortages have resulted in the widespread use of homemade face coverings.
- Standardized testing revealed varying levels of filtration efficiency and breathability among different fabric samples.
- In the absence of N95 masks, multi-layered materials that have been subjected to standardized testing are recommended for alternative face covering production.

## Quotes

- “Although people who are boosted aren't likely to become seriously ill, due to the highly contagious nature of the Omicron variant, face masks are still needed,” Ramkumar said.
- “Masks need to be comfortable, or people won't wear them,” Ramkumar said. “We tested 17 types of commercially available and homemade masks for our study. While R95 and N95 masks offer the best protection because of their filtration capability and dome shape, three-ply cotton masks with good fit also provide an adequate level of protection along with comfort.”
- “An efficient filter requires three Fs: filtration, fit and form, as in comfort,” Ramkumar said. “A balance of all three properties is necessary for sustained mask use.”

## More Resources

Ramkumar co-authored the paper, “Particle-Size-Dependent Filtration Efficiency, Breathability, and Flow Resistance of Face Coverings and Common Household Fabrics Used for Face Masks During the COVID-19 Pandemic,” alongside Texas Tech graduate students Olukayode James Ayodeji and Terrell A. Hillard, with the support of Texas Tech graduate student Mirza Khyum. The study was published in Volume 16 of the International Journal of Environmental Research earlier this month.