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Which DIY mask pattern should you use? Even experts can't pick one to recommend.

By **Sindya Bhanoo**

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Up to this point in the coronavirus pandemic, public health officials in the United States have advised healthy civilians against wearing face masks, despite a growing grass-roots masks-for-all movement. But Friday, President Trump announced the Centers for Disease Control and Prevention recommends that everyone wear a simple, cloth face covering while out in public.

For those interested in making and wearing a nonmedical mask, the choice can be overwhelming. There are thousands of DIY mask tutorials online, relying on everything from paper towels to men's underwear to bras. Some take a few minutes to make, while others are more complex. More tutorials are posted daily, and some have millions of views. Which template should we follow? What material is best?

A growing number of experts — medical doctors and virologists among them — say that a homemade mask, even a bandanna, might provide protection from both transmitting and getting the coronavirus. And there is some evidence to validate this. A 2013 study published in the journal *Disaster Medicine and Public Health Preparedness* found that well-fitting homemade masks made of cotton T-shirts provide some protection from droplet transmission, the method by which the coronavirus is spread. Another study found that mask use and hand hygiene reduces cases of respiratory illnesses in college dormitory settings.

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But because there is little research to indicate how well or what homemade masks work, there is no consensus among experts on a best design, and the scientists we spoke to were reluctant to endorse any one homemade mask pattern.

“That would be dangerous, because there’s no evidence pointing towards one type,” said Raina MacIntyre, an epidemiologist and doctor at the University of New South Wales in Sydney, who has done extensive research on the usefulness of masks. “These are all just common-sense approaches people are trying.”

Guidance from researchers

But MacIntyre does believe that universal mask-wearing will help prevent the transmission of the virus and flatten the curve. She and other researchers offered guidelines based on the existing research and their knowledge of virus transmission.

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The basics? Good coverage is important. The mask should reach above the bridge of the nose and below the chin. Fit is important. A mask should be snug. A fabric tie might work better than an elastic band. And if a mask is going to be reused, it must be kept clean. Layers add additional protection, so three-ply is good, as is including a small pocket or pouch, into which an additional filter can be inserted.

When selecting material, a trade-off must be made between filtration efficiency and breathability. Vacuum bags are highly effective filters, according to a [document](#) put out by the Stanford Anesthetics Informatics and Media Lab, but may not be a good choice because of the effort required to breathe through them. Paper towels and wet wipes are too porous and are of little use.

Many DIY mask tutorials, including [those from medical centers](#) across the nation, recommend using cotton and cotton blends to make masks. MacIntyre's concern with cloth is that it retains moisture and provides an ideal breeding ground for bacteria. In a [2015 study](#) in BMJ Open, she and her colleagues found that hospital health workers in Vietnam who wore cloth masks fared worse than workers in the control group, some of whom wore no mask at all.

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This, MacIntyre suspects, was partly because of lack of proper mask care. Those using cloth masks for personal use should wash their masks frequently, she said. “Wash it every day and hang it outside to dry, if possible,” she said. “Sunlight is very germicidal.”

She suggests that each family member have several masks, so that clean ones are always available and dirty ones are not reused.

MacIntyre recommends that civilians use disposable dust and gas masks, the sort worn by industrial and construction workers, rather than homemade cloth masks. But she acknowledged those are difficult to procure during the pandemic, when many are hoarding masks, supply chains have been affected and health-care workers are in greater need.

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Peter Tsai, the materials scientist who invented the electrostatic charging technology that N95 masks — the highest-quality medical masks on the market — rely on, also believes that homemade masks are an important part of the United States' battle against the coronavirus. He offered another material for DIY mask makers to consider: nonwoven fabrics.

Nonwoven fabrics, which Tsai did years of research on to improve medical masks, are made of individual fibers or filaments that are bound together mechanically, thermally or chemically. They are not knit or woven together, like most cotton.

Not all nonwoven fabrics are ideal for masks. Wet wipes are made of nonwoven fabric but are too porous, Tsai said. Vacuum bags are also generally made of nonwoven fabric but are not breathable.

Tsai recommended using car shop towels as mask material. The towels, available in rolls and often blue in color, would do a better job of filtering droplets than cloth, he said. The material is “very strong,” he said. “And it can be washed with soap and water and reused.” There are YouTube videos that offer tutorials on [using this material](#).

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The towels, he said, could also be used in conjunction with cloth masks, serving as an additional filtering layer. Still, like MacIntyre, he said that cloth is better than nothing. “Any cloth material can help. It is not perfect, but it can stop large droplets from getting out, and from getting in,” he said.

Caveats from other experts

Not every expert is a strong advocate of homemade masks, or of all Americans wearing them.

Stanley Perlman, a microbiologist at the University of Iowa who does not have an opinion about the best design for masks, thinks their greatest benefit might be in serving as a reminder to prevent face-touching. But he had a warning. Mask wearers could contaminate themselves by touching the outside of a mask when putting it on and taking it off, he said via email. After taking off a mask, hand-washing is necessary.

The greatest case against universal mask usage, some experts said, is that it could embolden Americans to make risky choices and result in a failure to follow social distancing and hand-washing guidelines. Masks are an extra precaution, not a replacement for the ones we already should be taking.

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“Masks should not be a false assurance,” said Don Milton, a virologist at the University of Maryland who studies how viruses are spread.

Medical center designs

People who want to make their own masks might consider the designs that medical facilities, including Dell Medical School in Austin, Vanderbilt Medical Center in Nashville and Kaiser Permanente in California are requesting from home sewers. All three organizations rely on designs that use tightly woven, high-quality cotton material and either elastic or fabric ties to keep the masks in place.

Kaiser also has a pattern for a nonwoven mask, but it is not sharing that design publicly with volunteer sewers. “We want to allow people to access what they have at home,” said Jodie Lesh, a senior vice president at Kaiser Permanente who is leading the homemade mask initiative. Kaiser plans to use the masks for nonclinical personnel and guests. Its design is based on one released by Providence St. Joseph Health, a network of hospitals and care centers across six states, including Washington, where the first cases of covid-19 were identified.

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Lesh and her colleagues consulted with in-house infectious disease specialists and then asked home sewers to try out some different templates. “A lot of them were the moms of our staff,” she said. “They gave us feedback on how easy or tough they would be to produce.”

Dell Medical School is collecting homemade masks for Meals on Wheels, in-home health aides, and others who do not work in hospitals but are in need of protection. Settling on a design was not easy, said Nishi Viswanathan, who is leading Dell’s initiative and is the head of Texas Health Catalyst, a program at Dell designed to accelerate the adoption of promising health innovations.

“To be very honest, there is a lot of ambiguity,” Viswanathan said of the information available on masks. “We’re doing the best we can with the limited information we have.” So far, she and her team have distributed more than 200 homemade cloth masks in the Austin area.

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In selecting a design, Viswanathan and her team worked with an infectious disease specialist at Dell Medical School. They found a wealth of information in a Facebook group where thousands of medical professionals, home sewers and other makers have come together to innovate and share ideas.

The information keeps coming as DIY mask makers experiment with different possibilities, Viswanathan said. Most recently, she learned about the possibility of incorporating industrial air filters with a high rating for filtration into masks for additional protection. “Lots of folks are talking about masks that have provisions to insert these filters,” she said. “We are researching it.”

This is a time of tremendous innovation, she said.

Sindya Bhanoo is a health and science reporter living in Austin.

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