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## N95 Masks vs. Surgical Masks: Which Is Better at Preventing The Coronavirus?

📅 2020-03-01 (<https://smartairfilters.com/en/blog/n95-mask-surgical-prevent-transmission-coronavirus/>) 👤

Thomas Talhelm (<https://smartairfilters.com/en/blog/author/thomas/>) 📁 Coronavirus

(<https://smartairfilters.com/en/blog/category/coronavirus/>), Masks

(<https://smartairfilters.com/en/blog/category/masks/>)



Scientists have actually randomized people to wear N95 or regular surgical masks, then tracked how many people got infected with colds and flus similar to the coronavirus. This data can tell us whether N95 or surgical masks are more effective

at preventing transmission of viruses. The results surprised me.

### Coronavirus & Mask Livestream

Wondering whether masks work to protect you against the coronavirus? Check out our [livestream recap covering all the info here](https://www.facebook.com/smartairfilters/videos/1097078063991680/) (<https://www.facebook.com/smartairfilters/videos/1097078063991680/>)!

### People's Intuitions About N95 Masks and The Coronavirus

The results are surprising because I've seen several people claim that we **need** N95 masks to stop the coronavirus. They say surgical masks just won't cut it when it comes to the coronavirus.

Similarly, a doctor interviewed on CNN

(<https://www.cnn.com/videos/health/2020/02/28/coronavirus-questions-doctor-patel-acfc-sot-vpx.cnn>) said that masks don't work.

And to be honest, that's my intuition too. N95 masks fit a lot tighter than surgical masks, and they capture a higher percentage of particles ([https://smartairfilters.com/en/blog/do-pollution-masks-work/?utm\\_source=Quora](https://smartairfilters.com/en/blog/do-pollution-masks-work/?utm_source=Quora)). They're what I wear in Delhi and Beijing.

## The Surgical Mask vs. N95 Mask Test

Scientists tested this question by randomly assigning over 2,000 nurses to wear N95 (<https://jamanetwork.com/journals/jama/article-abstract/2749214>), or surgical masks. Then they tracked how many of them caught the flu.

I polled people on Twitter

(<https://twitter.com/SmartAirFilters/status/1219814044829286401?s=20>) to see what people guessed. A majority (68%) guessed N95, so I'm not alone in my intuition.

But when the data came back, it turned out that rates of infection were the same!

Differences weren't significant, although surgical mask users actually had slightly lower infection rates.

### **OK, Maybe That Study Was a Fluke**

Data can be fluke-y. That's just one study. But it's not the only one.

Researchers in Canada randomly assigned 446 nurses (<https://jamanetwork.com/journals/jama/fullarticle/184819>) to wear N95 or surgical masks during a few months of cold and flu seasons (September to December). Then they tracked how many got the flu or a cold.

Again, no significant difference! Both masks performed just as well at preventing the transmission of the viruses. Twenty percent of nurses wearing surgical masks got sick versus 22% wearing N95 masks.

## **Entirely Reasonable Skepticism**

At this point, there must be at least a few savvy readers thinking, “aha!”

I know what's going on! These studies didn't have a control group, so we don't know whether the masks actually worked. If they both don't work, then of course there's no significant difference!

That's a great question. It's just hard to test because, what are we going to do? Assign nurses to NOT wear masks? That seems irresponsible.

What we need is some situation where people face infection but don't normally wear masks. It turns out, scientists found just such a place:

Home!

**The No-Mask Test on Viruses**

Researchers in Australia studied parents taking care of their children (<https://www.ncbi.nlm.nih.gov/pubmed/19193267>), who were sick with the flu.

Because people often **don't** wear masks at home (even around sick people), researchers could defensibly randomly assign people to wear masks or not. They randomly assigned parents to wear no mask, a surgical mask, or an N95 masks like the one I'm wearing here.

Then they tracked how many parents got the flu.

Compared to parents not wearing masks, parents wearing surgical masks had 27% odds of getting the flu versus 24% wearing N95 masks (called "P2" masks here).

Thus, masks seemed to work! But again, surgical masks were just as effective as N95 masks. And the effect size was fairly large—75% reduction in infection risk.

The table above reports hazard ratios, **not** raw percentages. In raw percentages, 17% of all participants got sick versus 5% among surgical masks and 4% wearing N95 masks.

Perhaps not surprisingly, the masks only worked for people who actually wore them. There was no benefit among people who often forgot or just gave up on wearing the mask.

## **How on Earth Could Surgical Masks Work as Well as N95 Masks at Capturing Viruses**

OK, at this point, there must still be some skeptical readers out there. There's no way that surgical masks can capture particles that small! I saw a doctor on Quora say that "most masks" can't capture particles the size of viruses.

But when we ignore our intuition and look at actual test data, reality is far more interesting. Test data shows surgical masks are surprisingly effective ([https://smartairfilters.com/en/blog/surgical-masks-surprisingly-effective-pm2-5/?utm\\_source=Quora](https://smartairfilters.com/en/blog/surgical-masks-surprisingly-effective-pm2-5/?utm_source=Quora)), even for tiny particles ([https://smartairfilters.com/en/blog/do-pollution-masks-work/?utm\\_source=Quora](https://smartairfilters.com/en/blog/do-pollution-masks-work/?utm_source=Quora)). For example, in one study, researchers tested particles down to .007 microns (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2662779/>) (even smaller than viruses (<https://www.sciencedirect.com/topics/medicine-and-dentistry/virus-particle>)) and found that a simple surgical mask blocked 80%.

Yet still, N95 and N99 masks outscore them ([https://smartairfilters.com/en/blog/do-pollution-masks-work/?utm\\_source=Quora](https://smartairfilters.com/en/blog/do-pollution-masks-work/?utm_source=Quora)). For example, in that study, N95 masks captured 96% (see also 1 (<https://www.nature.com/articles/jes201642>)).

So it's downright surprising that surgical masks are just as effective! Maybe virus particles are actually easy to capture because they fly on water droplets. Or maybe mask usage prevents people from touching their mouth and nose. For now, I can only speculate.

**Bottom line:** There's scientific evidence finding that (1) masks prevent flu infection and (2) surgical masks prevent infection of viruses like the coronavirus (Covid-19), as well as more sophisticated N95 masks.

Breathe safe!

**P.S. Do we even know whether masks capture tiny virus particles? Aren't they too small for masks?**

This is a solid intuition I've seen several times, including [here on Quora](https://www.quora.com/Can-wearing-masks-stop-the-spread-of-the-coronavirus/answer/Thomas-Talhelm) (<https://www.quora.com/Can-wearing-masks-stop-the-spread-of-the-coronavirus/answer/Thomas-Talhelm>), repeated by a doctor.

The only problem it doesn't fit the data. I summarize that data here: [Can wearing masks stop the spread of the coronavirus?](https://smartairfilters.com/blog/coronavirus-pollution-masks-n95-surgical-mask/) (<https://smartairfilters.com/blog/coronavirus-pollution-masks-n95-surgical-mask/>).

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Thomas Talhelm (<https://smartairfilters.com/en/blog/author/thomas/>)

Thomas is an Associate Professor of Behavior Science at the University of Chicago Booth School of Business and the founder of [Smart Air](https://smartairfilters.com/) (<https://smartairfilters.com/>), a social enterprise to help people in China breathe clean air without shelling out thousands of dollars for expensive purifiers.

Here's what else you should know about:

Can DIY Masks Protect Us from Coronavirus?

(<https://smartairfilters.com/en/blog/diy-homemade-mask-protect-virus-coronavirus/?rel=1>).

Can Masks Protect People from The Coronavirus?

(<https://smartairfilters.com/en/blog/coronavirus-pollution-masks-n95-surgical-mask/?rel=1>).

## Can Air Purifiers Filter Out The Coronavirus?

(<https://smartairfilters.com/en/blog/can-air-purifiers-filter-out-the-coronavirus/?rel=1>).

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Gab



I have an interpretation. The 9.4% – 10.5% (not 20-22 those are counts) infection rate is due to other paths, such as eye mucosae, so that's why it's equal N95 vs surgical. On why surgical performs so good and indistinguishable from N95: both masks prevent a direct droplet falling into the mouth of the wearer. Mouth to mouth contamination when talking. Surgical mask typically makes you breath from the sides of it, while N95 has an advanced filter. Both are good enough so that the viral load entering the mouth is so low that infection via that way is way... Read more »

Reply

🕒 2020-03-20 10:34 am

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eddie



I cant believe the conflicting information about this. Ofcourse there is a reason why people who are close to corona patients wear them, its because they decrease the chances of getting the virus! They are healthy too you know! There is no such thing as leave more for doctors and nurses, hospitals already have the biggest supply! And public doesnt have any! Whats the point if more people got sick?? Anyways,, Many countries are running out from masks but i was finally able to get some got some from a website called gazibo.com At least these masks provide a good... Read more »

Reply

🕒 2020-03-19 4:13 pm

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Ant Henson



Study here showing that the Most Penetrating Particle Sizes (MPPS) for respirators with filter ratings varying from N95 to FFP3 were in the range of 0.03-0.06 microns, which is far smaller than the Coronavirus in question. The percentages of these particles that were blocked are as follows: N95 -> 95.72% FFP2 -> 97.78% P100 -> 99.991% FFP3 -> 99.836% <https://www.ncbi.nlm.nih.gov/pubmed/19261695> It appears that N95-rated filters are actually incredibly effective for blocking this size of particle, and higher-rated filters (like those found in common FFP3 respirators for DIY use) are significantly better again. Of course, it's all well and good to... Read more »

 Reply

🕒 2020-03-19 3:10 am

Alice



Could the N95 masks and the surgical masks worked the same because the N95 masks were not fit tested, or fit tested properly. If not air would not have gone through the filter.

 Reply

🕒 2020-03-18 2:38 am ^

Liz - Smart Air



Hi Alice, good question! For N95 masks, you can do a fit test by yourself. We wrote an article on this topic before, here is the link: <https://smartairfilters.com/en/blog/poor-mans-fit-test/> (<https://smartairfilters.com/en/blog/poor-mans-fit-test/>)

 Reply

🕒 2020-03-18 11:01 am

Walt



There is one more empirical test of the efficiency of masks. In Korea and in China, mask wearing is (almost) mandatory, and both have stopped their epidemics dead in its tracks (within 10 days). Italy did not require masks and they are not stopping the virus. As an experimental physicist, I believe a field test more than any theory. If it works, use it and find out later why it works. It is ludicrous to say cannot work because you don't understand why it does work.

 Reply

🕒 2020-03-17 5:02 am

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## ABOUT SMART AIR

Smart Air is a social enterprise based in China, India, Mongolia and the Philippines that creates simple, no-nonsense air purifiers and provides free education to combat the impacts of air pollution. More about who the heck we are (</en/about/our-story/>)



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Meet our team in person: We're in [China \(/cn/\)](/cn/), [India \(/in/\)](/in/), [Mongolia \(/mn/\)](/mn/) and the [Philippines \(/ph/\)](/ph/).

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