COVID-19 MASK USE: EVIDENCE-BASED RECOMMENDATIONS

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BACKGROUND
Without an effective vaccine or treatment, efforts to mitigate the spread of COVID-19 have focused on behavior change activities. Policy recommendations have centered on appropriate hygienic practices such as hand washing with soap, cough and sneeze etiquette, social distancing, and regularly disinfecting environments.¹ To date, there has been mixed messaging about whether or not masks are effective prevention measures. This document outlines our recommendations based on the latest evidence.

KEY TAKEAWAYS

Healthcare settings
- Healthcare workers should have the highest priority access to personal protective equipment (PPE), including face masks, eye shields and gloves.
- When interacting with COVID-19 patients, healthcare workers should use N95 respirators if possible, and surgical masks if not, and only use fabric masks as a last resort.
- When facing shortages of medical masks, measures can be taken for extended use and reuse of medical masks.

Essential workers
- Essential workers – workers who have to be in regular contact with others while providing essential services (e.g. retail, public transport) – should have second highest priority in access to PPE, lower priority than healthcare workers but higher than the general public.
- When facing shortages of medical-grade PPE, make and use homemade masks (e.g fabric).

General public
- If symptomatic, wear masks when interacting with others; if taking care of patients, wear masks around patients as well as other people; if asymptomatic, wear masks when in public.
- Making and use fabric masks; only use medical masks if there are enough for healthcare workers and essential workers (unlikely in the current pandemic).

Mask use
- All users of masks should follow instructions for effective use of masks.
- When facing shortages, masks can be reused following instructions for disinfecting and reusing for the corresponding type of mask.
- If reusing, ideally one should have at least two masks of one’s own (not shared) and cycle them, always cleaning a mask after using and before reusing.
- Do not relax other preventative measures, e.g. hand hygiene, social distancing, and keeping a safe distance when interacting with others.

¹ https://apps.who.int/iris/bitstream/handle/10665/329438/9789241516839-eng.pdf
RECOMMENDATION 1: WEAR FACE MASKS WHILE IN PUBLIC, REGARDLESS OF WHETHER ONE HAS SYMPTOMS.

There has been no direct evidence on the effectiveness of masks in preventing the spread of COVID-19. However, evidence on the role of masks in reducing the spread of the flu is informative in understanding whether masks can reduce the spread of COVID-19. Both diseases spread via:

- **Droplets** – The viruses spread through respiratory droplets produced when an infected person coughs or sneezes, which can land in the mouths or noses of people who are nearby or be inhaled by them. This is more likely to occur to those in close contact (within about 2 meters) with an infected person.
- **Aerosols** – There is increasing evidence that COVID-19 spreads via airborne transmission in aerosols (a suspension of small liquid droplets in air), as does the flu.
- **Surfaces** – This is a possible way for both COVID-19 and the flu to spread, even though there has not been any direct evidence of COVID-19 spreading in this way.

There are a number of studies on the effectiveness of various types of masks in reducing the spread of flu or other respiratory infections. Overall, there is mixed evidence on whether surgical masks and respirators reduce the transmission of flu in communities.

However, balancing benefits and harm, we recommend the general public wear masks during the current COVID-19 pandemic for the following reasons:

- There is mechanistic plausibility that masks can reduce the transmission of COVID-19.
- Lab studies show that surgical masks reduce the spread of droplets and aerosols containing similar viruses from infected individuals.
- There is little harm in wearing face masks, as long as individuals wear them properly and do not risk-compensate by reducing other precautionary measures.

Furthermore, given the number of lives at stake in the current COVID-19 pandemic, the precautionary principle implies that we should be willing to adopt potentially effective public health recommendations that cause little harm with a lower bar of certainty on their effectiveness (than for

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4. Some systematic reviews find evidence that masks protect against respiratory infections in healthcare and community settings: [https://www.ncbi.nlm.nih.gov/pubmed/25858901/](https://www.ncbi.nlm.nih.gov/pubmed/25858901/); while others find an effect of mask wearing combined with hand hygiene but no effect of mask wearing alone [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3779801/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3779801/); [https://www.cochranelibrary.com/cda/dia/10.1002/1cda.2065/full](https://www.cochranelibrary.com/cda/dia/10.1002/1cda.2065/full). One systematic review finds that there is some evidence to support the wearing of masks or respirators during illness to protect others, and fewer data to support the use of masks or respirators to prevent becoming infected [https://www.ncbi.nlm.nih.gov/pubmed/20929668]. The WHO reviews ten randomized controlled trials and concludes that there is no evidence that face masks are effective in reducing transmission of laboratory-confirmed influenza in household and community settings [https://apps.who.int/iris/bitstream/handle/10665/379438/9789241516839-eng.pdf](https://apps.who.int/iris/bitstream/handle/10665/379438/9789241516839-eng.pdf).
5. The WHO, after taking into account a similar set of considerations, recommends that asymptomatic people wear masks in severe flu epidemics or pandemics to reduce transmission in the community, and that symptomatic individuals wear masks at all times when in contact with others [https://apps.who.int/iris/bitstream/handle/10665/379438/9789241516839-eng.pdf](https://apps.who.int/iris/bitstream/handle/10665/379438/9789241516839-eng.pdf).
6. [https://www.nature.com/articles/s41591-020-0843-2](https://www.nature.com/articles/s41591-020-0843-2); [https://www.ncbi.nlm.nih.gov/pubmed/24229526](https://www.ncbi.nlm.nih.gov/pubmed/24229526). Note that since there are lab studies looking at the penetration of particles through masks, they are not inconsistent with mixed evidence from studies in healthcare or community settings that look at infection as the outcome. The difference may be driven by 1) some people (especially non-healthcare workers) not wearing masks properly, 2) viruses infecting people through channels other than nose and mouth, e.g. eyes, leading to reduced protection against infection outside of lab settings.
approving medicines). Such recommendations should be accompanied by messaging on effective use as well as caution against risk compensation.

Because people who are infected, but are either asymptomatic or do not yet show symptoms, could transmit the SARS-CoV-2 virus, it is insufficient for only symptomatic people to wear masks to reduce the transmission. **Everyone, including asymptomatic people, should be encouraged to wear masks.**

Wearing masks is especially important in contexts where it is difficult to comply with social distancing, which is particularly the case in low- and middle-income countries.

**WHAT SOME COUNTRIES ARE DOING**

Masks have been widely adopted in many countries, including places that have had success in controlling the spread of COVID-19. Among these are South Korea, Hong Kong, and Taiwan. In much of East Asia, the general assumption is that anyone could be a carrier of the virus, and therefore, everyone should wear a mask to avoid infecting others.

European countries and cities, including Austria, Slovakia, and the German city of Jena, have made wearing masks compulsory for people while grocery shopping, taking public transportation, and in other public spaces.

The U.S. Centers for Disease Control and Prevention is now encouraging all Americans to wear cloth masks in public, after initially advising that only healthcare workers, people exhibiting symptoms, and their caretakers need to wear masks.

**RECOMMENDATION 2: RESERVE MEDICAL MASKS FOR HEALTHCARE WORKERS, ESSENTIAL WORKERS, AND HIGH-RISK POPULATIONS**

Countries around the world are facing shortages of personal protective equipment, including medical masks (N95 respirators and surgical masks). Policymakers, NGOs, and other stakeholders should prioritize which groups get masks first to reduce the likelihood of transmission and protect those most likely to suffer health complications.

**Personal protective equipment should always be reserved for healthcare workers until supplies are sufficient for them and abundant.** They are most exposed to the virus, which means masks should

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8 [https://www.bmj.com/content/369/bmj.m1435](https://www.bmj.com/content/369/bmj.m1435)
10 This is because: 1) many people need to interact with others to generate income, 2) many people do not have the liquidity to buy in bulk and need to shop regularly 3) online shopping and delivery are less common, 4) many people live in crowded settlements, 5) many people do not have access to private transportation options.
have a more protective effect on them than those with less exposure. Furthermore, protecting them is also crucial to the functioning of the healthcare system and the protection of the public.

**Additional masks may be allocated to other groups who are especially likely to transmit, be exposed to the virus, or who are likely to suffer complications as a result of the virus, including:**

- Individuals actively exhibiting COVID-19 symptoms
- People who are elderly, immunocompromised, or have a history of respiratory illness
- People living in or in contact with either of the above groups
- Retail employees, drivers of public transport vehicles (including buses and minibuses), or other workers exposed to large numbers of potentially sick people; in places that have implemented mandatory social distancing measures, this should include all workers in essential services.

**PRIORITIZE USING N95 MASKS OVER SURGICAL MASKS**

There are two main types of medical masks: N95 respirators and surgical masks. We recommend the use of N95 respirators over surgical masks for the protection of healthcare workers in contact with COVID-19 patients, if both are available.

While there is no direct evidence on the superior protection effect of N95 respirators over surgical masks against COVID-19, we base our recommendation on the following:

- Lab studies show that respirators offer better protection against aerosols as well as particles of sizes similar to the SARS-CoV-2 virus.
- Studies in healthcare settings find superior protection of respirators against some infections.

N95 respirators should be fit tested and worn correctly (including having a seal check) to ensure maximal protection.

While surgical masks are less efficient than N95 respirators in protecting against airborne particles, they still offer some protection, and should be worn when no N95 respirators are available.

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15. Despite mixed evidence on the effect of masks in reducing flu transmission in communities, some studies focusing on healthcare settings show protective effects of masks against some respiratory illnesses (https://www.ncbi.nlm.nih.gov/pubmed/29140516). This could be due to higher exposure to viruses in healthcare settings and/or healthcare workers wearing masks more effectively.


17. https://jamanetwork.com/journals/jama/fullarticle/2762694. There are other types of respirators which are more rarely used (https://www.cdc.gov/niosh/topics/respirators/factsheets/respsars.html).

18. The former is demonstrated by a study that looks at filtration of particles with sizes between 0.02 and 1 µm, or 20 and 1000 nm (https://www.ncbi.nlm.nih.gov/omc/articles/PMC2440798/). On the latter, the SARS-CoV-2 virus particles have diameters between 60 and 140 nm (https://www.nejm.org/doi/full/10.1056/NEJMoa2001012): some N95 masks have been shown to lead to penetration of 6% or less of particles within that range of sizes, while some surgical mask lead to penetration of 20.5% to 84.5% (https://www.ncbi.nlm.nih.gov/pubmed/16490606).


23. The US CDC has more resources on proper use of N95 respirators: https://blogs.cdc.gov/niosh/blog/2020/03/16/n95-preparedness/

RECOMMENDATION 3: PROMOTE THE PROPER USE OF NON-MEDICAL FABRIC FACE MASKS

Since many countries currently have a shortage of N95 respirators and surgical masks, and these should be reserved for healthcare workers, the general public should be encouraged to make and wear homemade masks. Lab studies show that even though homemade masks do not offer the same level of protection as N95 respirators and surgical masks, they do offer some protection against viral aerosols.25

We recommend anyone wearing masks (including healthcare workers and the general public) follow proper instructions for making and wearing these masks. Recommendations to make masks at home have been issued by the US CDC the Indian government,27 and the Surgeon General of the US released a video on making masks with rubber bands and folded fabrics found at home.28 Scientists have found that one of the most effective household materials is a double layer of 100% cotton cloth.29

Since homemade cloth masks offer less protection than medical-grade masks, they should only be used as a last resort for healthcare workers,30 who should be offered priority access to medical-grade masks and other protective gears including gloves and goggles.31

USE MASKS EFFECTIVELY

Masks need to be used properly in order to prevent the spread of diseases. The World Health Organization (WHO) has the following guidelines:32

- “Before putting on a mask, clean hands with alcohol-based hand rub or soap and water.
- “Cover mouth and nose with mask and make sure there are no gaps between your face and the mask.
- “Avoid touching the mask while using it; if you do, clean your hands with alcohol-based hand rub or soap and water.
- “Replace the mask with a new one as soon as it is damp and do not reuse single-use masks.
- “To remove the mask: remove it from behind (do not touch the front of mask); discard immediately in a closed bin; clean hands with alcohol-based hand rub or soap and water.”

Those wearing masks should still minimize situations where the mask is needed by social distancing, staying home, practicing hand hygiene, and taking other precautions where possible. People

25 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2440799/
28 https://www.youtube.com/watch?v=tPx1yqvJgf4&feature=youtu.be
29 This table shows the effectiveness of surgical masks as well as common household materials in reducing the transmission of bacterial and viral aerosols (higher average indicates better filtration capacity): https://www.researchgate.net/figure/Filtration-Efficiency-and-Pressure-Drop-Across-Materials-Tested-with-Aerosols-of-Bacillus_tbl1_258525804
30 If health workers choose to work using cloth masks, we recommend them to have at least two and cycle them following the cleaning instructions listed below.
31 Wearing a mask is not enough for protecting health workers against COVID-19; their protective gears including gloves and goggles are also required as a minimum as SARS-CoV-2 also infects through contact with contaminated surfaces and self-contamination (https://bmjopen.bmj.com/content/5/4/006577.responses).
wearing masks may believe they are protected, which can lead to risky behavior that results in a net-negative to wearing them in the first place.

**REUSE MASKS WHEN NECESSARY**

When facing shortages of masks, used masks can be treated and reused, though one should take care to properly treat used masks.

- **Cloth masks:** We recommend at least washing masks with water and soap or detergent and drying thoroughly; ideally, they should also be washed (or boiled) in hot water of 70 degrees Celsius or above for 15 to 30 minutes.

- **Surgical masks and N95 respirators:** A study suggests that treating with dry heat (e.g., baking in an oven) at 70 degrees Celsius (and no higher) for at least 30 minutes can effectively inactivate the virus while minimally affecting the protective function of the mask. Treating with UV-C, hydrogen peroxide vapor or hydrogen peroxide gas plasma are other potential options.

Health facilities that are considering reuse of masks may wish to consult further guidelines on decontamination and reuse of respirators and on extended use and limited reuse of respirators, and implement measures including use of a cleanable face shield over medical masks.

**If reusing masks, one should make sure the cloth mask is cleaned properly before using it again.**

Thus, we recommend everyone makes at least two masks for themselves which they can cycle while one of the masks is being cleaned and dried. In addition, **we recommend avoiding sharing masks among household members and having at least two masks of one’s own,** to ensure the fit of the masks to one’s face size, and that masks are cleaned before being reused.

In addition, cloth masks are easier to clean for re-use than surgical masks, which are more likely to be damaged during cleaning. Therefore, recommending the use of cloth masks may be more appropriate in cases where the public

- Does not have access to a large number of surgical masks;
- Is reluctant to purchase many masks;
- Does not have the means or discipline to properly clean surgical masks before each new use.

**COMBINE WITH OTHER PREVENTATIVE MEASURES**

Since respiratory illnesses, including COVID-19, transmits between people, the most effective strategy to mitigate the impact of a pandemic in the absence of vaccine or treatment is to reduce...
contact between infected and uninfected persons as well as reducing the chance of the virus spreading condition on contact between persons.

**In addition to mask wearing, we recommend other preventative measures to reduce the spread of COVID-19, such as:**

- Hand washing
- Respiratory etiquette for coughing and sneezing\(^{38}\)
- Regularly disinfecting environments
- Social distancing

Since all the above measures contribute to reducing the chance of disease transmission and do not necessarily substitute for one another,\(^ {39}\) we recommend implementing multiple measures, starting from the least costly ones, to reduce the disruptions they cause on livelihoods, especially of low-income households.\(^ {40}\)

**ABOUT IDINSIGHT**

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\(^{38}\) This includes: covering the mouth and nose with a hand, sleeve or tissue when coughing or sneezing; finding the nearest waste basket to dispose of the used tissue immediately; and washing hands after touching respiratory secretions or contaminated objects (or both) ([https://apps.who.int/iris/bitstream/handle/10665/329438/9789241516839–eng.pdf](https://apps.who.int/iris/bitstream/handle/10665/329438/9789241516839–eng.pdf)).

\(^{39}\) For instance, even when people practice social distancing, they may still interact with others to carry out essential economic activities (e.g. grocery shopping) – maintaining a safe distance and wearing masks when doing so, and practicing hand hygiene after reaching home, are important for reducing the chance of disease transmission.

\(^{40}\) [https://www.cgdev.org/blog/masks-handwashing-vs-physical-distancing-do-we-really-have-evidence-based-answers](https://www.cgdev.org/blog/masks-handwashing-vs-physical-distancing-do-we-really-have-evidence-based-answers)