

Suggested Recommendations to Reduce the Probability of COVID-19 Contagion

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Shortcut to this doc; <https://tinyurl.com/covid-recs> It is okay to share this with others if you find it useful. If you have a comment to improve this document, or a question not discussed here you can email me at <jlj.colorado@gmail.com>

[Links](#) like this are for the general public. [Links](#) like this are scientific documents, everyone should be able to understand the conclusions, but details may be harder.

Disclaimer: this is what I am doing and what I am recommending to my friends and family. Many people have been asking me, so this is just an efficient way to say what I think to whoever is interested. These are my personal opinions and are not endorsed by CU-Boulder. I am not a medical doctor. I am an aerosol scientist ([Link](#)) and a [Highly Cited Researcher](#), and I am involved in discussions with dozens with experts and the WHO about air transmission of COVID-19. My recommendations are similar or more conservative than those of [CDC](#) and [WHO](#). The only point where I disagree with current WHO recommendations is in air transmission, where I (and many other scientists) think the risk is higher than what they say.

Modes of Transmission

- We are in a pandemic because of asymptomatic carriers being contagious. Assume everyone you see could be one, as could you.
- Transmission through touching.
 - + I highly recommend [this video](#) to get a better sense of this mode. Great for kids too
 - + Avoid gloves, they give a false sense of security, hard to use correctly. Just wash / disinfect your hands “fanatically”. ([Link](#))
- Transmission through coughing / sneezing:
 - + Keep a good distance (at least 6 ft = 2 m), wear a mask.
 - + Note that droplets & aerosols from coughing and sneezing are transmitted much much farther than 3-6 ft (1-2 m) ([Link](#))
- Transmission through regular breathing / talking.
 - + The virus is exhaled in breath. It stays in the air for hours, as the particles are too small to settle to the ground quickly. It is mostly removed by ventilation.
 - + People talking and exercising emit a lot more viruses than just breathing. But still some emission while breathing. Some people are super-emitters, unclear why ([Link](#))
 - + Air transmission is controversial, but the evidence is overwhelming in my opinion. I have been working with a group of 37 worldwide scientists working to try to convince WHO to change their position. WHO is very responsive but not yet convinced.
 - + In the words of a colleague that has worked on this field for years: “Medical doctors have an incredibly bad understanding of aerosols and are very resistant to change.” This culture seems to dominate at WHO.
 - + The US National Academy of Sciences, Engineering, and Medicine has accepted that air transmission is possible ([Link](#)), as have many countries.
 - + [This undergrad lecture](#) from Prof. Linsey Marr of Virginia Tech (leading expert in this field) has a lot of good background information, and her [Twitter feed](#) is a good way to follow this issue in near real time
- Transmission through the eyes

- + If the virus lands in the eyes, infection can result ([Link](#), [Link](#))
- + This is well accepted and well established for respiratory viruses ([Link](#))
- + Therefore, it is useful to wear glasses. Goggles (e.g. ski or laboratory goggles) may be useful, especially in indoor spaces.

Indoors in Public Spaces:

- + Contagion from an infected person is 19 times more likely indoors than outdoors ([Link](#))
- + Stay at home! Go to supermarkets etc. as little as possible. Buy food for a long time. Order online for delivery of curbside pickup if possible. To protect yourself, and also to protect those workers from contagion ([Link](#))
- + If you go, go early in the morning (less live virus in surfaces and air, as the virus from the previous day has partially died, [Link](#)), at times with the fewest people, keep it as short as possible. Keep more than 6 ft (2 m) from others.
- + Wear a mask (any mask is better than no mask, [Link](#), [Link](#)).
 - + DO NOT buy medical masks now, those should be reserved for medical professionals and essential workers.
 - + Remove the mask from your face carefully trying to not touch the outside, which may have viruses. Wash your hands after touching the mask, leave it in the sun (UV light has some disinfectant power) or on a shelf for the virus on the outside to decay, or wash it if possible.
 - + *Masks don't make it fully safe, don't relax social distancing because you are wearing one!*
 - + If you have an old N95 mask, wear it since health care cannot accept donations of old masks. But realize that getting a good fit (so that air doesn't leak between the mask and the face) is very difficult. Get in front of a mirror and look for gaps. The mask should be "sucked in" and get closer to your face when you breathe in.
 - + Cloth or surgical masks are quite good at filtering viruses that you exhale ([Link](#)). They are less good at filtering viruses in the air that you inhale, but they still reduce the risk by tens of percent.
 - + There are many guides to make your own mask (e.g. [Link](#), [Link](#))

Indoors at Home

- + A mail carrier or Amazon packaging / delivery worker could be an asymptomatic carrier. Treat mail and packages as if they are infected. The virus can live on cardboard for a day, on plastic & metal for 3 days ([Link](#)).
- + Let mail, packages, and groceries sit out of reach for at least 3 days if possible (we have been doing one week), and wash your hands after putting them there.
- + Disinfect anything that you will use faster than 3 days, or that or that has to be refrigerated (virus lives 1 mo.) or frozen (virus lives 2 yrs). [This video](#) has a good procedure for disinfection, except I would do it outside or on a porch if possible. Wash fruits and veggies with dish soap and water.

Outdoors:

- + Chance of contagion is lower due to higher dilution, but not zero. A study in Japan concluded that it was 19 times lower ([Link](#))
- + This is most important for people for whom COVID-19 could be deadly, such as the elderly, or people with pre-existing conditions. Note that you could be an asymptomatic carrier, and a young healthy-looking person you pass by could actually be immunocompromised etc. So keep a distance from everyone you cross.
- + There is no “magic distance” where one is completely safe. Dilution increases greatly with distance, so the chance is negligible at very large distances.
- + But turbulent dilution / dispersion proceeds with eddies and laminae, in which the exhaled air can stay concentrated for larger distances.
- + The best analogy is to think of everyone you pass by as a smoker, you don’t want to smell their exhaled smoke (low dilution of their exhaled air in that case). It is unlikely, but one of them could be a super-emitter. [This interview](#) has more details.
- + Still do go out and exercise (not exercising is a health risk too), but go to places with low density of people, and keep ~ 25 ft (7 m) from others (you’ll get a little more exercise doing that). Especially if you are downwind of others, or in calmer air. Windy days are safer because of faster dispersion. Avoid narrow trails where you cannot step aside to keep that distance, or crowded areas.
- + Wearing a mask is useful, especially in areas with more people walking around. You are also modeling good behavior. I do it. Multiple countries / cities require it, and more will require it in the near future. But not needed if you are in a deserted area.

Importantly, we’ll have to do many of these things until we have had zero new cases for over two weeks in our community. And potentially longer, once people start traveling again and we may get imported cases.