Avoiding Covid While Travelling

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Personal Notes and Preamble:

It is hard to "prove" that these measures work. To my knowledge, I have never caught covid, which includes while travelling, though I have gone on three significant trips to Japan in 2023 and 2024. They add up to six long air travel days between Toronto and Tokyo / Osaka, and about three months of moving between different types of accommodations in a different country. I adopt a 'kitchen sink' approach to avoiding covid: I think of every conceivable tool and deploy them all at once. I am strongly motivated because my mother is disabled and on immune-suppressing medication, so I would give anything to make sure she doesn't get sick. What this means is that I don't know which of these tools was the real 'difference-maker', or if it required the sum total of all of them in concert to create the desired result of not getting covid. I know I'm not going to scale back anytime soon! But for the purposes of using this report as a tip sheet for other travellers, I'd suggest considering which of these strategies are practical and accessible to you, and building your own collected strategy from these ideas — and perhaps from ideas of your own! If there's anything you'd add to this list, please share!!

Some citations have been added thanks to the contributions of my dear friend *@BE@zeroes.ca*, but for the most part, this is not meant to be an academic source about subjects that are well established in the literature (e.g. covid's transmissibility and so on). There are many, many places where you can read about that at your own leisure. Links to web-based sources are included sparingly where helpful; many of them lead to vast treasure troves of information, so take your time and open tabs. Links to sellers are only added in cases where products can primarily be purchased only from the manufacturer directly.

Also, when it comes to discussing whether things are expensive or affordable, obviously this is subjective. With few exceptions, I will not be citing exact prices for anything due to the variability of currencies and international markets.

Before the Journey: Things To Prepare in Advance

Everything takes time to get a hold of, especially if you are trying to avoid in-person shopping, so I'd recommend assembling your travel toolkit before you've even made any plans to travel. Better to have these things on hand than have to scramble on a deadline.

N95/FFP2 (or Better) Respirator

These are table stakes for avoiding covid. Covid is being transmitted not only in populated indoor spaces, but also through the air outdoors. It can linger in empty indoor spaces to infect the next person to pass through. It's airborne, so imagine cigarette smoke, or a fart cloud: if you can "smell it", congratulations, you're infected now. Being outdoors isn't magic; it just provides more airspace and more of a chance for the virions to dissipate before they reach you. You have to give it that space, though, and sitting across a picnic table from someone is not going to cut it.[1]

Travelling will involve being in all of these types of spaces: crowded indoor spaces, crowded outdoor spaces, and questionable indoor spaces where it is unclear how long has passed since they were last vacated (hotel rooms). You will need to be wearing a respirator in all of those places, as it is your primary partner for filtering covid out of the air you breathe. Thus, it behooves you to find a respirator that fits you properly, and that you find comfortable enough to wear for extremely long periods of time — at minimum, door-to-door, though if you are travelling with companions or cohabit with others, you may also be on symptom watch for a number of days on either end as well. This means taking the time to try a lot of different respirators, and test them for fit, and experiment with long durations. As a rule of thumb, headstrap respirators provide a more secure long-term fit than earloop respirators, but wear whatever fits you and that you can bear to wear for very long periods of time.

In terms of quantity, I pack enough masks to change my mask twice a day for the first five days (waking and sleeping, since I have always been sharing a room with someone else; I find that changing frequently to a fresh mask makes it much easier to endure very long periods of mask-wearing), and to have a fresh mask each day of the trip, especially in hot and humid weather, plus a bunch of cute KF94s for days when I will be outside only. I have one extra comfy type of mask (the 3M V-flex) for air travel days and to wear when sleeping during symptom watch periods (more on that later), and a mask that is less goofy looking at the cost of being slightly less comfortable (the 3M Aura) as my 'going out', 'day'

mask. I usually end up taking home lots of surplus unused masks, but it's better to have more than you need rather than too few. In cooler conditions, an elastomeric will be more economical, but may be intimidating to locals and may create social barriers that can cause other problems on your trip. Use your best judgment about the cultural and environmental conditions at your destination.

The highest luxury of safety, especially for air travel, is a full-face powered respirator (PAPR). At very close range, eyes seem to be an additional vector of covid transmission, as people speak or cough and launch tiny aerosolized particles that land on the surface of your eyeballs. Having something covering your entire face leaves no room to question! (Regular eyeglasses or safety glasses also offer a protective effect.) PAPRs are very expensive, however, and sometimes flight attendants will give you a hard time, due to confusing regulations from various airlines. I've heard protestations ranging from "you can't use that while it's plugged in to the power outlet" to "you'll have to take that off if the oxygen masks come down in an emergency" and so on. Airport security have also been mystified by my Microclimate Air; I explained that it is an "industrial tool that filters particulates". I have never been denied the right to use this technology at any point, and my family has worn Microclimate Air helmets on flights to Japan, Mexico, the United Kingdom, and Iceland, as well as domestic flights within Canada, but the strange questions from airline staff make me wonder how much longer we will continue to enjoy access to this safety tool.

The advantage of a PAPR is that you do not need to pass a fit test with it. It creates a positive pressure environment that passes filtered air to you, and then filters your breath on its way out.

In a more sensible and kinder world, we would each have as many types of respirators as we have shoes, for every environment and occasion.

Necessity

Non-negotiable, in whatever form you can get your hands on.

Accessibility

If purchasing respirators is outside of your reach, please check if there is a mask bloc local to you that can provide respirators to you for free. If you are able to buy your own, also consider supporting your local mask bloc to make respirators accessible to all. When buying your own, respirators range greatly in prices, ranging from just a few cents per mask if you get a large quantity, to hundreds of dollars for a powered respirator. These costs must also be calculated over time. It also depends on how many you will need to try before you find your 'forever respirator buddy' that both passes a fit test and is comfortable for you. Elastomerics cost more up front, and may also have expensive replacement filters, though these filters need to be replaced very infrequently. Disposables aren't cheap either, especially over time. Note that it is the straps which fail first on a disposable respirator; the filtration medium itself can be used until it becomes difficult to breathe through, or soiled enough to create other hygiene concerns depending on the sensitivity of your skin.

Fit-Testing

Fit becomes more important than ever when you're counting on a respirator to keep you safe for a long period of time, and in very high risk situations. A mask that does the job when sitting across a picnic table from somebody, may not be adequate for sitting in an airplane waiting to take off, as the cabin slowly fills with the breath of hundreds of international travellers. (Yes, airplanes use HEPA filtration and ventilation… but often these systems aren't turned on until takeoff.)

Respirator fit-testing can be done quantitatively (in a laboratory, or with a specialized Portacount machine that counts particles outside vs. inside the respirator), or qualitatively (by sticking a bag on your head and seeing if you can taste bitterent/saccharin when you squirt it in your face with a respirator on). Qualitative fit-testing is much more accessible to the average person, and it's what I did. (Ironically, many fit-testing laboratories aren't covid-safe, since they are mostly for industrial clients.) You can buy a fit-testing kit, which comes with two labelled nebulizers (one for each type of solution: the 'control' that determines whether you can detect the solution, and the actual fit-testing solution), a hood with a hole in it that the nebulizer nozzle can fit through, and bottles of fit-testing solution (control and test solution), as well as instructions. However, the same effect can be achieved with a garbage bag, a nebulizer you buy separately and a bottle of Bitrex solution, or saccharin mixed up from packets of Sweet 'n' Low.

Nebulizer means a nebulizer, NOT a perfume atomizer.

You can search YouTube for handy DIY demonstrations of mask fit-testing kits. Personally, I bought the Gerson fit testing kit, which comes with saccharin solution, and supplemented it by additionally buying 3M-brand Bitrex sensitivity & fit test solution, since my father could not detect the saccharin. Bitrex also provides a much more definitive qualitative result, because it tastes unmistakeably horrible.

Do not store Bitrex bottles on their sides, as the solution will creep up the threads of the cap and make a mess that is very unpleasant to clean up.

Assemble all the masks you want to try, and test them, preferably outside, as the solution will build up in the air indoors and make you less sensitive to detect a leak. Follow the instructions and procedures in the kit carefully.

Once you have a crop of masks that you can pass a fit test in, the next consideration is duration. Which masks can you wear comfortably for the longest period of time?

Here are my findings:

- Elastomeric respirators can provide a great seal, but they become uncomfortable quickly (for me, at least) in hot climates, or after a few hours. So, for me, elastomerics are sprinters rather than marathoners — but you can only find out for yourself and your own physiology.
- When it comes to disposable respirators for travel, the 3M V-flex reigns supreme. It is cottony-soft against the skin, provides a great seal even when lying down or sleeping on your side, and is flexible enough that you can scratch your nose through it!!!!! It is like a little face-blankie. I have endured multiple five-day shared-space quarantines, wearing a V-flex 24-hours a day, sleeping and waking, and it was tolerable. I don't think I could do it with any other mask. If the V-flex doesn't work for you, find your own V-flex: your match made in heaven, that you can comfortably wear for very long periods of time. Give yourself the time to try lots of masks and find your perfect fit.

Necessity

Medium-high, depending on whether you are engaging in air travel. Basic user fit-tests (e.g. breathing hard and seeing if the filter sucks in and out, or tricks like putting a sheet of plastic over the filter of a Flo Mask and seeing if you can create a vacuum) may suffice for situations of lower population density or CO_2 concentrations.

Accessibility

Brand-name fit test kits are priced exorbitantly, probably because they are largely marketed to industrial clients. DIY kits are much more affordable and can be assembled largely from things you can find around the house.

Sip Valve Installation

If your travel days are not too long, or if you will reliably have a chance to unmask outdoors or in a private vehicle to eat or drink, this may not apply to you, but for long-haul flights and long travel days, hydration is crucial. Sip Mask valves allow you to pass through a small cocktail straw to drink without breaking the seal on your mask.

Different masks require different tools to install a Sip valve properly, especially if you are clumsy like I am.

3M Auras are okay with scissors used as described in the instructions for Sip masks, but the scissors need to be sharp, especially at the tips. Be sure to err on the side of making the hole too small rather than too large.

Flo Mask filters need the use of a 10 mm hole / grommet punch to puncture through the filter material, especially Pro filters that have very durable layers.

V-flex material is a bit stretchy and prone to splitting along the little seams and creating a much bigger hole than intended, so I use an awl to punch a hole, which I then carefully stretch with a pencil or with my pinky finger until it is big enough to squish the valve through.

You may find other masks require different strategies, but start with scissors as advised by Sip Mask, and see how you

go.

Once the valve is installed, do a quick seal check (suck in air rapidly to breathe heavily and see if the material of the mask sucks in and out) to make sure there are no gaps. I make sure to carry multiple backups with me when travelling: one with a Sip valve already installed, and a few unmodified respirators, just in case the valve fails while en route.

Remember that you must also pack your valve installation tools so that you can prepare a Sip valve for the return trip. They will need to go in your checked bag, as scissors and awls and such may be confiscated by airport security.

The valve ring and cap can be decorated with stickers to make you smile!!

Necessity

Important for long travel days in high risk situations (e.g. air travel of more than an hour), and according to your health needs. Does represent a degree of risk and stress, though, as an improper installation can actually compromise the seal of your respirator. That being said, I have not experienced a failure that resulted in infection for myself or three other travellers, including someone on immunosuppressant medication.

Accessibility

Sip Mask ships internationally, though I experienced that shipping to Canada is slow. It may also be stocked by your local mask bloc. They are quite expensive for what they are (over $100 CAD for five, including shipping; buy directly from Sip Mask to get their 'buy four, get the fifth free' deal). However, they are the only providers I know of for such a technology, so they can set their prices at will. They come packaged with narrow straws that work well with the valves, and if you are stingy with these straws, they can last you a long time and you will find yourself with a great surplus. You can also purchase cocktail straws for cheap; if you can find water-bottle-length ones that bend, that's the dream! Valves themselves will last a long time if treated gently, and can be washed with soap and water between installations. Do inspect them regularly and do user seal checks if you have any doubts, since rough handling when inserting the straw can cause them to split and no longer seal effectively.

Carbon Dioxide Monitoring

A CO_2 monitor is very handy when travelling to identify situations of higher risk than they may appear. CO_2 accumulation in a space is a proxy for identifying the percentage of the air in a space has recently exited somebody else's lungs. Lower concentrations of CO_2 mean good air exhange with the outside atmosphere. Higher concentrations mean that breath is building up in the space, and requires filtration or UV-irradiation to offset the accumulated density of (potential) infectious pathogens in the space.[2][3]

- As a baseline: 420 ppm is the CO_2 level outside in Earth's atmosphere.
- 1000 ppm is when I tell my mom to leave a space, no questions asked. This would prompt a failure for Japan's building ventilation audits. Sadly, most countries have not implemented such standards.
- Airplanes on the tarmac can easily get up to 3000–4000 ppm. This is not very nice at all; 3000 ppm means you are breathing 7% rebreathed lung butter.
- Cars with air conditioning set to 'recirculate' can get even higher than that.

Most areas of an airport — at least, Toronto Pearson airport, Tokyo Haneda airport, and Itami and Kansai airports in Osaka — will be between 700–800 ppm. This is around 1% rebreathed air; or, in other words, it takes the span of one hundred breaths to achieve the equivalent of snogging a stranger. (So, yeah, you still want to be wearing a mask.) Some areas will get higher or lower, especially if people are crowding around a gate, or are all deplaning at the same time. Use your CO_2 monitor to hunt for places with lower concentrations of CO_2 to be your spot to post up while waiting for your flight, and maybe to find an opportunity to sneak some nibbles under your mask. (More on that later.) Danger zones are not really possible to eyeball; at the risk of stating the obvious, breath is invisible, and builds up in concentrations in certain areas based on complex interactions of fluid dynamics, architecture, and the building's own mechanical air circulation. An empty corner with low ceilings may be more dangerous than the huge airspace of an airport terminal with lots of people in it (as long as they are a reasonable distance away from you). Do not mistake 'privacy' for 'breath safety'!! A bathroom stall, for example — especially ones on an airplane, but also including any others on the ground — is, in terms of breath concentration, frequently the most dangerous place of all.

Get to know your CO_2 monitor and understand the vibe of how much carbon dioxide builds up in what kinds of spaces over time, and with how many inhabitants. You may be surprised to learn something new about your own dwelling!

Necessity

These provide better environmental awareness, and inform behavioural judgment calls (e.g. "is this a good place to try to sneak a snack?"). Not necessary if you want to operate at maximum vigilance the whole time — so, perhaps more of a 'peace of mind' tool. That being said, I refer to mine constantly and find it invaluable.

Accessibility

CO_2 monitors come in a range of price points, and there are a few different types of sensors that have different drawbacks. Cheaper monitors (e.g. the Vitalight) may require frequent calibration to counteract an 'autocalibration' feature that will reset its baseline to assume that its lowest recent reading is considered 400 ppm — which will lead to dramatic undercounts thereafter! The gold standard is the Aranet 4, which is very expensive, but not only does it offer the most reliable readings, but it comes with a few other luxuries: its e-ink screen means that I haven't had to change its battery since I got it last year, and it has a handy smartphone app that means I can just leave it in my bag and use my phone to check ambient CO_2 via Bluetooth. The app also produces graphs that allow you to check CO_2 concentrations over time rather than relying on real-time readings. CO2.click offers a mid-priced made-in-Canada portable CO_2 monitor with a high quality sensor, and it needs to be charged once a day. It also generates graphs via a web portal that it requires wifi access to update.

Vaccine Boosters

You may wish to time your vaccination booster such that you receive your dose two weeks before your travel day, so that you are maximally protected at your highest-risk times.

Necessity

As this guide is about travelling without catching covid in the first place, this is technically a nice-to-have, as it is a life preserver that will hopefully keep you out of hospital if the worst should happen.

Accessibility

Varies by country and health status. They're still free, right?

Pet Care

Any organism with ACE2 receptors can contract covid.[4] (See also here and here regarding dogs and cats catching covid from their owners.) So if you have any critters under your care that will need looking after in your absence, do plan in advance for someone you trust (like, really trust) to petsit for you. If you have a novid friend who could do the job, that is fantastic and ideal! — and also, very rare, sadly… so, for everyone who remains untouched by a unicorn, can you find someone who will actually keep their word to wear a respirator whenever they enter your home?

Necessity

Only applicable if you have pets, but if you do, it's about as necessary as things get.

Accessibility

Very difficult without a lot of luck and goodwill. I wish you all the best.

Personal HEPA Filter

These are useful on travel days if you want to be able to eat indoors more safely, and to boost air cleaning in smaller spaces at your accommodation (i.e. the bathroom). I recommend the SmartAir QT3 because it has a lot of data about its efficacy and range.

Necessity

Optional — very situational in use. See the rest of this guide for its application and determine if that sounds like a covid mitigation pathway that applies to you.

Accessibility

The QT3 is great value but may still be out of reach for folks on a very strict budget. This is a situation where cheaper alternatives may simply not have the firepower to be helpful.

Far-UVC

These are much more portable and powerful air cleaning tools, but are very expensive and in some cases actually prohibited for import (…Canada…). If you can get your hands on them, they will clean indoor air lickety-split, but they are definitely a luxury of air cleaning.

Necessity

Optional. They just speed up effective air changes by a LOT.

Accessibility

Really quite expensive, and sometimes even impossible to import to some countries due to lagging and benighted regulatory bodies.

CPC Mouthwash and Other Types of Rinses

The first few days after travel are a good time to gargle with cetylpyridinium chloride (CPC) mouthwash, which has been proven to kill virus accumulating in the throat and mouth,[5][6] so even if you picked up some unwanted guests, you may be able to eliminate them before they gain too much of a foothold. Some people also use nasal sprays, but I have no experience with this in terms of its efficacy versus its drawbacks, so I cannot recommend it; their pros and cons may be worth researching and considering.

Necessity

Low. Very much a nice-to-have. I can't measure how much or whether it made a difference to me staying covid-free.

Accessibility

Widely available at pharmacies anywhere.

Testing

You may wish to bring rapid tests with you, in the case that someone shows symptoms and you'd like to determine if you receive a positive. There are many reasons for feeling sick and run down during travel; all my life, travelling has meant sore throats (from environmental changes such as dry air or unfamiliar airborne irritants, or acid reflux due to chaotic mealtimes), headaches (from dehydration, caffeine withdrawal, atmospheric pressure changes, or disrupted daily routines), fatigue (from jetlag, physical exertion, and general sleep deprivation), and gastrointestinal issues (from eating unfamiliar foods, or sensitivity due to sleep deprivation). These symptoms gain sinister new implications in the pandemicene, and we can get really caught up in worrying about what they might mean, or even questioning whether you are experiencing a symptom at all.

Unfortunately, rapid tests are so insensitive and throw false negatives so regularly that I have not found them helpful when I am not symptomatic, nor even when I do feel unwell. I have never tested positive on one, and testing negative is not especially reassuring. They seem like a good thing to have on hand in case you get a very obvious suite of covid symptoms all at once, but I cannot speak to experience about this.

For a test with orders of magnitude more sensitivity and accuracy (requiring only 400 copies of viral RNA per millilitre for detection, rather than needing millions of copies of viral RNA per millilitre as a rapid test does), you can purchase a molecular LAMP testing machine such as the Pluslife. These are still quite expensive and difficult to access. The machine is small and portable, and can be shipped safely on an airplane, but because of the difficulty in acquiring such a machine, I don't risk bringing it with me when I travel. I keep it at home, and use it to test out of a post-travel quarantine after just two days instead of five.

Necessity

I judge that this is optional. Rapid tests are not great at flagging asymptomatic cases. If you get sick, you're sick; whether it's covid or not, you don't want to be sharing it around. If you're sick, assume it's covid, and do all the things you should do (isolate, and do radical resting for as long as you can; if you have a stash of Paxlovid, hit it; gargle with CPC mouthwash to fight the colonies in your throat, and so on; this guide is not about what to do if you have covid). The Pluslife is a definite luxury item. Though I use it only for abbreviated quarantines on the return end of the trip, bolder people than I could make very good use of it throughout a trip.

Accessibility

Rapid tests can be acquired for free with some government programmes, and are not too expensive even out-of-pocket, though sometimes it takes some hunting to find a pharmacy that is still stocking them. A molecular LAMP machine and compatible covid test cards are quite expensive indeed, and for now only appear to be available via a single distributor in Germany (Altruan; they do ship internationally).

Nurture Your Calm

Do not underestimate psychological effects. You may be anxious about this trip, for any number of reasons. This is normal and okay. No matter what other people may be breathlessly repeating (sometimes literally), covid is dangerous and it continues to be a life-altering threat to everyone, whether or not you fit the model of 'the vulnerable'. You may be out of practice of being in crowds and navigating overstimulating environments like airports or train stations. Don't be hard on yourself for having these very human responses. Being stressed out can make even the most habitually cautious of us forget key components of our process, so be kind to yourself, and prepare whatever tools you prefer to use to soothe yourself. (Personally, I find noise-cancelling headphones to be lifesaving technology.) In some ways, self-regulation tools are as crucial as any other tool on this list.

Also, looking very calm and responsible is very useful for getting other people to respond to you in kind.

Necessity

This is a worthy goal, though it can very hard to achieve.

Accessibility

Your self-soothing kit is probably stuff you already own, so that's good news! But if you want to treat yourself to something that will make life a little easier, that's great too!

Travel Bookings

It must be emphasized: the safest way to avoid covid is not to travel at all. These are dark times for fun little weekend getaways. Travel during a pandemic is the very opposite of relaxing. At best, it is a lot to juggle; more realistically, it is f___ing harrowing.

Some tips about the best ways to travel during an unmitigated airborne pandemic:

- Travel alone, if you can, or only with people who agree with you about the importance of avoiding covid and how it should be done. Talk to them about everything in advance and get everyone on board together with your agreed process, and committed to following it.
- Travel modes ranked from safest to least safe (with regard to airborne infectious disease only; concerns about incinerating the planet are a separate story):

  On foot, cycling, driving a private land, sea, or air vehicle, or riding on a friendly quadruped

  Great. Outdoor air, or indoor air breathed only by you and your vetted travel companions, is the best way to go.

  Trains and airplanes

  Sharing air with large numbers of strangers is not the best, and air filtration and ventilation can vary quite a bit on these modes of conveyance. Trains in Canada can have horrible CO_2 concentrations indicating gravely poor

ventilation standards, but trains in Japan are much more reasonable. (People also tend to be quiet on trains in Japan, which helps a lot; yammering on public transport is not only annoying to everyone, but also launches a lot of aerosolized particles into the air.[7]) Airplane air quality will vary depending on many factors as well, even at different times on the same flight. Your CO_2 monitor will be your friend on these vehicles if you want to be informed about the threat profile of your environment.

Taxis

The math on these is complicated. CO_2 can get very high, very quickly in the small space of a car, especially if the air conditioning is set to recirculate. If the climate permits, opening a window (better yet, two, for a cross-breeze, especially one in the front and its opposite in the back) can create lots of ventilation quickly. And even if that isn't possible, you are still rolling the dice on whether this particular driver is infected with covid at this particular time. Is a very high concentration of rebreathed air with one person more risky than a lower concentration with a lot more people? It's very hard to do this calculation, and depends on community rates of infection, which is information that is getting harder and harder to access.

Shared automobiles and buses

These have the drawbacks of both frequently high CO_2 and having lots of strangers breathing together. If you can open a window, great. If you can't, well… I don't know what to say. These are some of the worst indoor air quality conditions I've witnessed. I would not voluntarily do a cross-country bus trip these days if I had literally any other option.

Choosing Your Class:

This is going to be perhaps disturbing to read, and I don't see any other covid-avoiding people talking about this, and I genuinely do not know what difference it makes, but: I recommend travelling at the highest class you can afford.

As early contact tracing reports can attest, being in first class does not make you immune to covid,[8] and in fact being in first class exposed people to greater risk during the days of mask mandates in air travel, because first class passengers spent more time unmasked to eat or drink. However, these are not those halcyon days of mandated masks on airplanes, and now it's just the pure math of how many other sardines are breathing in your face for the duration of the flight. Here are some of my observations, as someone who has willingly thrown a lot of savings into travelling Air Canada's "Signature class" (meaning in the little individual sleeper pods).

First of all, and most importantly, you are not shoulder-to-shoulder with strangers for, say, fourteen hours straight (the duration of a flight from Toronto to Tokyo). Frankly, the thought of this gives me heart palpitations. As mentioned earlier, the eyes also seem to be a vector of transmission when at close range, and having people quite close to you in all directions for a very long period of time is really pressing your luck. A full-face PAPR, or a fit-tested respirator plus airtight eye protection, would probably be quite sufficient in a practical sense, but I must also admit that fear of confrontation with fellow passengers for using these very visible covid mitigations is a major factor for me, as a woman who has done a lot of travelling alone. Being in a more expensive class means a lower concentration of rebreathed air in general (as my Aranet can attest) due to having a lower density of passengers in your area of the cabin, and near-field transmission is largely avoided when you are in your own little pod with forehead-high walls all around you. It just adds another layer of mitigation around you: a little more breathing room (pun intended) in case any of your other tools have a gap or fail. Also, if you look like a rich person, flight attendants are less likely to give you a hard time for your PAPR or anything else that makes you an unusual traveller.

Also sometimes absurd things happen, like when my mom and I had an entire train car to ourselves, because no one else was out of their minds enough to buy Gran Class seats for the six stops between Kanazawa and Tsuruga. You can't get much safer than that! (We still kept our masks on, just in case — or, really, just out of habit.)

Whatever class you choose, window seats are safer, because then you only have a direct neighbour on one side, and because air will blow from the gaspers above and then sideways across you to your other passengers. According to models and contract tracing studies, air travels laterally across rows, and can jump aisles and rows. Being in the aisle, especially near one of the bathrooms, puts you at risk of being breathed on by people lining up to use the bathroom.

Necessity

Not at all necessary, if your other protections are rock-solid enough.

Accessibility

Definitely the most exorbitant tool on this list.

Accommodations

Your accommodations are to be the fortress where you do all of your mandatory unmasked activities: brushing teeth, showering, eating. Thus, access should be limited as much as possible only to you and your vetted travel companions, and the fewer air vents it shares with other tenants, the better.

The very best option is a standalone structure with no shared HVAC with any other tenants, no on-site staff, and limited housekeeping services: basically, a vacation rental house. You will want a kitchen to prepare your own meals (or store and reheat your takeout leftovers). These are often much more reasonably priced than you might imagine, and will give you an opportunity to 'live like a local'. An outdoor patio is nice for simultaneous dining during symptom watch / quarantine periods (more on that later).

Second best is an apartment hotel with a kitchen. Often these allow you to negotiate more infrequent housekeeping. The 'do not disturb' sign should be a fixture on your door. Transmission between hotel rooms via the hallway or shared HVAC has been observed in contact tracing studies at quarantine hotels, but so far I have not been stricken by this phenomenon. Some people stuff towels under the door to block air flow from the hallway, but without knowing where else fresh air may come from and the possibility of creating dead zones where pollutants might accumulate, I tend to follow the rule of thumb that, the more passive air circulation (and thereby air mixing and particle dispersion), the better. Air quality engineers may know better, though.

If you must stay in a conventional hotel room, you may find it handy to choose a hotel that provides a refrigerator in the room so that you can store nourishing meals more easily. Note that conventional hotels tend to get ornery much more quickly if your 'do not disturb' sign prevents housekeeping from entering for too many days in a row, and you may find your room unceremoniously invaded at a time not of your choosing.

Necessity

I suppose this depends if you have any novid friends or family to bunk with!

Accessibility

Ranges quite a bit, and you may find that vacation rentals are more affordable than hotels, in some circumstances. You'll be saving a lot of money by cooking rather than getting takeout too!

On the Travel Day

Assemble your travel kit. Count up how many respirators you want to have on hand for the day itself and as an emergency stash when you land, in case your luggage is lost or delayed. Pre-install any Sip valves, or pack an athletic hydration pack (e.g. CamelBak) to wear with a PAPR like the Microclimate Air. (Obviously you cannot fill this with water until you are on the other side of security.) Pack up your personal HEPA filter. (I recommend a SmartAir QT3.) Some airlines, like Air Canada, forbid the use of HEPA filters in the cabin (because they are anti-science barbarians), but also forbid packing HEPA machines in one's checked bag, so you'll probably have to carry this with you even if you can't use it in the air. Bring your self-soothing toolkit as well.

Recommended Process for Airports

Wear a comfortable and non-threatening-looking disposable respirator for the check-in and security process. Practise holding your breath and lowering your respirator so that the ticket & gate agents can verify your identity, then purging the mask by exhaling a lungful through it as you don it again. A clear full-face PAPR will allow them to see your face without removing your respirator, but you will have to take it off to go through security anyway, so you may as well start with a regular respirator from the beginning.

For very long trips: you want to have as full a tummy as possible, and be as plump with hydration as you can be, before boarding your plane. If you can gorge yourself before leaving your home, that's the best, but if you have a long journey

just to get to the airport, you may be looking to top up your tum-tum there too. At least in Japan, many airports have an outdoor observation deck where people go to watch planes take off and land. This is an ideal place to spend as much layover time as possible, and the optimal place to gorge yourself with food and drink as much as possible before your flight! Note that observation decks are on the outside of security, so budget enough time to get through security and arrive at your gate. In the absence of an outdoor observation deck, use your CO_2 monitor to find a place with a lower concentration of rebreathed air, and deploy…

Elana's Under-Mask Nibble Technique (UMNT):

Step 1

Position QT3 HEPA filter within 20 cm of your face. Maybe you can balance it on something, or point it up from your lap as you hunch over gracefully. At that range, the air in front of your face will be ~95% filtered air.

Step 2

Hold breath, lower mask, shovel food in mouth, purge mask by exhaling as you re-don mask, chew, swallow. Repeat as necessary.

Eating indoors at an airport is by no means a zero risk proposition, but it is still a damn sight safer than eating on the airplane, so if you cannot fast for the entire flight duration — or even if you'd like to reduce the number of meals you eat on the plane from two to one — this is a lesser evil. It is a personal judgment call whether you'd rather fast, but as a guardian for my mom, I really value keeping my wits as sharp as possible from door to door.

If you are switching to a PAPR for the plane, once you are through security, use your CO_2 monitor to find a place with a low concentration of rebreathed air, hold your breath, and switch. This is also the time to fill your hydration pack with drinking water (or whatever other type of healthy beverage you'd like to source at the airport).

Wait as long as possible to board. See if you can be the very last person on the plane! There is no reason at all to stew in virus breath for one minute longer than necessary.

If your airline permits the use of personal HEPA filters, get that baby situated at your seat.

The air from the overhead gaspers is HEPA filtered by the airplane. There has been much discussion of its efficacy as an "air curtain" between you and your fellow passengers, versus the "entrainment" effect of blowing more contaminated cabin air at your face. What I can say I have observed is that having a gasper at full blast in your face for an entire long-haul flight can cause a terrible dry air sore throat that can confuse a post-travel symptom watch (as well as being very distressing and uncomfortable). In general, more air circulation is always better, to promote good air mixing and dispersal of particles to lower concentrations, to reduce the infectious dose in any given spot. So perhaps a good compromise is to keep the gasper open, but not blasting in your face.

If your flight is short enough to fast for the duration, this is the best possible practice. However, if you must eat while on the plane:

- If personal HEPA filters are permitted to be used in the cabin by your airline, follow UMNT (under-mask nibble) technique.
- If HEPA filters are forbidden in the cabin (as they are on Air Canada), I wear a Microclimate Air PAPR, and apply Step 2 of the UMNT with it instead. Its bubble of filtered air within the helmet makes it possible to breathe clean air between bites.

I actually wear a V-flex for most of the flight, and hold my breath and switch to a Microclimate Air 2 just when I need to eat; this way, if any flight attendants get ornery about it, we're already in the air. Since I reserve it for this usage, I find it more comfortable to remove all of the velcro padding on the inside of the helmet (apart from the large triangular piece on the forehead, but including the pieces that attach the elastic head strap) to make it easier to slide up and down on the top of my head. You will want to experiment with what works for you and your head shape and hair situation.

If you are in a middle seat between unmasked strangers and do not have a full-face respirator or safety glasses, it is completely inconspicuous to just keep your eyes closed for the entire flight! Pop on an audiobook, take a nap — or just look like you're napping! — all while protecting each of your face-holes from infectious disease. I also use my half-

lidded ‘bedroom eyes’ whenever availing myself of the airplane toilet, and keep my eyes closed in there as much as I can manage.

After landing, be prepared to have to hold your breath and unmask briefly at customs to verify your identity. Sometimes this process is automated, which, naturally, makes things even harder. Customs at Japanese airports, for example, require that you remove both eyeglasses and mask while simultaneously applying the first fingers of each hand to a fingerprint scanner. At this point, you may be quite dazed from jetlag and a long flight, so this can be cognitively challenging, even to remember not to speak while your mask is down. Try to think about it procedurally. Take off glasses first. Suck in a breath, exhale, then suck in another breath and hold. Pull mask off; it needs to be away from the chin so that the camera can see the entire contour of your face. Apply fingers to scanner and hope that the machine likes you. If you must squeak in a tiny breath, that’s okay; that’s why we have a quarantine procedure for the first five days after landing.

You’ve Landed: The First Five Days

The first order of business is to clean the air of your new fortress, since you don’t know when the last people were in there, or what their infectiousness status may have been. Since covid can linger in the air for minutes to hours depending on environmental conditions, the goal should be to achieve at least three full air changes before you remove your respirator. (All of the information and formulae in the rest of this section about flushing spaces comes from my air change bible, this post by HVAC engineer Joey Fox.) This is because each air change, in practice, will remove 63% of pollutants from a space, so three air changes will achieve a 95% removal of pollutants, which is (I judge) a reasonable level when dealing with ambiguity about whether somebody was recently there, or whether they had covid in the first place.

As bonus content: 5–7 air changes is probably better practice when dealing with a confirmed covid-infectious person entering the space. This also aligns with CDC recommendations about how to flush spaces after occupancy: 3 air changes (95% reduction of pollutants) for no confirmed case, 5 (99%) for confirmed covid, 7 (99.9%) for confirmed measles. …for whatever their recommendations are worth these days.

If the windows open safely (with consideration for pests, flying insects, or other public health intruders), open them. If there are any bathroom or kitchen fans, get them going on maximum. Anything that gets the air mixing well in the space (ceiling fans, other types of portable fans, air conditioning units with fan speed control) will help to get the air moving and activate any dead zones.

Check your CO_2 monitor in all the rooms, and make note of the locations that have better or worse ventilation according to CO_2 accumulation. (Your own body provides a renewable source of CO_2 even if nothing is lingering or leaking in from neighbours.)

Some hotel rooms and vacation rentals come with HEPA air cleaners as a regular part of the furniture; I have found this to be the case in Japan, at least. However, you may want to be prepared to BYOAC (Bring Your Own Air Cleaning).

Depending on your luggage space and mode of transport, you may be able to flat-pack a Corsi-Rosenthal box and assemble it at your destination. You could also consider buying a commercially-available HEPA air cleaner at your destination, if that is within your budget and you will be there long enough to merit the investment, and have a sensible storage, shipping, or re-homing plan at the end. Portable HEPA filters like the QT3 are very helpful for near-field applications like the UMNT (Under Mask Nibble Technique), but are not powerful enough to make a dent in regular-sized rooms. They can help to augment air cleaning in smaller rooms like bathrooms, when used in concert with bathroom fans and long durations between occupants.

A much more portable option for air cleaning, albeit significantly more expensive, is far-UVC (222nm) irradiation. This technology is on the newer side, but is well-researched regarding efficacy in destroying airborne infectious particles,[9] as well as safety to skin and eyes. Its drawbacks are also understood, in creating ozone and other air pollutants as the byproducts of breaking down pollutants into their constituent parts. Its applications, however, are still being bogged down in some slow-moving arenas of government approval, particularly in Canada. However, if you can get your hands on a far-UVC lamp, such as Naomi Wu’s Nukit array, these can be very efficient ways to achieve rapid effective air changes per hour (eACH), and take up much less luggage space than a HEPA device that is appropriately sized for whole-room filtration.

Far-UVC devices should be used carefully and in combination with ventilation, in order to flush spaces of ion buildup and other molecular byproducts of disinfection. While 222nm wavelengths cannot penetrate or damage the surface layers of the skin or eyes, and the filter glass on a properly-constructed far-UVC lamp will block any traces of harmful wavelengths on either end of the emission curve, it is still wise not to risk the cumulative damage of exposure to even very small amounts of harmful ultraviolet light over time, so use this tool as much as is required to achieve three effective air changes, and no more.

This is what I do, based on my layperson understanding of how far-UVC irradiation works and rudimentary calculations, but I am very interested to hear what experts in the field would advise. With the Naomi Wu Nukit array, I set it up in each space and let it work for about thirty minutes at a time. With a single 15W UVC lamp specced for ≥10 foot ceilings (e.g. the Krypton-36 from Far UVC Technologies), I shine it into each space for thirty seconds. You can choose to have people in the room while the far-UVC is working, or not; the technology is proven safe, but there is nothing wrong with an abundance of caution and avoiding shining the light directly on people, unless it is being used as a sole layer of protection and is being counted on to disinfect breath in real-time (and why would you do that?).

If you have brought a Corsi-Rosenthal box or a commercial HEPA filter, or if you found one in your room when you arrived, practise calculating how to achieve three air changes according to a machine's clean air delivery rate (CADR, provided by reputable manufacturers). The information you need to make this calculation is: the unit's CADR (you may need to do some web searching for this if getting newly acquainted with a commercial HEPA air cleaner), and the estimated cubic volume of the space you are trying to flush. The formula is the following:

- Air Changes Per Hour = (Clean Air Delivery Rate) ÷ (room volume)
- ACH = CADR ÷ (length × width × height of room)

If your CADR was provided in cubic feet per minute, take that value and multiply it by sixty to get a rate per hour, and make sure you are measuring (or estimating) room volume in cubic feet as well.

If CADR was provided in litres per second, multiply that value by 3.6 to convert it to cubic metres per hour, and make sure you are measuring (or estimating) room volume in cubic metres.

Once you have calculated ACH, determine for how many minutes you must flush the space to achieve the number of air changes you desire, by calculating:

- (desired number of air changes) ÷ (ACH)

This will output the number of hours you must flush. To get the same figure in minutes, multiply by 60:

- (desired number of air changes) × 60 ÷ (ACH)

In the absence of any mechanical filtration or ventilation at all, some air quality engineers say that a space will achieve three air changes through passive air exchange after six hours, so that can be your upper benchmark.

Bear in mind that these protocols ought to be followed after anyone not in your party passes through (e.g. cleaning staff), which is why it is a big advantage to choose places that lack or are willing to limit housekeeping services.

Now you know how long you must wait before you can confidently take off your respirator in your new fortress of clean air! Celebrate with a big gargle of CPC mouthwash! Hooray!

Protocols With Travel Companions

If you are travelling with a comrade, you may wish to go on symptom watch for a period of time after arrival to see if any of you contracted something during the risky process of travelling. The policy my mom and I follow is to spend five days from the beginning of the trip masking around each other, to see if any symptoms come up. This means, if sharing a room, wearing a respirator 24 hours a day (including when asleep), eating at separate times and flushing or disinfecting the space after the first person unmasks to eat, and flushing or disinfecting the bathroom after brushing teeth and showering.

Because I am much more concerned about infecting my mom than I am about her infecting me, it was more important that my mom unmask in clean air than that I should, so we would arrange things so that she would eat or shower first, and I would go afterwards. We would also position the HEPA filter in front of her when she was eating, for extra protection.

Another time, when we were joined by a novid friend who came to Japan a couple of weeks after we did, we made use of a sheltered, private, outdoor space on the property, and served his meals there for the first five days.

Even after the first five days, if there are any mishaps or seal breaches over the course of one's sojourn, one can always return to these protocols until a suitable symptom watch period has passed. These days it is very difficult to gather information on how long it takes for the current variant to show symptoms, so use your best judgment on how long to quarantine if someone has had a potential exposure event.

If you brought tests with you, use your judgment if you would like to reserve them for a time when you or your companion(s) feel sick, or if you would like to rapid test every 48 hours during symptom watches, on the chance that you might flag a pre- or asymptomatic infection. If you brought a molecular LAMP machine, test after a day or two, to give a possible infection a chance to incubate. A negative from a molecular LAMP assay can be trusted, and you will be cleared to share air.

During The Trip

Use your good novid sensibilities. Don't take off your mask in indoor public spaces, or even outdoors if there are people nearby, or if people might suddenly jump into your personal space. Keep your CO_2 monitor on you to keep an eye on the environmental conditions, and leave (if you can) if things are more dangerous than they appear. Enjoy the beautiful outdoors.

It can be challenging to find opportunities to eat and drink safely (either outdoors, or by making a timely return to your clean air fortress), so plan your days well. Keep drinks and straws on you in hot weather, and install a Sip valve into fresh masks whenever you need to.

In different locales and weather conditions, outdoor dining can be easy or difficult to find. In my family's experience, Kyoto has very few options for patio dining, and while there is a lot of street food, it is frequently found in very crowded locations where it is difficult to find a place where one can get enough personal space to unmask safely. On the other hand, ubiquitous convenience stores, department stores, and takeout stalls, all offer delicious food that can easily be brought back to your clean air fortress to be enjoyed. In contrast, Iceland in summertime seems to have spacious patios for every restaurant, such that you may rarely need to take food home for anything but breakfasts. I have seen reports from Hong Kong and Seoul that reveal many little nooks and tables where one can dine outdoors at various cafes and diners, as long as one has the courage to ask to be served outdoors. If you are travelling to a place you do not know well, I suggest assuming that you will need to self-cater in your fortress, and consider any fortuitous outdoor dining opportunities to be pleasant serendipity. In a place with many mouthwatering temptations, my policy has always been to tell my travel companions: find a place where we can sit and eat outdoors in peace first, and we can identify a nearby food source afterwards. At least in Kyoto, we rarely clear that first condition.

On Travel Days Mid-Trip

If you will be doing long travel days in the midst of your sojourn that take you away from your clean air fortress, be vigilant and opportunistic of chances to eat meals as you travel. In Japan, long train commutes are common and comfortable, but it can be hard to find opportunities to get out into fresh air mid-trip. The tray tables on the shinkansen (high speed rail) are plenty spacious enough to accommodate a QT3 with an ekiben (train station bento), facilitating a very pleasurable UMNT experience. Many train stations have entirely open-air platforms, and even the very large urban train stations may have an uncovered portion of the platform with lower CO_2 concentrations, giving you a chance to grab a bite when changing lines.

Stay nourished and hydrated despite the challenges; being run-down, hungry, and thirsty, puts you at greater risk of infection, too, so do what you can to find safe windows to take good care of your body.

When It’s Time To Come Home

Don’t forget to prepare your travel kit for the return journey as well. Set aside your comfy travel masks to keep in your carry-on, and pre-install your Sip valves. Follow the same procedure you used on the way here. You’re getting good at this!!

Back Home

Please be kind and quarantine for at least five days after returning from a trip. If you have pets, this means quarantining away from them too, as they are likely unvaccinated, and covid may harm them quite a bit. If you cohabit with others, have a plan about where you will stay and how you will eat until you clear an agreed-upon symptom watch period. Perhaps you can follow similar protocols as described above for the first five days of this trip. If you have access to a molecular LAMP assay, you can use that to test out of quarantine after a couple of days — long enough for anything you might be growing to replicate enough to actually flag the test.

You did it! You must be tired. Don’t want to do that again for a while, eh? Sleep it off, and take heart in knowing that you really did everything you could not to participate in the chains of transmission that are currently shackling this world. You’re doing great. We’re all proud of you.

[1] For an absolutely massive info dump about the physics of all of this, check out this enormous report from the World Health Organization (archive.org backup link) where they evidently spilled, in 2024, all of the things they’d been wanting to say but were held up by, I don’t know, liability? — for years.

[2] S. N. Rudnick & D. K. Milton, “Risk of Indoor Airborne Infection Transmission Estimated from Carbon Dioxide Concentration,” *Indoor Air* 13(3) (2003): 237–245. doi.org/10.1034/j.1600-0668.2003.00189.x, onlinelibrary.wiley.com/doi/abs/10.1034/j.1600-0668.2003.00189.x.

[3] Zhe Peng & Jose L. Jimenez, "Exhaled CO_2 as a COVID-19 Infection Risk Proxy for Different Indoor Environments and Activities," *Environmental Science & Technology Letters* 8(5) (2021): 392-397. doi.org/10.1021/acs.estlett.1c00183, pubs.acs.org/doi/10.1021/acs.estlett.1c00183.

[4] Thomas H. C. Sit *et al*., "Infection of dogs with SARS-CoV-2," *Nature (London)* 586(7831) (2020): 776–778. doi.org/10.1038/s41586-020-2334-5, www.nature.com/articles/s41586-020-2334-5.

[5] Chaminda J. Seneviratne *et al*., "Efficacy of commercial mouth-rinses on SARS-CoV-2 viral load in saliva: randomized control trial in Singapore," *Infection* 49(2) (2021): 305–311. doi.org/10.1007/s15010-020-01563-9, www.ncbi.nlm.nih.gov/pmc/articles/PMC7734110/.

[6] Fernanda de Paula Eduardo *et al*., "Salivary SARS-CoV-2 load reduction with mouthwash use: A randomized pilot clinical trial," *Heliyon* 7(6) (2021): e07346. doi.org/10.1016/j.heliyon.2021.e07346, www.ncbi.nlm.nih.gov/pmc/articles/PMC8222261/.

[7] Zhe Peng *et al*., "Practical Indicators for Risk of Airborne Transmission in Shared Indoor Environments and Their Application to COVID-19 Outbreaks," *Environmental Science & Technology* 56(2) (182022): 1125-1137. doi.org/10.1021/acs.est.1c06531, pubs.acs.org/doi/10.1021/acs.est.1c06531.

[8] Nguyen Cong Khanh *et al*., "Transmission of SARS-CoV 2 During Long-Haul Flight," *Emerging Infectious Diseases* 26(11) (2020): 2617-2624. doi.org/10.3201/eid2611.203299, wwwnc.cdc.gov/eid/article/26/11/20-3299_article.

[9] Ewan Eadie *et al*., "Far-UVC (222 nm) efficiently inactivates an airborne pathogen in a room-sized chamber," *Scientific Reports* 12(1) (2022): 4373. doi.org/10.1038/s41598-022-08462-z, www.nature.com/articles/s41598-022-08462-z.