Occupational Health Clinics for Ontario Workers

Centre de Santé des Travailleurs(ses) de l'Ontario

Addressing Airborne Transmission by Doing Something about Ventilation

John Oudyk & Kevin Hedges

Occupational Hygienists

November 27, 2020

Index case – contact tracing

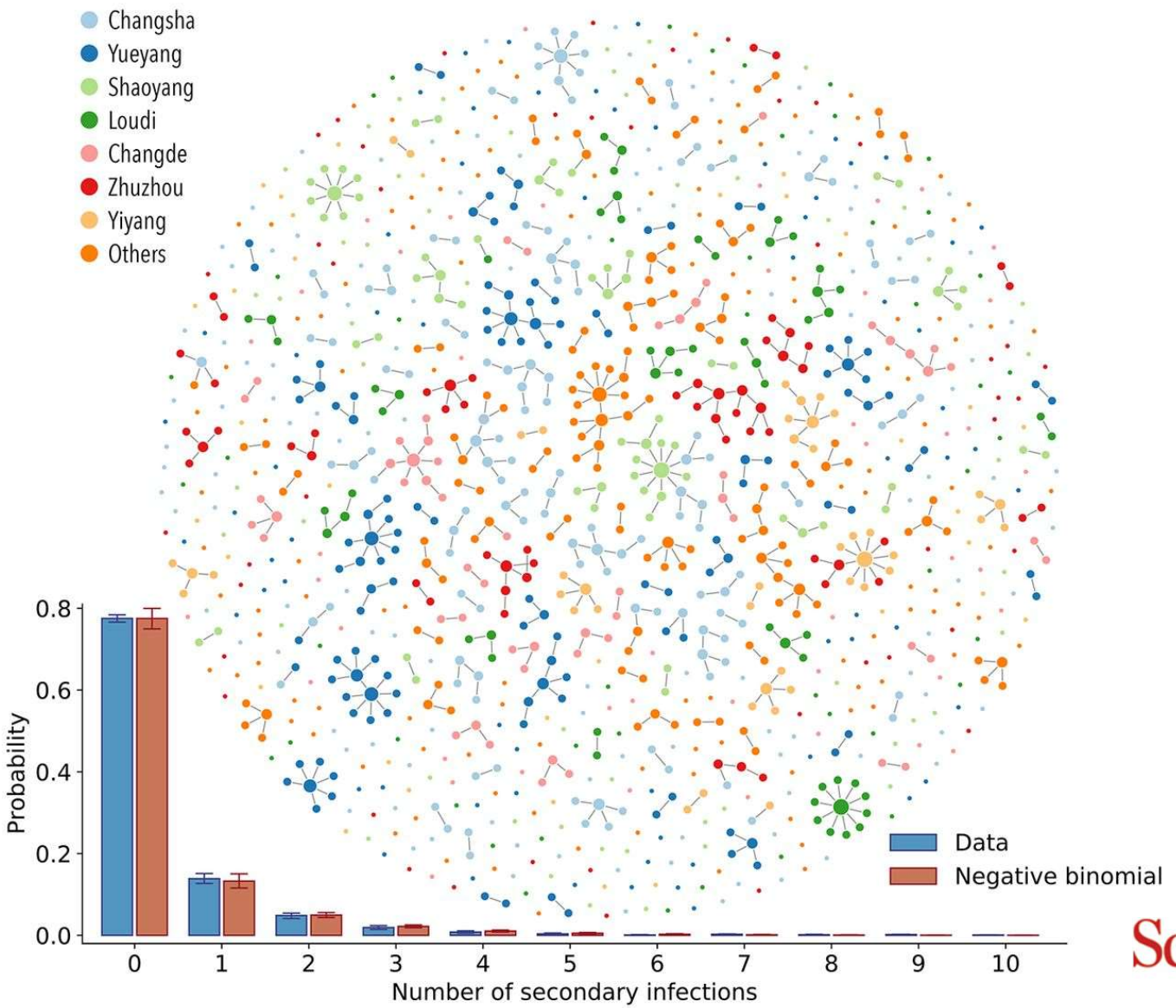
- My grandson: 3 weeks into JK (end of September)
- Isolated in sick room because of a runny nose
- Mom comes and brings him home (1/2 hr drive in the car with sister)
- We pick him up for the afternoon because Mom's at the end of her rope
- Next day Mom is sick too and Dad has a scratchy throat (stays home from work)
- Grandson comes over again and shows us his school work (cough etiquette drawing) – coughs in my face and when reminded about etiquette, says "that's just for school"
- I get sick that evening, a few days later my partner and my son get sick (a few days later his girl friend) and my grandson's sister also gets a mild case
- Grandson and his Dad get tested for COVID – both negative
- Whatever it was, symptoms came on fast (1-2 days) and everyone got it (half his class off sick, eventually it went through all the other classes and half the teachers have been off)

COVID is different:

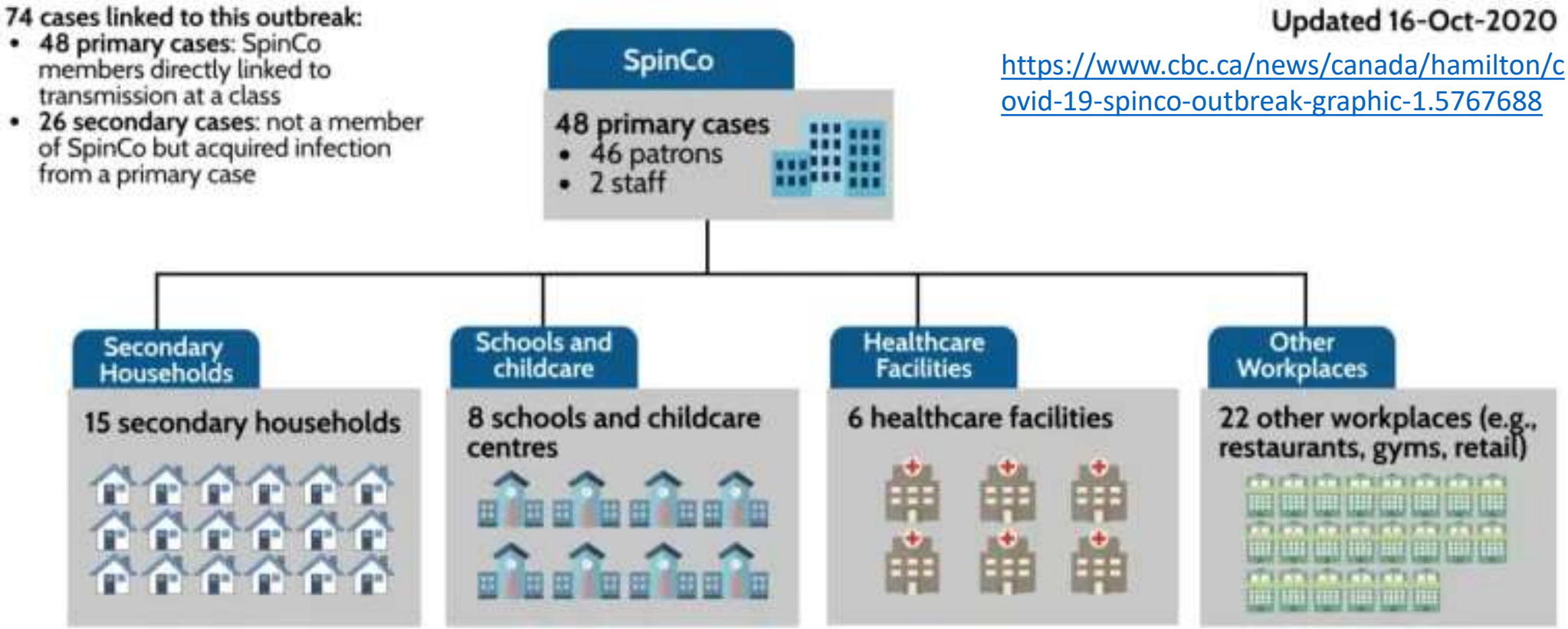
- Most cases don't spread to more than 1 or 2 people
- A minority of cases spread to a lot of people (supers-spreader events)
- Super-spreading event is an interaction between person, environment and the time trend of the disease
- Pareto distribution (power law), 10-20% of cases cause 80% of further infections

Fig. 1 SARS-CoV-2 transmission chains.

Kaiyuan Sun et al. Science 2020;science.abe2424



Science
AAAS



Key messages

- Primary cases originating from SpinCo were connected to various other settings resulting in 26 secondary cases in some of these settings.
- This information is preliminary and subject to change pending further investigation.

Brandon meatpacking plant outbreak:

a 4th C: cold

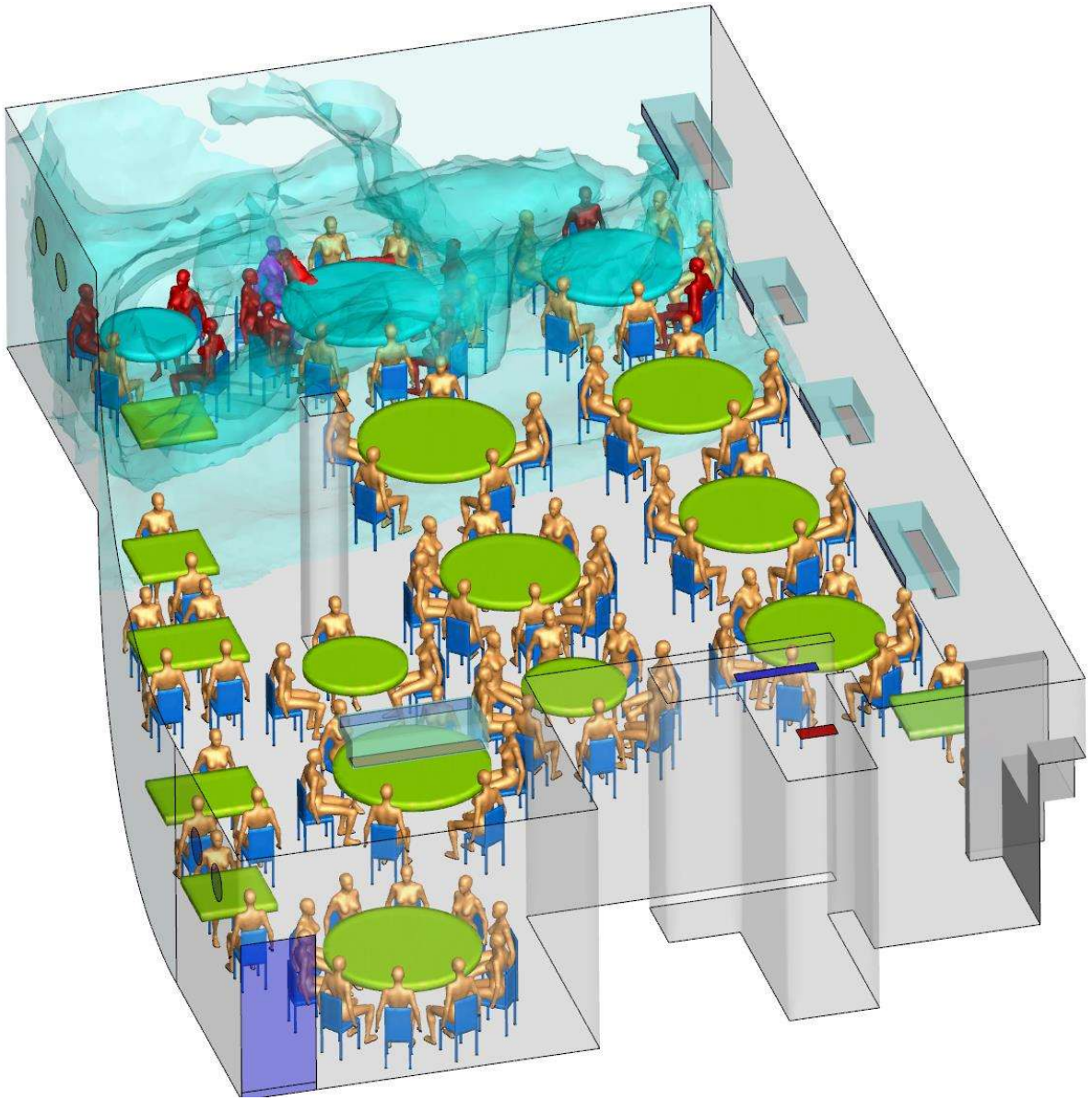
Restaurant in Guangzhou (Jan 24)

- Lu et al (Apr 2 2020) “COVID-19 Outbreak Associated with Air Conditioning in Restaurant, Guangzhou, China, 2020”
  - “We conclude that in this outbreak, droplet transmission was prompted by air-conditioned ventilation. The key factor for infection was the direction of the airflow.”
  - “Our study has limitations. We did not conduct an experimental study simulating the airborne transmission route.”

The restaurant in Guangzhou, China

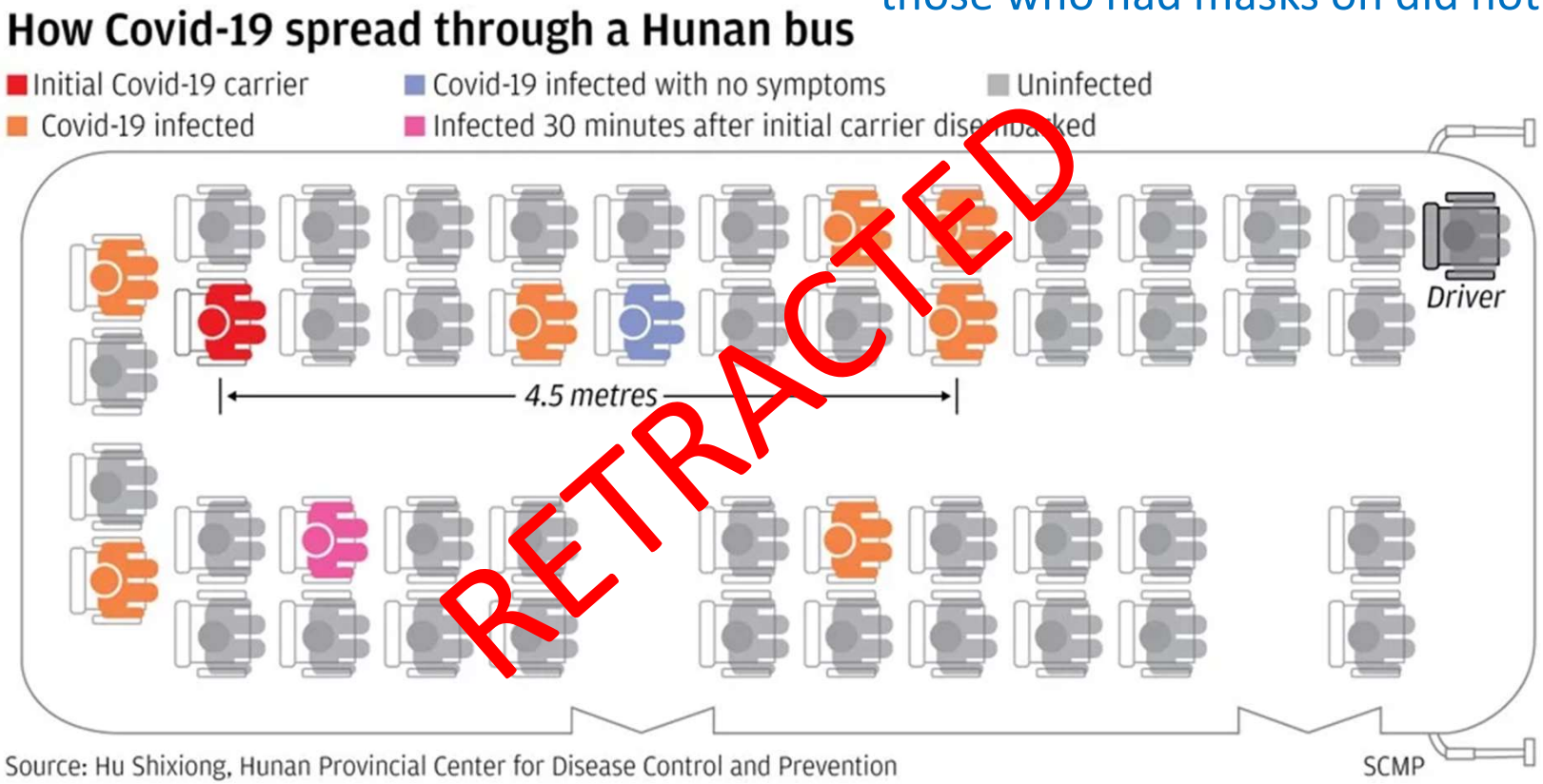
- Li et al (Apr 23 2020) “Evidence for probable aerosol transmission of SARS-CoV-2 in a poorly ventilated restaurant”:
  - “In summary, our epidemiologic analysis, onsite experimental tracer measurements, and airflow simulations support the probability of an extended short-range aerosol spread of the SARS-CoV-2 having occurred in the poorly ventilated and crowded Restaurant X on January 24, 2020.”
  - “Specifically, although close contact and fomite exposure may play a major role in the transmission of SARS-CoV-2, extended short-range aerosol transmission of the virus is possible in crowded and poorly ventilated enclosures. Our study suggests that it is crucial to prevent overcrowding and provide good ventilation in buildings and transport cabins for preventing the spread of SARS-CoV-2 and the development of COVID-19.”

Li et al (Apr 23 2020)
“Evidence for probable aerosol transmission of SARS-CoV-2 in a poorly ventilated restaurant”



Transmission on a bus:

those who had masks on did not get infected



https://www.scmp.com/news/china/science/article/3074351/coronavirus-can-travel-twice-far-official-safe-distance-and-stay

From: **Community Outbreak Investigation of SARS-CoV-2 Transmission Among Bus Riders in Eastern China**
https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2770172
JAMA Intern Med. Published online September 01, 2020. doi:10.1001/jamainternmed.2020.5225

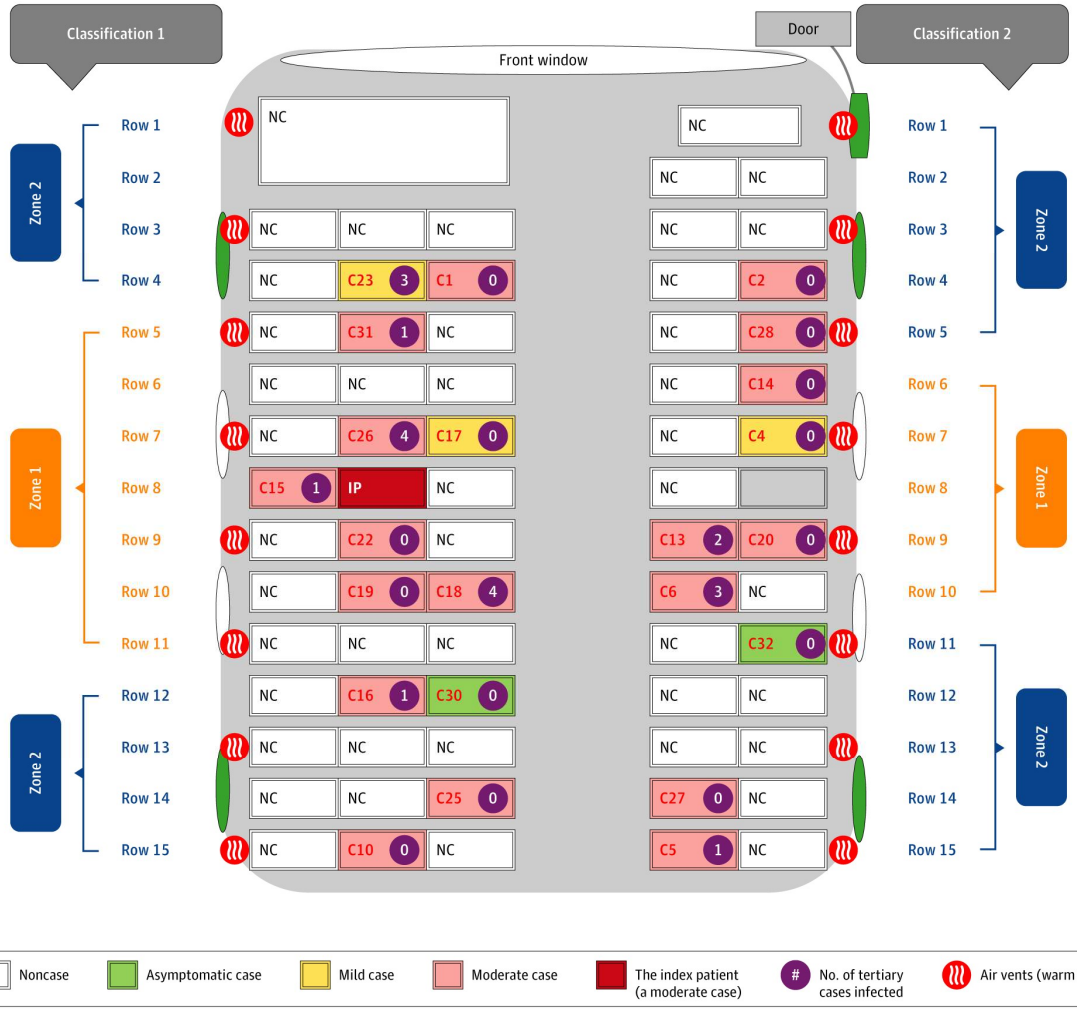


Figure Legend:

Schematic Diagram of Bus 2, the Bus Carrying the Coronavirus Disease 2019 (COVID-19)

Initial Patient (IP)Classification 1 and 2.

Two different approaches to define high-risk and low-risk COVID-19 zones are indicated:

zone 1 (high-risk zone) and zone 2 (low-risk zones).

Severity levels of cases were indicated. Windows are indicated with ovals, and there are 4 green side windows and that could be opened for fresh air.

C indicates case; NC, noncase.

Skagit Valley Chorale outbreak (March 10):

"61 attended rehearsal on March 10, amid concerns about COVID-19 transmission. Precautions were taken during rehearsal, including the use of hand sanitizer, no hugging or handshakes, and maintaining distance between singers."

"53 cases in total were subsequently identified including the index case, with 33 confirmed through positive COVID-19 tests and 20 unconfirmed but probable secondary cases based on symptoms and timing."

https://onlinelibrary.wiley.com/doi/10.1111/ina.12751

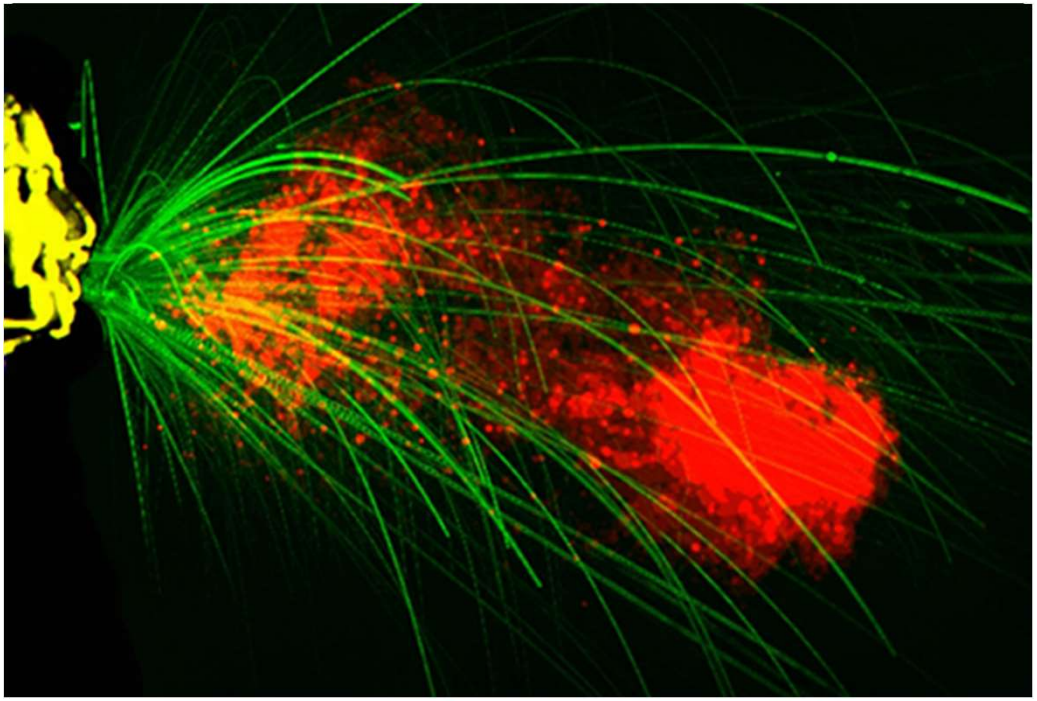
Amsterdams Gemengd Koor (mixed choir)

Practices:

- Feb 25
- Mar 3 (a few sick – stayed away)
- Mar 7 (15 absent, some will still attend concert)
- Mar 8 concert (30 missing)

- 130 members attend
- 102 ill
- 1 death (+3 partners died)
- members of the string orchestra and soloists also infected
- very few of the 1000+ concert attenders were infected (still awaiting the results of the investigation)
- in the Netherlands at the time there had been a total of only 400 people with confirmed COVID

https://www.trouw.nl/nieuws/die-ene-passion-die-wel-doorging-met-rampzalige-gevolgen~b4ced33e/?referrer=https%3A%2F%2Fwww.google.com%2F

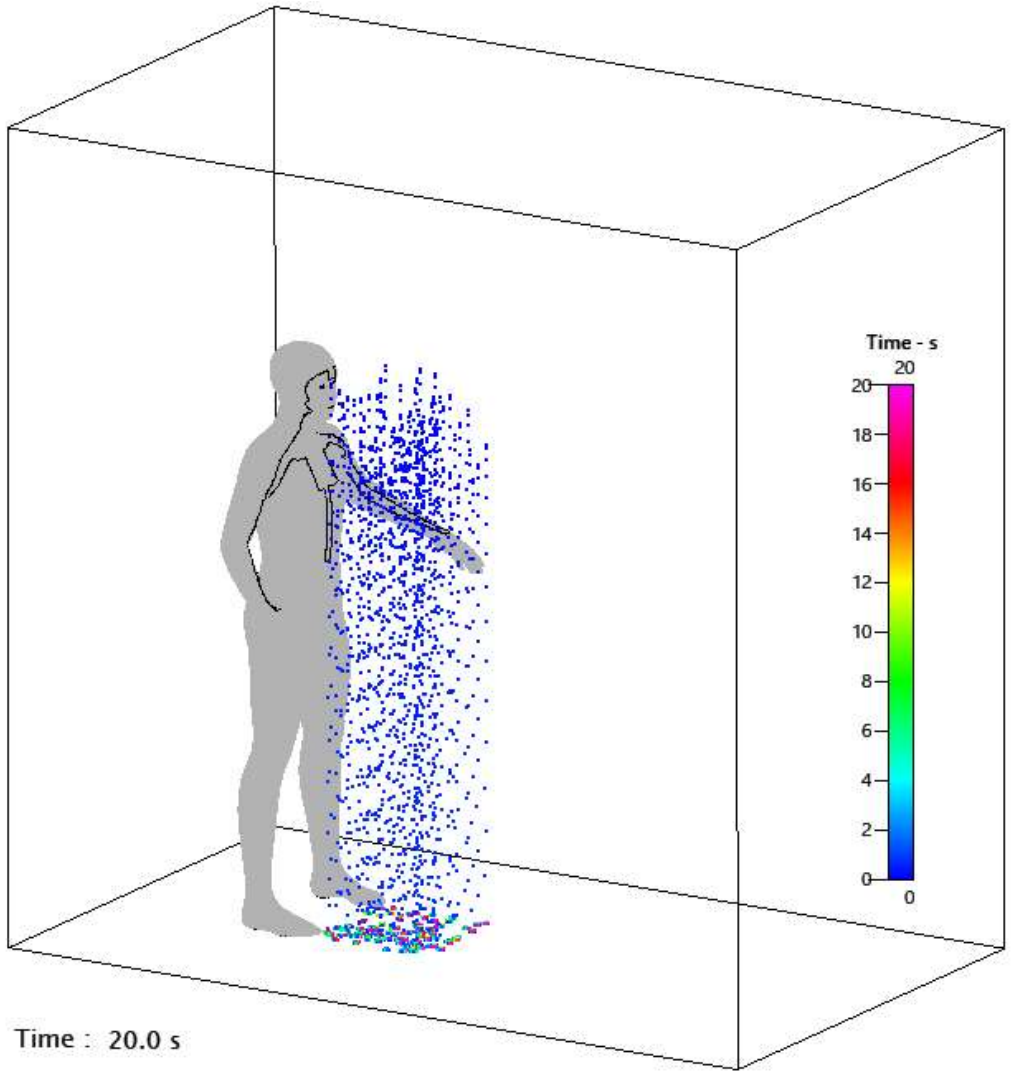


"plume" and "room" dispersion aerodynamics ("plume" independent of room air flow patterns) – stop it with a mask

Figure 1: Image reproduction showing the semi-ballistic largest drops, visible to the naked eye, and on the order of mm, which can overshoot the puff at its early stage of emission [14, 15]. The puff continues to propagate and entrain ambient air as it moves forward, carrying its payload of a continuum of drops [13], over distances up to 8 meters for violent exhalations such as sneezes [17].

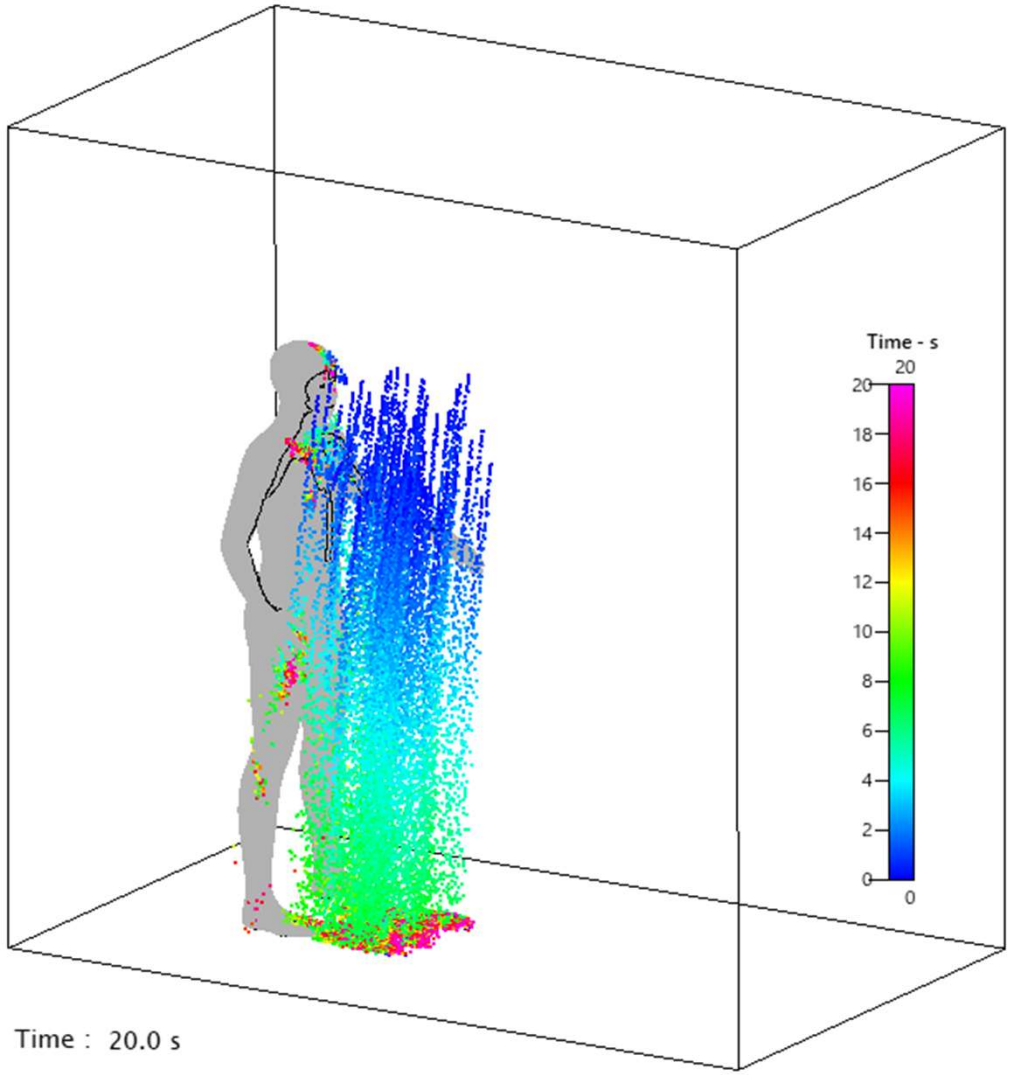
https://www.sciencedirect.com/science/article/pii/S0301932220305498

Particle trajectory:
320 µm particle



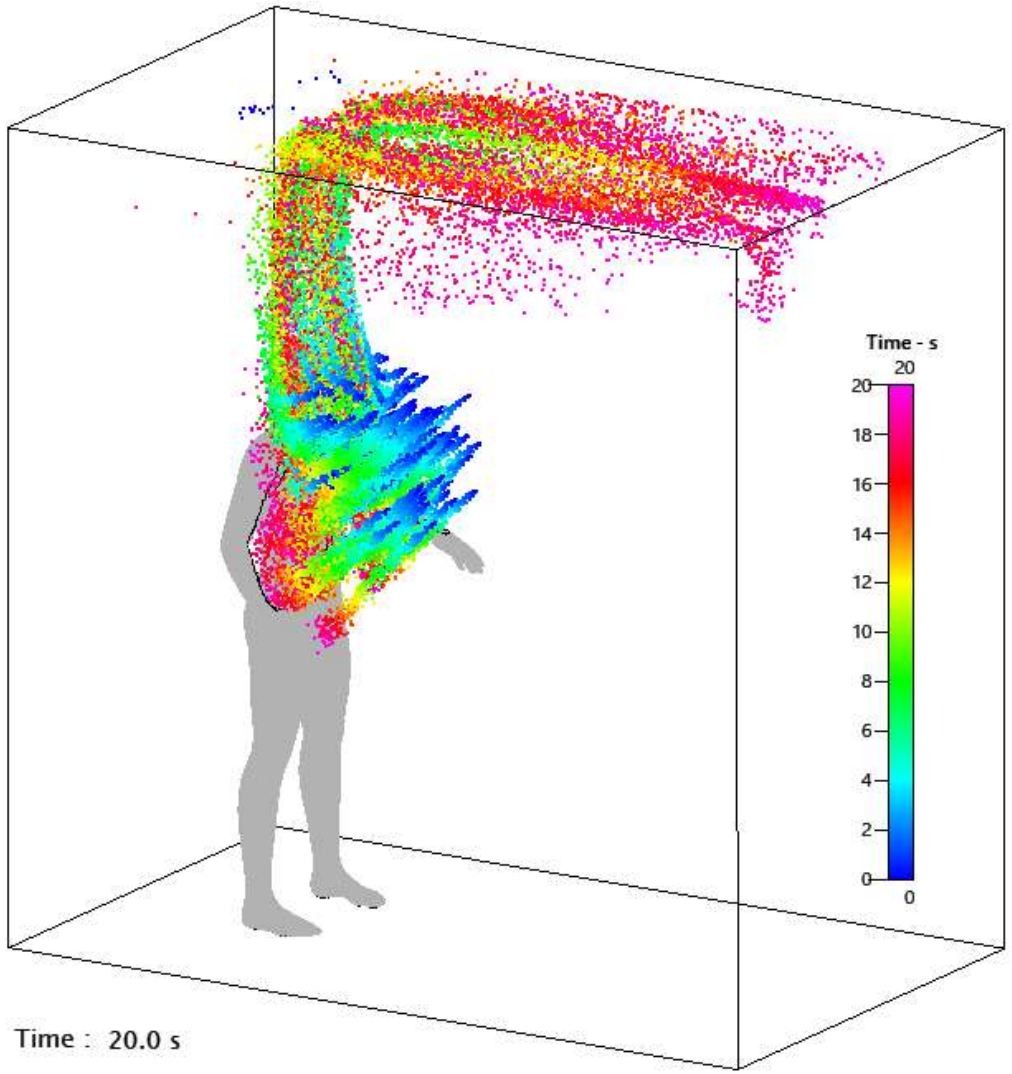
https://athenasys.co.jp/main/product/cfd-ace/spray/spray_on_virus_diffusion_en.html

Particle trajectory:
80 µm particle



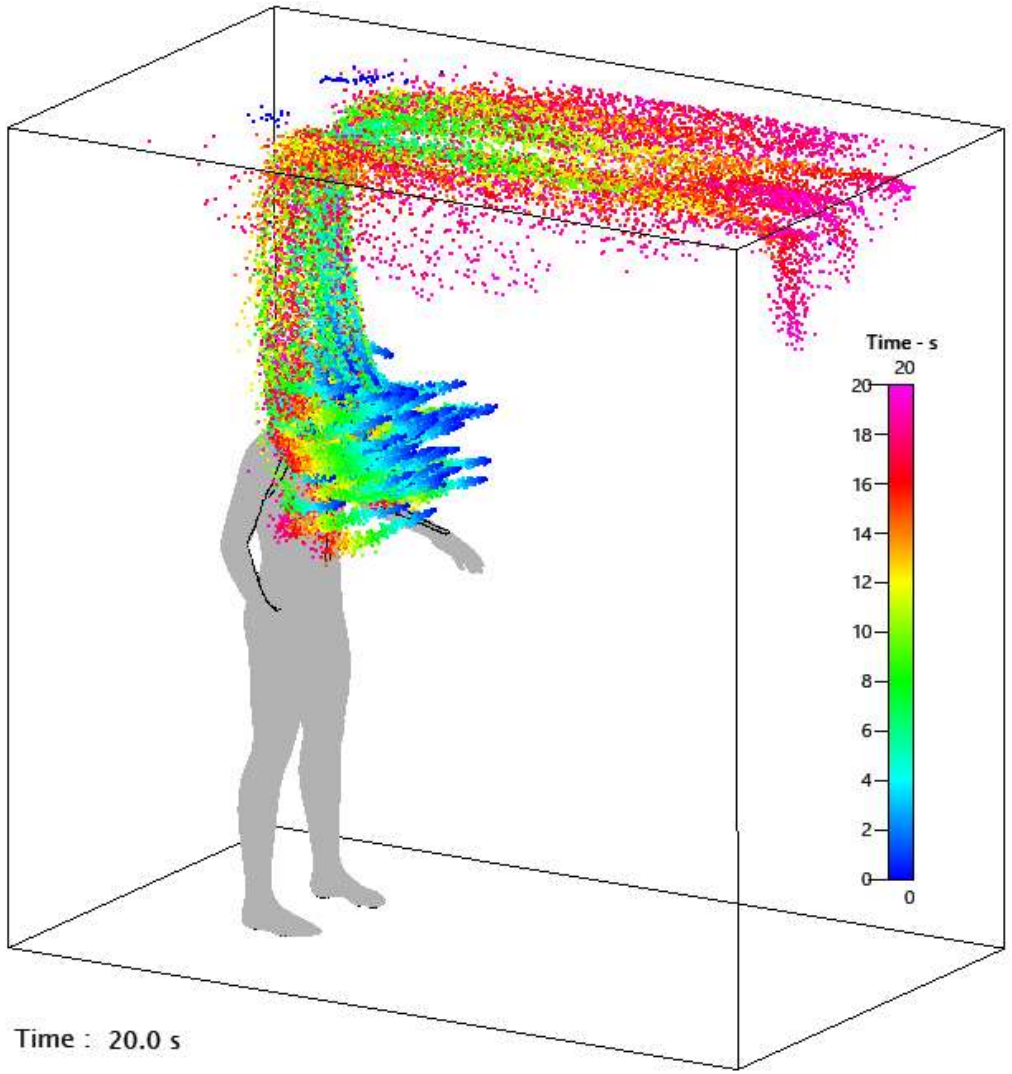
https://athenasys.co.jp/main/product/cfd-ace/spray/spray_on_virus_diffusion_en.html

Particle trajectory:
20 µm particle



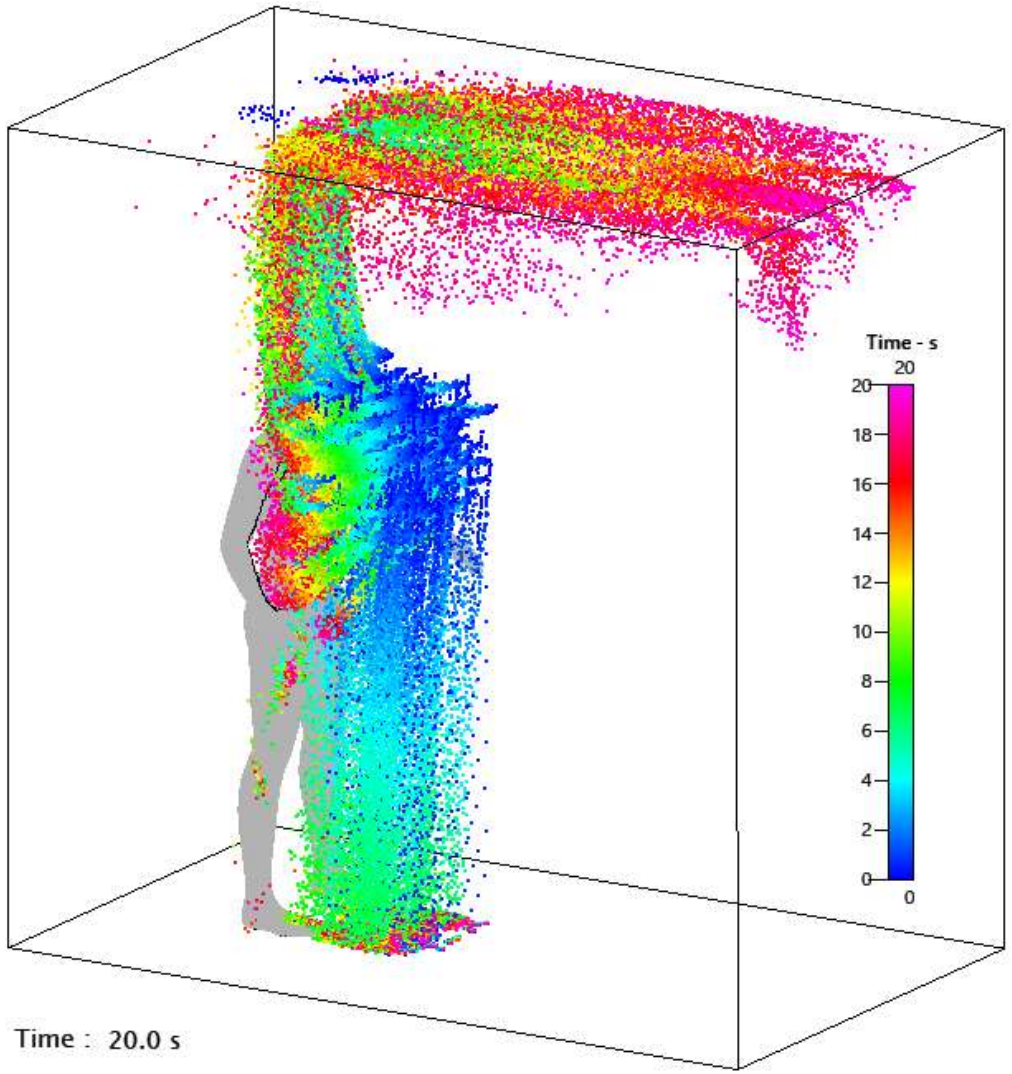
https://athenasys.co.jp/main/product/cfd-ace/spray/spray_on_virus_diffusion_en.html

Particle trajectory:
5 µm particle



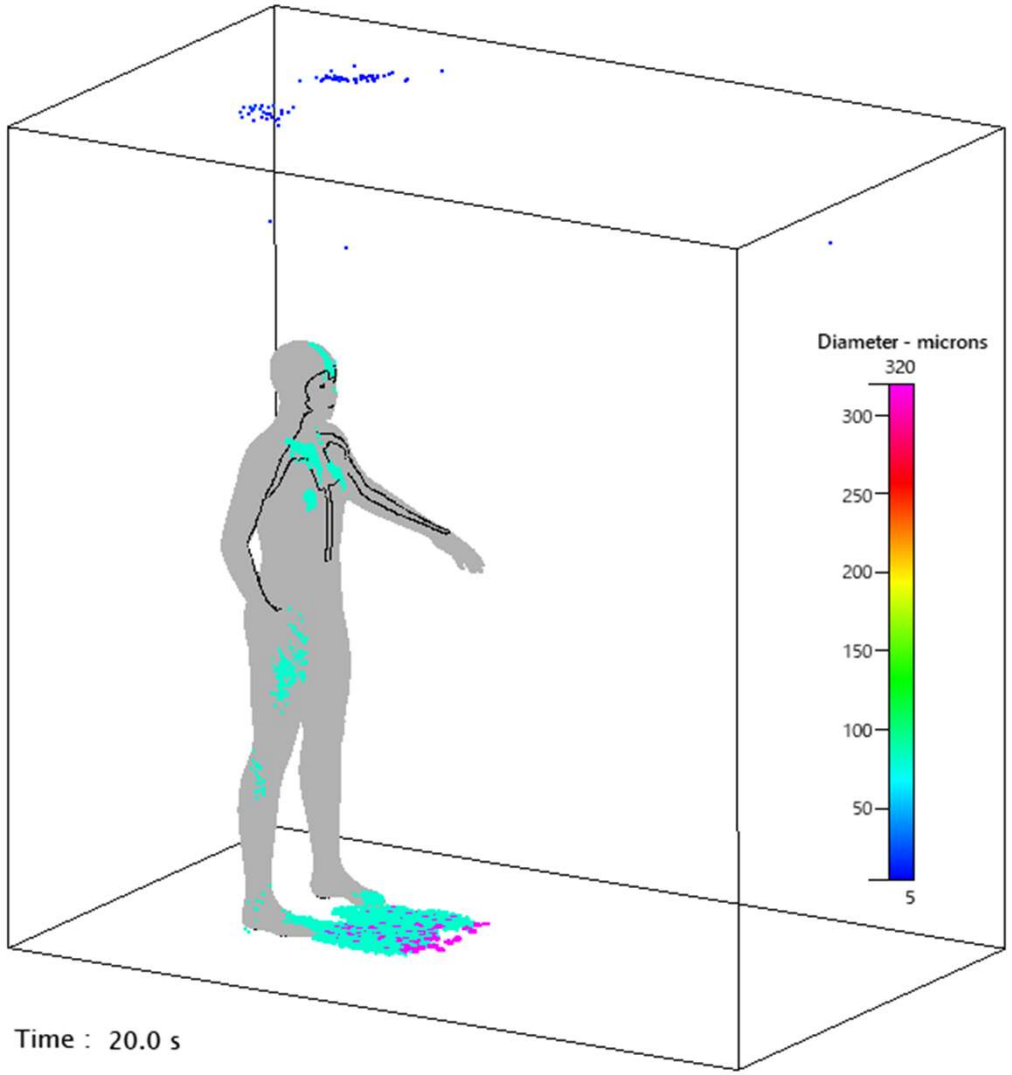
https://athenasys.co.jp/main/product/cfd-ace/spray/spray_on_virus_diffusion_en.html

Particle trajectory:
all particle sizes



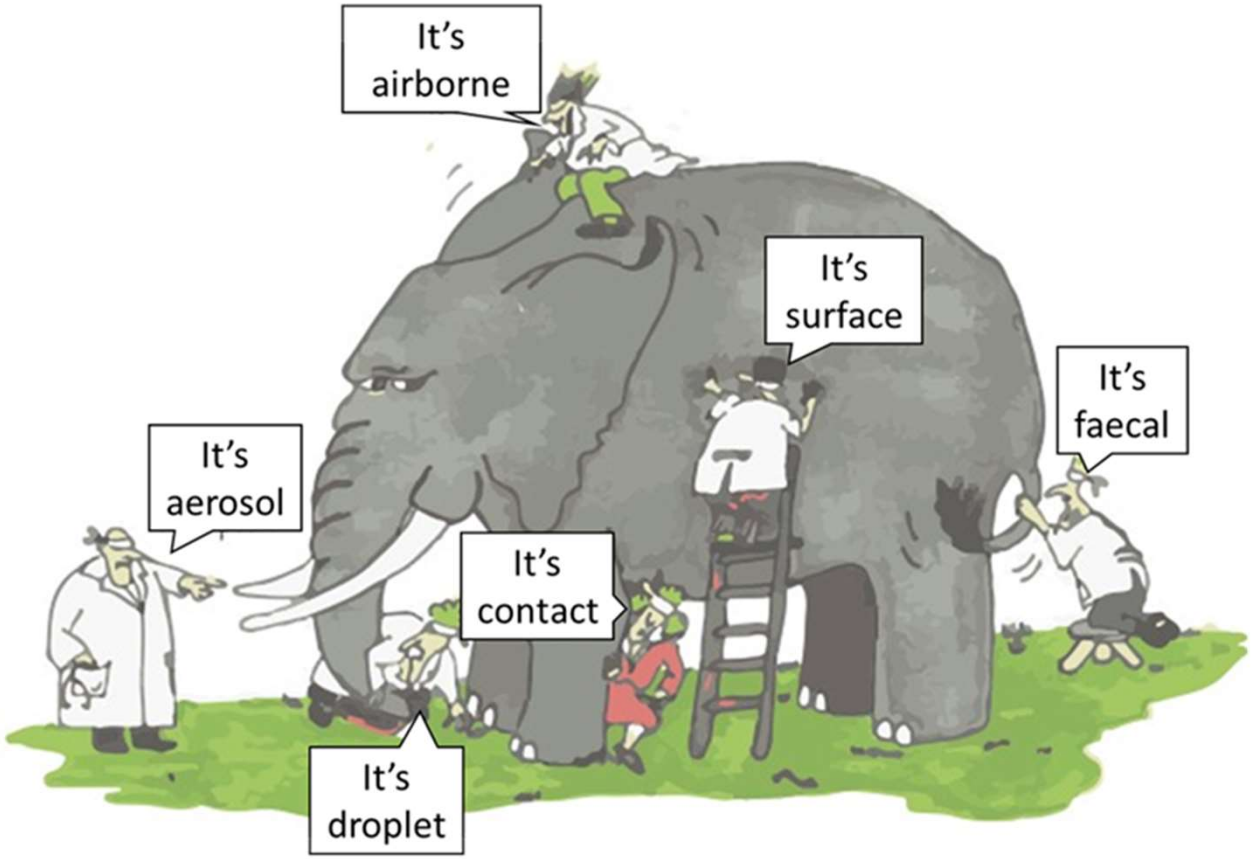
https://athenasys.co.jp/main/product/cfd-ace/spray/spray_on_virus_diffusion_en.html

Particles adhering to floor, wall, and body



https://athenasys.co.jp/main/product/cfd-ace/spray/spray_on_virus_diffusion_en.html

Confusion and misinformation about transmission routes, reminds me of the Indian folk story: the 6 blind people and the elephant



PHAC: on modes of transmission

"Spreads from an infected person to others through respiratory droplets and aerosols created when an infected person coughs, sneezes, sings, shouts, or talks. The droplets vary in size from large droplets to smaller droplets, sometimes called aerosols, which linger in the air under some circumstances."

"Reports of outbreaks in settings with poor ventilation suggest that infectious aerosols were suspended in the air and that people inhaled the virus. These settings have included a choir practice, fitness classes, and restaurants. Transmission in these settings may have been facilitated by certain environmental conditions, such as re-circulated air."

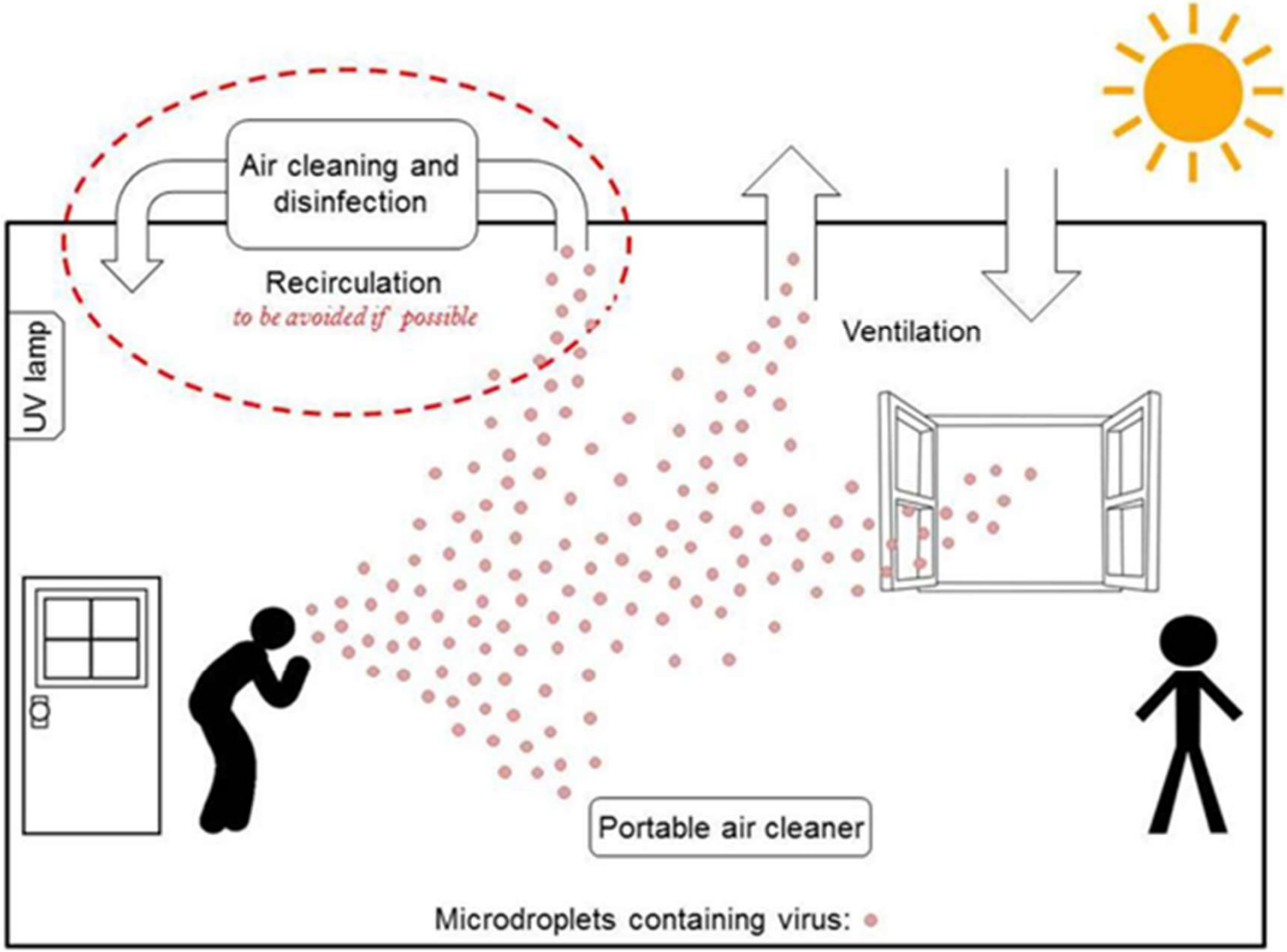
"Avoid or take additional measures and keep exposure very brief in:

- closed spaces
- crowded places
- close-contact settings and close-range conversations
- settings where there is singing, shouting or heavy breathing, for example, during exercise

It is particularly important to avoid settings where these risks overlap, e.g., closed, crowded spaces where close-range conversations occur."

"Maximize ventilation by ensuring that heating, ventilation and air conditioning (HVAC) systems are in good working order. Drawing as much fresh air as possible from outside will decrease the concentration of aerosols. Reduce the noise level in public spaces, for example turn off the music, so people can speak as quietly as possible."

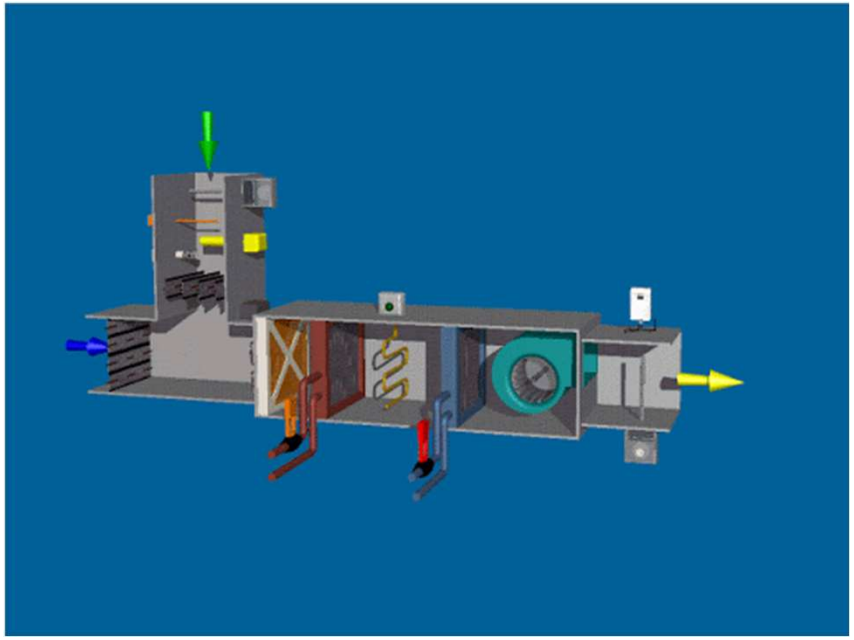
https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/health-professionals/main-modes-transmission.html

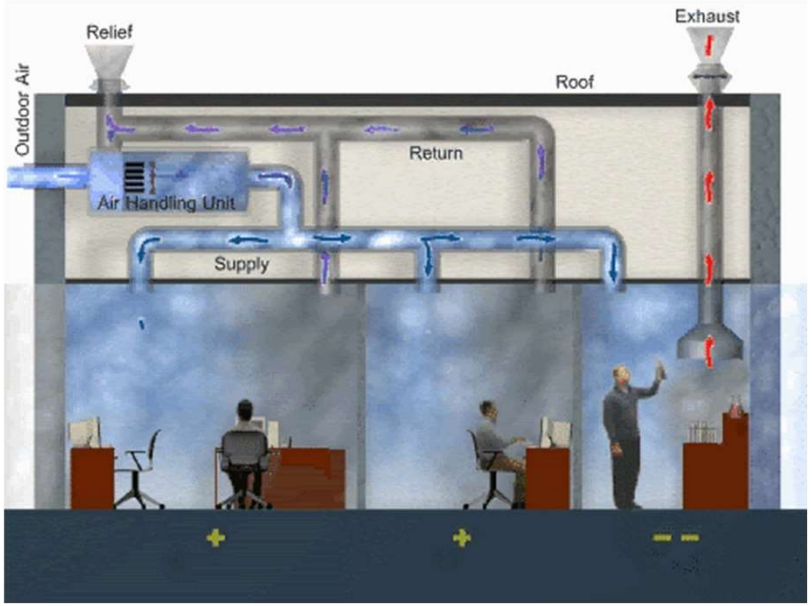

Air cleaning and disinfection
Recirculation
to be avoided if possible
Ventilation
UV lamp
Portable air cleaner
Microdroplets containing virus:

ECDC: Heating, ventilation and air-conditioning systems in the context of COVID-19: first update (Nov 10/2020)

1. Transmission of SARS-CoV-2 commonly occurs in closed indoor spaces.
2. HVAC systems may have a complementary role in decreasing transmission in closed indoor spaces by increasing the rate of air exchange, decreasing recirculation of air and increasing the use of outdoor air, and using adequate types of filter.
3. The risk of human infection with SARS-CoV-2 caused by air distributed through the ducts of HVAC systems is rated as very low.
4. The air flow generated by air-conditioning units may facilitate the spread of droplets excreted by infected people over long distances within closed indoor spaces.
5. Well-maintained HVAC systems, including air-conditioning units, securely filter large droplets containing SARS-CoV-2. It is possible that aerosols (small droplets and droplet nuclei) containing SARS-CoV-2 spread through HVAC systems within a building or vehicle and through stand-alone air-conditioning units if air is recirculated. However, the extent to which such potential aerosol route contributes to COVID-19 transmission is unknown and rated as very low for well-maintained, central HVAC systems.
6. There is limited evidence regarding the effect of stand-alone air filtration and other air cleaning technologies on the transmission of SARS-CoV-2.

Heating Ventilating and Air Conditioning (HVAC) unit





go look on the roof …

make sure you look inside

never know what you'll find …

2do list: go look inside your HVAC unit

Jeffrey Siegel (U of T) IAQ expert on filters:

Possible particulate potentiating effective raising risk of infection

"There is no direct scientific evidence of benefit, but some reduced exposure can reasonably be inferred based on the ability of some filters to remove particles that contain a SARS-CoV-2 virus. In order for filters to have any impact on infectious disease transmission, transmission has to occur through the airborne route, filters have to be properly installed and maintained in appropriate systems to treat recirculated air, and filters have to be appropriately designed for the building in which they are used. More importantly, in most buildings and in most situations, filters may be considerably less effective than other infection control measures including social distancing, isolation of known cases, and hand-washing."

https://www.nafahq.org/covid-19-corona-virus-and-air-filtration-frequently-asked-questions-faqs/

Measuring air flow to figure out how many air changes per hour (ACH) (the proper way):

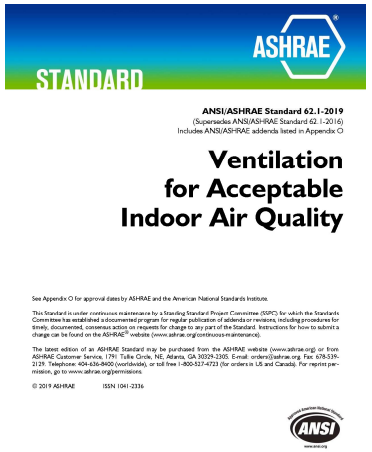
The problems with air changes (ACH):

2do list: make fan setting is on "ON"

- Most HVAC systems designed to turnover the volume of the room about 5 to 6 time per hour (if the fan setting left on "ON" not "AUTO")
- Usually only 10-25% of the air being circulated by the HVAC unit is outdoor air
- Thus, if you have 5-6 air turnovers per hour, only 10-25% of that air is outdoor air ("fresh air"), so actually the rate is 0.5-1.5 outdoor air changes per hour.
- This all assumes you have "perfect mixing" i.e. the air circulates over the whole volume of the room leaving no "dead air" spaces
- Open windows and doors will give you more air exchanges and possibly more outdoor air supply
- If you go to 100% outdoor air supply you won't be able to manage the temperature and humidity in extreme weather (very hot or very cold)

CO_2 as a surrogate measure for outdoor air supply:

- **carbon dioxide** as an evaluation criteria (measures air turnover rates)
- standards (surrogate, not exposure)
  - **ASHRAE** #62.1-2019:
    - 17 cfm OA/person (equivalent to 900 ppm CO_2 if outside CO_2 is 400 ppm; 15 cfm/person equivalent to 1100 ppm CO_2 or CO_2 level no more than 700 ppm above background)
  - **Ministry of Labour:**
    - background (outside air) 400-500 ppm
    - no problem up to 600 ppm
    - possible problem 600-800 ppm
    - probable problem 800-1000 ppm
    - more outdoor air needed 1000+ ppm
    - 8-hr ON TWAEV 5000 ppm



Issues with CO_2 measurements:

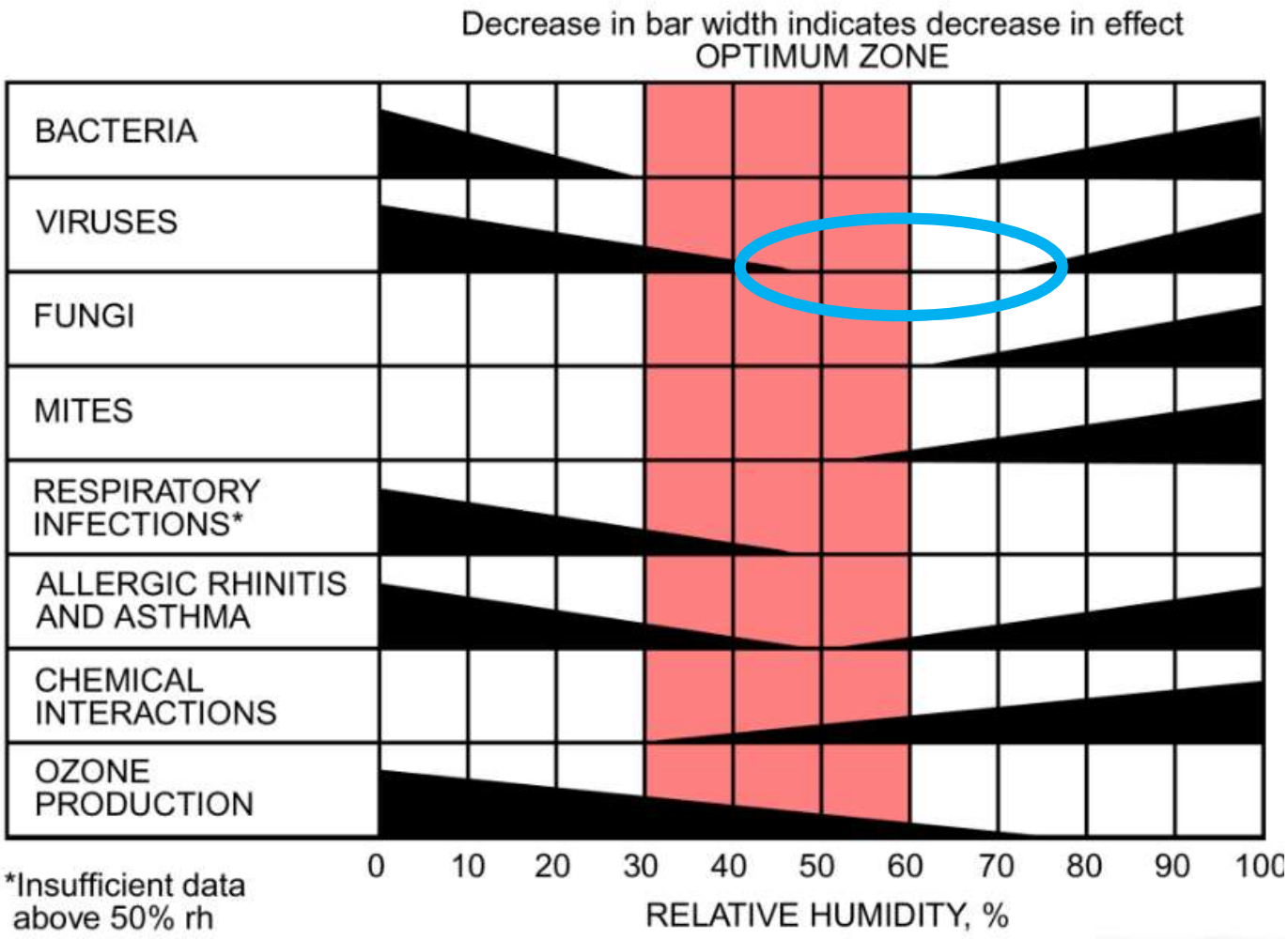
- relatively cheap CO_2 sensors are available (<$100) and even measurement machines aren't that expensive ($150+) unless you want a really good one ($2500+)
- don't breath on the sensor (you exhale 30,000 ppm)
- make sure there are no other sources of CO_2 (e.g. combustion exhaust, dry ice, outdoor air entrainment, etc.) – outdoor air is no less than 400 ppm (if less check your machine) but with lots of traffic nearby it could be as high as 700 ppm (then check the differential)
- if you take a grab sample take at peak occupancy just before they leave (or open windows/doors/etc.) – no time weighted average – better to track pattern over time
- surrogate for outdoor air supply – if it doesn't work, you can measure the airflows directly
- most IAQ standards suggest not to exceed 1000-1200 ppm (below 800 ppm is better)
- at 100% outdoor air, CO_2 level should be <600 ppm
- lower occupancy will mean lower CO_2 but not more outdoor air supply (dilution by lowering occupancy i.e. source reduction)

Thermal comfort issues:

2do list: prepare for thermal discomfort

- Due to the heating/cooling load that 100% outdoor air may bring (ideal outdoor air temperature for air conditioning is 10°C (or 50°F in American)) occupants may experience some thermal discomfort
- Adjusting workplace clothing is a means of addressing this issue (lots of sweaters, blankets, even thin gloves) and space heaters
- Open windows and the use of barriers (e.g. Plexiglas dividers) may disrupt designed air flows (use soap bubble gun to see the air flow patterns)
- Relative humidity (e.g. 40-70%) will be very difficult to maintain in the Canadian winter – steam injection humidification systems are probably the best, if designed and maintain adequately

Health Risks vs. Relative Humidioty



E.M. Sterling, A. Arundel, and T.D. Sterling, Criteria for Human Exposure to Humidity in Occupied Buildings(ASHRAE Transactions, 1985), Vol. 91, Part 1

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http://plumbingandhvac.ca/ontario-to-unlock-50-for-school-hvac-upgrades/

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Ontario to 'unlock' $50M for school HVAC upgrades

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BY PLUMBING & HVAC STAFF ON AUGUST 14, 2020 NEWS

Toronto, ON — In announcing a nearly $1.5 billion package to support school boards reopening safely in September, the provincial government also said it will provide $50 million in one-time funding to support improved ventilation, air quality and HVAC system effectiveness in schools.

Boards will focus on improving air systems in older schools, portables and neighbourhoods with higher rates of community transmission, stated a release. School boards will "continue to maximize their use of existing school renewal funding, which totals over $1.4 billion this school year," said the government.

During the press conference Minister of Education Stephen Lecce noted that older schools can use individual HVAC mobile units with the funding to support current ventilation instead of entirely remodeling a school's airflow system.

$50 million for 5000 schools = $10,000/school

Just about enough to buy a bunch of air purifiers

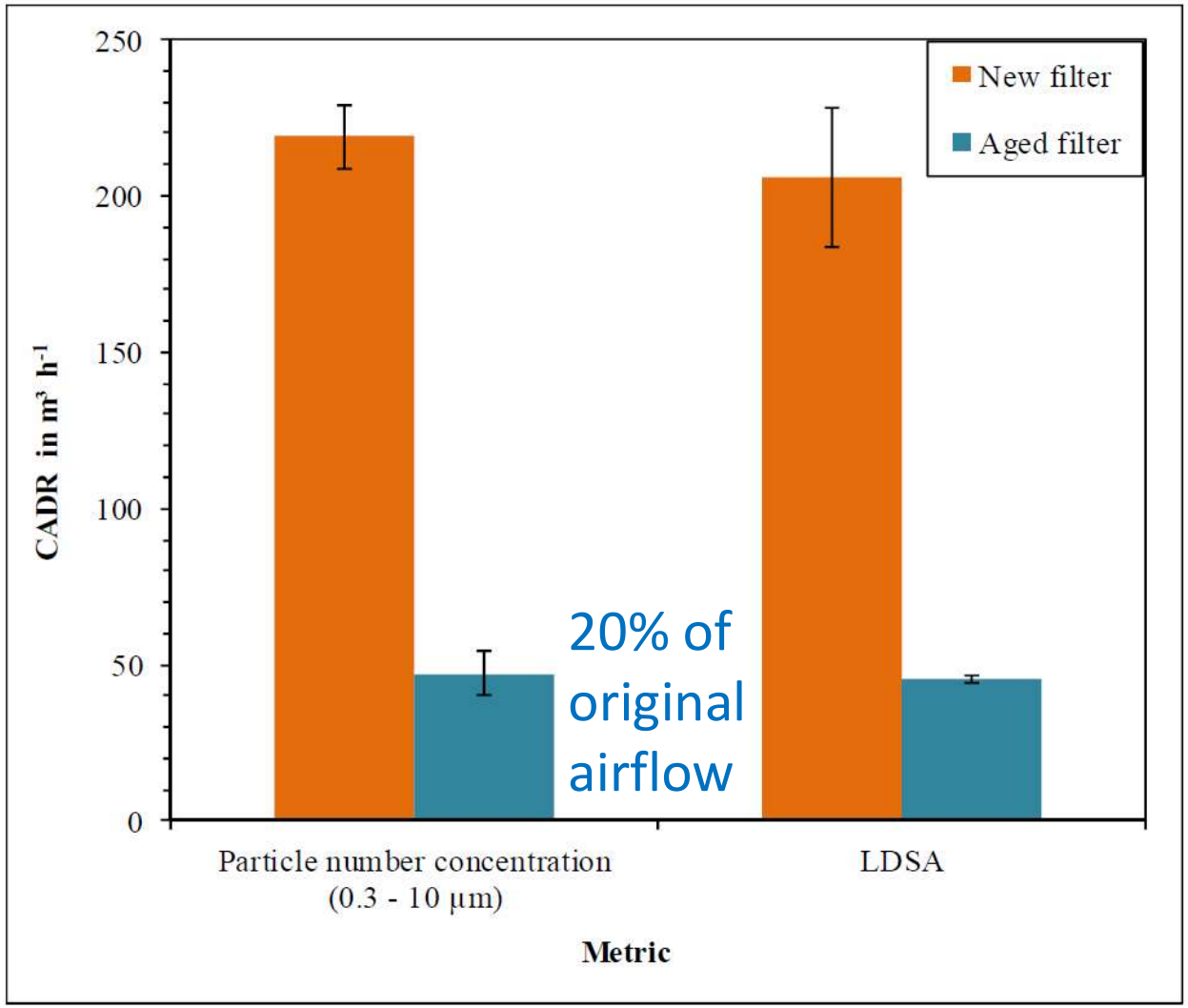
An excuse not to bring in more outdoor air ($)

	Low	Mid	High
Air Purifier	Levoit LV-H134	Blue Pure 121	Medify MA-112
Image			
CADR	312 cfm	400 cfm	560 cfm
AHAM Verification	✖	✔	✖
Maximum Noise Level	54 decibels	56 decibels	70 decibels
Rated Power	45W	61W	95W
Pros & Cons	✓ 100% ozone-free ✓ 360-degree air intake ✗ Not AMAM approved	✓ Minimalist design ✓ Washable pre-filter ✗ No true HEPA filter	✓ Very high CADR ✓ Large filter surface ✗ No air quality monitor on V2.0
In-depth Review	-	Blueair Blue Pure 121 Review	Medify MA-112 Review
Customer Ratings	★★★★½	★★★★½	★★★★½
Prime Status	Prime	Prime	-
Current Price	$407.82	$439.99	Price not available

Clean Air Delivery Rate (CADR):
need roughly a CADR (dust) of 70 cfm/100 ft^2

recommended background noise level: 30-40 dBA

Aged filters



2do list: if you're getting into these units, make sure you do your homework (size & locate them properly) and take good care of them!

Fig. 3. Mean CADR (bars) with scatter (error bars) based on two different metrics for new and aged filters, n = 3, respectively.

https://aaqr.org/articles/aaqr-19-01-oa-0029.pdf

Jeffrey Siegel (U of T) on UV systems & other technologies:

"A properly designed and maintained **UV system**, often in concert with filtration, humidity control, and airflow management, has been shown to reduce infections from other viruses. The details of the system are very important (e.g., design of fixtures, lamp type, lamp placement airflow amount and mixing, etc.). Simply adding UV to an existing system without consideration of these factors has not been demonstrated to have a benefit."

"**Ionizers, ozone generators, plasma**, and other air cleaning technologies; None of these technologies have been proven to reduce infection in real buildings, even if they have promise based on tests in a laboratory or idealized setting. Some of them have substantial concerns about secondary issues (such as ozone production)."

https://www.nafahq.org/covid-19-corona-virus-and-air-filtration-frequently-asked-questions-faqs/

Guo BM, Xu P, Xiao T, He R, Dai M, Zhang Y, Review and comparison of HVAC operation guidelines in different countries during the COVID-19 pandemic, Building and Environment (2020)

Table A.1: comparison of the main strategies

	ASHRAE	REHVA	SHASE	Related Society of China
Outdoor air	1. Increase the amount of outdoor air. 2. Open outdoor air dampers, as high as 100% if possible.	1. Supplying as much outside air as reasonably possible. Switch the terminal devices to 100% outdoor air if possible. 2. Open windows regularly.	1. Supplying as much outside air as reasonably possible. Switch the terminal devices to 100% outdoor air if possible. 2. Open windows regularly.	1. Supply as much outside air as reasonably possible. Switch the terminal devices to 100% outdoor air if possible. 2. The ratio of outdoor air should be greater than 40%.
Operation of HVAC systems	1. Operate HVAC related device local 2. Keep the system on for 24 hours a day, 7 days a week if possible. 3. Disable DCV.	1. Run ventilation at the nominal speed for at least 2h before occupancies and at a lower speed 2h after occupancies. 2. Run toilet ventilation system for 24 hours a day, 7 days a week. 3. In DCV systems, change the CO_2 setpoint to 400 ppm.	1. Increase the running time of HVAC equipment, running it continuously for 24 hours if possible. 2. Run the exhaust system in toilets continuously. 3. Lower the CO_2 setpoint.	1. Increase the air supply temperature in heating mode and decrease the temperature in cooling mode.
Temperature and humidity setpoint	1. Control the temperature and humidity is beneficial. But the temperature and relative humidity setpoint should be considered on a case-by-case basis.	1. There is no need to adjust the temperature and humidity setpoint.	1. The temperature should be controlled between 17 and 28 ℃, and the relative humidity should be controlled between 40 and 70%.	Haven't mentioned.
Pressure Differential	1. The air should flow from safe areas to unsafe areas, from personal use areas to public areas.	1. Ensure the negative pressure in the toilets.	1. Ensure the negative pressure in the toilets.	1. A slight positive pressure should be maintained in the kitchen. 2. Keep negative pressure in toilets.
Filters equipped in the HVAC system	1. Improve the level of the central air filter as much as possible, at least to the grade of MERV-13.	1. Filters should be replaced and maintained as usual.	1. For a system with 100% outdoor air, the filter can be operated as usual. 2. For return air operation, check the differential pressure of the filter more often and replace the filter sooner than usual.	1. Maintain filters as usual.
Air cleaning	1. HEPA filters and UVGI are recommended.	1. It is recommended to locate the air-cleaning device close to the breathing zone. 2. Special UV cleaning equipment	1. Air cleaners are effective as an auxiliary device. 2. Ventilation is more effective than air cleaners.	1. Indoor air cleaners should be operated. 2. UV devices shouldn't be installed in the HVAC system.

	ASHRAE	REHVA	SHASA	SQSIQA
outdoor air (OA)	100% outdoor air if possible	100% outdoor air if possible	100% outdoor air if possible	100% outdoor air if possible
hrs of operation	24/7 if possible	run at low volume from 2 hrs after, till 2 hrs before occupancy	run HVAC continuously for 24 hours if possible	**2do list:** here's a whole list to review with JHSC
temperature/ humidity set points (temp & RH)	case by case (depends on OA)	no need to adjust temperature and humidity setpoint	temp: 17-28°C RH: 40-70%	increase supply air temp in heating; decrease for cooling
demand-controlled ventilation (DCV)	disable	use CO_2 set point of 400 ppm	lower CO_2 set point	–
filters	MERV-13 or better	filters as usual	for 100% OA, filter as usual – otherwise, replace more often	maintain filters as usual
washrooms	(run ventilation 24/7 – implied)	run toilet ventilation system 24/7 close the lid when flushing avoid dry water seals	run toilet ventilation continuously close the lid when flushing check water seals	keep the plumbing vent pipe clear check water seals regularly

Do you know how good your ventilation is?

French & English

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Ventilation checklist (COVID-19)

The following checklist can be used as a guide. Pertinent questions are suggested that can be used to assess the suitability of ventilation in the workspace/building that are to be occupied.

According to ASHRAE: "Statement on airborne transmission of SARS-CoV-2. "*Transmission of SARS-CoV-2 through the air is sufficiently likely that airborne exposure to the virus should be controlled. Changes to building operations, including the operation of heating, ventilating, and air-conditioning systems, can reduce airborne exposures*". Therefore, engineering or control via ventilation is critical and provides a higher order control.

Question	Y / N	Additional Guidance	Reference/Notes
1. Has the Hierarchy of Controls (HOC) been used to implement physical distancing, appropriate engineering, administrative, and personal protective equipment (PPE) options in that order (Refer to CDC worker protection tool 1) based on a risk assessment?			1
2. Check in with the person in charge of the day to day operation of the heating, ventilating and air conditioning (HVAC) system.		Ask about the status of the HVAC system. For example: Is it running properly? What service does it need? Are its parts clean? Does anything need to be done to make the system work more effectively? Are the Plans and Specifications available for review, just in case? Is there anything else to know?	9

OHCOW Ventilation Checklist:

2do list: download and review the OHCOW ventilation checklist

26 questions, some with guidance and references

- connecting with the people who operate the system
- increase outdoor air supply
- measure air changes per hour (ACH)
- check integrity of complete system (clean if necessary)
- operate system 24/7
- ensure adequate washroom supply and exhaust ventilation
- use at least MERV 13 filters if possible
- consider the use of air cleaners
- keep relative humidity between 40-60%
- perform risk assessment

https://www.ohcow.on.ca/ventilation-checklist-2.html

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Regional Risk Tool & Tips

Escalating Advice Based on Your Region's COVID-19 Infection Experience For

Communicating, Cleaning, Handwashing, Ventilating, Distancing, Screening, and Masking

This page provides a tool to determine your local infection risk and corresponding tips for COVID-19 prevention in non-healthcare workplaces.

- based on Public Health Ontario published weekday COVID-19 case counts
- a rolling 14-day COVID-19 average of cases in each Public Health region in Ontario
- regional infection risk levels are classified into 5 categories (coloured bands)
- escalating set of tips, based on risk, to protect your workplace from COVID-19
- plus daily summary **Regional Risk Table At A Glance**

Ontario COVID-19 Regional Risk Tool:

Risk Legend

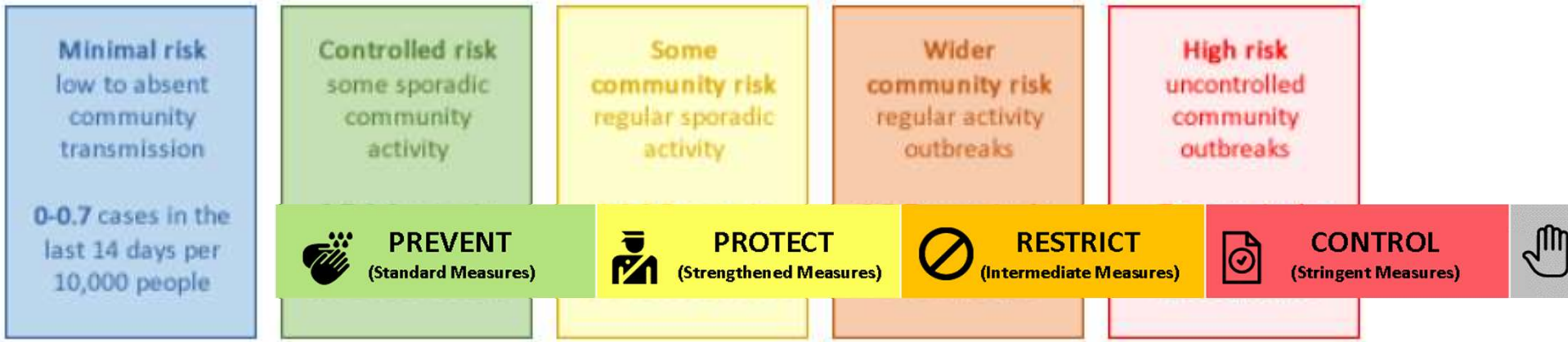
Minimal risk – low to absent community transmission

Controlled risk – some sporadic community activity – controlled occasional minor outbreaks

Some community risk – regular sporadic activity – controlled occasional larger outbreaks

Wider community risk – regular activity – periodic outbreaks

High risk – uncontrolled community transmission &/or outbreaks



Rank	Region Public Health Unit (PHU)	Regional Infection Risk Level*	ON Framework catgories**
1	Peel Public Health	High risk	CONTROL
2	Toronto Public Health	High risk	CONTROL
3	York Region Public Health	High risk	CONTROL
4	Region of Waterloo Public Health and Emergency Services	High risk	CONTROL
5	Windsor-Essex County Health Unit	High risk	CONTROL
6	Halton Region Public Health	High risk	RESTRICT
7	City of Hamilton Public Health Services	High risk	CONTROL
8	Wellington-Dufferin-Guelph Public Health	High risk	CONTROL
9	Durham Region Health Department	High risk	RESTRICT
10	Brant County Health Unit	High risk	CONTROL
11	Thunder Bay District Health Unit	High risk	RESTRICT
12	Simcoe Muskoka District Health Unit	Wider community risk	RESTRICT
13	Niagara Region Public Health	Wider community risk	RESTRICT
14	Grey Bruce Health Unit	Wider community risk	RESTRICT
15	Ottawa Public Health	Wider community risk	PROTECT
16	Huron Perth Health Unit	Wider community risk	RESTRICT
17	Southwestern Public Health	Wider community risk	PROTECT
18	Haldimand-Norfolk Health Unit	Wider community risk	PROTECT
19	Middlesex-London Health Unit	Wider community risk	PROTECT
20	Eastern Ontario Health Unit	Some community risk	PROTECT
21	Chatham-Kent Public Health	Some community risk	PROTECT
22	Northwestern Health Unit	Some community risk	PROTECT
23	Hastings Prince Edward Public Health	Some community risk	PROTECT
24	Peterborough Public Health	Some community risk	PROTECT
25	Kingston, Frontenac and Lennox & Addington Public Health	Some community risk	PREVENT
26	Lambton Public Health	Some community risk	PROTECT
27	Haliburton, Kawartha, Pine Ridge District Health Unit	Some community risk	PROTECT
28	Public Health Sudbury & Districts	Some community risk	PREVENT
29	Renfrew County and District Health Unit	Some community risk	PROTECT
30	North Bay Parry Sound District Health Unit	Controlled community risk	PREVENT
31	Porcupine Health Unit	Minimal risk	PREVENT
32	Leeds, Grenville & Lanark District Health Unit	Minimal risk	PREVENT
33	Timiskaming Health Unit	Minimal risk	PREVENT
34	Algoma Public Health	Minimal risk	PREVENT

2do list: monitor your local community risk of infection

NOTE: ** The Ontario Framework Categories are based on the official provincial colour coded categories explained at: https://files.ontario.ca/moh-adjustments-covid-19-responseframework-keeping-ontario-safe-and-open-en-2020-11-13.pdf (see in particular slide 9). It should be noted that we only used the weekly incidence rate per 100,000 to assign our version of the ON categories. We were not able to include some of the other factors included in the provincial assignment (e.g., % positivity of daily tests, the reproductive number (Rt – the number of new cases traced each known cases), the number and status of outbreaks, trend in cases without an epi connection, hospital and ICU capacities, and, PHU capacity for contact tracing). We are also not able to assign the lockdown category since this category is based on a judgement call not on a specified weekly incidence rate number. Therefore, the ON categories assigned in this table may not necessarily align with the official version.

https://www.ohcow.on.ca/regional-risk-tool-and-tips.html

Escalating Advice Based on Your Region's COVID-19 Infection Experience for:

Communicating,
Cleaning,
Handwashing,
Ventilating,
Distancing,
Screening, and
Masking

Ventilating:

1. Regularly clean HVAC unit and ensure proper maintenance and filter changes
2. Ensure building and exhaust fans run continuously (e.g. thermostat setting at "ON" instead of "AUTO") to maximize the amount of fresh air coming into the building
3. **Boost washroom ventilation and air changes**
4. **Keep windows open whenever possible where it doesn't interfere significantly with HVAC's operation**
5. **Review Ventilation Checklist with JHSC/HSR & HVAC technician or expert**
6. **Maintain relative humidity between 40-60% where feasible**
7. **Adjust the ventilation system to increase outdoor air supply (adjust thermostat to allow for less temperature control during weather extremes) – ensure occupant originating CO2 levels are 500-800 ppm (lower better)**
8. **Install minimum of MERV 13 or 14 filters – check to ensure air volume is not significantly compromised**
9. Use one or more portable MERV 13, 14 or HEPA air filters if ventilation can't be increased, they are suitably sized and adequately maintained
10. Organize washroom break schedules to allow distancing and leave enough time between users to allow air changes
11. Consider UV disinfection in air handling units with appropriate safety precautions.
12. Keep ventilation in building running on low even when unoccupied and/or several days before re-entry

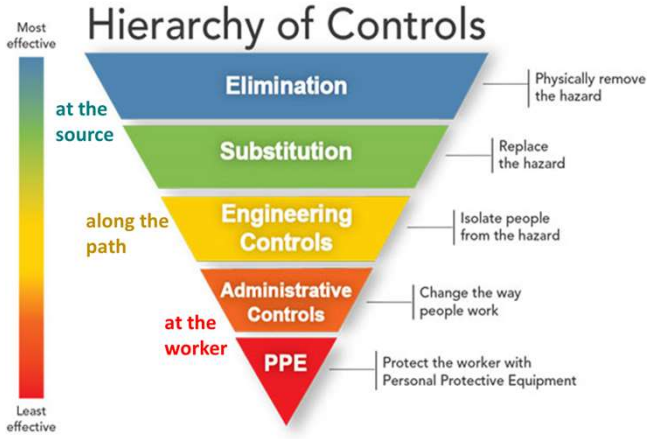
ECDC: Heating, ventilation and air-conditioning systems in the context of COVID-19: first update (Nov 10/2020)

1. **Removal and control of COVID-19 source(s)**
   - Hold off persons with COVID-19 or with COVID-19-related symptoms from staying with other people in closed indoor spaces.

2. **Engineering controls in mechanically ventilated (by HVAC systems) and naturally ventilated closed spaces**
   - Comply with best practice of maintenance and settings of HVAC systems in the context of COVID-19;
   - Ensure frequently opened windows in naturally ventilated closed spaces.

3. **Administrative controls**
   - Reduce occupancy of closed indoor spaces.

4. **Personal protective behaviour**
   - Keep physical distance;
   - Practise respiratory etiquette;
   - Wear a community face mask.



2do list

1. download and review the OHCOW ventilation checklist
2. monitor your local community risk of infection (adjust level of controls accordingly)
3. go look inside your HVAC unit (take some pictures)
4. make sure fan setting is on “ON” (keep outdoor air coming in)
5. prepare occupants for thermal discomfort (space heaters, extra clothes)
6. check into humidification (ideally between 40-60%)
7. review HVAC standards (OHCOW checklist or slide 36) with JHSC
8. if you’re getting air cleaning units, make sure you do your homework (size & locate them properly) and take good care of them!

Thanks for your time and attention!

"Open up the window, let the bad air out!" *Bruce Cockburn, 1999*