

# Occ-COVID Year 5: Pandemic preparedness - New Risk Assessment & IAQ Solutions (14 June 2024)



Occupational Health Clinics for Ontario Workers Inc.

Centres de santé des travailleurs (ses) de l'Ontario Inc.

“COVID-19 has killed over 53,000 Canadians, . . . The **probability** of another pandemic occurring within one’s lifetime is **roughly 38 percent and may even grow to an extraordinary 76 percent within the next few decades**, . . .and, respiratory pathogens such as COVID and influenza will likely be the cause . . . due to their **high mutation rates** and transmissibility” ([Public Policy Forum, 2023](#)).

This webinar is hosted by **Kevin Hedges**, FAIOH, COH, CIH who will discuss the recent WHO risk assessment, and how important it is to monitor indoor air for CO2, temperature and humidity.



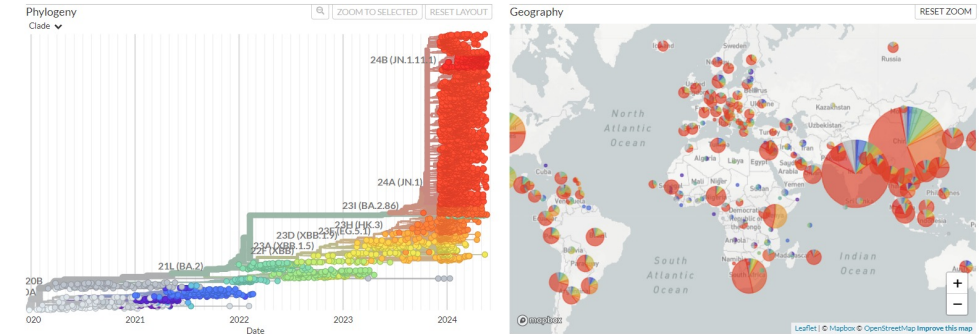
We are also excited to have **Joey Fox** PEng, return.

Joey is chair of the Ontario Society of Professional Engineers (OPSE), Indoor Air Quality Advisory Group. He will cover ensuring good indoor air quality, mitigating airborne diseases with ASHRAE 241 and use of UV.

Occupational Health Clinics for Ontario Workers Inc.  
**Prevention Through Intervention**

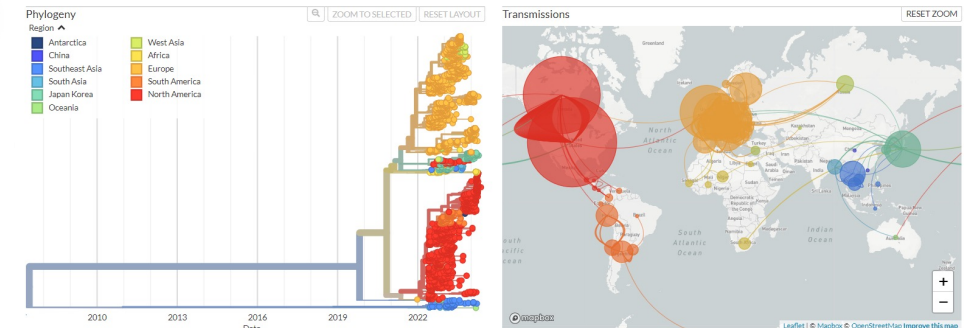
Genomic epidemiology of SARS-CoV-2 with subsampling focused globally over the past 6 months

Built with nextstrain/ncov. Maintained by the Nextstrain team. Data updated 2024-06-06. Enabled by data from [GISAIID](#). Showing 3789 of 3789 genomes sampled between Dec 2019 and May 2024.



Real-time tracking of influenza A/H5N1 virus evolution

Built with nextstrain/avian-flu. Maintained by Louise Moncla and the Nextstrain team. Data updated 2024-05-29. Enabled by data from USDA, Andersen Lab and [GISAIID](#). Showing 3281 of 3281 genomes sampled between Dec 2021 and May 2024.

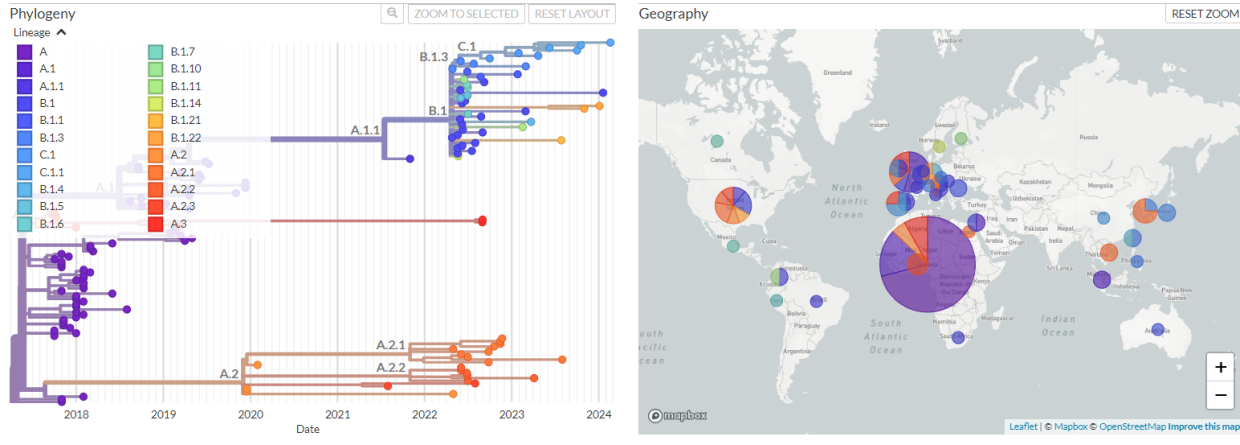


<https://nextstrain.org/>

## Genomic epidemiology of mpox clade IIIb viruses

Built with nextstrain/mpox. Maintained by Nextstrain team. Data updated 2024-06-12. Enabled by data from GenBank.

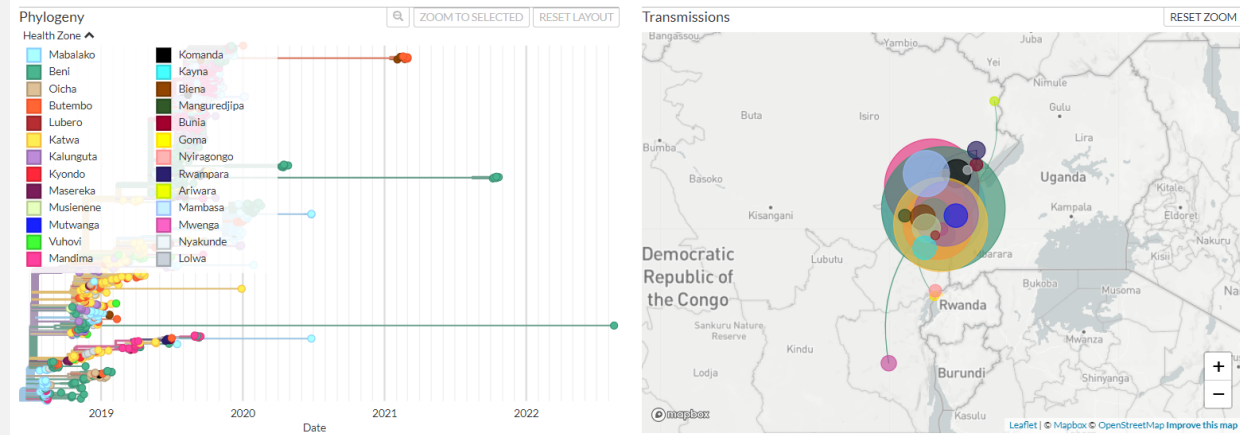
Showing 137 of 137 genomes sampled between Oct 2017 and Feb 2024.



## Genomic epidemiology of the 2018-20 Ebola epidemic

Built with inrb-drc/ebola-nord-kivu. Maintained by E. Kinganda Lusamaki, INRB & C. Pratt. Data updated 2024-05-21.

Showing 822 of 822 genomes sampled between Jul 2018 and Aug 2022.



# EPIWATCH



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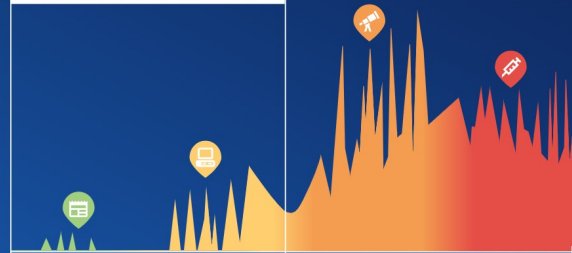
## Prevent the Next Pandemic with Epidemic Intelligence

Harness the power of AI and open-source data to capture early epidemic signals globally and rapid epidemic detection, leading to the prevention of global spread.



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### EPIWATCH ENABLES EARLY DETECTION & ACTION



CURRENT FOCUS  
& INVESTMENT

### Our Mission

To harness the power of AI and open-source data to capture early epidemic signals globally and enable early detection of epidemics, leading to prevention of global spread.

To provide real-time decision support tools including risk-analysis, prediction, simulation and modelling to help government and non-government stakeholders mitigate risk.

Hover over the flowchart to learn more.

<https://nextstrain.org/>

Occupational Health Clinics for Ontario Workers Inc.  
Prevention Through Intervention

<https://www.epiwatch.org/>

# New Risk Assessment Solutions

**ARIA**  
Airborne Risk Indoor Assessment

World Health Organization

Home Publication **Inhalation mechanism** Systematic review results Open Source repository FAQ

[Go to calculator](#)

ARIA is an online tool that enables users and building managers to assess the risk of SARS-COV-2 (COVID-19) airborne transmission in residential, public, and healthcare settings. The aim is to inform decisions that can significantly reduce the risk of transmission.

For more details on the model and its development, please refer to the publication: [Publication](#)

For more details on the values used by the model, please refer to the results of the systematic review: [Systematic review results](#)

Introducing ARIA: A CERN and WHO Collaboration

ARIA v1.2.10-01021001  
Powered by [CAMIRA](#)  
Do you have a feedback? Send an email to [techne@who.int](mailto:techne@who.int)  
Open Source Acknowledgements

technology

**Online global risk assessment tool.**

Airborne Risk Indoor Assessment (ARIA) is an online tool that enables users and building managers to assess the risk of SARS-COV-2 (COVID-19) airborne transmission in residential, public, and healthcare settings. The aim is to **inform decisions** that can significantly reduce the risk of transmission.

<https://partnersplatform.who.int/aria>



# COVID IS AIRBORNE

Canadian Experts Share Their Recommendations

The SARS-CoV2 virus is in the air — at close range and further away.  
This clear science can no longer be denied.  
Occupational health specialists and others from Canada and around the world have delivered this message since the pandemic began.

## FOURTH ANNIVERSARY

### RAISING OUR VOICES ABOUT COVID IN CANADA

IT WAS FOUR YEARS AGO — MARCH 11, 2020 — WHEN THE WORLD HEALTH ORGANISATION (WHO) DECLARED THE "NOVEL CORONAVIRUS" DISEASE, COVID-19, A PANDEMIC.

#### FEATURING:

**The Back and Forth of Modelling**  
Dr. Tara Moriarity (University of Toronto and COVID-19 Resources Canada)  
Dr. Gosia Gasperowicz (University of Calgary)

**National Opportunities to Make a Difference**  
Alec Farquhar | Dr. Simon Smith | Dr. Joe Vipond

**Snapshots from the Grassroots**

*How Do We Make More Progress?*



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<https://www.aerosoltransmissioncoalition.ca/>

# Five key areas of pandemic preparedness,



- 1) Apply the precautionary principle
- 2) Strive for elimination versus mitigation
- 3) **Ensure a multi-layered prevention approach** ←
- 4) Address the disproportionate impact of pandemics on people in vulnerable situations
- 5) Strengthen the institutional framework for pandemic planning and response

# Ensure a multi-layered prevention approach

Vaccinations are necessary but not sufficient. **There is no silver bullet!**

More is needed. It takes **good indoor ventilation** (at least to the ASHRAE 241 standard) and **filtering the virus from indoor air**. It requires the effective respiratory protection stipulated in Canadian Standard Association (CSA) respirator standard (Z94.4).

This multi-layered approach, with input from occupational health specialists, was recommended by Justice Campbell. It saves lives, prevents illnesses, and reduces closures of businesses and schools — thus, reducing the resulting polarization, and economic and societal impacts.

**Layered prevention strategies in public congregate settings, using tools to assess risk, monitor, and clean air, are critical for future health.**

ASHRAE Standard 241 (2023) "Control of Infectious Aerosols", now provides requirements to clean the air.

Using **carbon dioxide monitoring** “real time” as a surrogate to assess the quality of the air, will further indicate triggers and interventions required to clean the air.

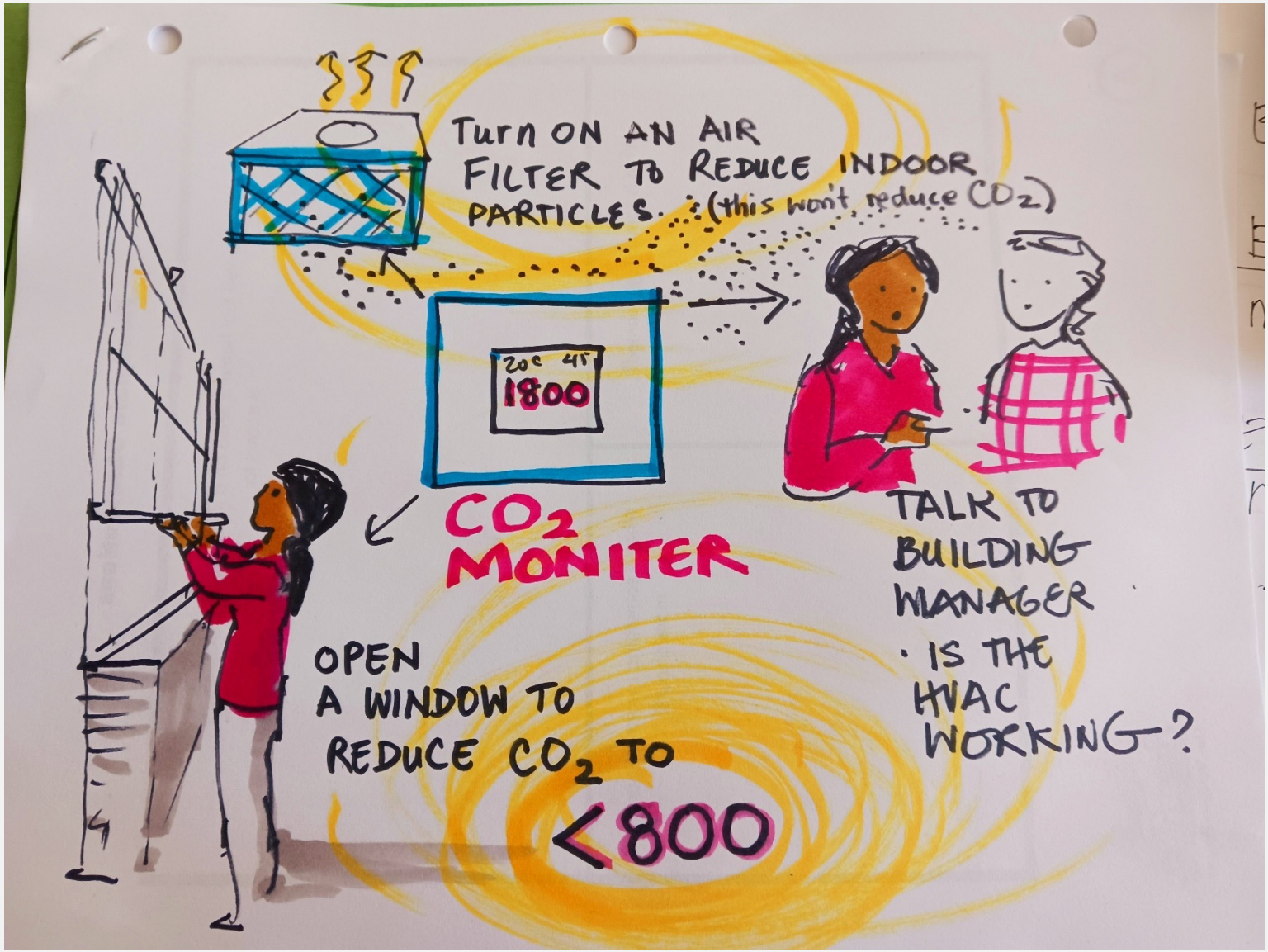
In addition, researchers from the University of Bristol have shown how carbon dioxide increases a virus's lifetime in the air.

Ambient carbon dioxide concentration correlates with SARS-CoV-2 aero stability and infection risk (Haddrell et al. 2024).

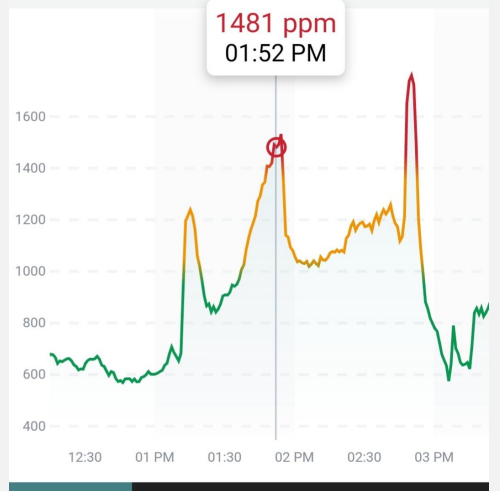
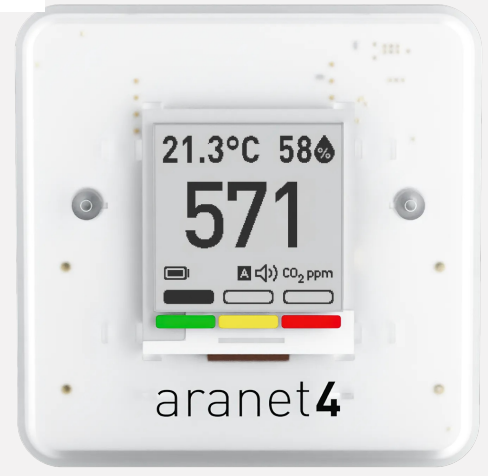
And with global warming it is more important than ever that we monitor indoors, CO<sub>2</sub>, temperature and humidity.

<b>no problem:</b>	<b>&lt;600 ppm CO<sub>2</sub></b>
<b>possible problem:</b>	<b>600-800 ppm CO<sub>2</sub></b>
<b>probable problem:</b>	<b>800-1000 ppm CO<sub>2</sub></b>
<b>more outdoor air needed:</b>	<b>1000+ ppm CO<sub>2</sub></b>





The most appropriate portable devices to use in the workplace are non-dispersive infrared (NDIR) CO<sub>2</sub> monitors.



[https://x.com/moss\\_sphagnum/status/1801339327537902056/photo/1](https://x.com/moss_sphagnum/status/1801339327537902056/photo/1)

Measure CO<sub>2</sub> (if elevated) → leave premises / air out / provide more fresh air → MERV 13 plus filters recirculated air and or air purifiers

**References:** UK HSE, [Ventilation in the workplace](#),



[Overview - Ventilation in the workplace \(hse.gov.uk\)](#)

- [Using CO<sub>2</sub> monitors.](#)
- [UK EMG-SPI-B: Application of CO<sub>2</sub> monitoring as an approach to managing ventilation to mitigate SARS-CoV-2 transmission](#)
- [NCCEH Indoor CO<sub>2</sub> sensors for COVID-19 risk mitigation: Current guidance and limitations](#)

## Predicting Airborne Infection Risk: Association Between Personal Ambient Carbon Dioxide Level Monitoring and Incidence of Tuberculosis Infection in South African Health Workers

Ruvandhi R. Nathavitharana,<sup>1,a,d</sup> Hridayesh Mishra,<sup>2,3,a</sup> Amanda Sullivan,<sup>1,b</sup> Shelley Hurwitz,<sup>4</sup> Philip Lederer,<sup>5,d</sup> Jack Meintjes,<sup>6</sup> Edward Nardell,<sup>7</sup> and Grant Theron<sup>2</sup>

<sup>1</sup>Division of Infectious Diseases, Beth Israel Deaconess Medical Center and Harvard Medical School, Boston, Massachusetts, USA; <sup>2</sup>DSI-NRF Centre of Excellence for Biomedical Tuberculosis Research, South African Medical Research Council Centre for Tuberculosis Research, Division of Molecular Biology and Human Genetics, Stellenbosch University, Cape Town, South Africa; <sup>3</sup>Public Health Research Institute, New Jersey Medical School, Rutgers, The State University of New Jersey, Newark, New Jersey, USA; <sup>4</sup>Division of Infectious Diseases, Brigham and Women's Hospital/Harvard Medical School, Boston, Massachusetts, USA; <sup>5</sup>Uphams Corner Health Center, Boston, Massachusetts, USA; <sup>6</sup>Unit for Infection Prevention and Control, Stellenbosch University and Tygerberg Hospital, Cape Town, South Africa; and <sup>7</sup>Division of Global Health Equity, Brigham & Women's Hospital, Boston, Massachusetts, USA

**Background.** High rates of tuberculosis (TB) transmission occur in hospitals in high-incidence countries, yet there is no validated way to evaluate the impact of hospital design and function on airborne infection risk. We hypothesized that personal ambient carbon dioxide (CO<sub>2</sub>) monitoring could serve as a surrogate measure of rebreathed air exposure associated with TB infection risk in health workers (HWs).

**Methods.** We analyzed baseline and repeat (12-month) interferon-γ release assay (IGRA) results in 138 HWs in Cape Town, South Africa. A random subset of HWs with a baseline negative QuantiFERON Plus (QFT-Plus) underwent personal ambient CO<sub>2</sub> monitoring.

**Results.** Annual incidence of TB infection (IGRA conversion) was high (34%). Junior doctors were less likely to have a positive baseline IGRA than other HWs (OR, 0.26; *P* = .005) but had similar IGRA conversion risk. IGRA converters experienced higher median CO<sub>2</sub> levels compared to IGRA nonconverters using quantitative QFT-Plus thresholds of ≥0.35 IU/mL (*P* < .02) or ≥1 IU/mL (*P* < .01). Median CO<sub>2</sub> levels were predictive of IGRA conversion (odds ratio [OR], 2.04; *P* = .04, ≥1 IU/mL threshold). Ordinal logistic regression demonstrated that the odds of a higher repeat quantitative IGRA result increased by almost 2-fold (OR, 1.81; *P* = .01) per 100 ppm unit increase in median CO<sub>2</sub> levels, suggesting a dose-dependent response.

**Conclusions.** HWs face high occupational TB risk. Increasing median CO<sub>2</sub> levels (indicative of poor ventilation and/or high occupancy) were associated with higher likelihood of HW TB infection. Personal ambient CO<sub>2</sub> monitoring may help target interventions to decrease TB transmission in healthcare facilities and help HWs self-monitor occupational risk, with implications for other airborne infections including coronavirus disease 2019.

**Keywords.** tuberculosis; tuberculosis infection control (TB-IC); IGRA; carbon dioxide monitoring; health workers.

## Conclusions.

HWs face high occupational tuberculosis (TB) risk. Increasing median CO<sub>2</sub> levels (indicative of poor ventilation and/or high occupancy) were associated with higher likelihood of HW TB infection.

Personal ambient CO<sub>2</sub> monitoring may help target interventions to decrease TB transmission in healthcare facilities and help HWs self-monitor occupational risk, with implications for other airborne infections including coronavirus disease 2019.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9383651/>

See also <https://ghsm.hms.harvard.edu/faculty-staff/edward-anthony-nardell>



Shows the application of an upper room UV fixture in a classroom. The fixture is the black box on the upper, left side of the front wall, with blue light visible. Another fixture on the rear wall would contribute to an effective upper room air disinfection zone. © Chaska Stern - TEAM GEWALTMANAGEMENT

Photochemistry and Photobiology, 2021, 97: 493–497

### Special Issue Invited Review

## Air Disinfection for Airborne Infection Control with a Focus on COVID-19: Why Germicidal UV is Essential<sup>†</sup>

Edward A. Nardell\* 

Division of Global Health Equity, Brigham & Women's Hospital, Harvard Medical School, Boston, MA,

Received 7 January 2021, accepted 16 March 2021, DOI: 10.1111/php.13421

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8251047>

<https://ghsm.hms.harvard.edu/faculty-staff/edward-anthony-nardell>

[It's Time to Clean Our Indoor Air Properly](#) (TIME)

*For current and future viral pathogens like SARS-CoV-19, relatively high levels of “equivalent” ventilation by **supplemental air disinfection** will be needed.*

Independent investigators aerosolized test bacteria into an unoccupied hospital room compared mechanical ventilation, upper room Germicidal UV (GUV), and three commercial room air cleaners.

**They found that upper-room GUV was about 9.4 times more cost-effective than mechanical ventilation for the same amount of air disinfection.**

Joey Fox is a professional engineer with over ten years in the Heating, Ventilation, and Air Conditioning (HVAC) industry specializing in schools. He is currently the chair of the indoor air quality advisory committee for the Ontario Society of Professional Engineers.



Throughout the COVID pandemic, he has used his experience to educate people about ventilation, filtration and general air cleaning to protect themselves from COVID.

<https://itsairborne.com/>

**It's Airborne**

Home About School Resources HEPA Filters & Air Cleaners Twitter Threads

Pin

Joey Fox

**How Can You Clean The Air? W.A.T.C.H.**  
Let's get this infographic into every classroom! I've worked with 3 graphic artists who have helped put this together. Ana Sofia...

Aug 23, 2023 73 1

Joey Fox

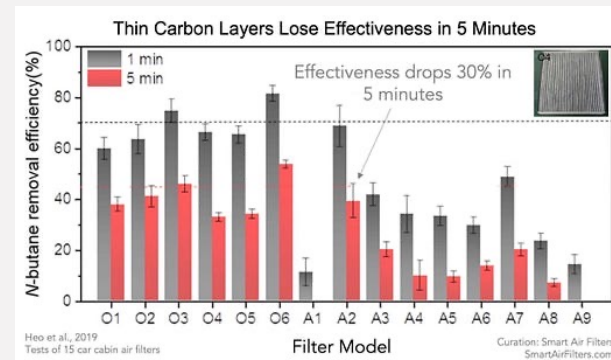
**Intro To Activated Carbon Filters**  
What they do. Do you need one. How to build one.

Jun 2 16 1

Joey Fox

**Is Airborne The Right Word?**  
A new document by the WHO tries to settle this issue

May 28 4 1



**Clean Air In Classrooms Using W.A.T.C.H.**

**Windows**

- Open windows as much as possible.
- If it's cold outside, even cracking windows slightly can help.
- Keeping the classroom door open helps circulate the air even more.
- Warm weather? Having 2 windows open while using a fan to blow air out of 1 of the windows is optimal.

**Air Movement**

Check to see if you feel air coming from the diffusers or air vents.

**Thermostat**

Keep the fan setting **On** when the room is being occupied.

**CO2 Levels**

Use a CO2 monitor with a non-dispersive infrared (NDIR) sensor.

CO2 Level (ppm)	Quality
< 600 ppm	Very Good
600 - 800 ppm	Good
800 - 1000 ppm	Acceptable
1000 - 1500 ppm	Poor
> 1500 ppm	Very Poor

HEPA Filter or Corsi-Rosenthal Box

Use the highest setting

- Noise setting

Disable Features like

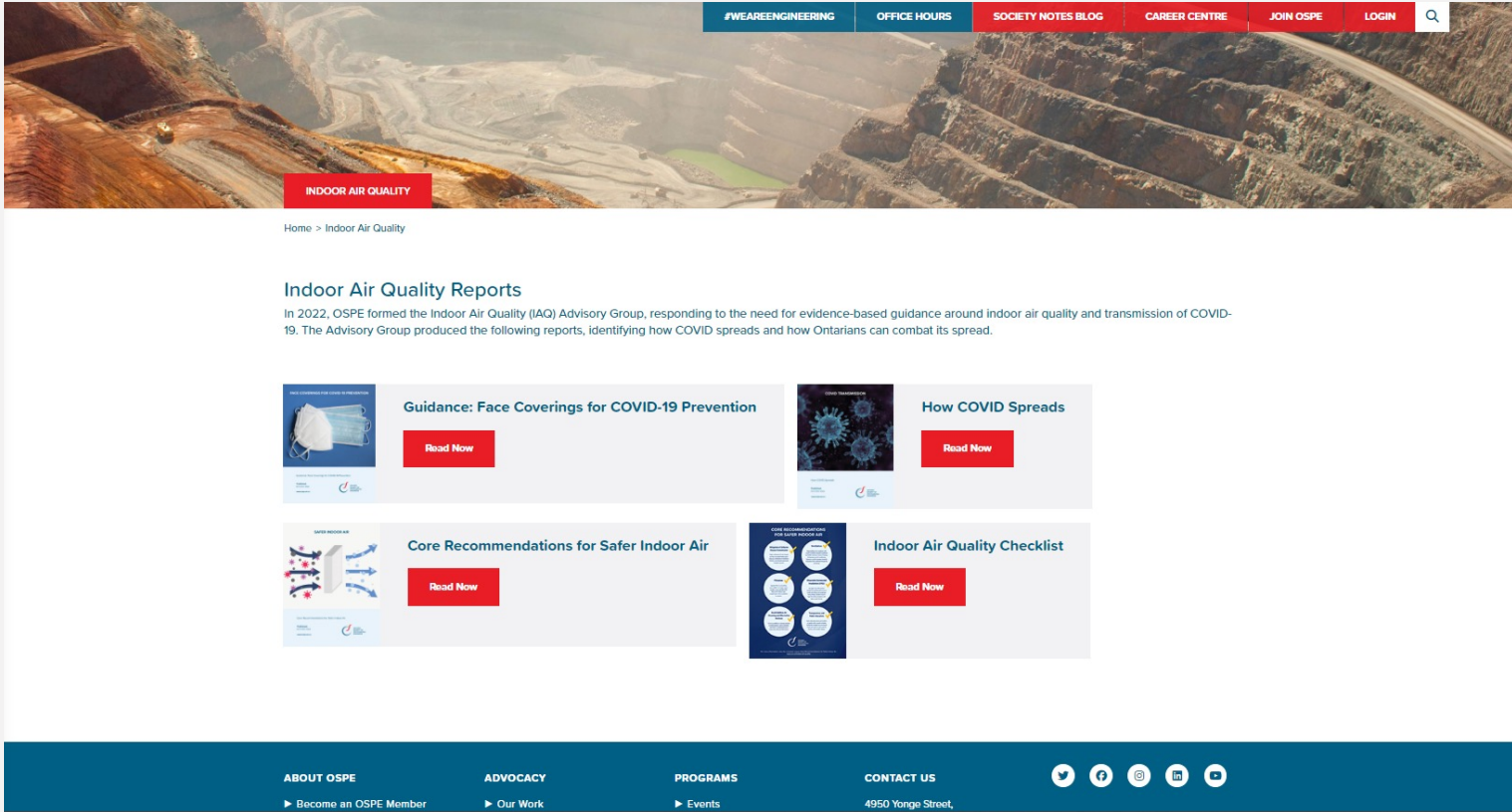
- Ionization
- Plasma
- UV with Catalyst
- Auto

**PLACEMENT IS IMPORTANT!**

- Move away from walls & corners (0.5 m - 1.5 m)
- Place as close as you can to the centre of the room
- Avoid blowing directly at anyone.
- Face away from walls & obstructions, e.g. blocking under a table.
- Replaced is better than on the floor.
- Place away from clean air sources, open windows, air vents & other HEPA filters.
- If you have multiple HEPA filters, space them out evenly.

For more information please visit: [itsairborne.com](https://itsairborne.com/)  
#itsairborne #infographic #engineering

We are excited to have **Joey Fox PEng**, return. As noted, Joey is chair of the Ontario Society of Professional Engineers (OSPE), [Indoor Air Quality Advisory Group](https://ospe.on.ca/indoor-air-quality/). He will cover ensuring good indoor air quality, mitigating airborne diseases with ASHRAE 241 and use of UV.



<https://ospe.on.ca/indoor-air-quality/>

# Clean Air Really Matters (September 2022)

# Lets hear it from the Engineers & stop the spread (December 2022)

# Back to school safety (August 2023)


**Clean Air REALLY Matters**

EVENTS, OCC-COVID, OHCOW EVENTS, WEBINARS (LIVE) 2022, COVID CONVERSATIONS, INDOOR AIR QUALITY (IAQ), TRANSMISSION / EXPOSURE CONTROL

Friday, September 16, 2022 – The 1st session in our new **Occ-COVID Conversations** series which allows for an in-depth presentation on key COVID prevention strategies by a subject matter expert, along with professional framing and discussion with an OHCOW host – and lots of questions (and answers) from our audience.

**Presenters:**

- Kevin Hedges, Occupational Hygienist, PH.D., CIH,COH
- Joey Fox, P.Eng., M.A.Sc.



<https://www.ohcow.on.ca/posts/clean-air-really-matters/>

Occupational Health Clinics for Ontario Workers Inc.  
Prevention Through Intervention

**Let's hear from the Engineers & stop the spread!**

COVID-19, OCC-COVID, OHCOW EVENTS, WEBINARS (LIVE) 2022, CHANGING WORKPLACE, CHEMICAL, CLEAN AIR, HVAC, SMALL BUSINESS

**Part of the Occ-Covid 2022 Webinar Series**


**Date:** December 9, 2022  
**Time:** 1:00-3:00 PM

**Speakers:**

- Joey Fox, P. Eng, M.A.Sc, HVAC Engineer and @O\_S\_P\_E Indoor Air Quality Chair (@joeyfox85)
- Marianne Levitsky, MES, CIH, ROH, FAIHA, founding President, Workplace Health Without Borders, Occupational Hygienist, EOOH Management Inc., adjunct lecturer, Dalla Lana School of Public Health (@mariannelev)
- Stéphane Bilodeau, P.Eng., Ph.D., Fellow of Engineers Canada, Bioengineering Lecturer at McGill University, CTO at Smart Phases, and World Health Network (IAQ) Task Force Coordinator (@smbilodeau)

Highlighting new OSPE evidence-based guidance, including virus transmission & respirator info, plus recommendations for safer air for all. In 2022, the Ontario Society of Professional Engineers formed the Indoor Air Quality (IAQ) Advisory Group, responding to the need for evidence-based guidance around indoor air quality and transmission of COVID-19. The Advisory Group has produced four reports thus far, identifying how COVID spreads and how Ontarians can combat it.

Join 3 members of the development team, OHCOW Occupational Hygienist Krista Thompson and our wise and experienced audience as they review and discuss use and application to drive virus prevention in Ontario workplaces.




Download pdfs of presentations shown in this webinar:

<https://www.ohcow.on.ca/posts/lets-hear-from-the-engineers-stop-the-spread-occ-covid-webinar/>

**Collaborating on Solutions for Cleaner School Air**

COVID-19, POST



**Back to School Safety**

**Recorded: Friday August 25, 1:00 - 3:00 pm**

Back to School safety: the importance of good indoor air quality in our schools for the health of students and teachers.

Let's Collaborate on Solutions for Cleaner School Air!

Cases rising + Classes return = Risk to all!  
Awareness, Engineering & Advocacy are needed now to Clean the Air - for everyone's health.

**Schools and Transmission**

As well as being centres of learning for our youth, schools are workplaces for thousands of teachers and staff. What happens in schools affects millions of children and their families, and can drive illness and infection rates in society at large. This [June CIDRAP article](#) (from the [underlying JAMA Study publication involving Smart Thermometer Surveillance](#)) highlights that 70.4% of all household transmissions began with a child and rates clearly dropped during school breaks.

Join our August Occ-COVID Conversation with a look at recent Australia experience, efforts and guidance plus how the new ASHRAE standard can be leveraged, all framed by an introduction to grassroots school safety advocacy efforts from across the country.

**AGENDA**

1. Introduction – Collaboration for A Clean Air Future – Amanda Hu (member of the Canadian Covid-19 School Safety Group)
2. Australian Experience & Guidance for Primary and Secondary Schools – Brad Prezant, Affil. AIRAH, MSPH, MBA, CIH, COH, CAQR WELL AP Principal Consultant at Prezant Environmental, Former VP, International Society of Indoor Air Climate and Quality (ISIAQ).
3. The basics of what we all need to know to stay safe into the fall -ASHRAE 241 Part 6, Joey Fox P. Eng. @O\_S\_P\_E IAQ Advisory Group Chair. <http://itsairborne.com>
4. Still Wandering in the Woods – Staff impacts and opportunities, Paul Sylvestre, National Health & Safety Rep, Ontario Region, Canadian Union of Public Employees (CUPE)
5. How can we make it happen? – 2023 School Safety Advocacy Efforts and Ideas Amanda Hu and other members of the Canadian Covid-19 School Safety Group
6. Discussion – All

The event is hosted by: Kevin Hedges, Ph.D, CIH, COH, Occupational Hygienist, OHCOW Eastern Region/Ottawa Clinic

<https://www.ohcow.on.ca/posts/collaborating-on-solutions-for-cleaner-school-air/>