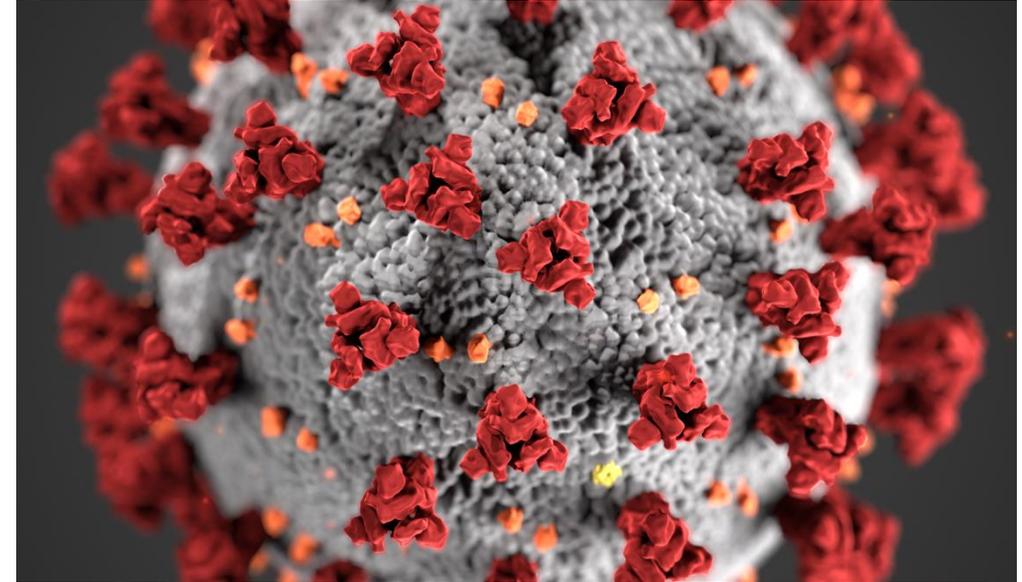


Occupational Hygiene in the time of COVID-19

June 11, 2020

Victoria Arrandale, PhD ROH
Assistant Professor, Dalla Lana School of Public Health
Associate Director & Affiliated Scientist, Occupational Cancer Research Centre

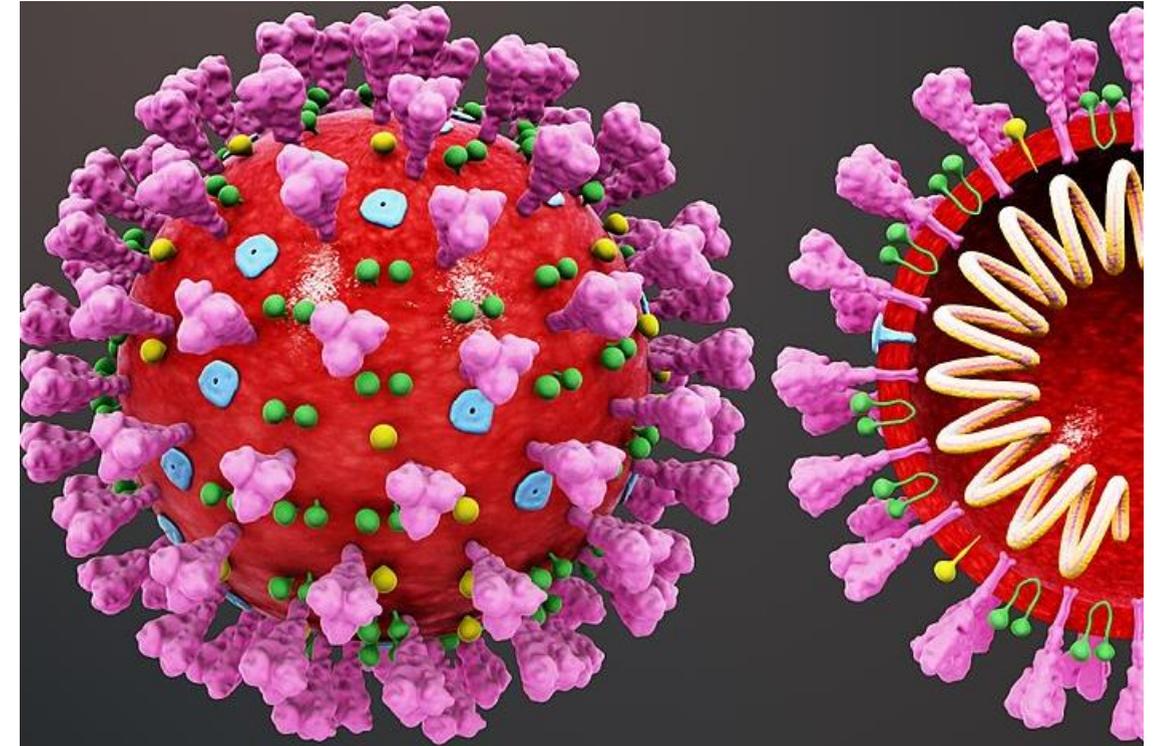


Outline

- COVID-19 Background & Epidemiology
- Transmission & Masks
- COVID-19 in the Workplace
- Guidance for Workplaces
- Considerations & Challenges

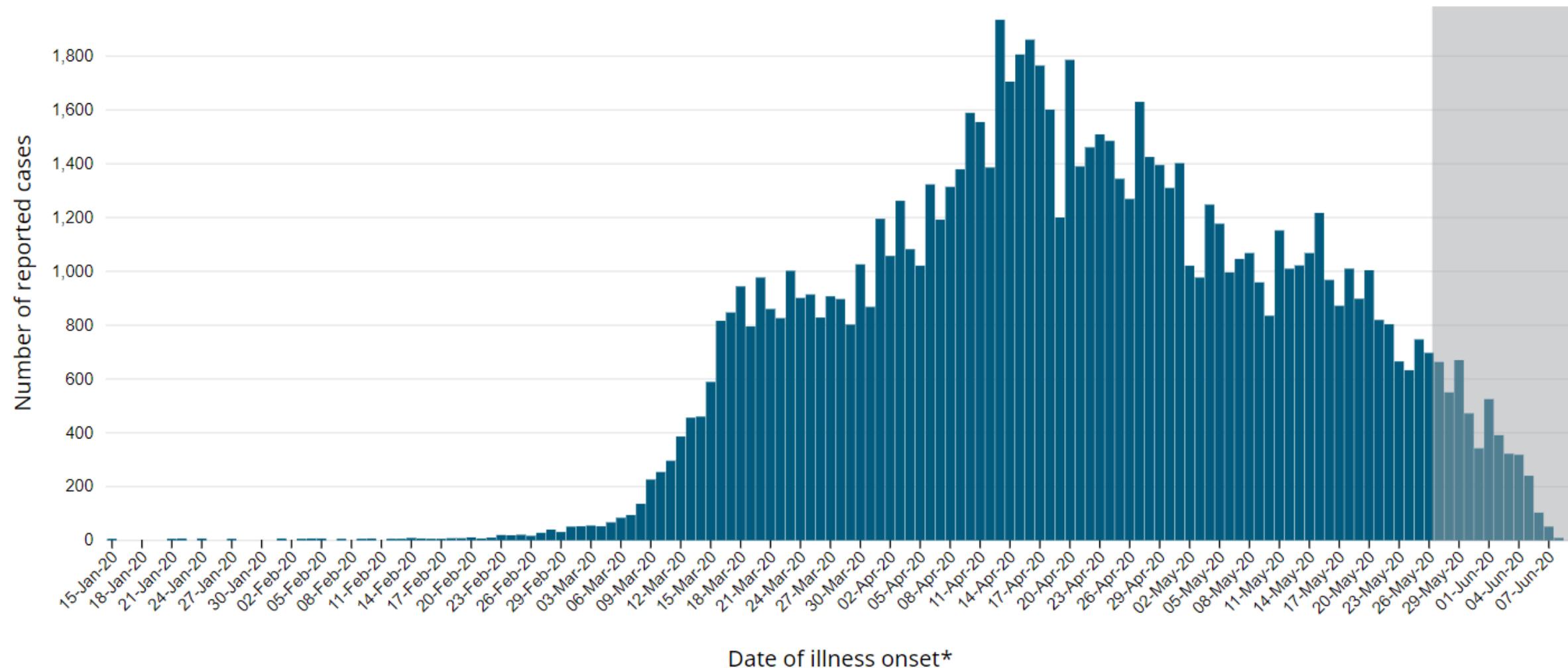
COVID19

- SARS-CoV-2 - severe acute respiratory syndrome coronavirus 2
 - Enveloped RNA virus, ~120nm diameter
 - Surface glycoproteins - S protein (purple, at right) responsible for binding and entry to host cell
- First officially reported in Wuhan, China on December 31, 2019
- First presumptive Canadian case reported January 25, 2020



Epidemiology in Canada

Figure 2. COVID-19 cases (n=90,357 ¹) in Canada by date of illness onset* as of June 9, 2020, 8 pm EDT



* If date of illness onset wasn't available, either specimen collection date or laboratory testing date was used.

<https://health-infobase.canada.ca/covid-19/epidemiological-summary-covid-19-cases.html#a2>

Impacts

- Mid-March 2020: many “shut downs” across Canada
- 3 million jobs lost (March – April 2020)
- 13% unemployment (April 2020)

Google Mobility Report

Percentage change in number of visits to various locations in Ontario compared to baseline value.

Closure of schools

Closure of daycares, libraries, bars & restaurants

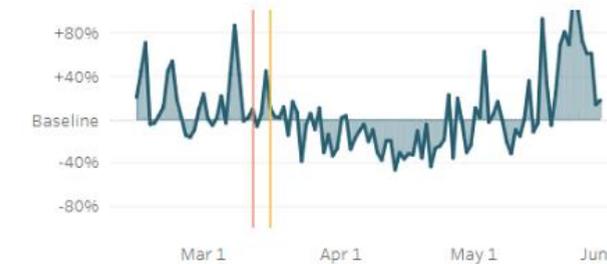
Grocery & pharmacy

-10% compared to baseline



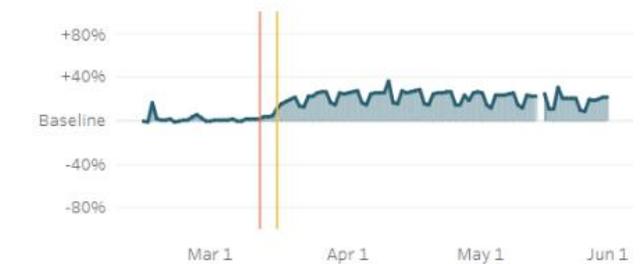
Parks

+17% compared to baseline



Residential

+21% compared to baseline



Retail & recreation

-38% compared to baseline



Transit stations

-57% compared to baseline



Workplace

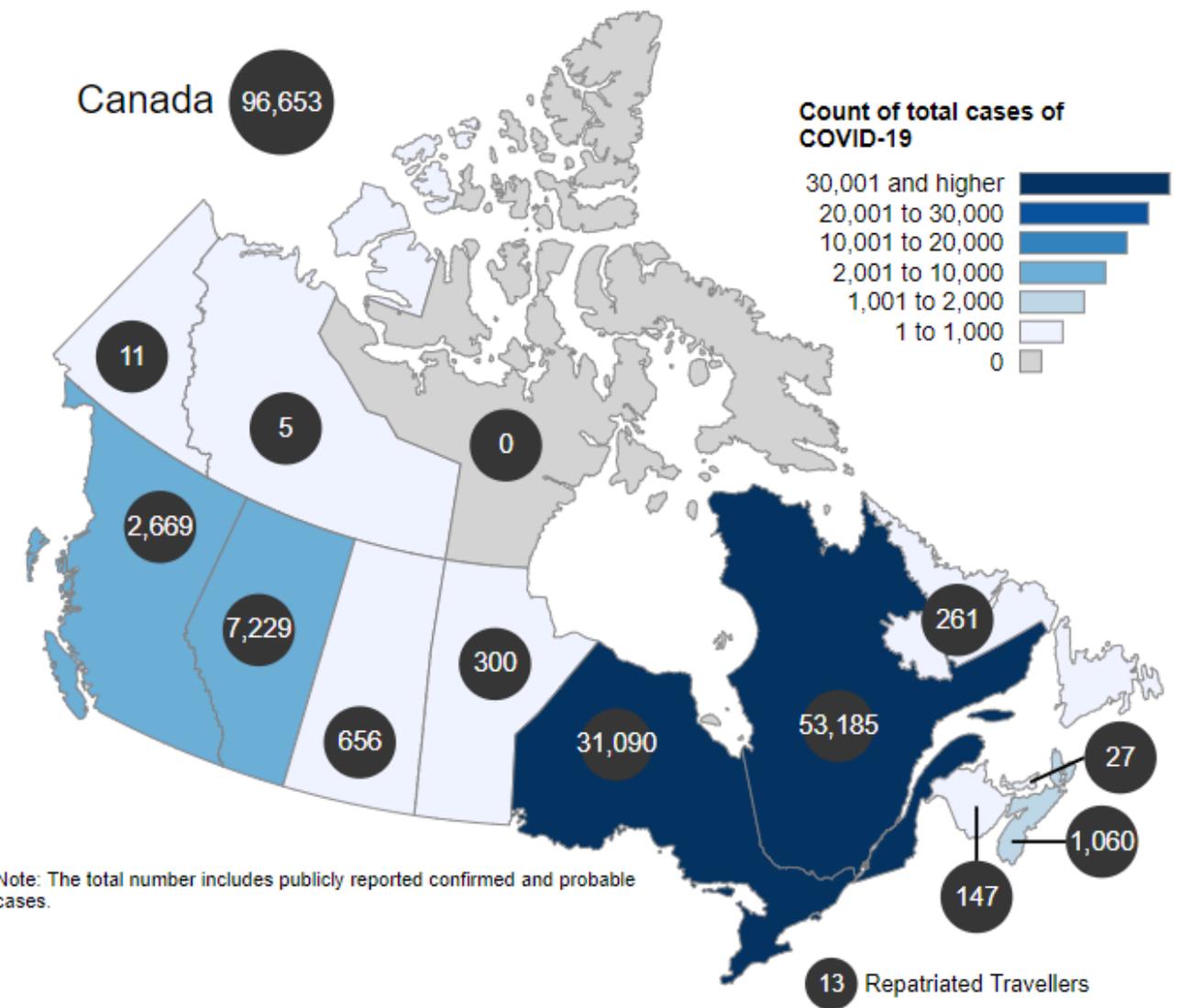
-50% compared to baseline



<https://howsmylattening.ca/#/analysis>

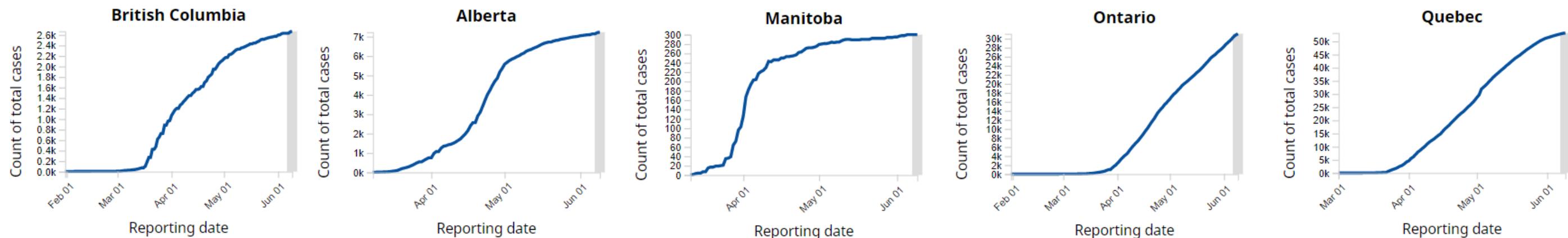
COVID-19 in Canada

- Total confirmed cases in Canada: >96,000
- Total deaths in Canada: >7800
- Info on workers & workplaces is challenging
 - Health care workers clearly impacted
 - Food processing, manufacturing



	Description	Cases	Deaths
Ontario	Long term care staff	732	7
BC	Staff/Other	491	1

Regional Differences

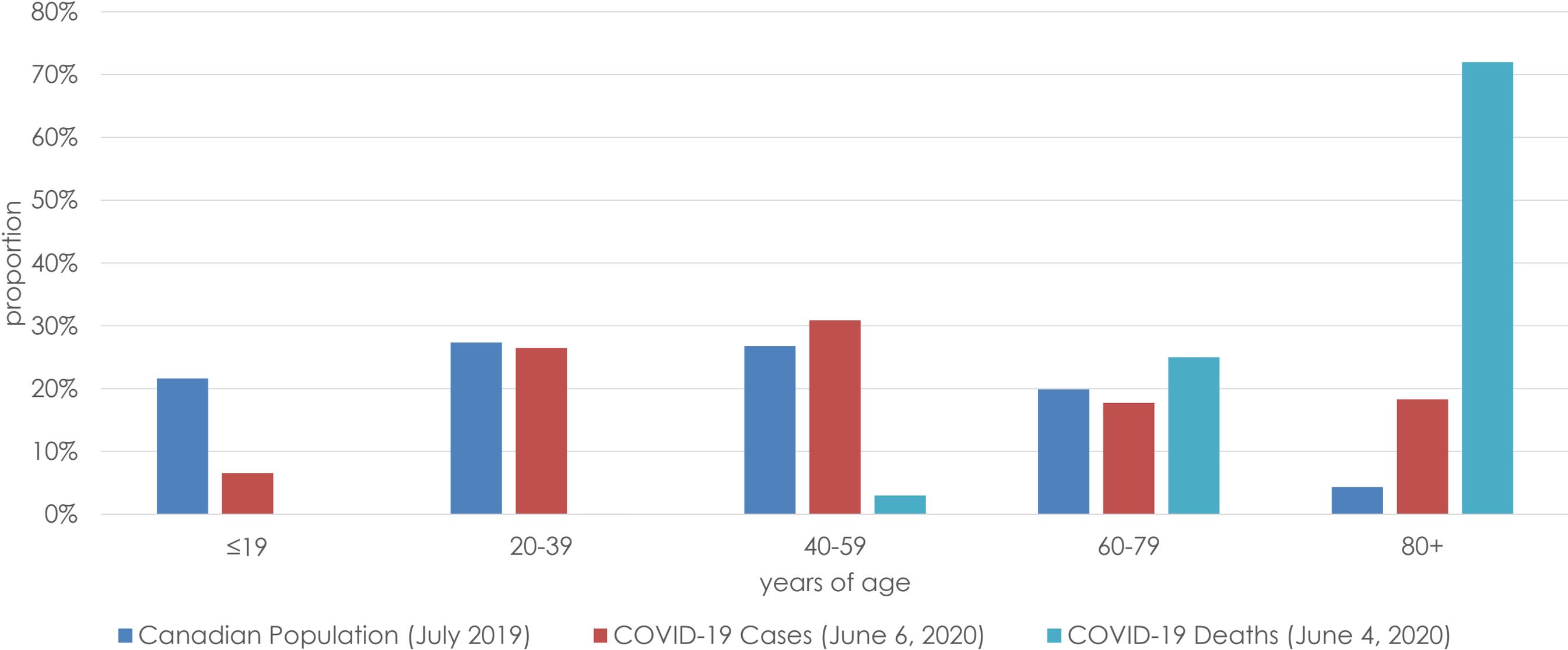


<https://health-infobase.canada.ca/covid-19/epidemiological-summary-covid-19-cases.html>

- Plateau suggests pandemic under control

* Different axes *

Description of Confirmed Cases



Statistics Canada. [Table 17-10-0005-01 Population estimates on July 1st, by age and sex](https://www.canada.ca/content/dam/phac-aspc/documents/services/diseases/2019-novel-coronavirus-infection/surv-covid19-epi-update-eng.pdf)
<https://www.canada.ca/content/dam/phac-aspc/documents/services/diseases/2019-novel-coronavirus-infection/surv-covid19-epi-update-eng.pdf>
<https://health-infobase.canada.ca/covid-19/epidemiological-summary-covid-19-cases.html#a2>

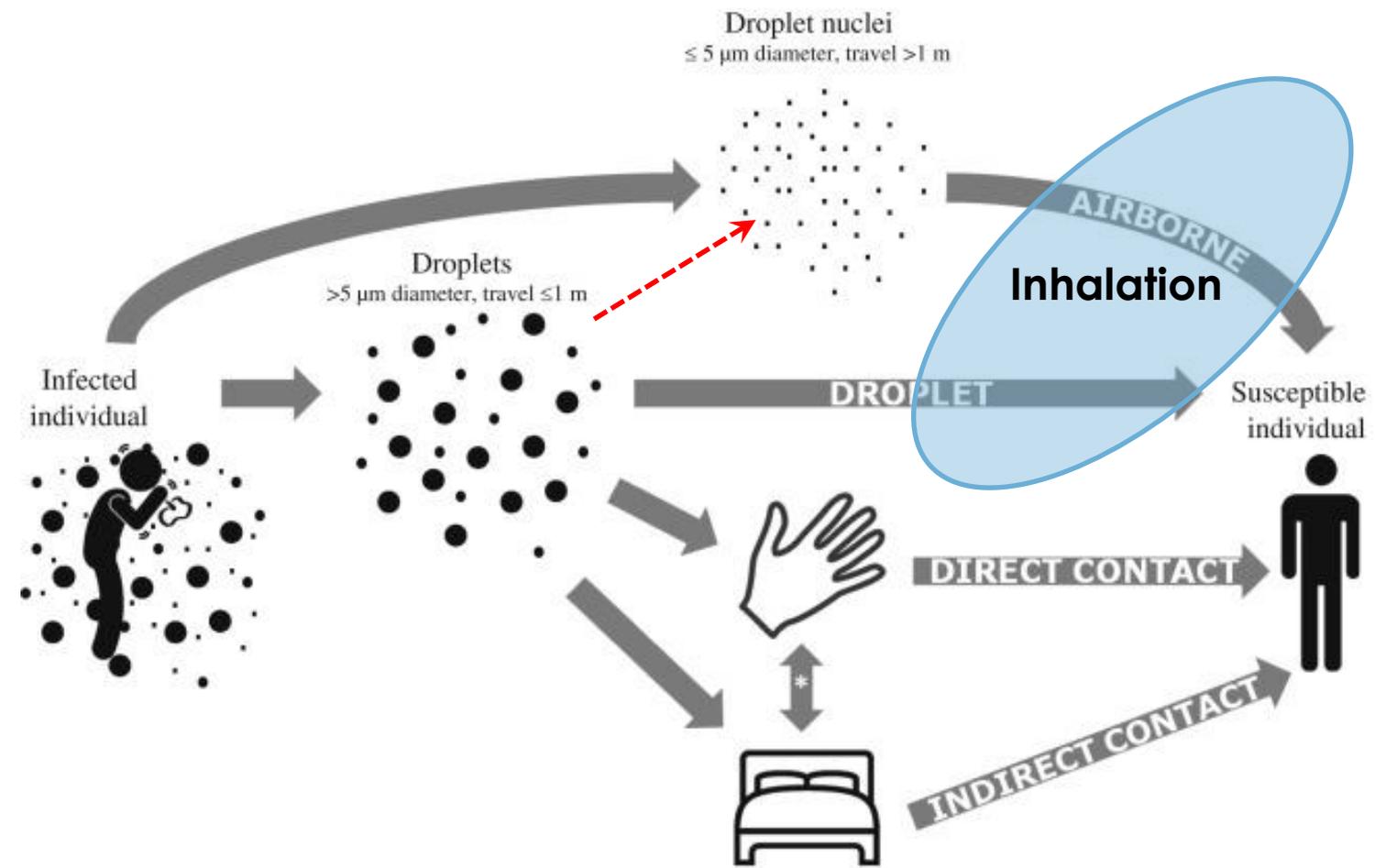
Transmission, According to WHO

COVID-19 primarily transmitted through respiratory droplets and contact routes

Airborne transmission possible where aerosols are generated (e.g., clinical procedures relating to care of COVID+ patients)

Rather arbitrary cutoffs
Continuum from droplet → droplet nuclei

Droplet transmission can result in inhalation exposure during close contact

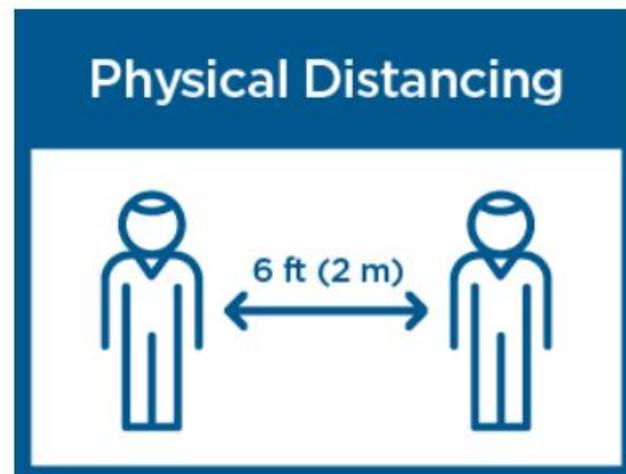


* Transmission routes involving a combination of hand & surface = indirect contact.

Public Health Guidance

Prevent transmission from close contact

- Stay home, especially when you have any symptoms
- Maintain physical distancing
- Frequent handwashing
- Avoid touching mouth and eyes with hands
- Good respiratory etiquette (e.g., covering your cough etc.)
- The use of face coverings where physical distancing is not possible



Stay 2 metres (6 feet) apart.



If you can't distance, wear a mask.

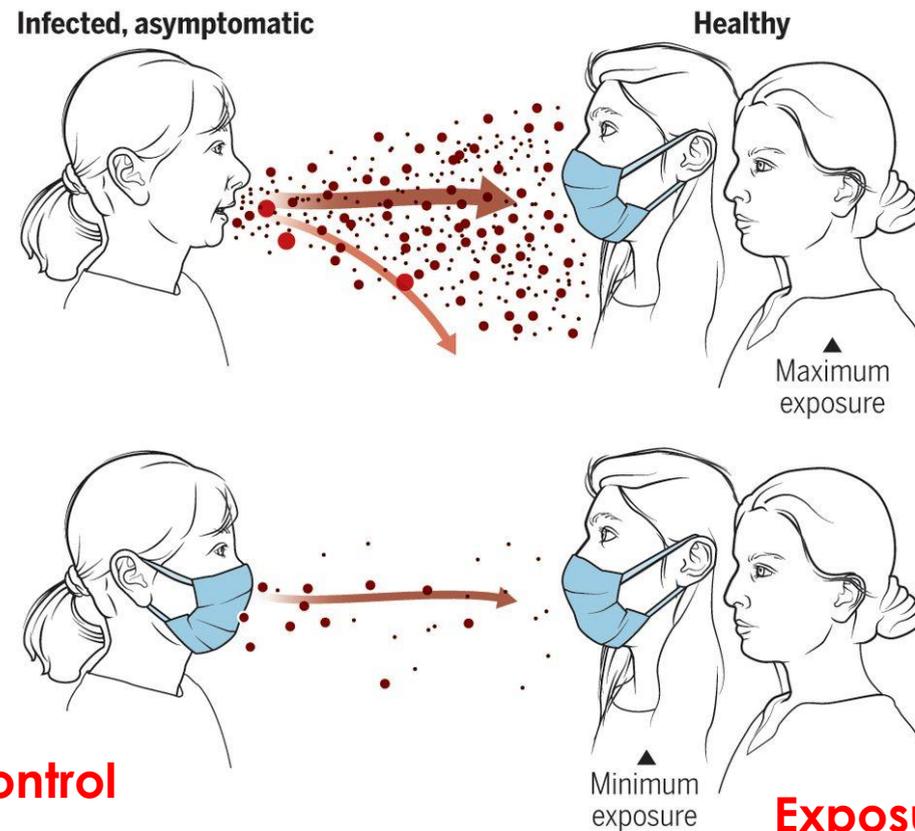
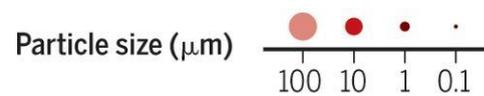


Wash your hands with soap and water.

Source Control and Exposure Reduction

Masks reduce airborne transmission

Infectious aerosol particles can be released during breathing and speaking by asymptomatic infected individuals. No masking maximizes exposure, whereas universal masking results in the least exposure.



GRAPHIC: V. ALTOUNIAN/SCIENCE

Perspective article, not primary research

Respirator \neq Surgical Mask \neq Face covering

Airborne lumps droplet and airborne WHO definitions

Author expertise:

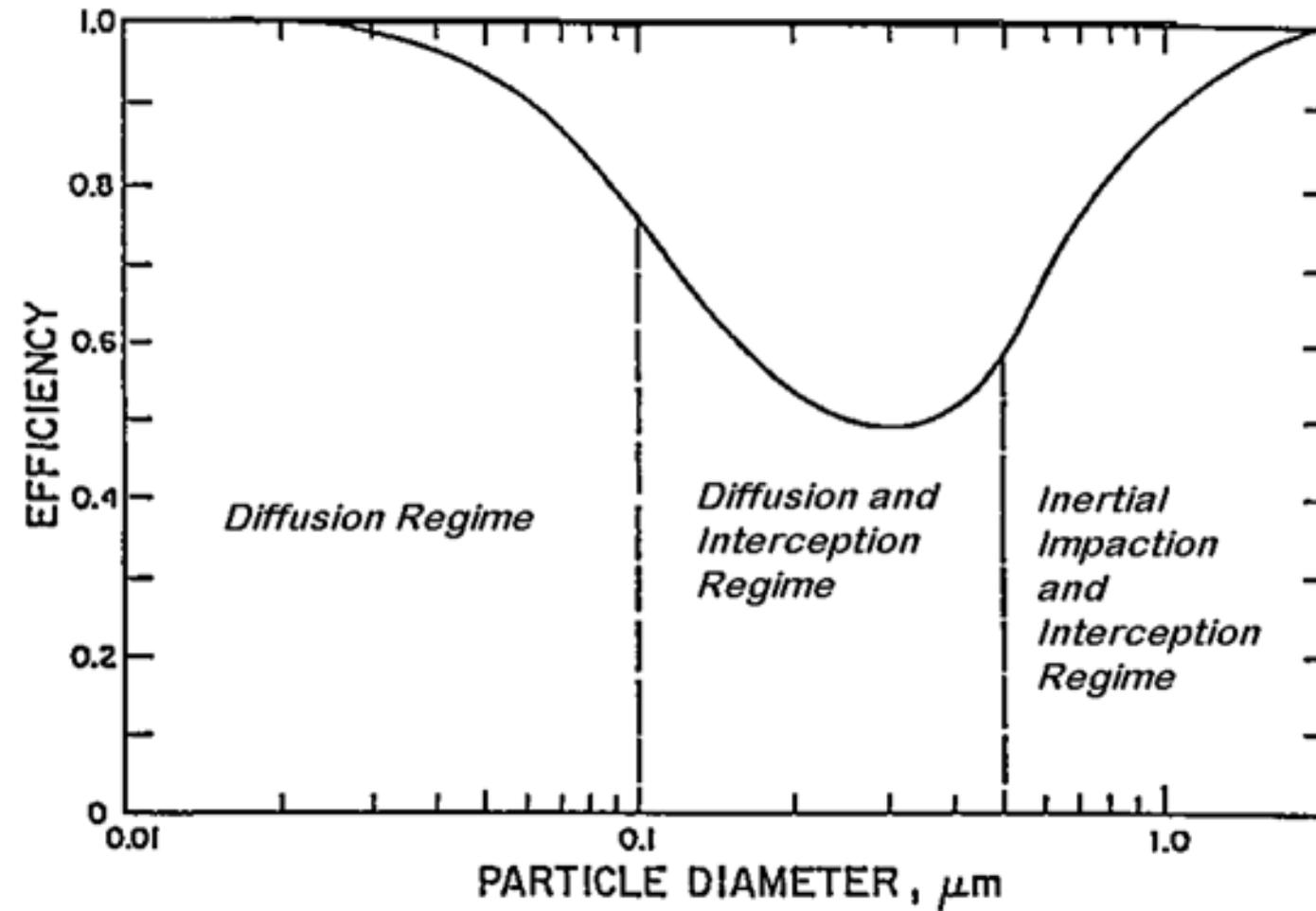
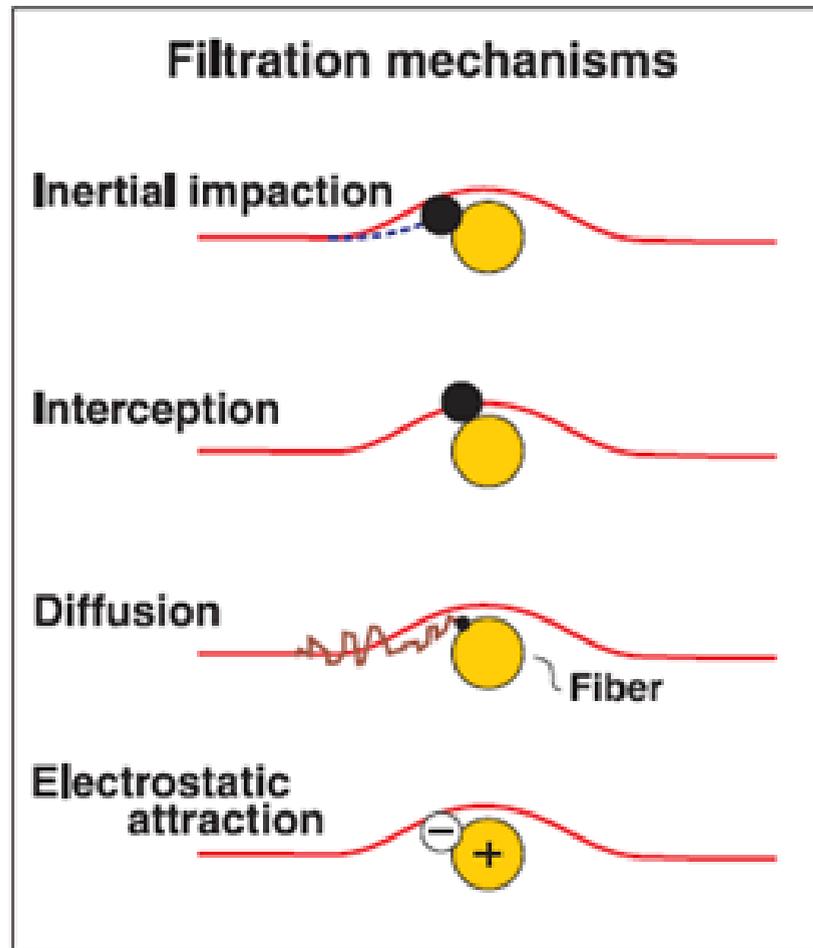
- Atmospheric sciences
- Aerosol science
- Infectious disease physician

Face Coverings: Some Evidence for Source Control and Exposure Reduction

<i>Fabric filtration (fabric only, not masks)</i>	Davies et al. 2013 (single layer)	<i>Bacillus atrophaeus</i> , bacteriophage MS2 Fabric filtration varied (48% - 83%)
	Rengasamy et al. 2010	NaCl aerosol Fabric filtration varied (<20% - 60%)
<i>Exposure reduction (masks on humans)</i>	Van der Sande et al. 2008	Home made masks PF 2.2 – 3.2 Surgical masks PF 4.1-5.3 N95 PF 66 - 113
<i>Source Control (masks on humans and mannequin)</i>	Davies et al. 2013 (humans, cough box)	Home made masks reduce most particle sizes, but not as effective as surgical masks
	Van der Sande et al. 2008 (mannequins)	Home made masks PF ~1 Surgical masks & N95 PF ~1.6-3.1



Recall: Filtration for N95 respirators



<https://blogs.cdc.gov/niosh-science-blog/2009/10/14/n95/>

We do not have near the same level of understanding about face coverings (cloth masks)

- Appear to provide some protection as protective device and source control
- But this varies across studies
- Even more variable in practice (designs, materials, fit, etc.)

Risks of masks?

contact with a contaminated mask, relaxing of other prevention measures, lack of evidence for efficacy against COVID-19



Masks and Transmission: Recent literature

Chu et al. 2020 Lancet

- Meta analysis of observational studies – strong design
- 26 Health care studies, 3 non-health care
 - Unclear on who wears mask (worker/patient? both?)
 - Surgical masks and face coverings are lumped together
- Odds of transmission with mask wearing (vs. not) 0.15 (0.07-0.34)

Cheng et al. 2020

- Study of mask wearing in Hong Kong
- Mask compliance >95%
- Mask wearing countries have flatter epidemic curves (correlation or causation?)
- Within HK, significantly more clusters involving “mask off” settings vs, “mask-on” settings

COVID-19 Respiratory Protection at Work

Health care or Health worker	AGMPs conducted*	N95 respirator
	No AGMPs, but patient/client facing*	Medical mask
	Not patient facing	Face covering
Non-Health Care	If physical distance (>2m) can be maintained	No face covering/cloth mask
	If physical distancing cannot be maintained (<2m)	Face covering/cloth mask

- *Other personal protective equipment is also required*
- *Need to consult provincial regulation/guidance*
- *CAN/CSA-Z94.4-18*
- *WHO: https://apps.who.int/iris/bitstream/handle/10665/332293/WHO-2019-nCov-IPC_Masks-2020.4-eng.pdf*

COVID19 in the Workplace

- Different than other work place hazards
 - Worker is the source
 - Impacts beyond workplace: families and communities
- Affects all workplaces, many who have never dealt with health hazards before
- Challenges:
 - Pre-symptomatic period
 - Some cases never have symptoms
 - Chau et al (2020) - daily testing of 30 cases among 14,000 quarantined individuals: 43% asymptomatic
 - “Tough it out” mentality
 - Lack of paid sick leave
- Some very high risk groups
 - Work camps/locations with shared housing
 - Processes that require close contact for extended durations

Why workplace outbreaks are a new frontier for COVID-19 in the GTA

Trucker, close contact are 2 new COVID-19 cases in Manitoba

Benito Quesada, union shop steward, identified as 3rd death linked to Cargill COVID-19 outbreak

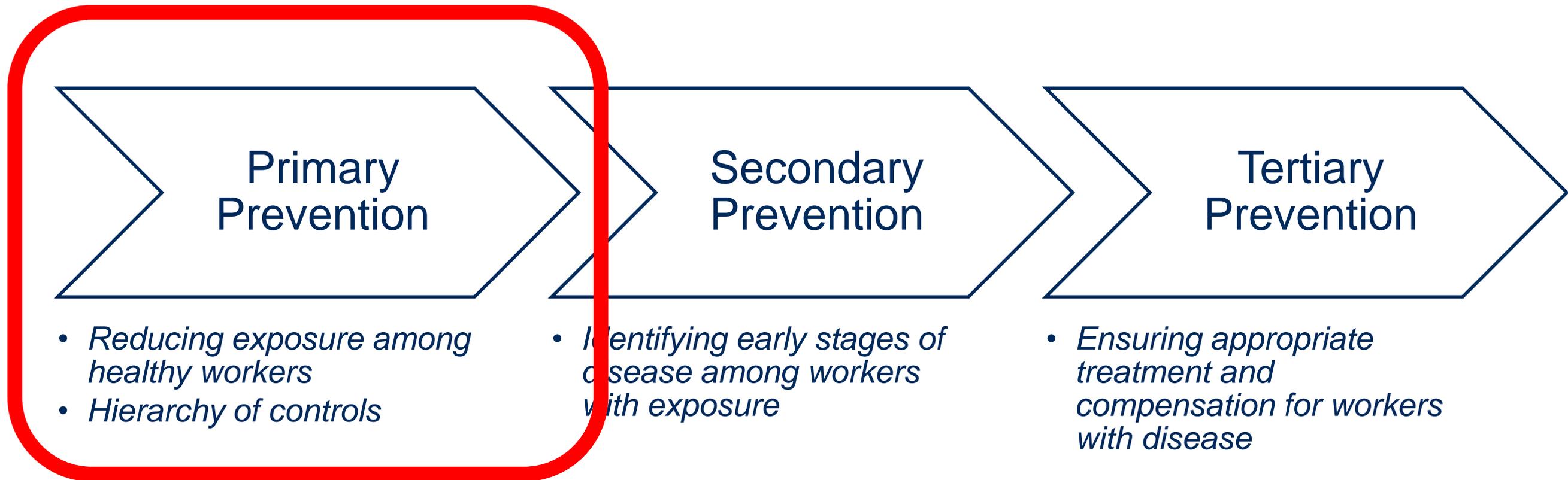
2nd worker at Orléans nursing home dies of COVID-19

Number of new cases continues to slowly inch up in Ottawa, according to latest OPH report

CBC News · Posted: May 29, 2020 3:45 PM ET | Last Updated: May 29



Prevention

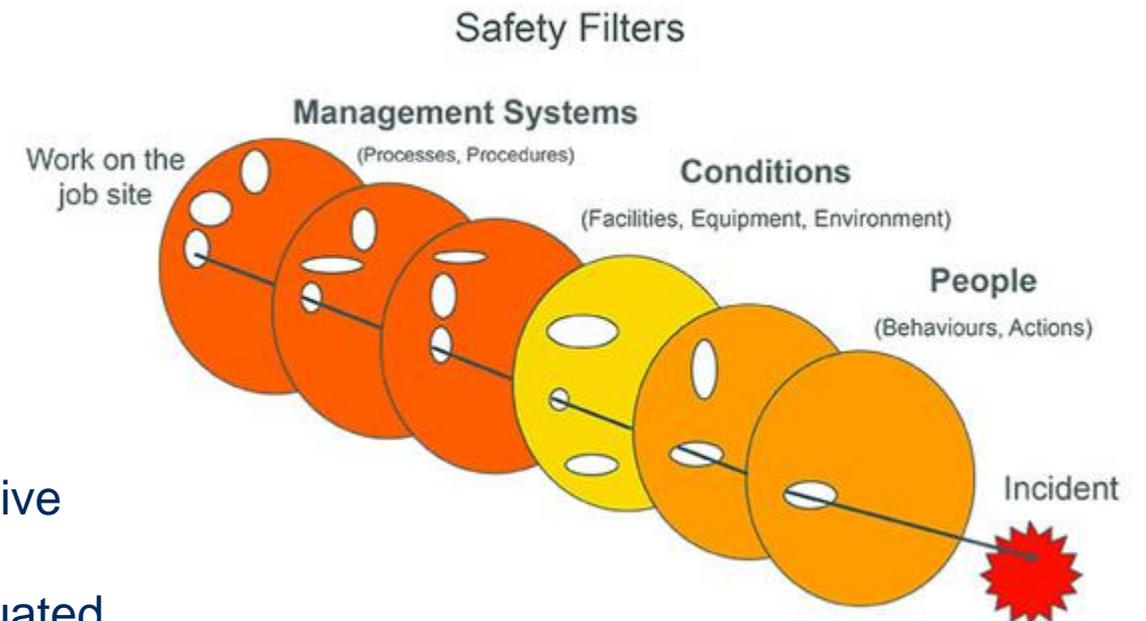


Multifaceted Interventions

- Recent scoping review of occupational disease prevention
 - Occupational asthma
 - Occupational contact dermatitis
 - Noise induced hearing loss
 - Occupational cancer

Conclusions: multifaceted intervention were more likely to be effective

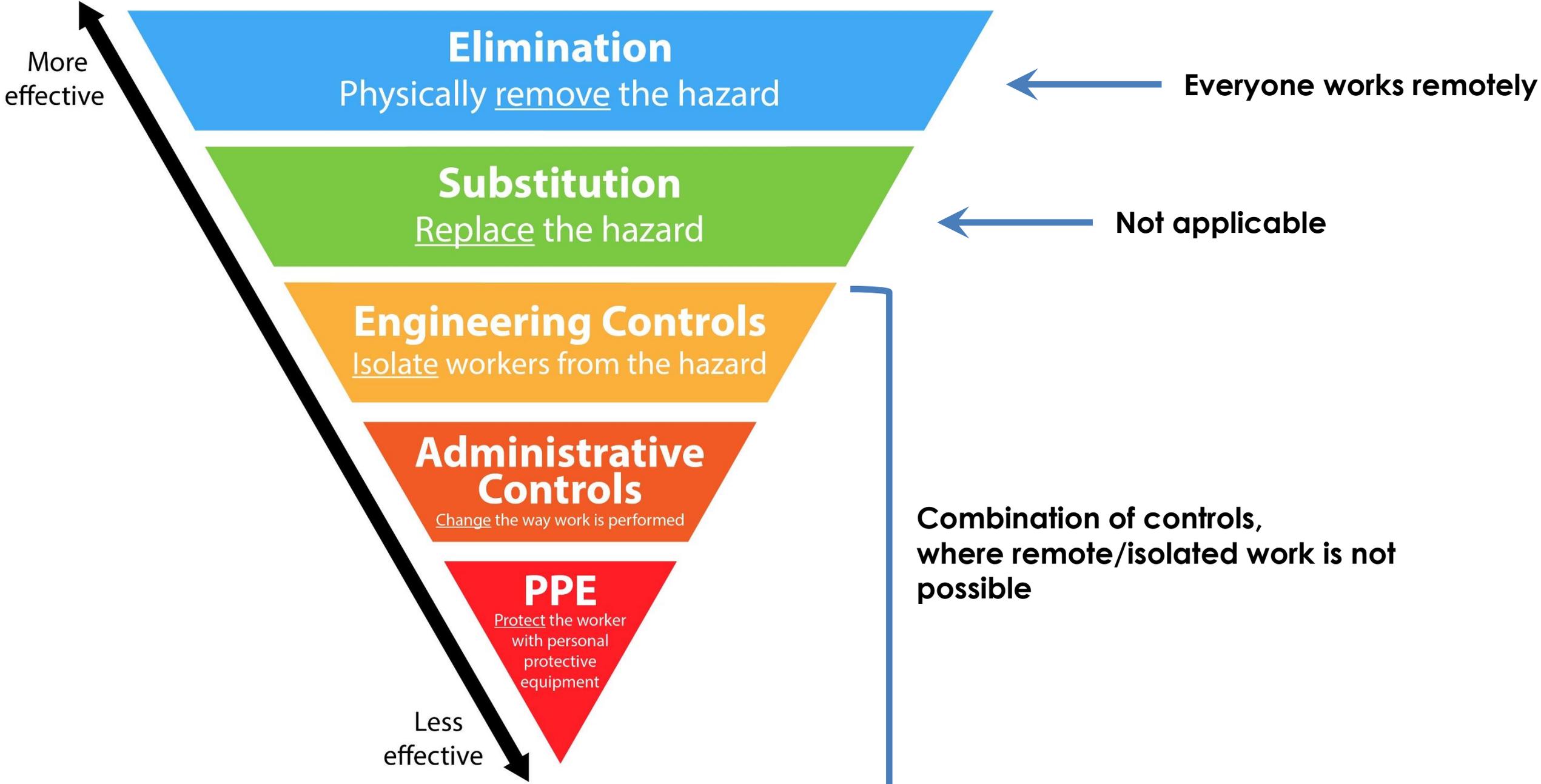
Limitations: very few prevention initiatives have been formally evaluated



<https://www.thesafetymag.com/ca/news/opinion/time-to-look-beyond-swiss-cheese/187225>

Keefe et al. Am J Ind Med 2020 Jun;63(6):490-516.

Primary Prevention: Hierarchy of Controls



Workplace Guidance – CSA Group & U of T

Rapid Research Report

Team effort, consultations

Aim:
Summarize the best occupational health and safety prevention practices to support safe re-opening and operation of workplaces during COVID-19 pandemic

Target release:
July 2020

Some preliminary ideas here...



Risk Assessment – WHO Framework

Frequent, close contact with other people?	Contact with people known to be or suspected of being infected with COVID-19?	Risk Category
No	No	LOW
Yes	No	MEDIUM
Yes	Yes <i>and/or</i> Contact with objects/surfaces possibly contaminated with COVID-19	HIGH

**COVID-19 at the workplace;
public health and social measures
for prevention and mitigation**

29 May 2020
Dr Maria Neira
Director, Environment, Climate Change and Health
World Health Organization, Headquarters

Domain I: Building Systems

- Buildings have been either closed or have reduced occupancy
- Decrease in building system usage:
 - Concerns about water stagnation and microbial growth, specifically *Legionella*
- Building systems may contribute to COVID-19 transmission

Water

- Drain and flush system
- Test for *Legionella*, treat if needed
- Maintain hot water temperatures
- Flush regularly if occupancy is lowered
- Consult water utility personnel as needed

ASHRAE Standard 188-2018

Washington State Department of Health
Public Services and Procurement Canada

HVAC

- Inspect system and related equipment
- Flush out period prior to occupancy
- Minimize recirculation of air
- Increase filtration of recirculating air
- Consider use of local air disinfection devices
- Evaluate potential for *Legionella*
- Regular cleaning of high-touch points

ASHRAE Standard 180-2018

Domain II: Workplace Organization

Physical Distancing

- Limit # of people on site
 - Flexible work options – work from home, isolated work
- Reduce # of people contacted
 - Cohorting of workers
- Workspace design
 - Barriers, screens
 - Signage, one way flow of customers
 - New methods of work – delivery, tele-options

Sanitation

- More frequent and more visible cleaning
- High touch surfaces cleaned twice per day, or when visibly dirty
- Hand washing facilities accessible
- Alcohol-based hand sanitizer available
- Avoid sharing of equipment, enhance cleaning if must be shared

Protective Equipment

- Outside of health care: face coverings when physical distancing cannot be maintained
- If PPE provided, needs training
- Gloves outside of healthcare only when handwashing/sanitizing is not possible, task-based

Domain III: Supporting Workers

Education & Training

- Communicate any new safety measures and expectations
- Provide training on new procedures and precautions
- Ensure worker involvement

Monitoring Health

- Workers should report a COVID-19 diagnosis, or close contact
- Ensure workers know local PH procedures
- Symptom screening is unlikely to catch all cases
- Site log to support contact tracing

Psychological Well-being

- Increased stress
- Training on signs of stress
- Regular communication with employees in isolation
- Support safe return to work as per local PH recommendations

Safety in New Work Environments

- New arrangement may introduce new hazards (e.g., home, alone)
- Need to assess risks
- Communication, training, and education on new work conditions

Accommodations

- Workers unable or unwilling to return to work
- Written accommodation policy
- Alternative work arrangements
- Sick leave or disability leave

Financial Supports

- Considerable economic stress
- Awareness of the support (provinces, federal) for workers and employers

Additional Considerations

1. Prevention of COVID-19 transmission should not reduce workers' protection against non-COVID-19 hazards
2. Prevention practices should not, as best as possible, introduce new hazards into the workplace

*Contact Dermatitis 2006: 55: 291–294
Printed in Singapore. All rights reserved*

Adverse skin reactions to personal protective equipment against severe acute respiratory syndrome – a descriptive study in Singapore

CHRIS C. I. FOO, ANTHONY T. J. GOON, YUNG-HIAN LEOW AND CHEE-LEOK GOH
The National Skin Centre, 1 Mandalay Road, Singapore, Republic of Singapore

~30-50% symptoms related to N95

~25-50% symptoms related to gloves

<5% symptoms related to gowns

Adverse skin reactions among healthcare workers during the coronavirus disease 2019 outbreak: a survey in Wuhan and its surrounding regions

DOI: 10.1111/bjd.19089 British Journal of Dermatology (2020)

~75% reported adverse skin reactions

+ hand washing, showering, longer duration of PPE use

Additional Considerations

1. Prevention of COVID-19 transmission should not reduce workers' protection against non-COVID-19 hazards
2. Prevention practices should not, as best as possible, introduce new hazards into the workplace

Cleaning and disinfecting products	→ Contact dermatitis → Work-related asthma
PPE	→ Contact dermatitis → Work-related asthma
Wet work (handwashing, glove use)	→ Contact dermatitis
Working alone or at home	→ Safety hazards → Ergonomic hazards
Stress	→ Psychosocial effects

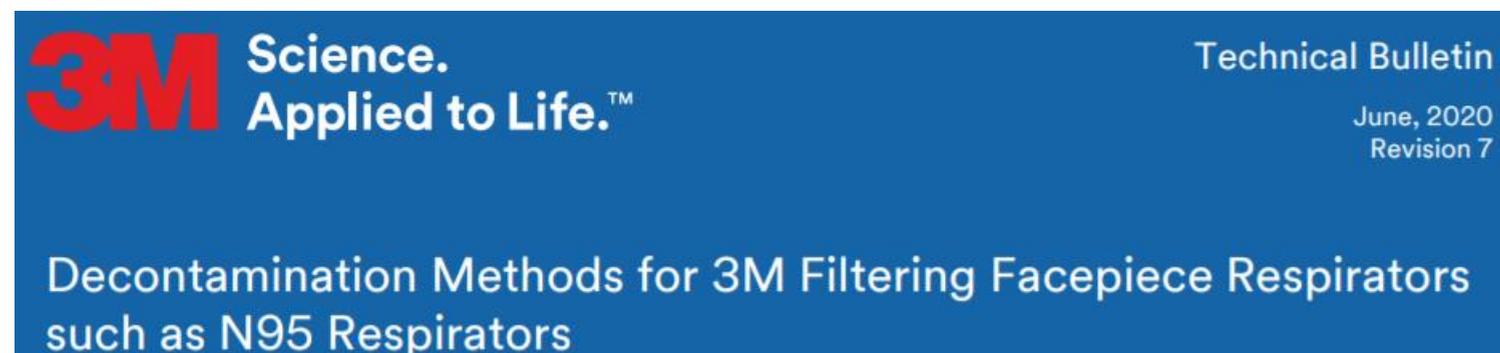
Special Case: PPE Shortages in Health Care

- March/April 2020: concern about sufficiency of PPE stockpile (particularly N95 respirators)
- Concern has subsided, but is among considerations in preparation for second and subsequent waves
- NIOSH guidance released on several emergency measures that can be taken – conventional/contingency/crisis
 - Extending use (multiple interactions, cohorted patients)
 - Use of expired respirators
 - Use of internationally certified respirators
 - Limited re-use N95s (“wait and reuse”)
 - Limited re-use of decontaminated N95s
- All have challenges, not ideal
- If supplies become limited, requires a decision on order of use
- Importance to use supplies wisely (“choosing wisely” campaign)

The screenshot shows the CDC website interface. At the top left is the CDC logo with the text 'Centers for Disease Control and Prevention' and 'CDC 24/7: Saving Lives, Protecting People™'. To the right is a search bar containing 'Coronavirus' and a search icon, with a link for 'Advanced Search'. Below the search bar is a teal header for 'Coronavirus Disease 2019 (COVID-19)'. The breadcrumb trail reads 'CDC > Coronavirus Disease 2019 (COVID-19) > Healthcare Professionals'. On the right side of the page are social media icons for Facebook, Twitter, LinkedIn, Email, and Print. The main content area features a home icon, 'Coronavirus Disease 2019 (COVID-19)', and a list of links: 'Symptoms' and 'Testing'. The article title 'Strategies to Optimize the Supply of PPE and Equipment' is prominently displayed, with a 'Print Page' button below it.

N95 Decontamination

- Some data to support decontamination by:
 - ultraviolet germicidal irradiation
 - vaporous hydrogen peroxide
 - moist heat (<75°C)



DO NOT USE: ethylene oxide, formaldehyde, ionizing radiation, microwave, alcohols, quats, soaps, detergents, temperature >75°C

- 3M lays out four “key aspects of successful decontamination”:
 - inactivate the target organism, such as the virus that causes COVID-19;
 - not damage the respirator’s filtration;
 - not affect the respirator’s fit;
 - and be safe for the person wearing the respirator
- 3M provides table of models, methods and # cycles that currently have emergency approval (US)



<https://multimedia.3m.com/mws/media/1824869O/decontamination-methods-for-3m-filtering-facepiece-respirators-technical-bulletin.pdf>

COVID-19 Challenges

Retraction Watch

Tracking retractions as a window
into the scientific process

Retracted coronavirus (COVID-19) papers

Rapidly evolving situation

- Speed and amount of information → Information overload, fatigue
- Applies to research - quality of research and peer review, retractions (15 to-date)

Workplace and community hazard – workplace can be a important site of transmission

- Workers bring it with them, and take it out into the community

Data

- Continue to lack information on work in our health data (and other social determinants of health)
- Unable to examine difference between occupational/industry groups

PPE supply

- Dependent on international supply chain (CSA Group work to come)
- Insufficient stockpile

Main Messages

- Most significant risk factor for transmission seems to be close contact with a case, likely inhalation of droplets
 - Primary focus should be on reducing close contact and maintaining >2m distance between people
 - Controls should be multifaceted
- Prevention of COVID-19 transmission will require communication, trust
 - Disclosure of case status, personal risk factors, family members
 - Good Safety culture = greater compliance with workplace safety policies and procedures
- In this case, occupational health is closely linked with public health
 - Workplace can be important site of transmission
 - Local risk will vary; local context is important
 - Preventing transmission at work will protect the broader community

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Thank you & Questions?

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