IEQ and Pandemic Response

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Presentation Outline

01

IEQ and Metrics

02

Importance of IEQ

03

Layered Approach

04

ASHRAE Standards

05

AMCA Research

06

Takeaways

Indoor Environmental Quality (IEQ)

- Human habitat after the Pandemic and beyond
- **Humans** and buildings energy
- IEQ
  - Indoor Air Quality (IAQ)
  - Thermal
  - Light
  - Acoustic

IEQ Metrics

- The Air Quality Index (AQI)
  - CO_2
  - Volatile Organic Compound (VOC)
  - Particulate Matter (PM2.5)
- Temperature
- Light
- Acoustic
- Clean Air Delivery Rate (CADR) measures the “clean air” rate delivered to a room through ventilation, filtration, or other methods.

IAQ Index Level

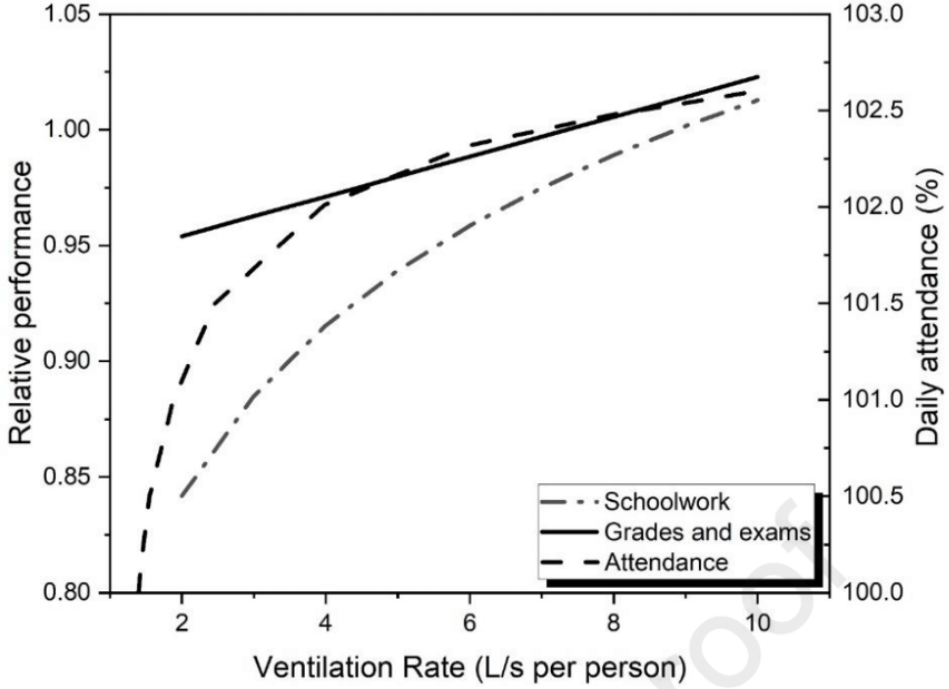
IAQ Index			
PM2.5	VOC	CO2	
$\mu g/m^3$	$\mu g/m^3$	ppm	Hazard Level
<12	100	700	Good
35	200	800	Moderate
56	300	1100	Poor
150	400	1500	Unhealthy
250	500	2000	Very Unhealthy
300	600	3000	Hazardous
500	700	5000	Extreme

https://greenecon.net/3-metrics-to-guide-air-quality-health-safety/carbon-footprint.html

Importance of IEQ

- HVAC Systems in public schools
- American Society of Civil Engineers
  - 53% of public school districts report the need to update or replace multiple building systems, including HVAC systems.
  - A June 2020 report by the Government Accountability Office (GAO) estimated that roughly 36,000 schools across the USA need to replace or update their HVAC systems.
  - Improved IEQ leads to more resilient schools.

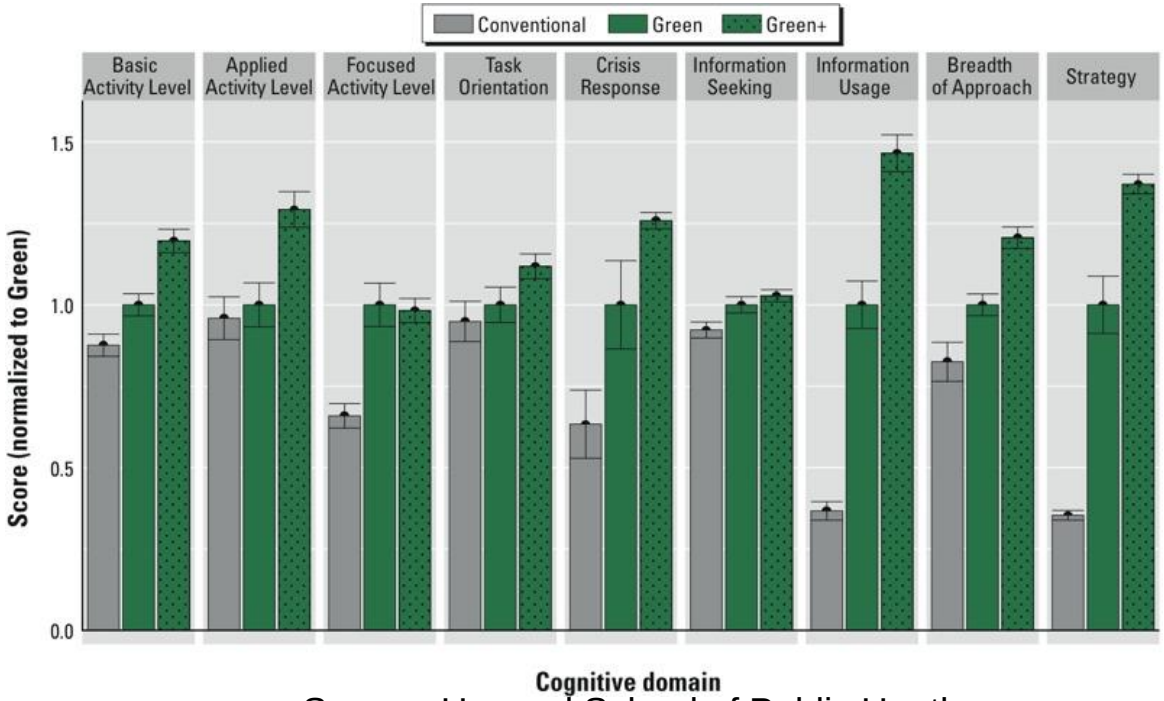
Impact on Improving IEQ



Source: Lawrence Berkely National Laboratory

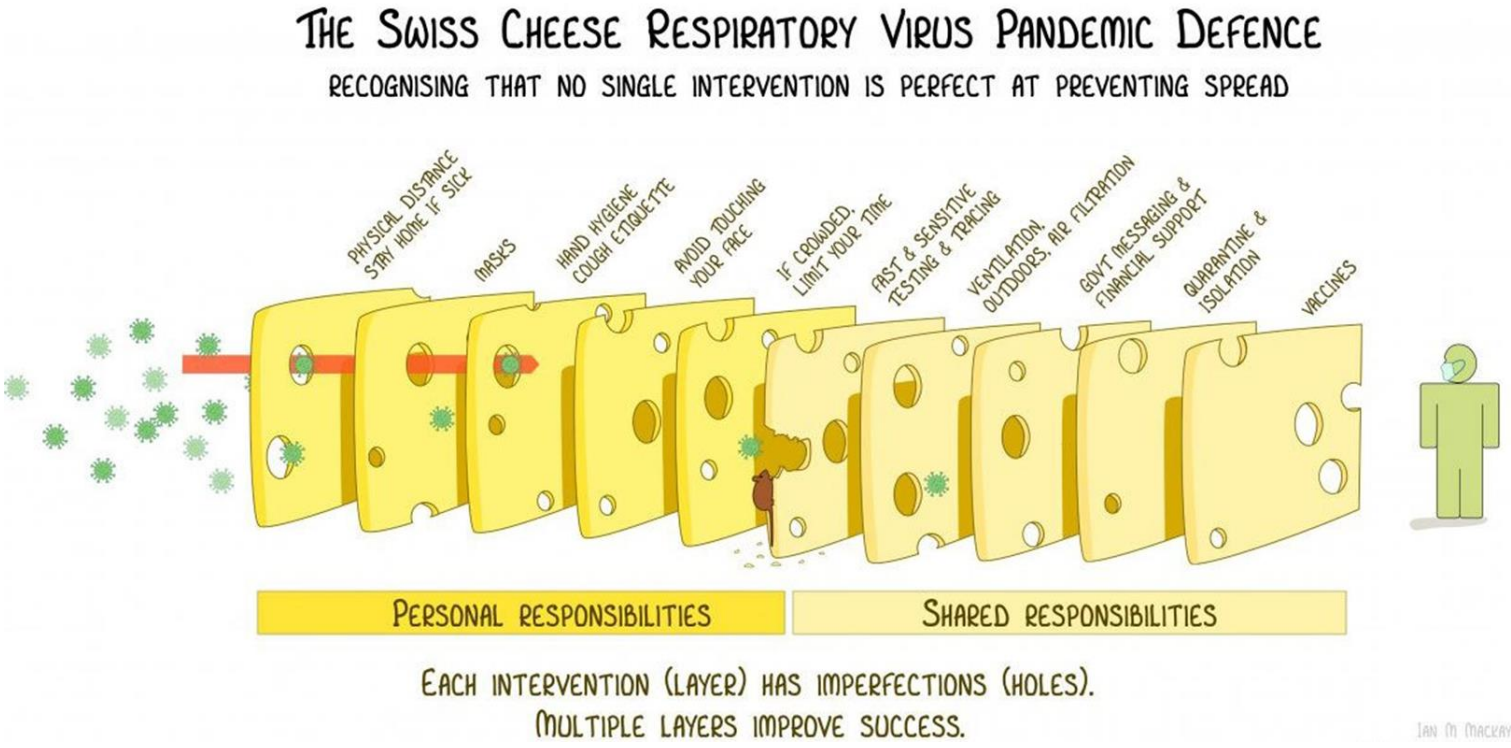
VOCs Negatively Impact Cognitive Function

- "Conventional" = High VOC (~600 ug/m^3)
- "Green" = Low VOC (~50 ug/m^3)
- "Green +" = Low VOC with double Ventilation



Source: Harvard School of Public Heath

A Layered Approach

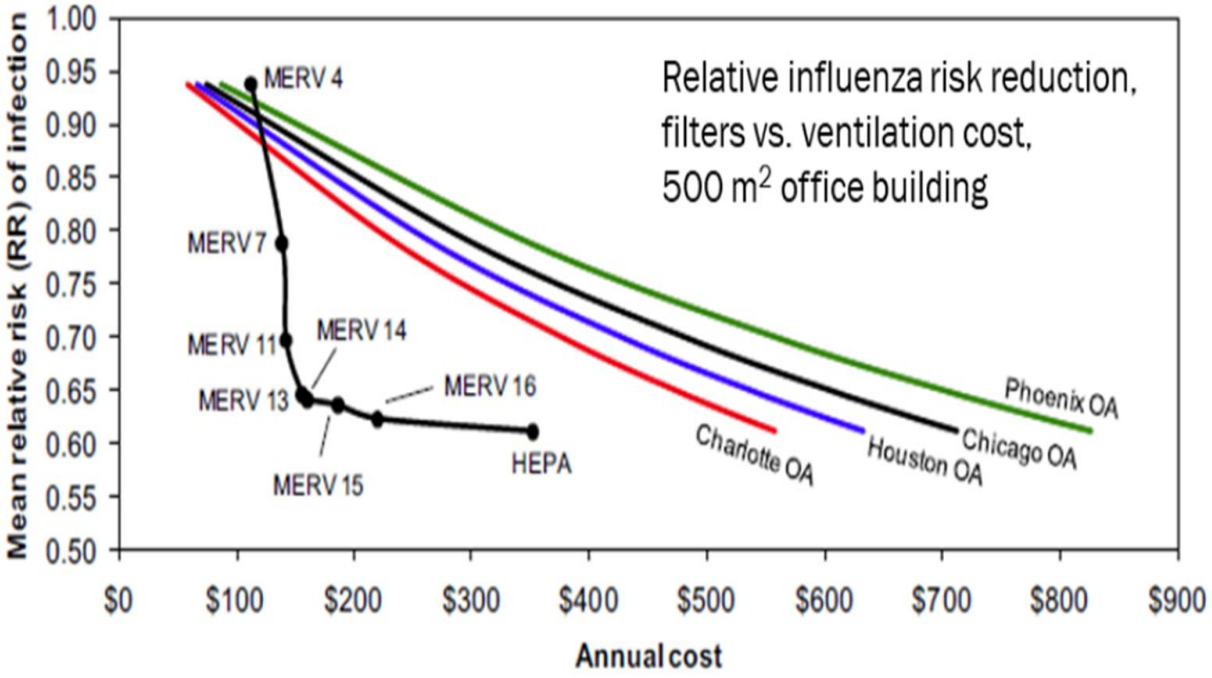


Solutions

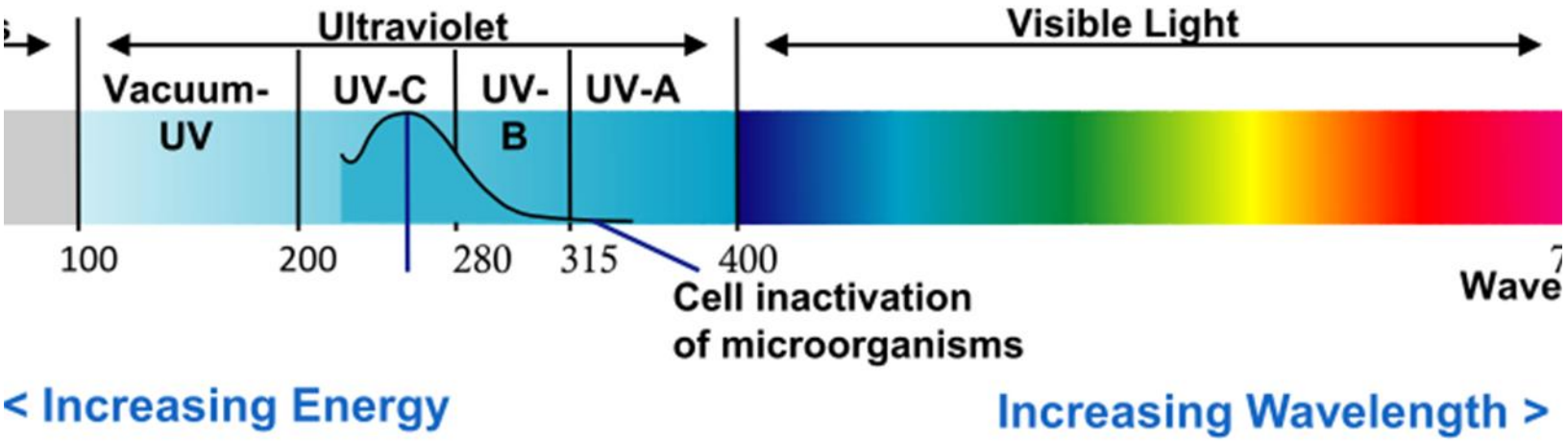
- Multiple Solutions for achieving clean indoor air
  - Ventilation
  - Filtration
  - Humidification
  - Air Treatment

- Layering solutions improve IEQ by providing complimentary strengths while covering for limitations in different systems.

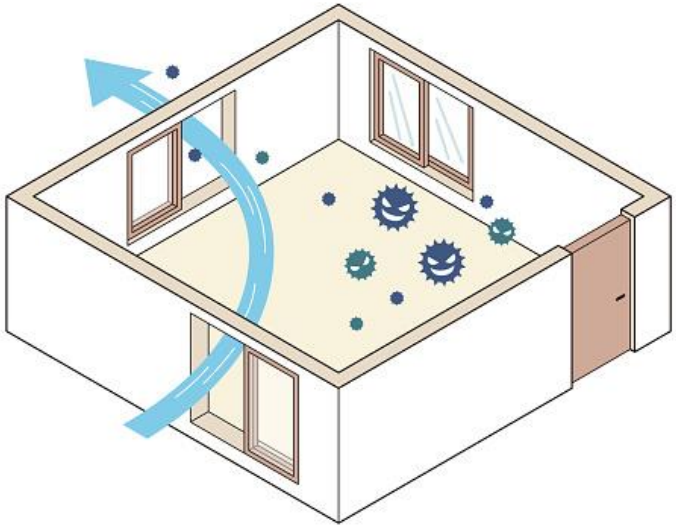
Filtration reduces the risk of influenza infection

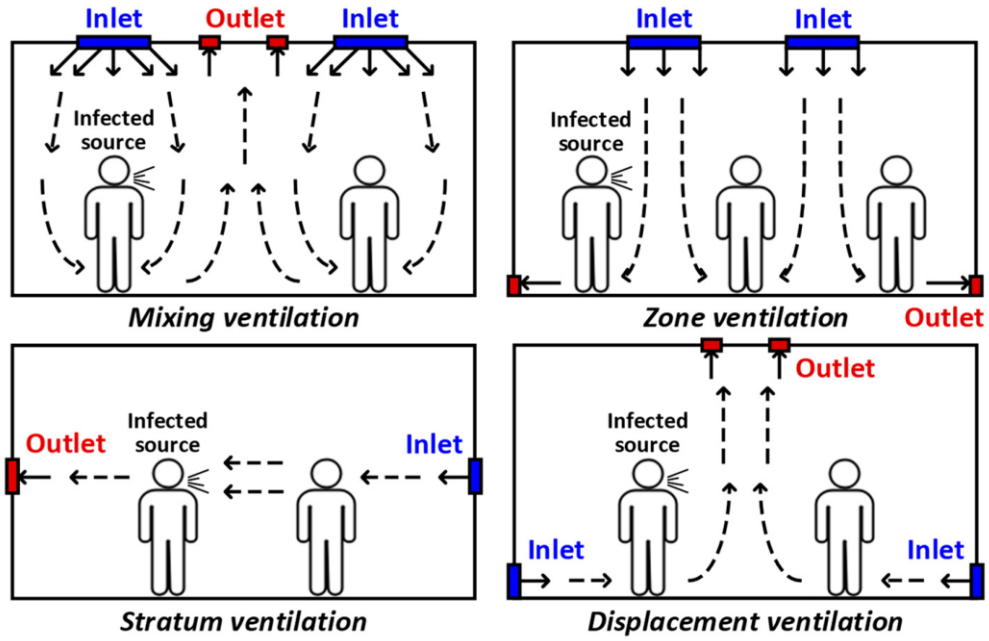


Pathogen Inactivation: UVGI



Air Distribution

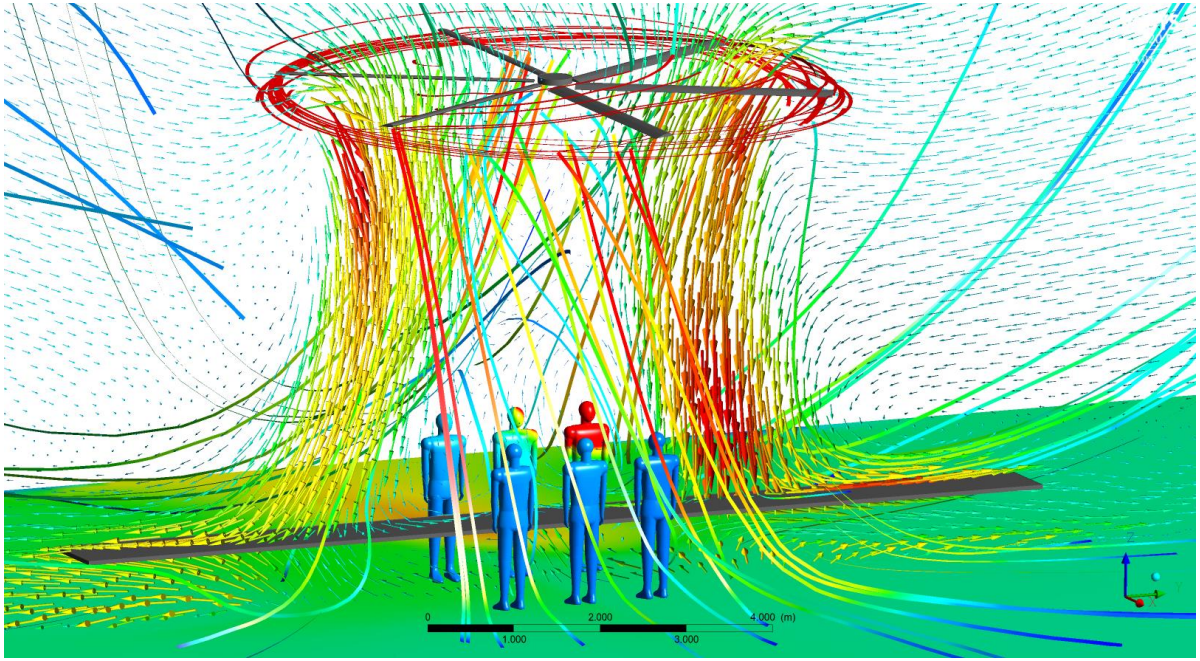




ASHRAE Standards

- ASHRAE 62.1 - Ventilation Requirement for acceptable Indoor air quality
- ASHRAE 62.2 - Normal Operating Conditions
- ASHRAE 241 - Control of Infectious Aerosols
  - Targets reduction of airborne transmission of infectious aerosols
  - Recommendations for elevated risks
  - It does NOT establish overall requirements for acceptable IAQ.

AMCA COVID Guidance for UNDUCTED Fans
Modeling Ceiling Fans



Takeaways

- Balancing energy efficiency and IEQ
- Cost and implementation
- Long-term adoption

Thank you!

Do you have any questions?

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