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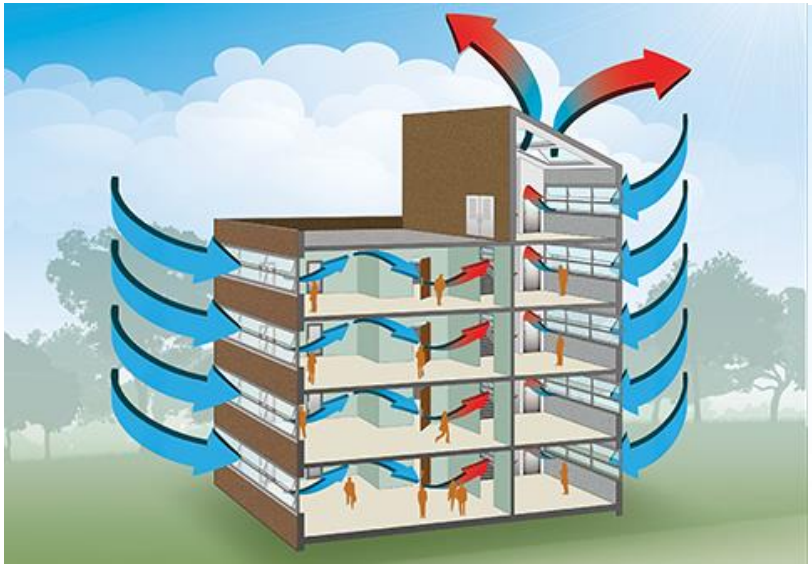
Indoor air quality in the new normal:
The importance of good indoor air quality



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Session objectives

At the end of the session participants should have a practical understanding of:

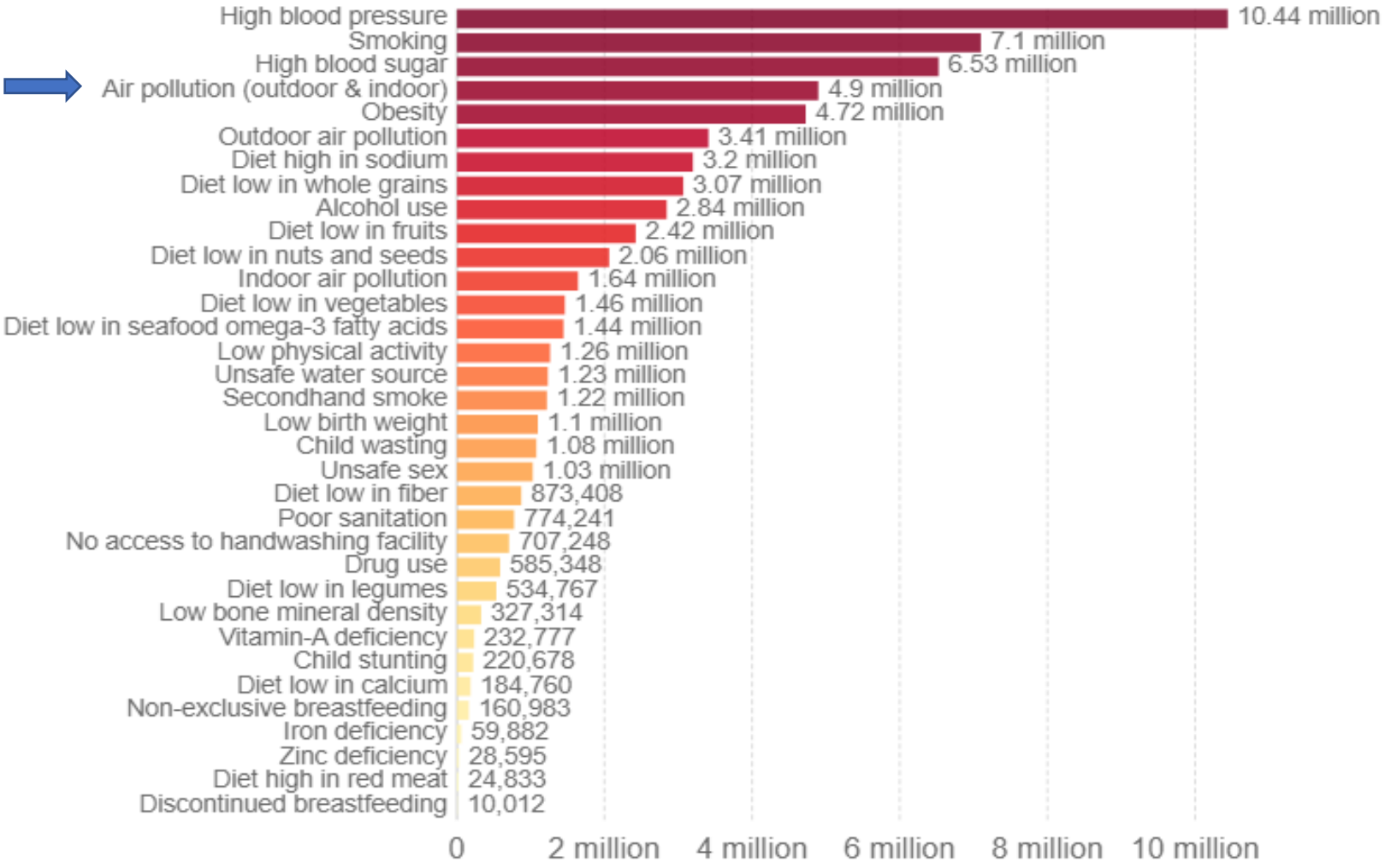
- Drivers of indoor air quality
- Sick building syndrome and its impact to workers health
- Guidelines in the workplace to ensure public health safety in the new normal
- Monitoring indoor air quality

Indoor Air Quality: Video 1

Number of deaths by risk factor, World, 2017

Total annual number of deaths by risk factor, measured across all age groups and both sexes.

Our World in Data



Source: IHME, Global Burden of Disease (GBD)

Indoor Air Quality

"The air quality **within and around buildings and structures**, especially as it relates to the **health** and **comfort** of building occupants."

US EPA

International Journal of
Environmental Research and Public Health

MDPI

Review

Indoor Air Pollution, Related Human Diseases, and Recent Trends in the Control and Improvement of Indoor Air Quality

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Abstract: Indoor air pollution (IAP) is a serious threat to human health, causing millions of deaths each year. A plethora of pollutants can result in IAP; therefore, it is very important to identify their main sources and concentrations and to devise strategies for the control and enhancement of indoor air quality (IAQ). Herein, we provide a critical review and evaluation of the major sources of major pollutant emissions, their health effects, and issues related to IAP-based illnesses, including sick building syndrome (SBS) and building-related illness (BRI). In addition, the strategies and approaches for control and reduction of pollutant concentrations are pointed out, and the recent trends in efforts to resolve and improve IAQ, with their respective advantages and potentials, are summarized. It is predicted that the development of novel materials for sensors, IAQ-monitoring systems, and smart homes is a promising strategy for control and enhancement of IAQ in the future.

Keywords: indoor air quality; indoor pollution; smart home; human diseases

Acceptable Indoor Air

"Air in which **there are no known contaminants at harmful concentrations** and which a substantial majority (usually 80%) of the people exposed do not express dissatisfaction"

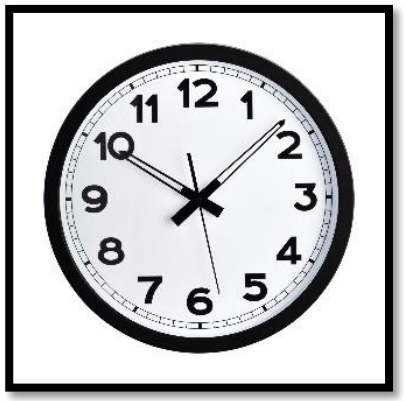
ASHRAE 62-1999

(The American Society of Heating, Refrigerating and Air-Conditioning Engineers)

Why should we be concerned about **Indoor Air Pollution**?

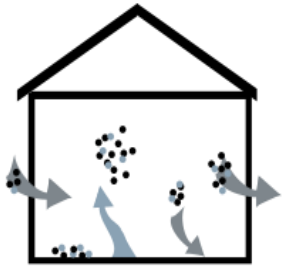
Reasons for Special Concern

~75–90% of time spent indoors



Many air pollutants known to be hazardous to health are emitted indoors

Indoor environments trap pollutants
Levels may be 2 to 5 times higher than outside



The quality of indoor air inside offices, and other workplaces is important not only for workers' **comfort** but also for their **health**.

Potential Sources of IAP

Source	Pollutant
Ventilation and air-conditioning systems (HVAC)	Molds, bacteria, CO
Restrooms	Molds and fungi
Furniture and carpets	Formaldehyde, organic solvents, asbestos
Office machines	Chemicals

Indoor Contaminants

- Chemical contaminants
- Biological contaminants

Chemical Contaminants

- VOCs
- Respirable particles (PM 10 and 2.5)
- Carbon dioxide

International Journal of
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Review

Air Pollution and COVID-19: The Role of Particulate Matter in the Spread and Increase of COVID-19's Morbidity and Mortality

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Abstract: Sars-Cov-2 virus (COVID-19) is a member of the coronavirus family and is responsible for the pandemic recently declared by the World Health Organization. A positive correlation has been observed between the spread of the virus and air pollution, one of the greatest challenges of our millennium. COVID-19 could have an air transmission and atmospheric particulate matter (PM) could create a suitable environment for transporting the virus at greater distances than those considered for close contact. Moreover, PM induces inflammation in lung cells and exposure to PM could increase the susceptibility and severity of the COVID-19 patient symptoms. The new coronavirus has been shown to trigger an inflammatory storm that would be sustained in the case of pre-exposure to polluting agents. In this review, we highlight the potential role of PM in the spread of COVID-19, focusing on Italian cities whose PM daily concentrations were found to be higher than the annual average allowed during the months preceding the epidemic. Furthermore, we analyze the positive correlation between the virus spread, PM, and angiotensin-converting enzyme 2 (ACE2), a receptor involved in the entry of the virus into pulmonary cells and inflammation.

Keywords: COVID-19; particulate matter; ACE2; inflammation; oxidative stress

- **well-maintained** and operated **HVAC** system can **reduce** the spread of **COVID-19** in indoor spaces by increasing the rate of air change
- **recirculation** modes (which recirculate the air) should **not** be used
- HVAC systems should be regularly **inspected**, **maintained** and **cleaned**

(World Health Organization)

Sick Building Syndrome (SBS)

- SBS was first coined in the 1970s
- Set of symptoms associated with **time spent** in building were observed
- Respiratory tract irritation, skin irritation, headache, dizziness, nausea, fatigue, concentration problems

Sick Building Syndrome

- Symptoms **diminish** or **cease** when occupants **leave** the building

- Cannot be **traced** to specific **pollutants** or **sources** within the building

Sick Building Syndrome

- Ozone produced by **printers** and **photocopiers**
- **Biological** Pollutants such as viruses, bacteria, pollen
- **Electromagnetic** radiation like televisions, **computers** and microwaves
- Inadequate **ventilation** or **defective** HVAC systems

Sick Building Syndrome

- **Control Measures** include a general **cleanliness** of the building
- Regular **cleaning** and **maintenance** of HVAC system
- No **smoking** in the workplace
- **IEC** is a key intervention

Guidelines in the workplace to ensure public health safety in the new normal

dole.gov.ph/news/dti-and-dole-interim-guidelines-on-workplace-prevention-and-control-of-covid-19/

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DTI and DOLE INTERIM GUIDELINES ON WORKPLACE PREVENTION AND CONTROL OF COVID-19

YOU ARE HERE: HOME › › DTI AND DOLE INTERIM GUIDELINE...

Posted on May 1, 2020

Monitoring Indoor Air Quality

- **Air changes per hour**, **ACH** is a measure of the **air** volume **added** to or **removed** from a **space** in **one hour**, divided by the **volume** of the space.

- is a measure of **how many times** the **air** within a defined space is **replaced** per **hour**

Typical Air Changes Per Hour Table

Residential	
Basements	3-4
Bedrooms	5-6
Bathrooms	6-7
Family Living Rooms	6-8
Kitchens	7-8
Laundry	8-9
Light Commercial	
Offices	
Business Offices	6-8
Lunch Break Rooms	7-8
Conference Rooms	8-12
Medical Procedure Offices	9-10
Copy Rooms	10-12
Main Computer Rooms	10-14
Smoking Area	13-15

Monitoring Indoor Air Quality : Video 2

End of Presentation

Thank you for your attention