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### What do we know about the air we breathe?

### The exposure case for indoor air quality

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### Exposures – where do they occur?









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# Location duration per day by occupational group

No answer/refused Unspecified location Unspecified location (not travelling) Home Second home or weekend house Working place or school Other peoples home Restaurant cafe or pub Sports facility Parks countryside seaside beach or coast Shopping centres markets other shops Other specified location (not travelling) Unspecified private transport mode Travelling on foot Travelling by bicycle Travelling by moped motorcycle or motorboat Travelling by passenger car as the driver Travelling by passenger car as a passenger Travelling by passenger car - driver status unspecified Travelling by lorry or tractor Travelling by van Other specified private travelling mode Travelling by taxi Travelling by bus Travelling by tram or underground Travelling by train Travelling by coach Waiting for public transport Other specified public transport mode Unspecified transport mode





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### **Air Pollution Exposures**

- Exposure to air pollution at work is a part of our everyday lives



Mazaheri et al. 2018. Env. Int., 120; 496-604



### About 90% of our time spent indoors – for many at least a third of that is at work.





### Indoor vs. outdoor?



Our pollution exposure profile changes when we account for indoors

Picture from: US EPA







Picture from: http://www.constructioninnovation.info/www.constructioninnovation.info/index2f08.html?id=1140



### Health risks considering personal exposure

Health risks can be driven by exposures (and sources) indoors

Table 5. Median indoor source contributions to HAPs risk from inhalation exposure.

Indoor source	Percent
Acetaldehyde	15
Formaldehyde	70
1,3-Butadiene	10
Benzene	20
Chloroform	70
Methylene chloride	45
1,4-Dichlorobenzene	35
Perchloroethylene	30
Trichloroethylene	25
PAH-B2	10
PAH-CD	20
Naphthalene	60

Loh et al. EHP, 115(8), 2007





concentrations. Dotted black line indicates significance. DOI: 10.1039/D

Han et al. Faraday Discuss. 2020





In a study of children in Delhi India

For every 10 µg/m<sup>3</sup> increase in personal level PM2.5 measurements, there was an 8% higher odds of being in a group of asthmatics where their asthma control worsened







Mostly Stayed the Same or Increased

## Indoor air monitoring?



- Outdoor air is regularly monitored
- We don't have this type of information for indoor environments







### Possibilities: Low cost monitoring?





- Smaller profile can be wearable or static
- Potential for remote monitoring
- Passive sampling
- May have less accuracy but potential for large scale deployment









# Thoughts for the future

- Outdoor air pollution is only one part of our exposure profile
- Most exposures occur indoors or in places where outdoor air pollution is moderated (e.g. transport)
- $\rightarrow$  We need to examine this relationship for effective interventions
- The composition of our air pollution exposure profile changes when we account for indoors
- $\rightarrow$  How will we fully account for this in understanding health
- Monitoring for indoor air and personal exposure needs different paradigms from outdoor air monitoring and actions





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### Thank you

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