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Health and wellbeing benefits from providing good indoor air quality

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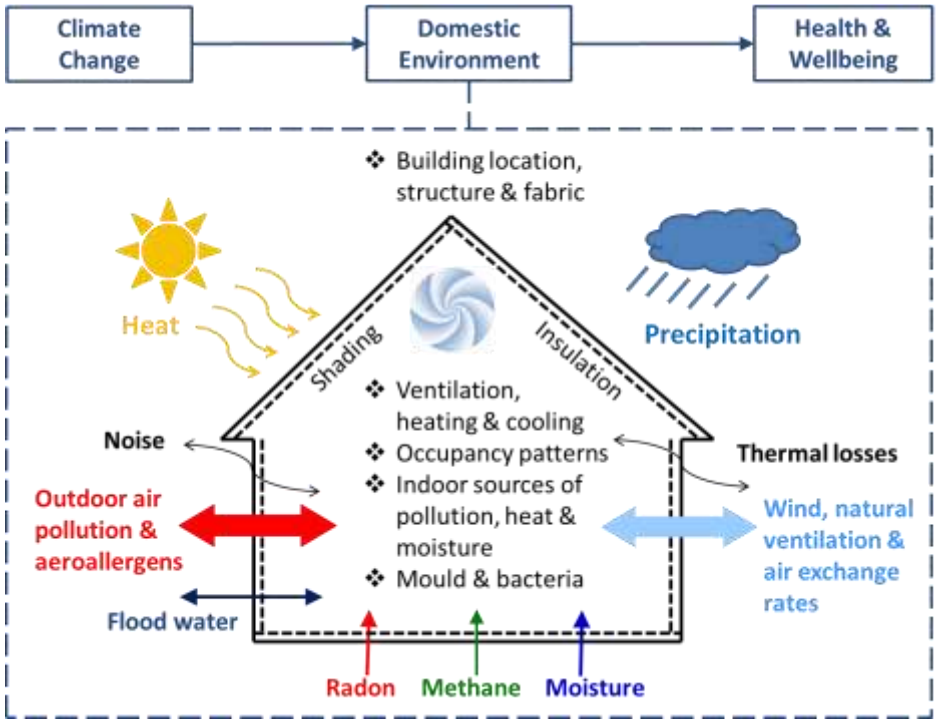
The big picture



Vardoulakis et al., 2015: Environment International, 85: 299-313

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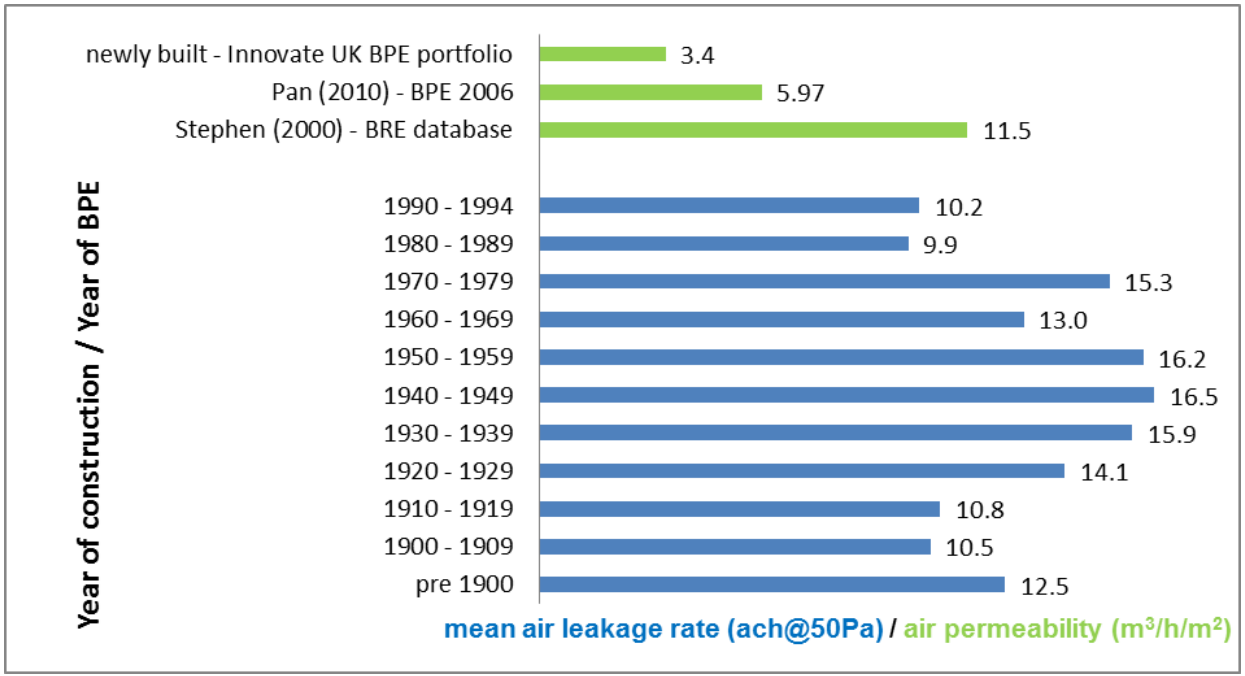
UK Homes - Air permeability



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Sources of IA pollutants

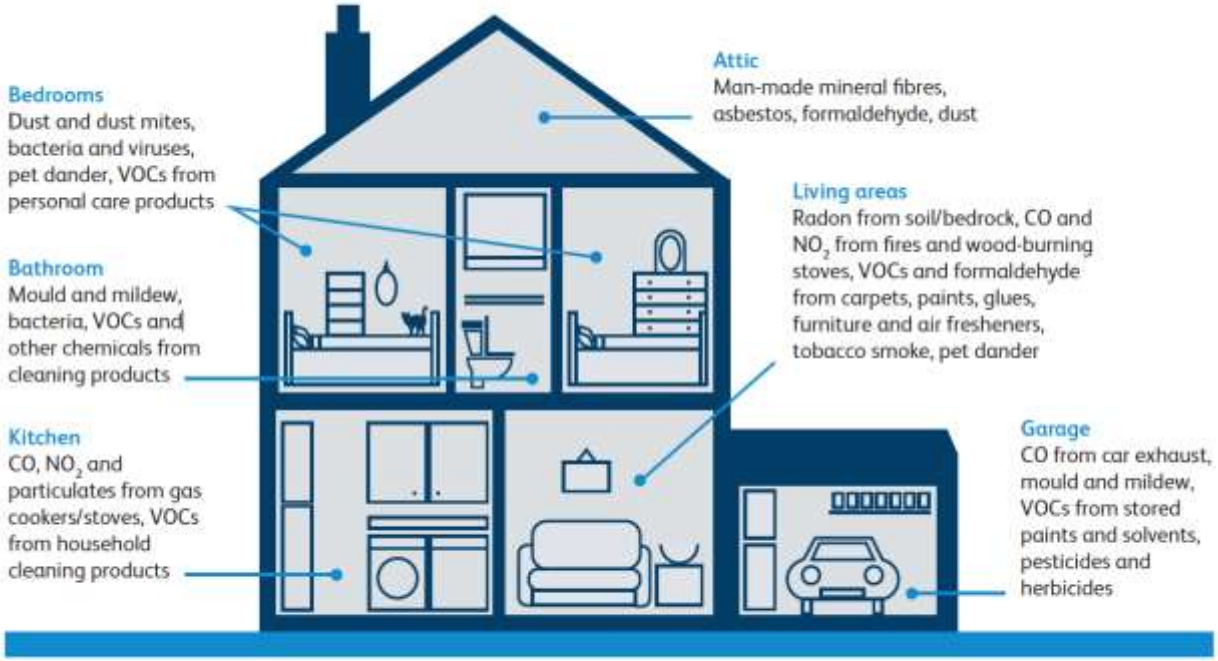

Fig 3. Sources and types of indoor pollution encountered in homes. VOCs = volatile organic compounds. Please note that these lists are not exhaustive and that the actual pollutants present, and their amounts, will vary from household to household.

RCP, 2016

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Indoor air quality – Health effects

Short-term effects

- Irritation of the eyes, nose, and throat, headaches, dizziness, and fatigue (VOCs)
- Cognitive performance, productivity (CO_2)
- likelihood of effects depends on:
  - age
  - pre-existing medical conditions
  - individual sensitivity
  - repeated exposure or high level exposure.

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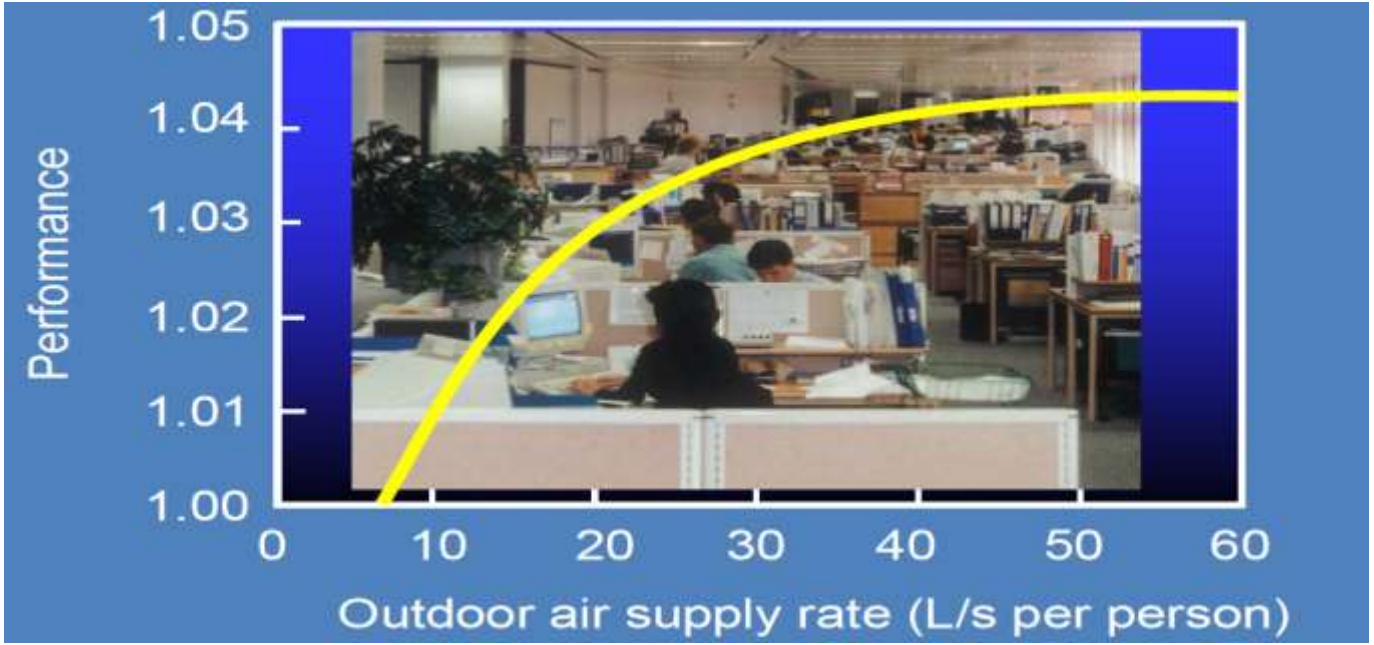
Effects on work performance



Source: Wargocki and Seppanen (2006)

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Improving productivity in the workplace

Workplace performance is both positively and negatively impacted by the indoor environmental conditions, particularly temperature and carbon dioxide (CO2) levels. Optimising the indoor environment leads to improvements in staff cognitive capability, speed and accuracy of work and output. The conclusion is that optimising the indoor environment in both existing and new buildings will enhance workplace performance and productivity.

Gupta, et al. (2018). *Improving productivity in the workplace: lessons learnt and insights from the Whole Life Performance Plus project*, Oxford Brookes University and LCMB Building Performance Ltd, Oxford.

More research is required

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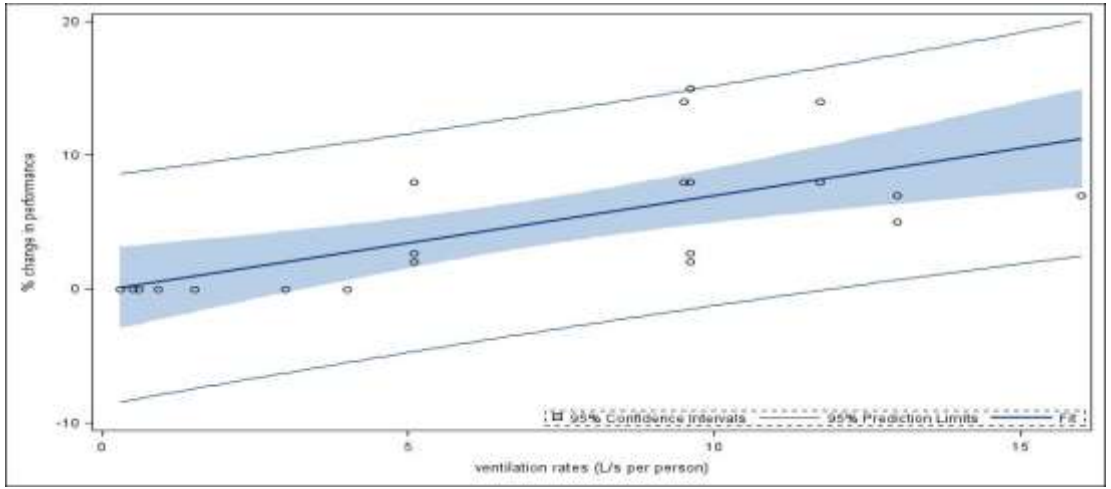
Childrens' performance vs ventilation



Percentage change in performance vs. average ventilation rate,
a linear regression model derived from six studies (Chatzidiakou et al., 2014)

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Indoor air quality – Health effects

Long-term effects

May show up either years after exposure has occurred or only after long or repeated periods of exposure (traffic related pollutants, radon)

- Respiratory diseases (asthma, chronic obstructive pulmonary disease - COPD)
- Heart disease (cardiovascular disease)
- Cancer (lung cancer)

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HEALTHVENT project

Otto Hänninen and Arja Asikainen (Eds.) (2013).

Efficient reduction of indoor exposures - Health benefits from optimizing ventilation, filtration and indoor source controls.

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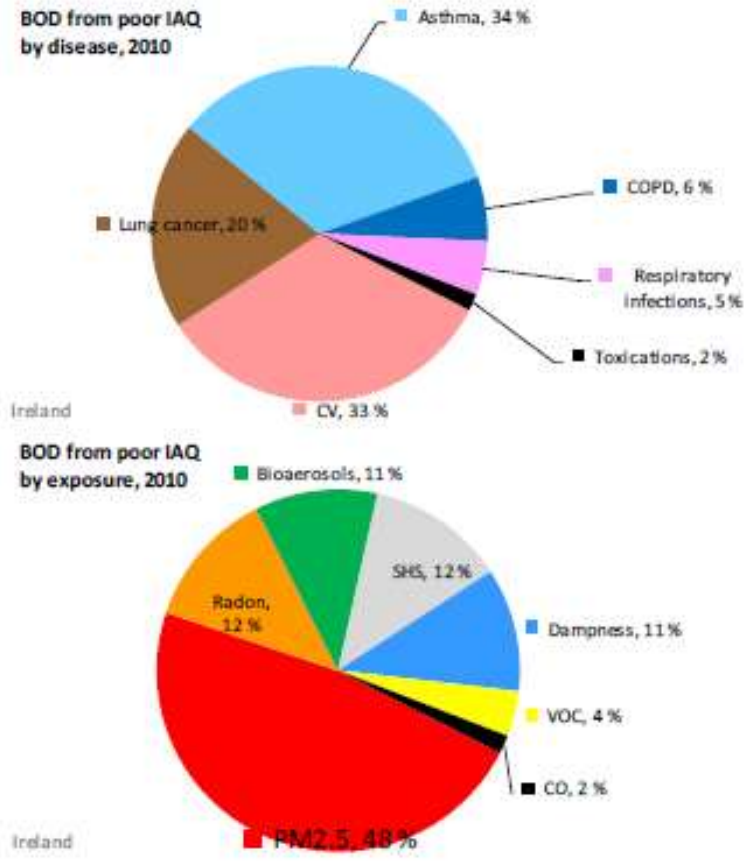

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IAQ work at PHE - 1

Cross-government / Organisations / Stakeholders

- Cross Government Group On Gas Safety And Carbon Monoxide Awareness / All Fuels Action Forum
- Department for Education – BB101 Guidance on ventilation, thermal comfort and indoor air quality in schools
- CIBSE TM40: Health Issues in Building Services
- NICE guidance on indoor air quality at home - PHETA
- RCP and RCPCH Systematic Review: “Effects of Indoor Air Quality on Children and Young People’s Health”.
- Government Review into CO Alarm Requirements (England)
- WHO project on “assessment of cumulative risk of children to Indoor air pollution”
- XWHG organised by MHCLG for the revision of Building Regs (Part L, Part F)

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IAQ at PHE - 2

➢ PHE review of IAQ guidelines for selected VOCs in the UK

Currently: TVOC: 300 µg/m^3, as an indicator.

Comprehensive literature review on VOCs in indoor air, in

- existing national and international standards,
- worldwide large-scale monitoring case studies of homes and offices,
- potential sources of VOCs,
- latest inhalation-based toxicological evidence assessments for health endpoints.

We propose health-based general population indoor guidelines for long and short-term exposure, for individual VOCs namely:

acetaldehyde, α-pinene, benzene, d-limonene, formaldehyde, naphthalene, styrene, tetrachloroethylene, toluene, trichloroethylene, and xylenes (mixture).

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IAQ at PHE - 3

- PhD projects (co-funded PHE and UCL LoLo CDT)

PhD project 1 (2017-2021): *"Quantifying the benefits of measures to reduce exposure of deprived communities to indoor and outdoor sources of air pollutants".*

PhD project 2 (2018-2022): *"Ventilation practices in new homes in relation to air quality, noise and overheating risk, and their impact on health"*

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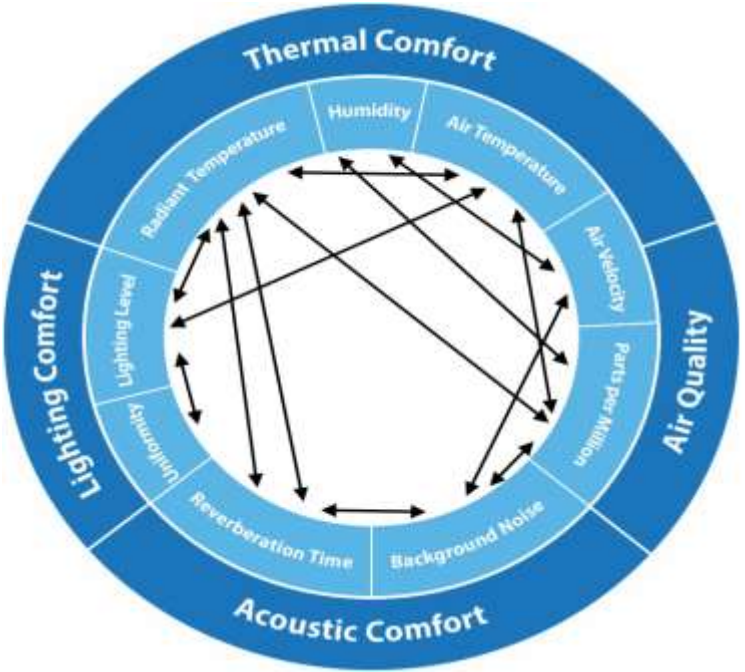
Holistic Approach

- *Strengthen our understanding of the relationship between indoor air pollution / overheating / noise and health and wellbeing*
- *The indoor environment, health and wellbeing is truly a cross government issue in the UK*
- *Cross Whitehall collaboration to review Building Regulations (Part F and Part L) to address ventilation, indoor air quality and overheating – considering noise*



BB101, 2018

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Let's work together

To improve indoor air /environmental quality and enhance our health and wellbeing

Thank you!

www.gov.uk/phe

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