HIGHLIGHTS
IAQ Metrics Workshop

Air Infiltration and Ventilation Centre

Brussels, Belgium

14-15 March 2017

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Overview

- What is the problem?
- What do we already know?
- What is the solution?
- What do we need to do to achieve this?

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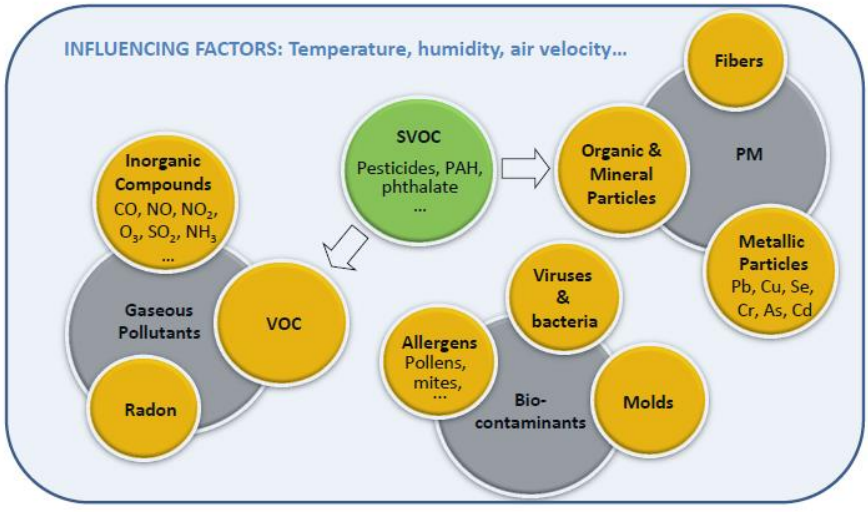
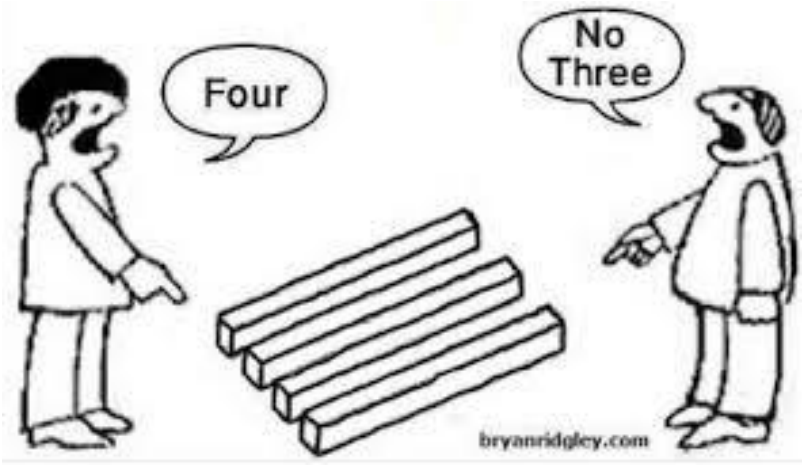
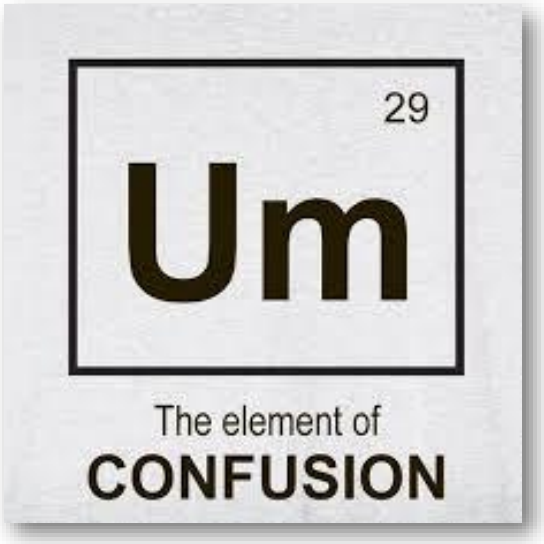
WHAT IS THE PROBLEM?



WHAT DO WE KNOW ALREADY?





ON TWITTER: Teichman at **@AIVCnews** workshop - average weight of **#IAQ** in green building rating schemes worldwide is 7.5%

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WHAT ARE THE SOLUTIONS?

ON TWITTER: We need to consider particle-chemical-biological interactions in #IAQ - **@WBahnfleth** talking **@AIVCnews** workshop

ON TWITTER: Can CO2 be a metric for **#IAQ?** It's a "definitely maybe" from Andy Persily - provided we know the limitations

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ON TWITTER: Performance based building needs to focus on end result not the means - Marcel Loomans **@AIVCnews #IAQ**

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Max. operator

Cohas (1996)
any pollutant

$$I_{BILGA} = \begin{cases} \max\left(\frac{C_i^{obs} - ELVc_i}{ELVa_i - ELVc_i}\right) si\ C_i^{obs} > ELVc_i \\ \max\left(\frac{C_i^{obs} - ELVc_i}{ELVc_i}\right) si\ C_i^{obs} \le ELVc_i \end{cases}$$

Weighted Additive Form

Gadeau (1996)
CO, CO_2, NO_2, HCHO

$$I_{CLIM2000} = \frac{1}{4}\left(\frac{[CO]}{30} + \frac{[CO_2]}{4500} + \frac{[NO_2]}{0.4} + \frac{[HCHO]}{0.06}\right)$$

Castanet (1998)
CO, CO_2, Bacteria

$$I_{LBVP} = \frac{[CO]}{5} + \frac{[CO_2]}{1000} + \frac{[Bacteria]}{1000}$$

Chiang and Lai (2002)
CO, CO_2, HCHO, TVOC, PM_{10}

$$I_{IEI\_IAQ} = \frac{1}{p}\sum_{i=1}^{p} Grade_i$$

QUAD-BBC (2012)
CO_2, NO_2, SO_2, O_3, CO, HCHO, Acetaldehyde, Ethylbenzene, Styrene, Toluene, o-Xylene, Acetone, $PM_{2.5}$, PM_{10}

$$I_{QUAD\text{-}BBC} = \sum_{i=1}^{p} \frac{C_i^{obs}}{ELV_i}$$

Sofuoglu and Moschandreas (2003)
Formaldehyde, TVOC, CO, CO_2, $PM_{2.5}$, PM_{10}, Fungi, Bacteria

$$I_{IAPI} = \frac{1}{8}\sum_{i=1}^{8} 10 \times \left[1 - \frac{C_i^{max} - C_i^{obs}}{C_i^{max} - C_i^{min}}\left(\frac{ELVc_i - C_i^{obs}}{ELVc_i}\right)\right]$$

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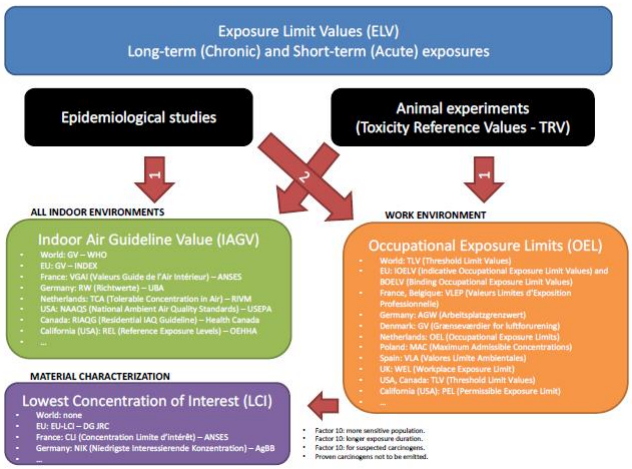
Exposure Limit Values



$$DALY_{disease} = YLL_{disease} + YLD_{disease}$$

DALY: disability adjusted life years lost
YLL: equivalent years of life lost to premature death (mortality)
YLD: equivalent years of life where reduced health or disability is experienced (morbidity)

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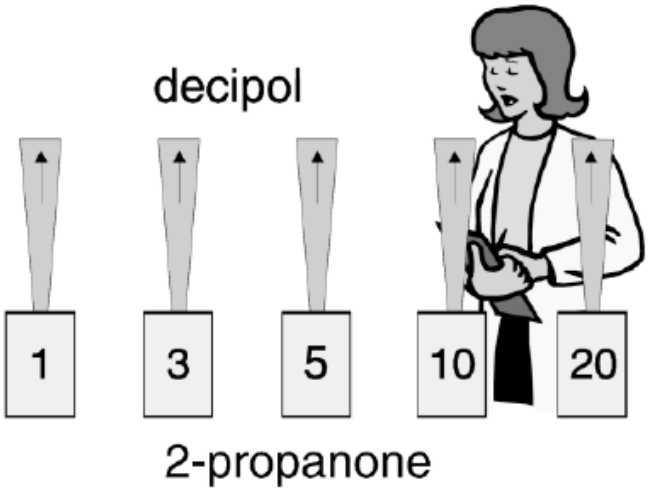
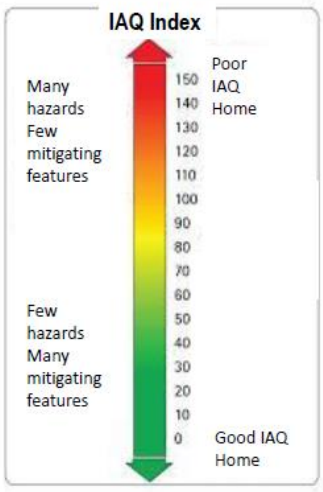


ON TWITTER: Wargocki at AIVC **#IAQ** Metrics workshop-Key advantages of PAQ: accounts for exposure, response, pollutant interactions. **@WargockiPawel**



ON TWITTER: Can we create a single number housing **#IAQ** rating metric? Interesting talk on this complex challenge by Iain Walker **@AIVCnews** workshop

WHAT DO WE NEED TO ACHIEVE THESE SOLUTIONS?

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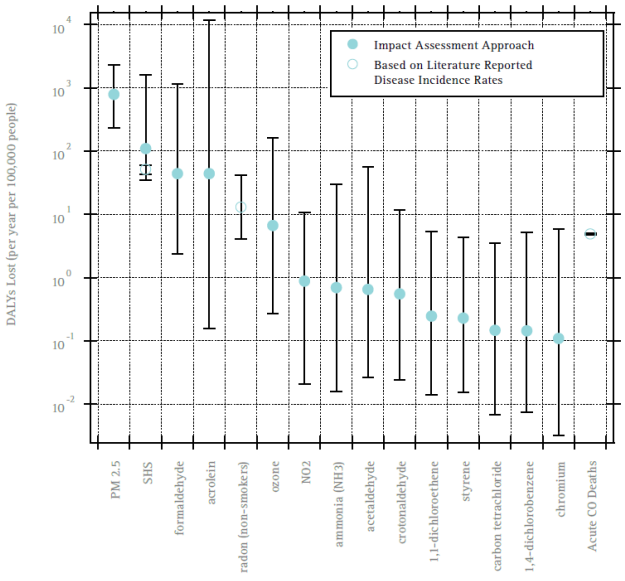

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Borsboom W, De Gids W, Logue J, Sherman M, Wargocki P. Technical Note AIVC 68. Residential Ventilation and Health. Air Infiltration and Ventilation Centre, Brussels, Belgium. 2016.

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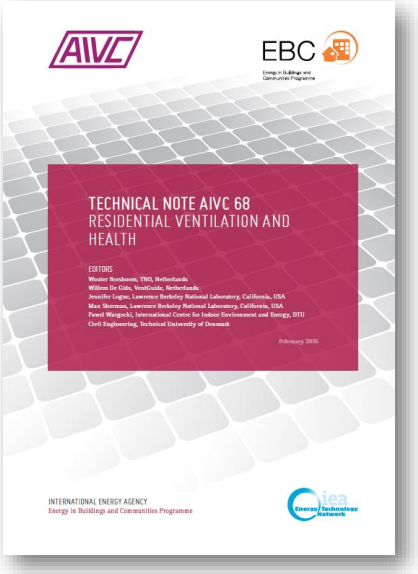

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ON TWITTER: @CathNoakes - Modeling infection risk too often misses "human link" and variability in indoor environment - at **@AIVCnews**

With thanks to

Cath Noakes

Iain Walker

Manfred Plagmann

See you at the AIVC Conference in Nottingham

13-14th September 2017