Swiss TPH

Clean air in urban spaces is possible - if you want it

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Professor of Public Health, University Basel Medical Faculty

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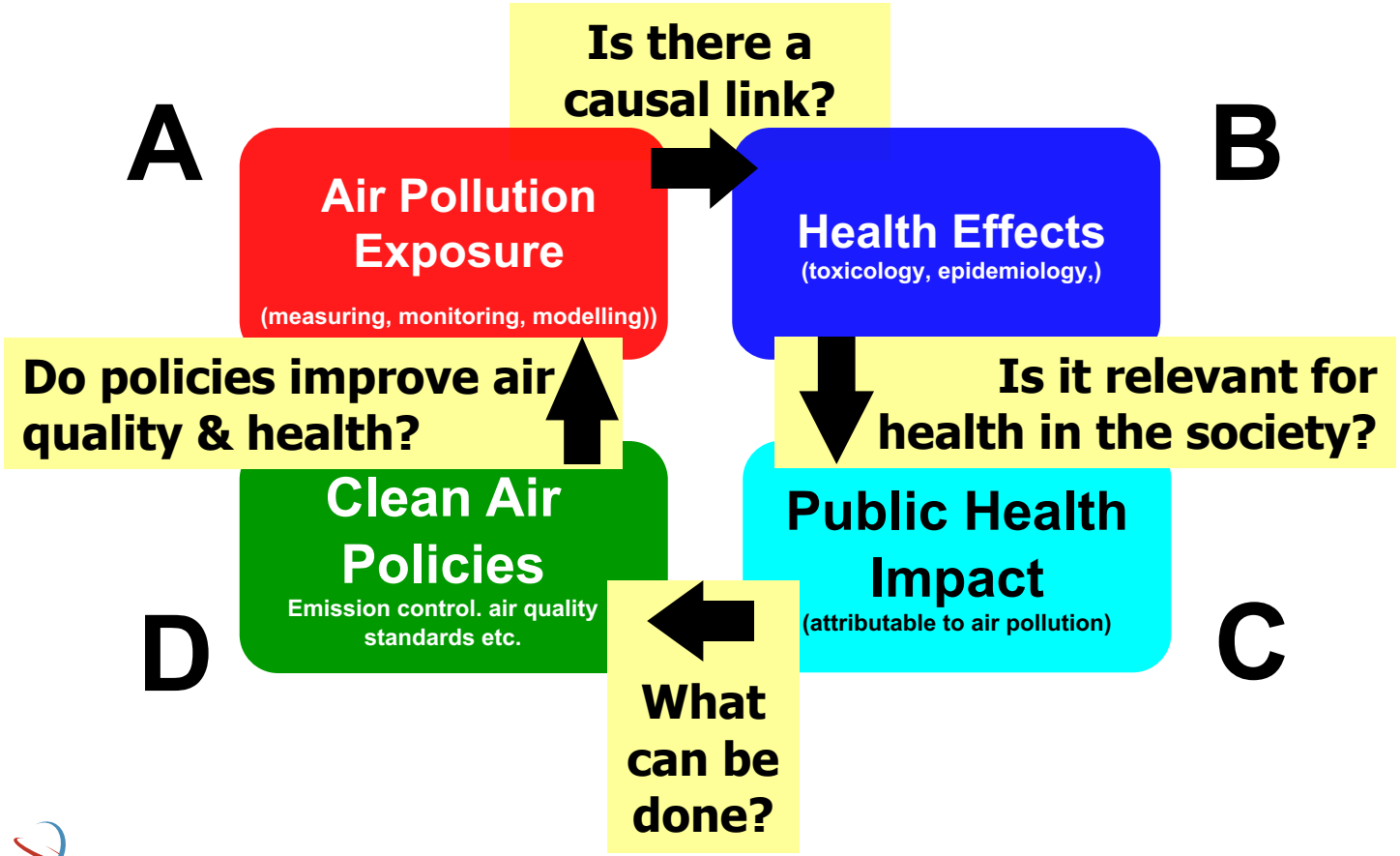
ETH SSPH+ Lecture Series – This is Public Health

Zoom lecture 23.3.2022 – 18:15h

https://us06web.zoom.us/j/82245904939?pwd=bXhPd3ZidzlaRHRwK3p5TEprdmt3QT09

Passcode: 534252

key questions of the Evidence Based Public Health Cycle (example of ambient air pollution)



Combustion is with us…

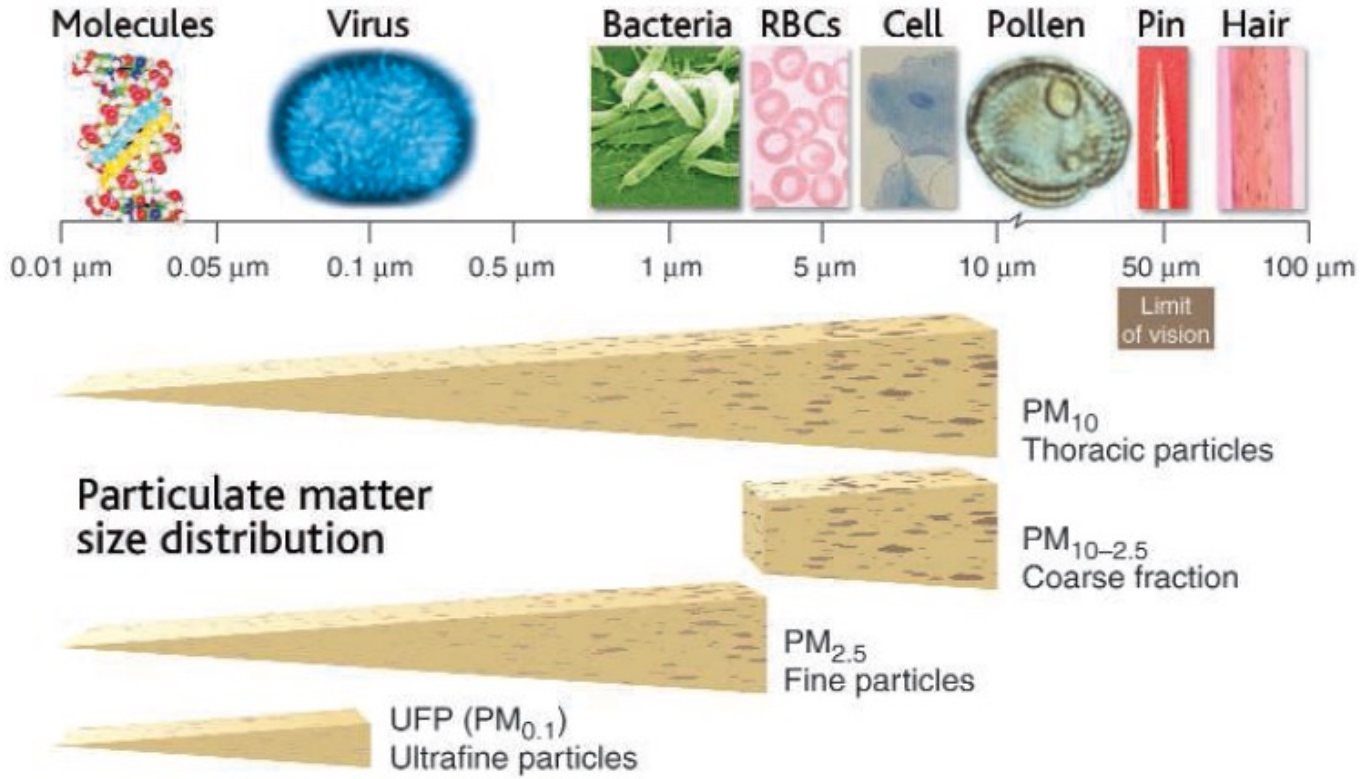
SOURCES OF AMBIENT AIR POLLUTION







“Particulate Matter” (PM) by size (diameter, in micrometers)



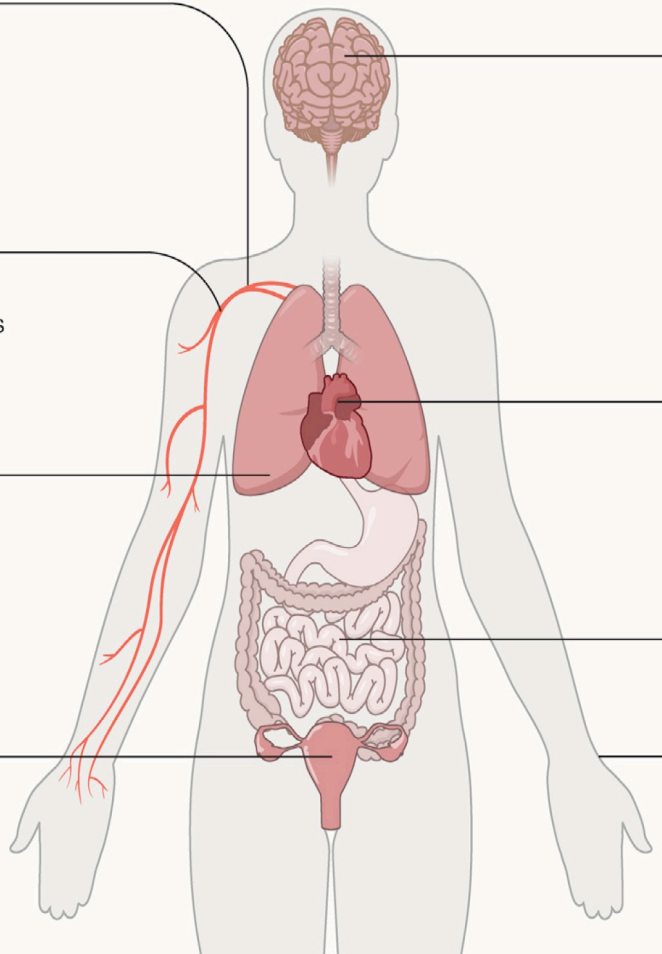
Nel et al, Science, 2005; 307:1858

WHY

to keep air clean?

- Visibility
- Health
- Crop
- Buildings
- Economic losses

https://www.swisstph.ch/en/projects/ludok/healtheffects/



Systemic responses
- Altered chemokine signaling, inflammation
- Circulating extracellular vesicles
- Circulating RNA species
- Altered metabolites

Circulating peripheral white blood cells
- Altered composition and states
- Epigenetic changes
- Mitochondrial dysfunction
- Telomere attrition

Lung
- Inflammation, cell death
- Epigenetic changes
- Immune cell interactions
- Altered lung microbiome
- Virus activation

Reproductive organs
- Inflammation
- Epigenetic changes
- Mitochondrial dysfunction
- Telomere attrition
- Endocrine disruption

Brain
- Neuroinflammation
- Neurotoxicity
- Stress hormone release
- Endocrine disruption
- Circadian rhythm disruption
- Altered nervous system function

Heart
- Inflammation, cell death
- Epigenetic changes
- Mitochondrial dysfunction
- Altered autonomous nervous system function

Gut
- Altered gut microbiome
- Altered metabolites

Skin
- Inflammation
- Epigenetic changes
- Immune cell interactions
- Altered skin microbiome

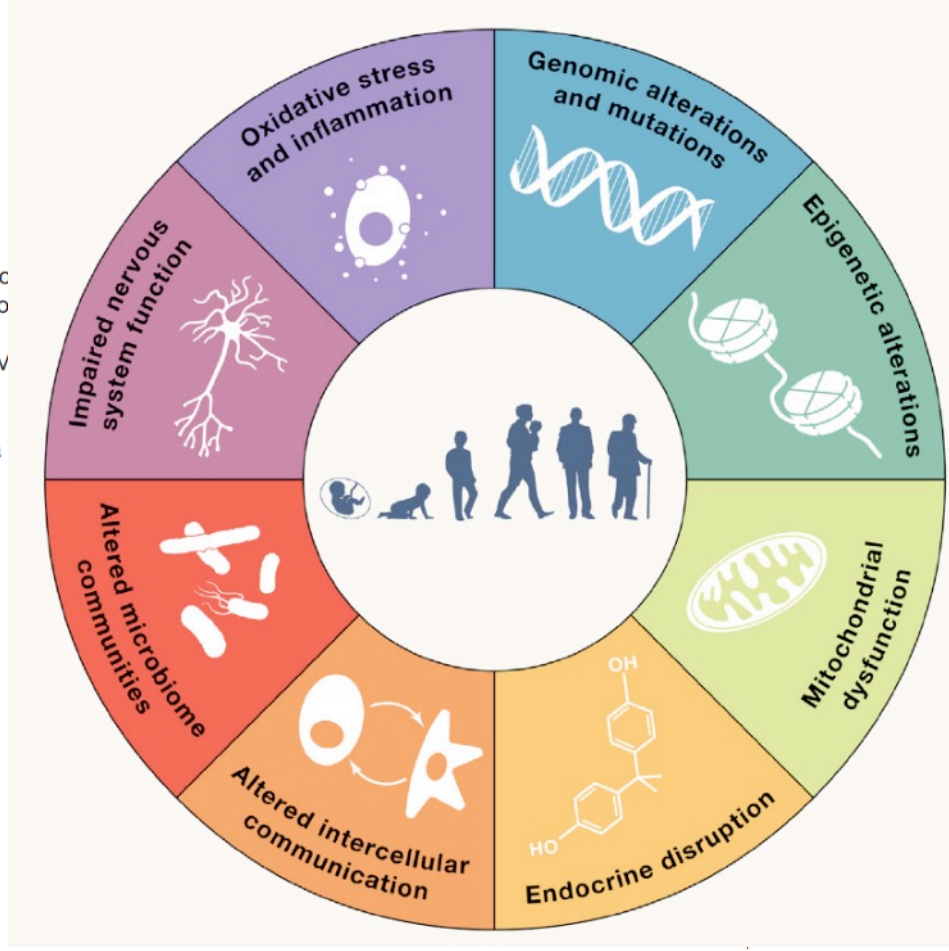
Cell
Leading Edge

Review

Hallmarks of environmental insults

Annette Peters,[1,2,3,*] Tim S. Nawrot,[4,5] and Andrea A. Baccarelli[6]
[1]Institute of Epidemiology, Helmholtz Zentrum München, German Research Center for Enviro
[2]Chair of Epidemiology, Institute for Medical Information Processing, Biometry and Epidemio
Ludwig-Maximilians-Universität München, 81377 Munich, Germany
[3]Department of Environmental Health, Harvard T.H. Chan School of Public Health, Boston, M
[4]Centre for Environmental Sciences, Hasselt University, Hasselt, Belgium
[5]Environment & Health Unit, Leuven University, Leuven, Belgium
[6]Department of Environmental Health Sciences, Mailman School of Public Health, Columbia
*Correspondence: peters@helmholtz-muenchen.de
https://doi.org/10.1016/j.cell.2021.01.043

CellPress



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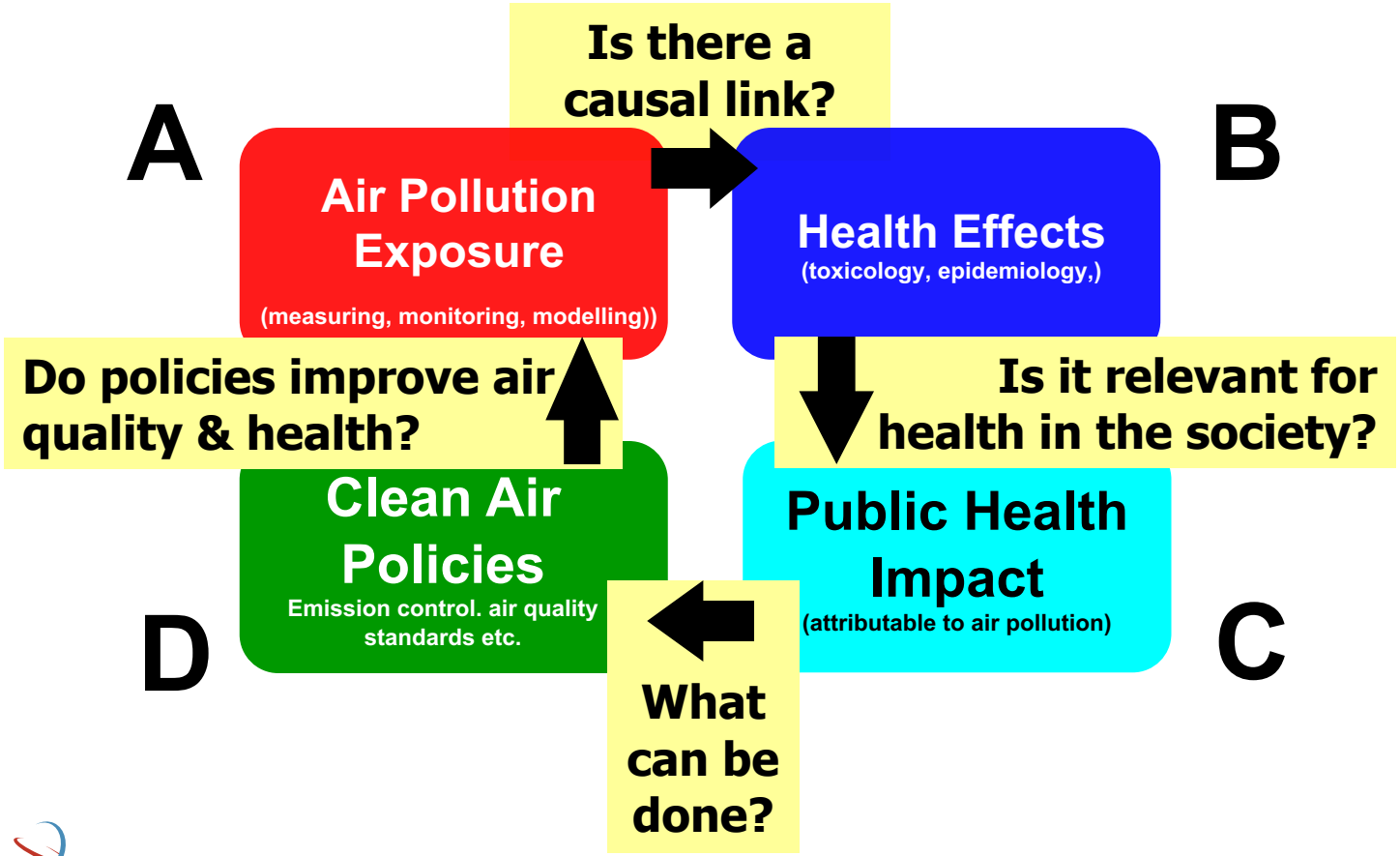
key questions of the Evidence Based Public Health Cycle (example of ambient air pollution)



Environmental factors: leading global killers

Landrigan et al / GBD , Lancet 2017

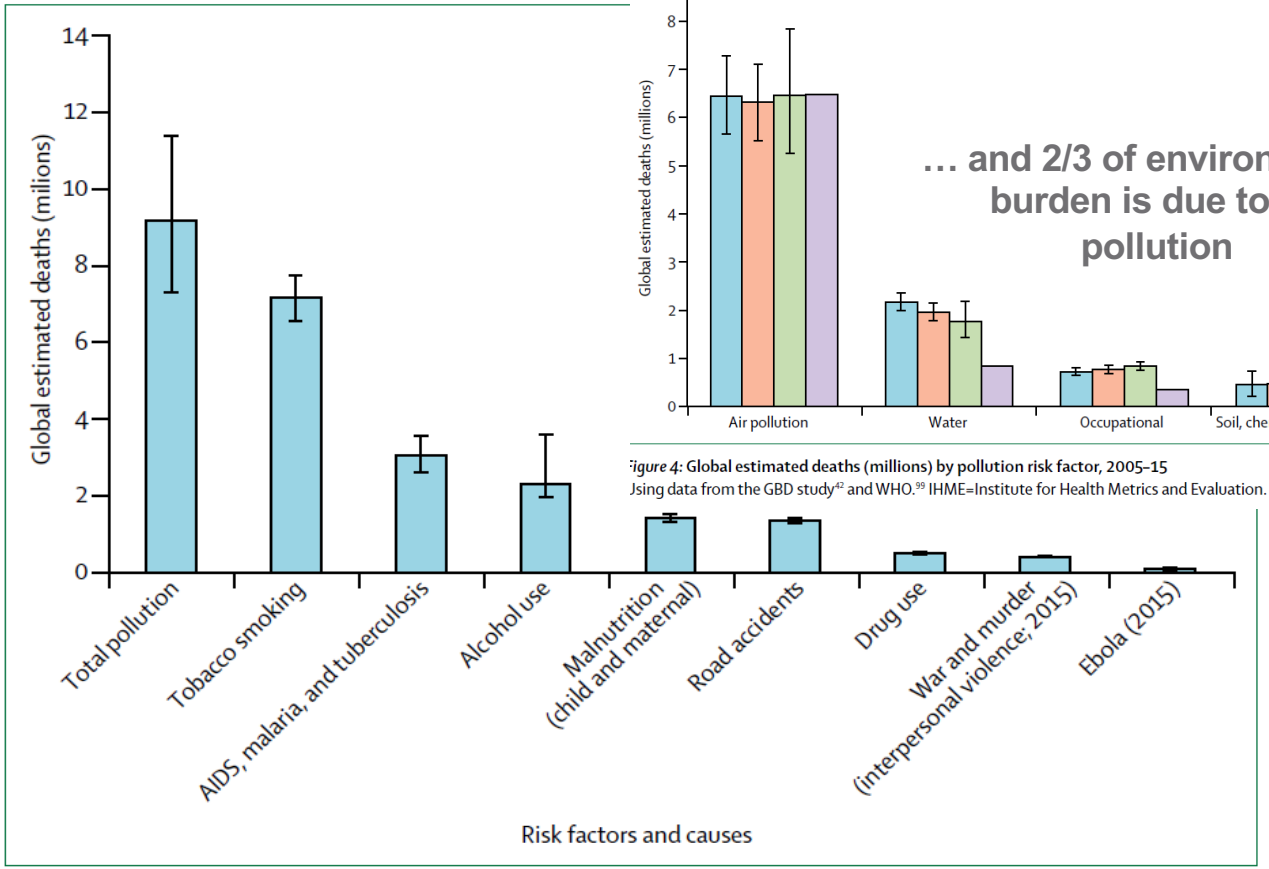
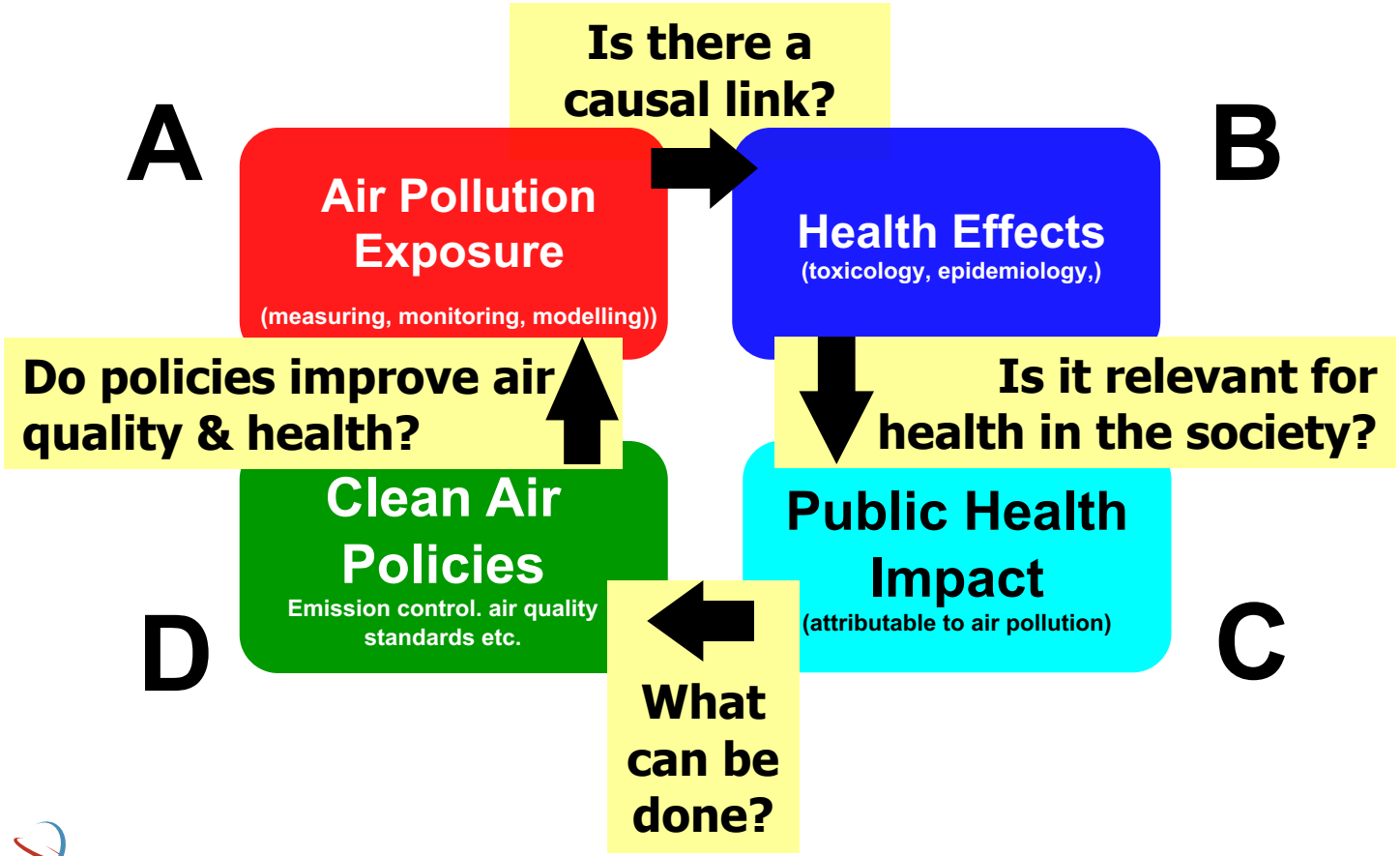


Figure 4: **Global estimated deaths (millions) by pollution risk factor, 2005–15**
Using data from the GBD study[42] and WHO.[99] IHME=Institute for Health Metrics and Evaluation.

Figure 5: **Global estimated deaths by major risk factor and cause, 2015**
Using data from the GBD Study, 2016.[41]

key questions of the Evidence Based Public Health Cycle (example of ambient air pollution)



HOW to keep air clean?

- Legal framework (“Clean Air Act”)
- Stringent EMISSION standards (clean combustion)
- Science based Ambient AIR QUALITY standards
- Design, plan, adopt, enforce and monitor clean air MANAGEMENT PLANS (tailored to local needs)

New (Sept 2021) WHO Air Quality Guideline values

Pollutant	Averaging time	2005 AQGs	2021 AQG level
$PM_{2.5}$, $\mu g/m^3$	Annual	10	5
	24-hour[a]	25	15
PM_{10}, $\mu g/m^3$	Annual	20	15
	24-hour[a]	50	45
O_3, $\mu g/m^3$	Peak season[b]	–	60
	8-hour[a]	100	100
NO_2, $\mu g/m^3$	Annual	40	10
	24-hour[a]	–	25
SO_2, $\mu g/m^3$	24-hour[a]	20	40
CO, mg/m^3	24-hour[a]	–	4

µg = microgram

MONITOR ambient air quality standards

1. **Follow the link**
2. **Choose your «Favorit city» → what is the current air pollution index?**
3. **Write in the chat, CITY and VALUE**

PS: Zurich Central today, 12:00h, was 27

https://waqi.info/

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https://pollev.com/ninok675

When poll is active, respond at **pollev.com/ninok675**

Text **NINOK675** to **22333** once to join

During the past 30 years: how did ambient air quality change in the cities around the globe? It got:

A) much worse almost everywhere

B) much better almost everywhere

C) much better in Western countries and much worse in Asia and Africa

Start the presentation to see live content. For screen share software, share the entire screen. Get help at **pollev.com/app**

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QUIZ QUESTION

During the past 30 years: how did ambient air quality change in the cities around the globe? It got:

A) much worse almost everywhere
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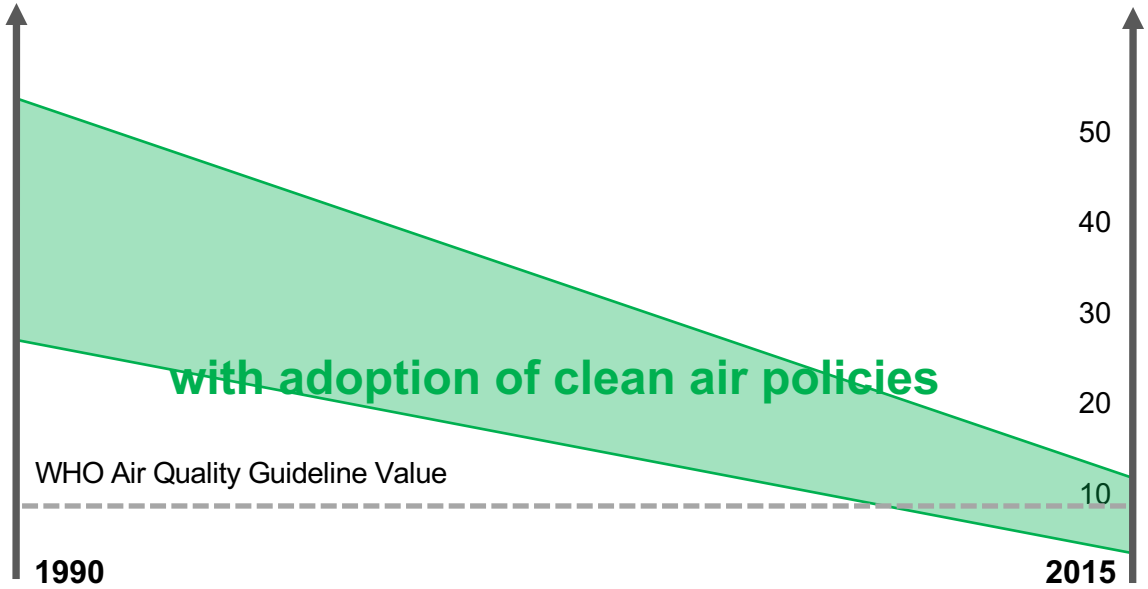
C) much better in Western countries and much worse in Asia and Africa

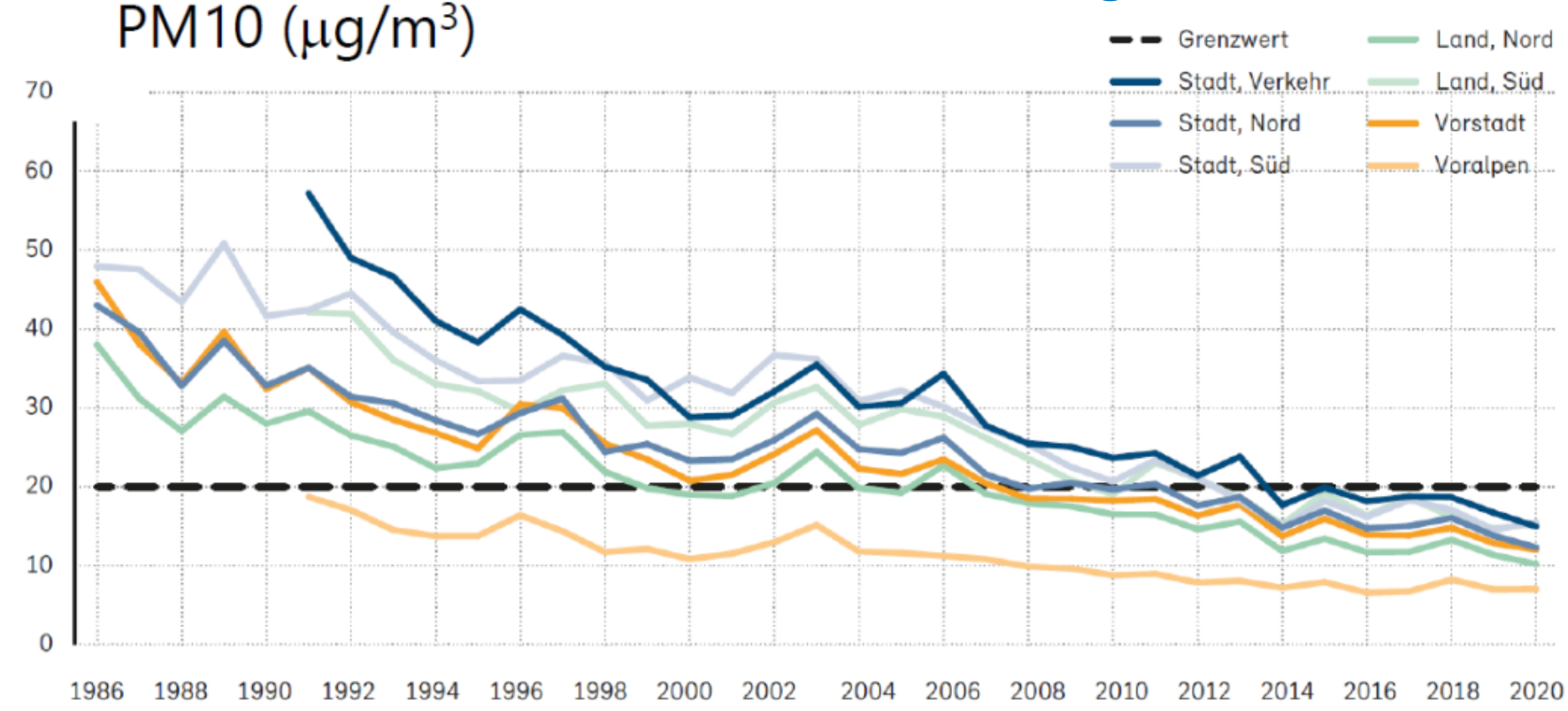
Trends in annual $PM_{2.5}$ concentrations 1990 – 2015
(for country trends: see Brauer et al ES&T2016)



Int J Pub Health, 2017 (open access)


DAVOS

Trends in particulate matter concentrations 1986 – 2020 at the Swiss federal monitoring stations



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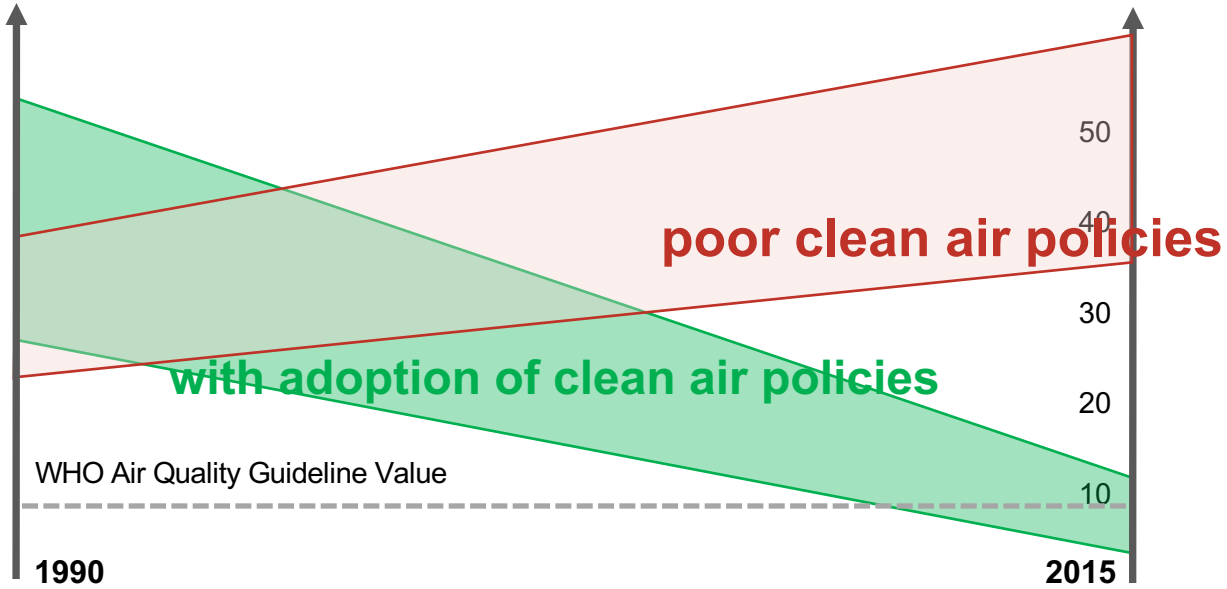

OUTLOOK

Globalization of

- Emission standards
- Ambient Air Quality Standards

Policies lag far behind science due to inaction of policy makers

% of countries with standards for at least ONE Pollutant	See web site
European Region	94%
South-East Asia	64%
Region of Americas	57%
Eastern Mediterranean Region	52%
Western Pacific	44%
African Region	36%
Total	**60%**

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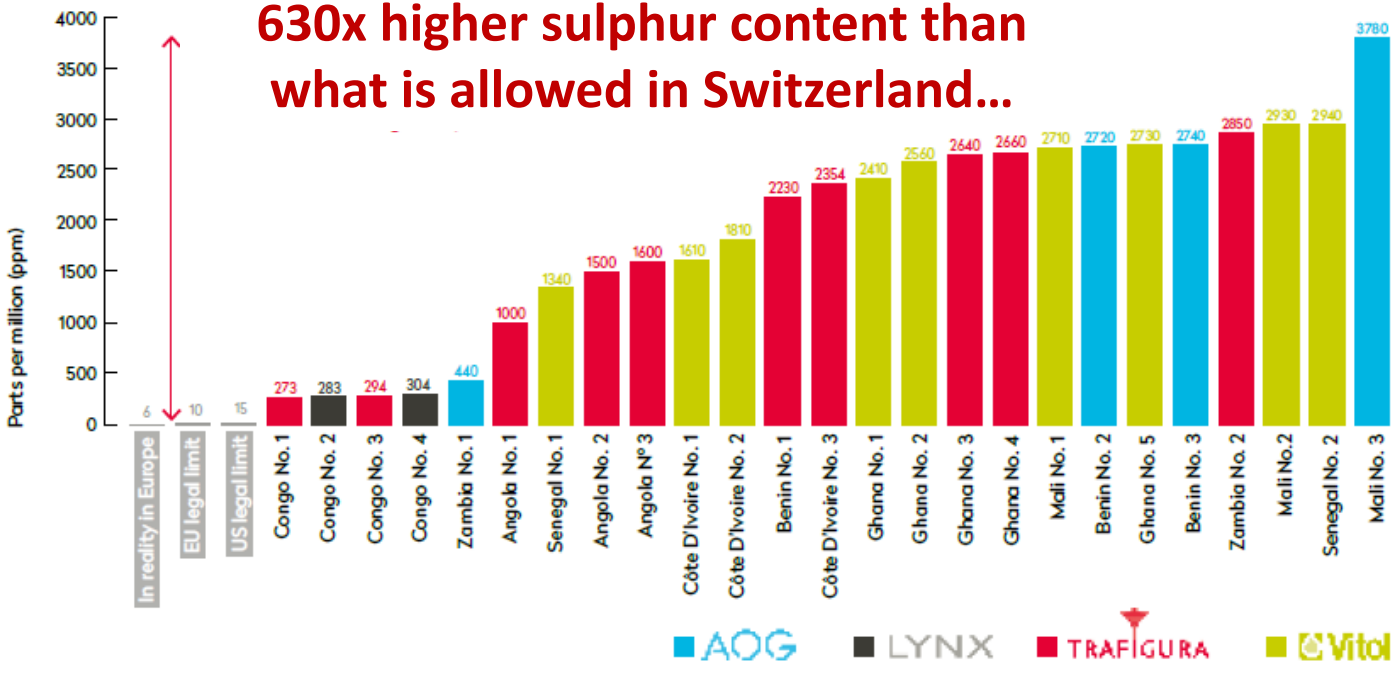
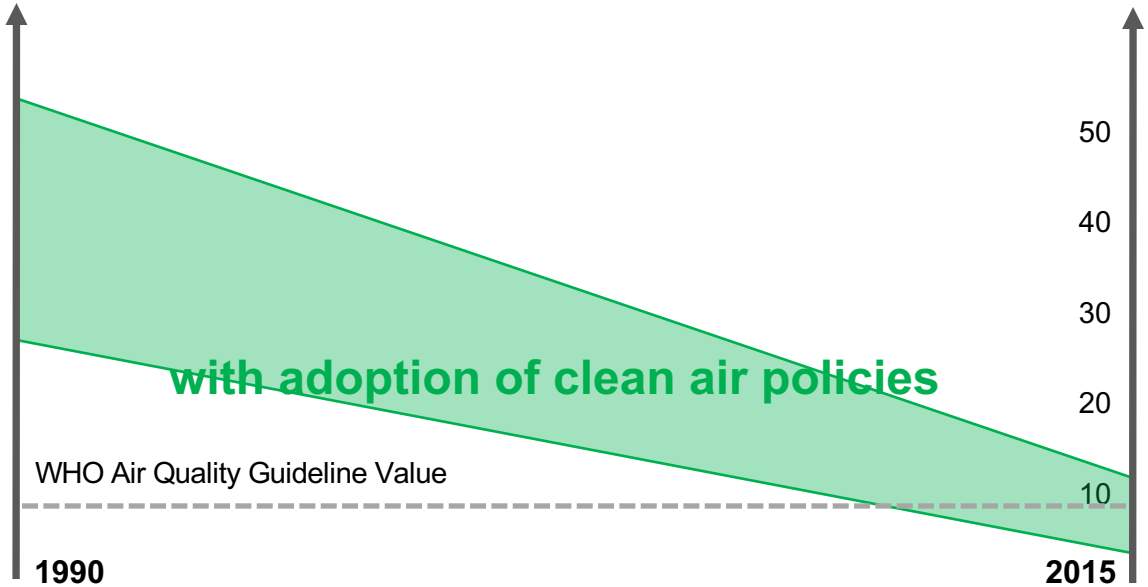
Kutlar et al, IJPH 2017

Sulphur levels as measured in «African Quality» diesel samples (ppm)
(See «Dirty Diesel» by the NGO «PublicEye»

Swiss traders sell diesel with up to 630x higher sulphur content than what is allowed in Switzerland…



Public health calls for globalized TRENDS of IMPROVING AIR QUALITY!



QUESTIONS?

Int J Pub Health, 2017 (open access)

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Thank you

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