

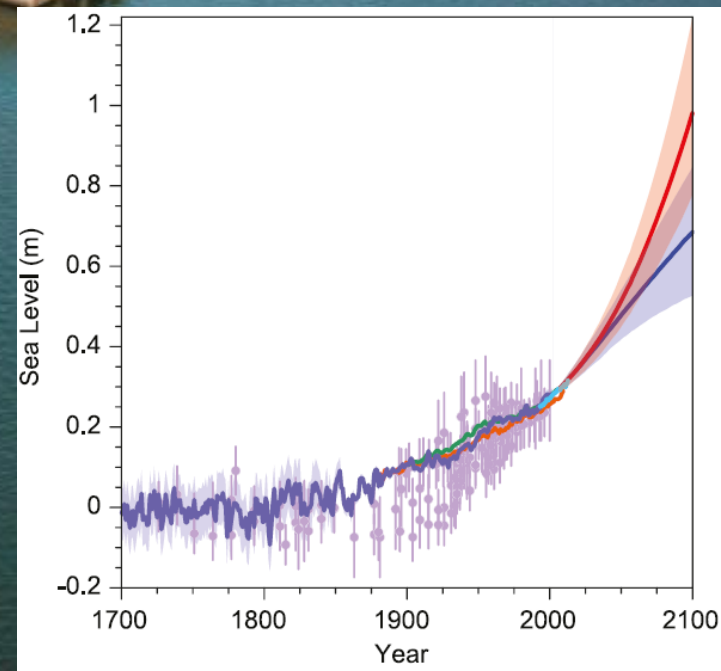
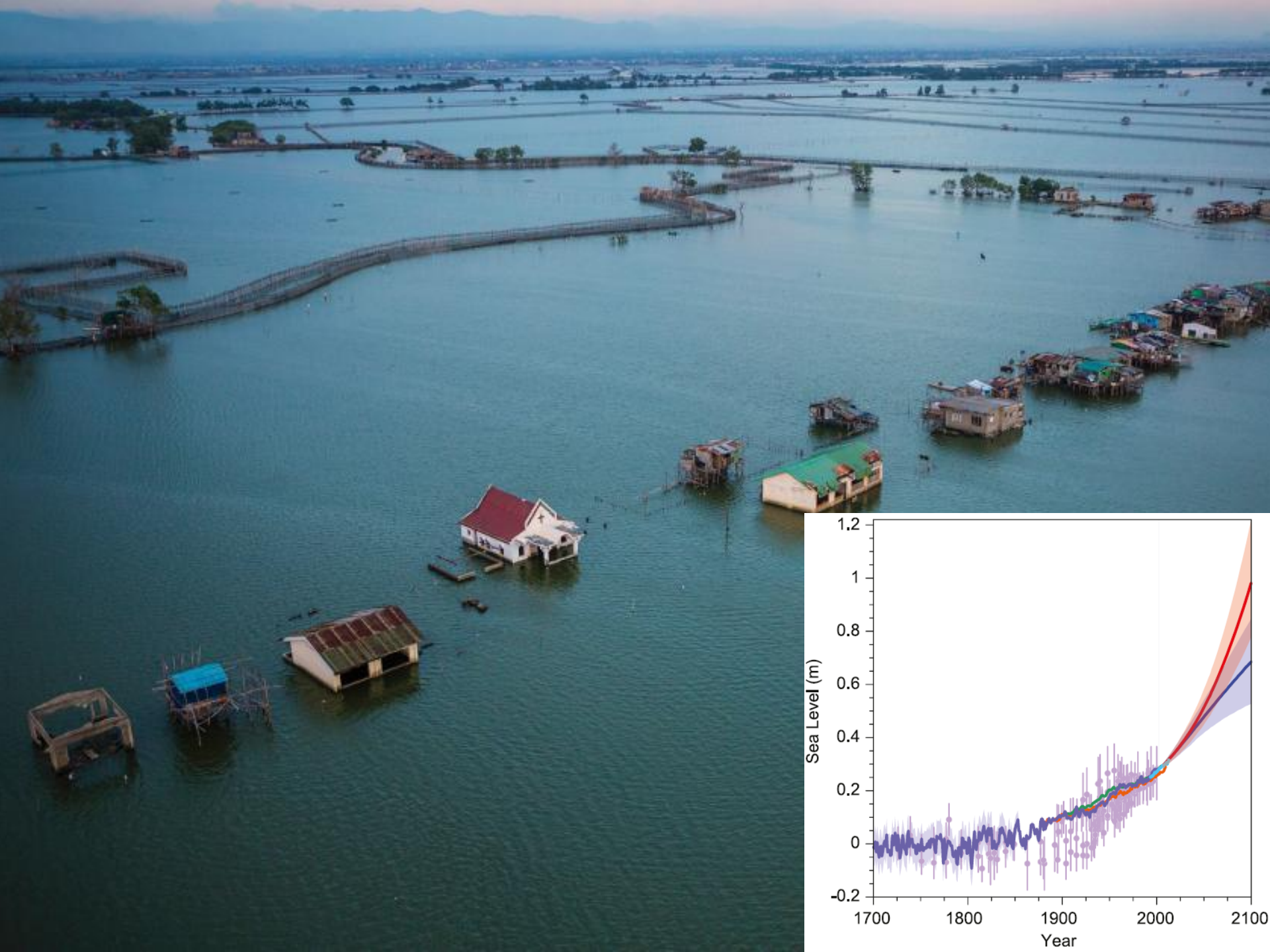
Environment and Cancer

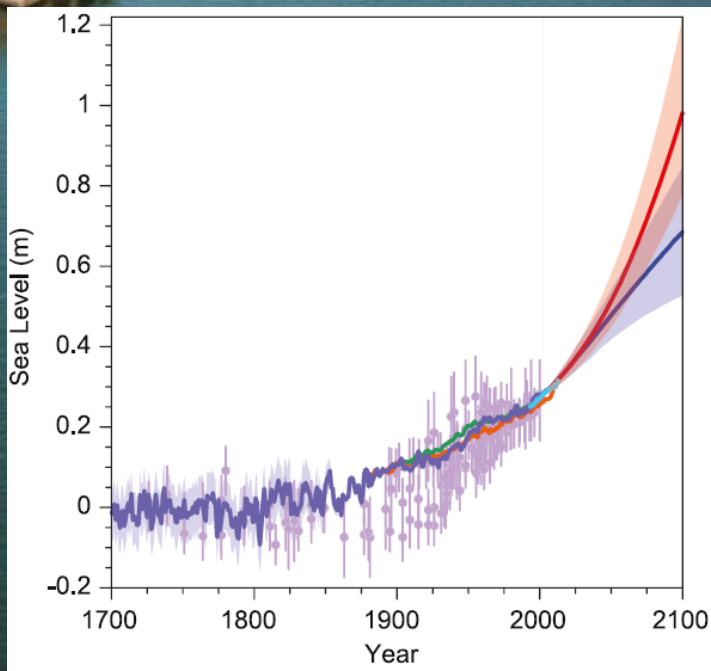
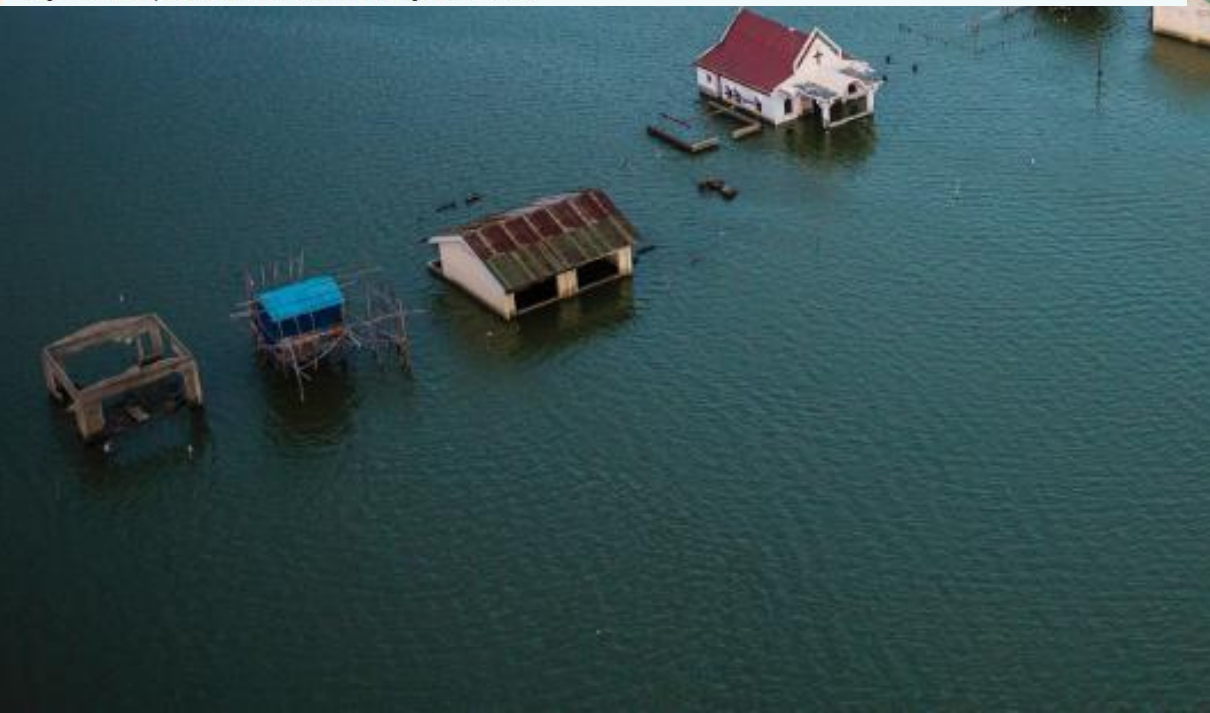
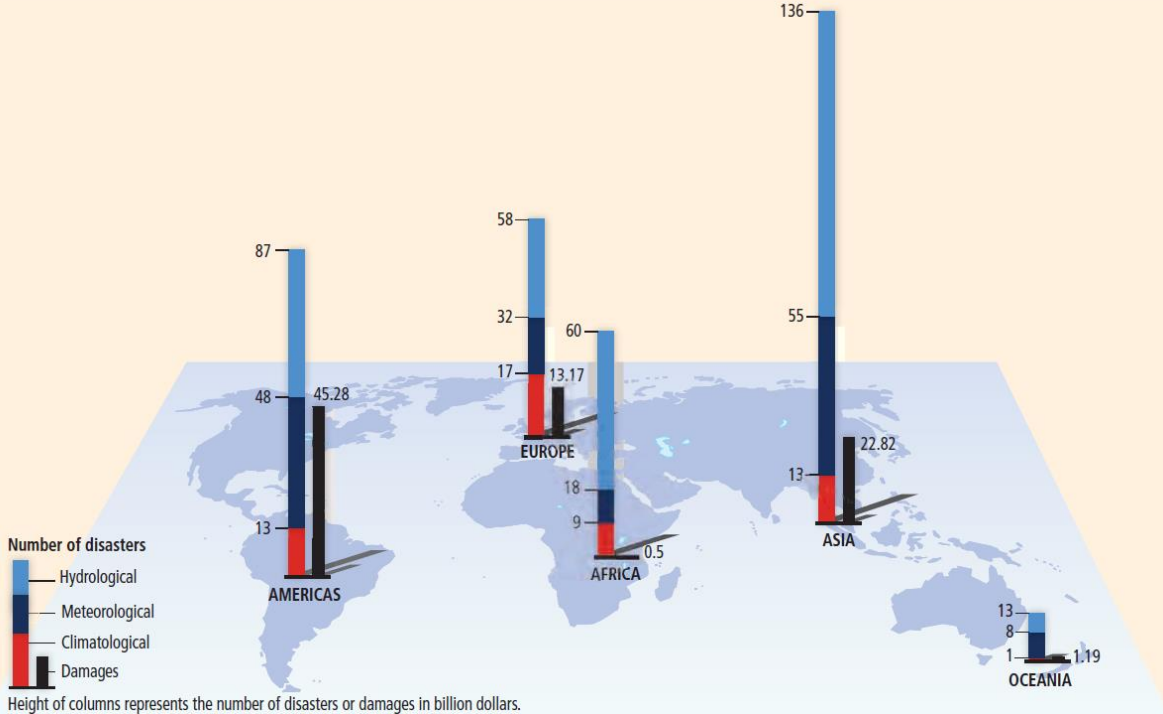
Manolis Kogevinas

Professor, co-Director, Centre for Research in Environmental Epidemiology (CREAL), Barcelona









Impact of Climate Change on Human Health



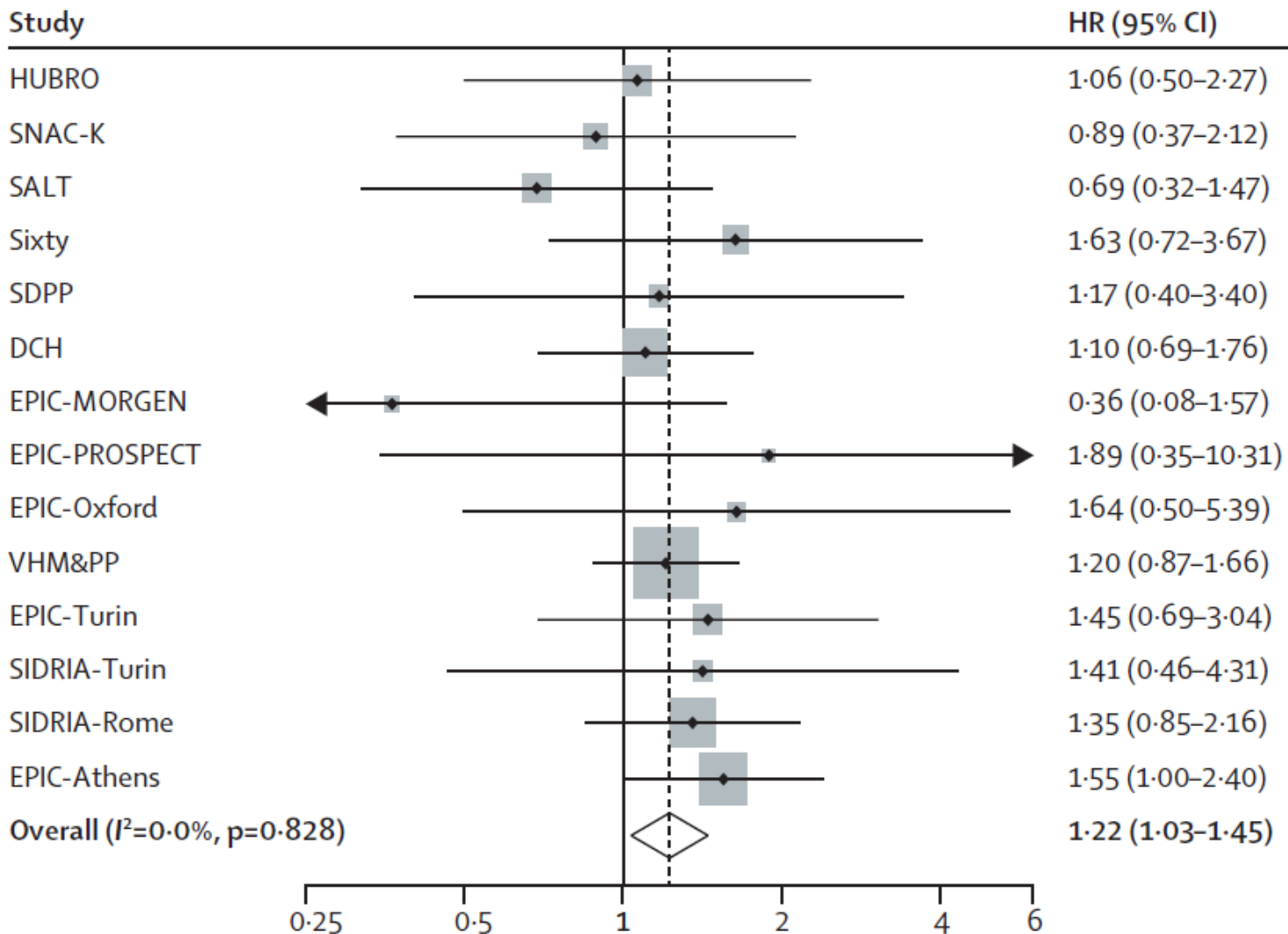
Environmental Causes of Cancer

- Outdoor Air-pollution
- Indoor air-pollution
- Second-hand smoke
- Drinking water contaminants, e.g. arsenic, *DBPs*
- Radiation, ionizing and UV
- Persistent Organic Pollutants, e.g. dioxins
- Fibres , e.g. asbestos, erionite
- *Endocrine disruption*
- *New exposures (non-ionizing radiation, light pollution etc)*

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Risk for lung cancer and air pollution (per 10 $\mu\text{g}/\text{m}^3$ PM_{10} concentration). European ESCAPE study

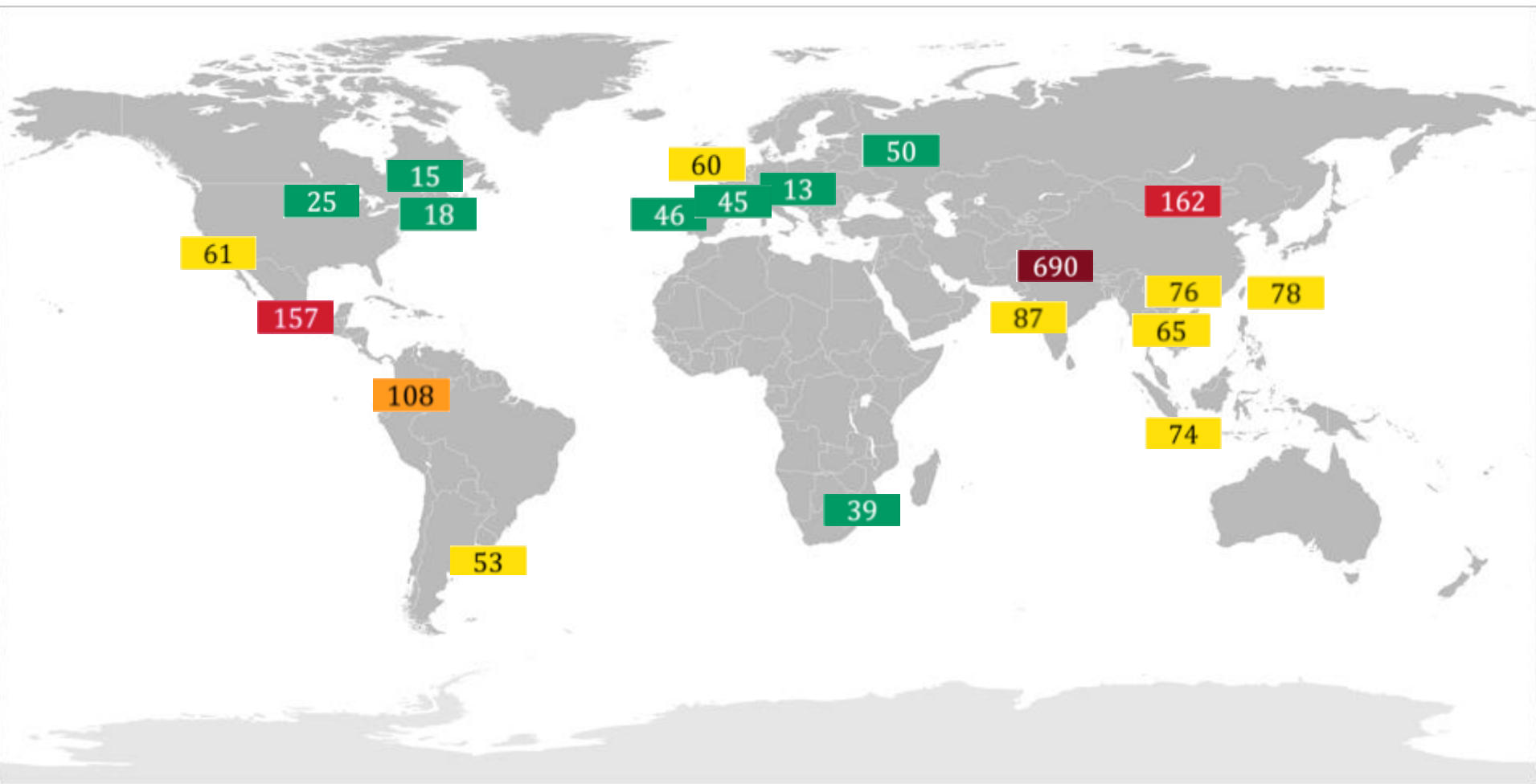


Delhi



Credit: Jonathan M. Samet and Cristina O'Callaghan

PM_{2.5} Levels From a 24-hr Continuous Average: Air Pollution Global Tour, April 19, 2016 PST



Conclusions

- Widespread exposures with no evident threshold
- Exposure prevention in high income countries

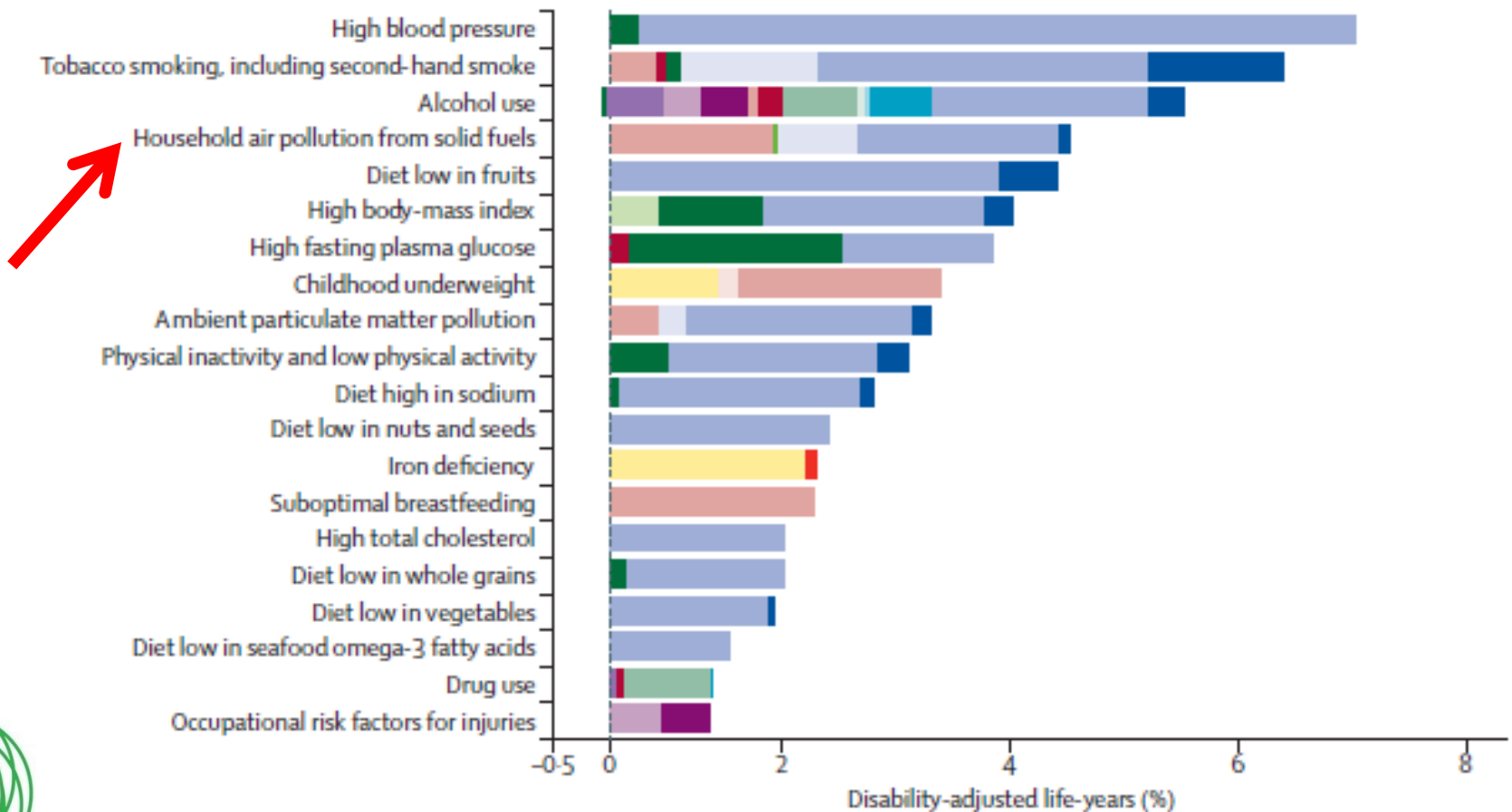


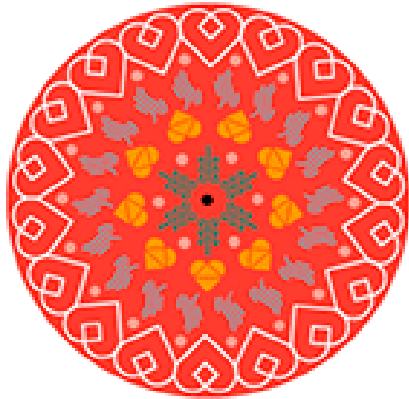
Household air-pollution from biomass

Peruvian Amazon



Indoor air-pollution from solid fuels (Group1 carcinogen for coal) is one of the main environmental exposures associated with lung cancer and other health effects (Global Burden of Disease, Lim, Lancet 2012)

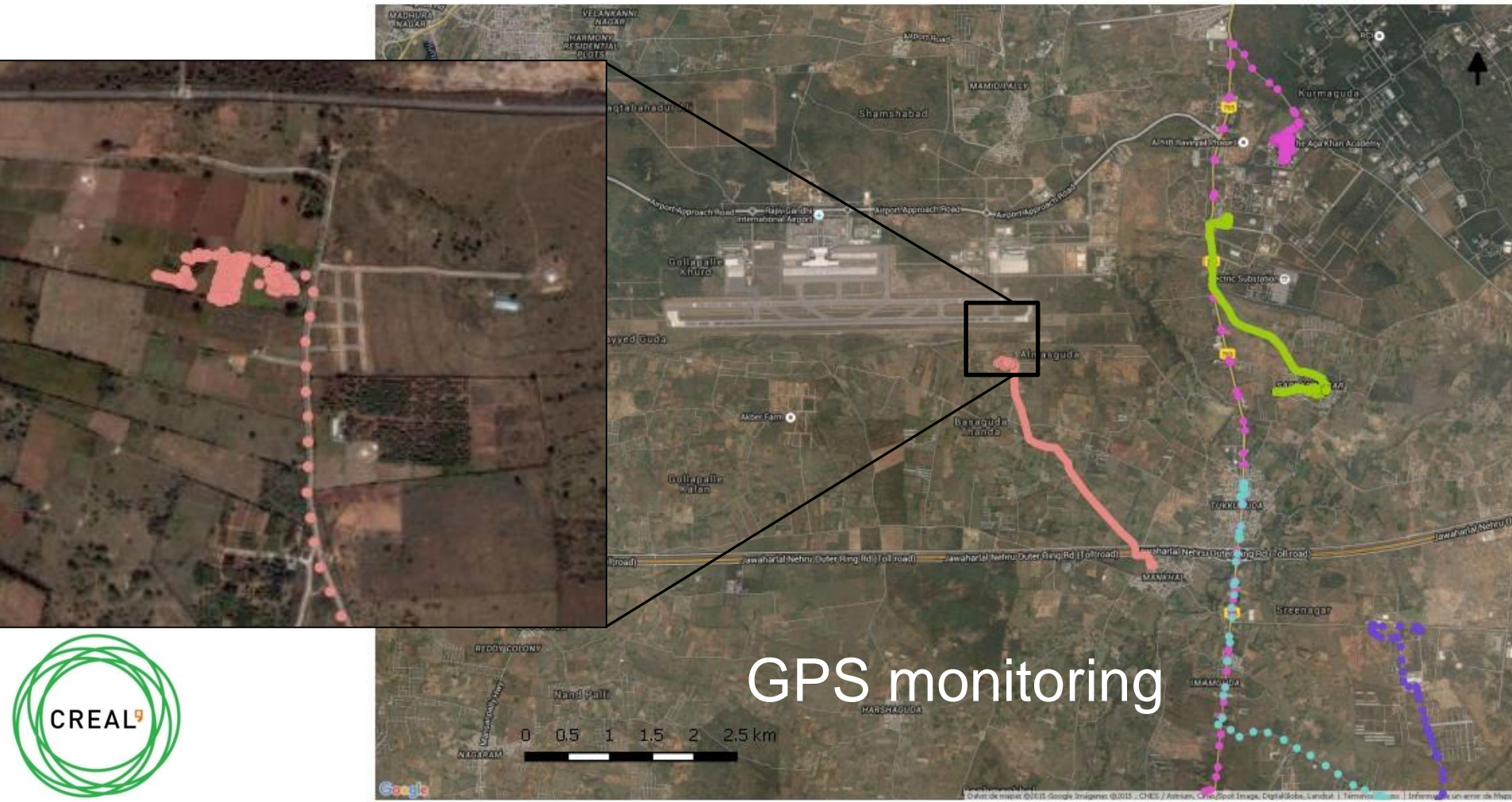




CHAI

Cardiovascular Health effects
of Air pollution in Telangana, India

Cathryn Tonne, CREAL

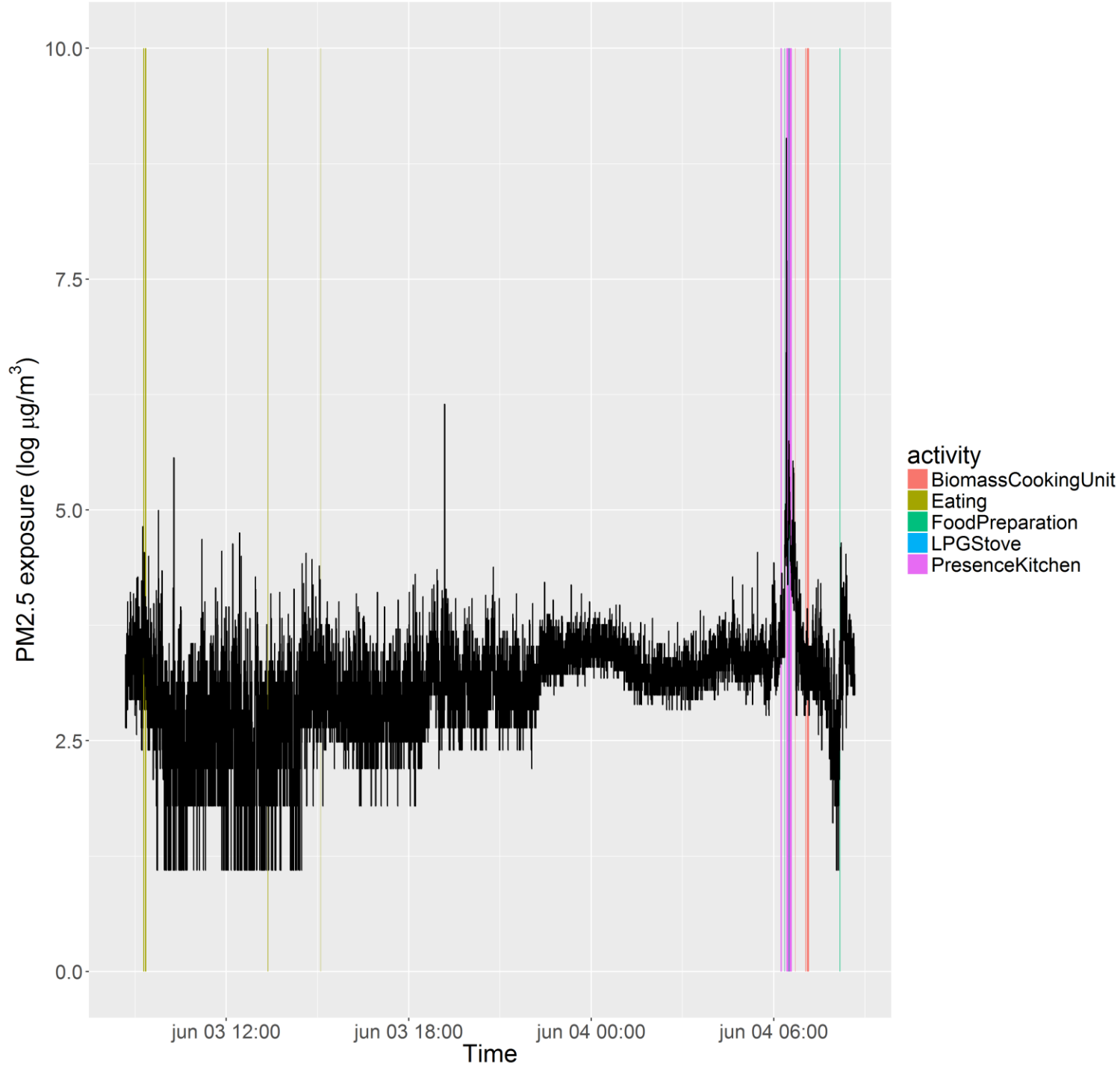




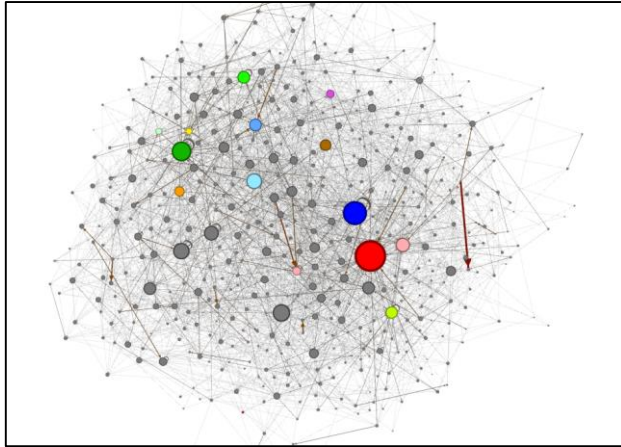
Personal monitoring



Ambient monitoring



“Modern” Epidemiology



C. F. Chubb, Ltd., Southampton S.W. London.

SCALE 30 INCHES TO A MILE.

(Slide from Perry Hystad, Oregon State University)

Conclusions

- Widespread exposures with no evident threshold
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- Rapid technological developments improve exposure assessment



Arsenic in drinking water



(Photo from IARC Monograph 2004)



Art exhibition, Dhaka, Bangladesh

Exposure to arsenic and cancer mortality.

Cohort study in rural Bangladesh

Cause of Death and Average Arsenic Exposure ($\mu\text{g/L}$)	No. Deaths	HR (95% CI)
Cancer deaths		
<10 ^b	55	1.00
10–49	71	1.10 (0.77–1.59)
50–149	229	1.44 (1.06–1.95)
150–299	181	1.75 (1.28–2.40)
300+	53	1.56 (1.06–2.30)
Test for trend	$P = 0.007$	



Bladder cancer risk according to lifetime arsenic exposure, Maine, New Hampshire and Vermont, 2001–2004 (lagged 40 years)

Arsenic exposure	Case patients	Control subjects	OR (95% CI)
Average arsenic concentration, $\mu\text{g/L}^\dagger$			
≤ 0.4	280	314	1.00 (Referent)
$>0.4\text{--}0.7$	260	309	0.91 (0.71 to 1.17)
$>0.7\text{--}1.6$	233	304	0.93 (0.72 to 1.20)
$>1.6\text{--}5.7$	220	248	1.06 (0.81 to 1.40)
$>5.7\text{--}8.7$	26	33	0.92 (0.51 to 1.66)
>8.7	37	29	1.49 (0.85 to 2.61)
			$P_{\text{trend}}^\ddagger = .16$



(Baris, JNCI 2016)

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- Widespread exposures with no evident threshold
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- Rapid technological developments improve exposure assessment
- Difficulties in the evaluation of widespread low level exposures (note that “low” is a relative concept)





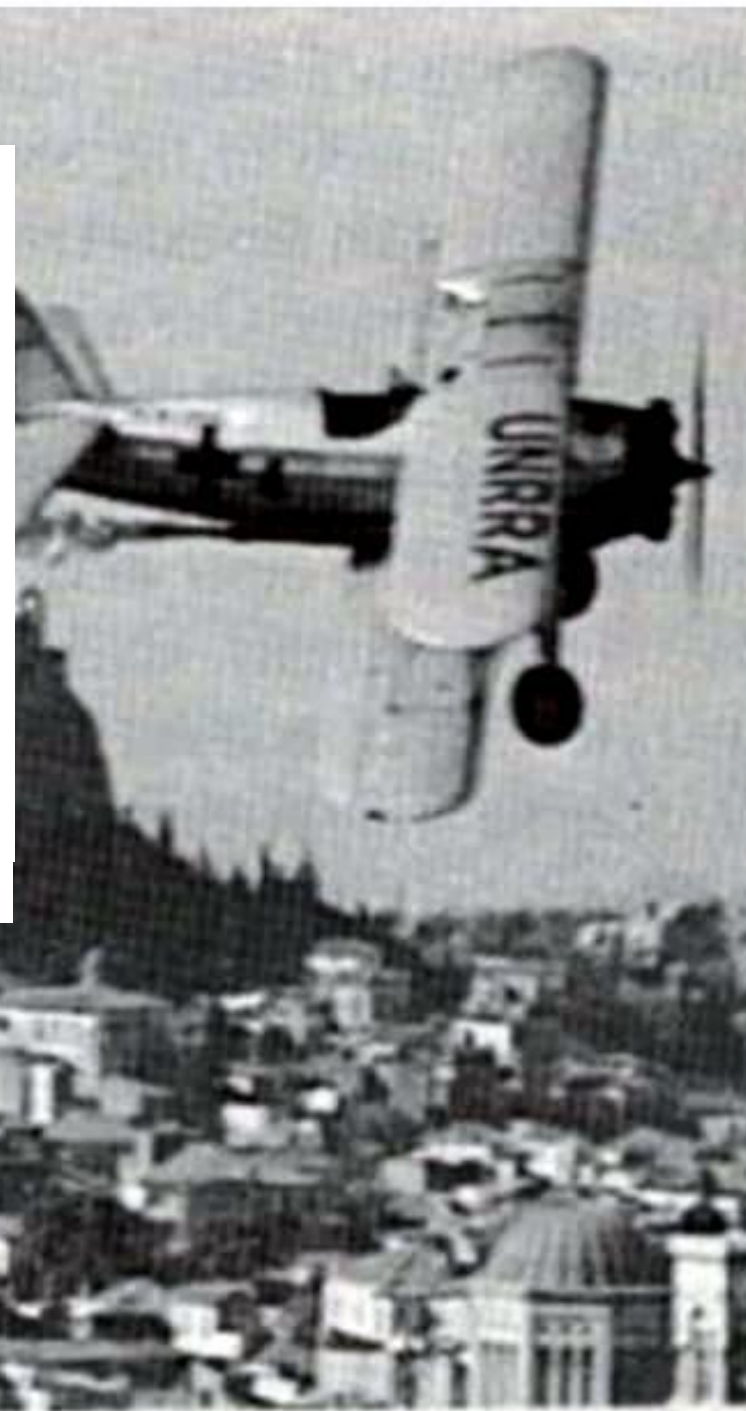
Spraying it about — in 1946, whole districts of Athens were sprayed with DDT from low-flying aircraft in attempts to halt the spread of a cholera epidemic by flies.

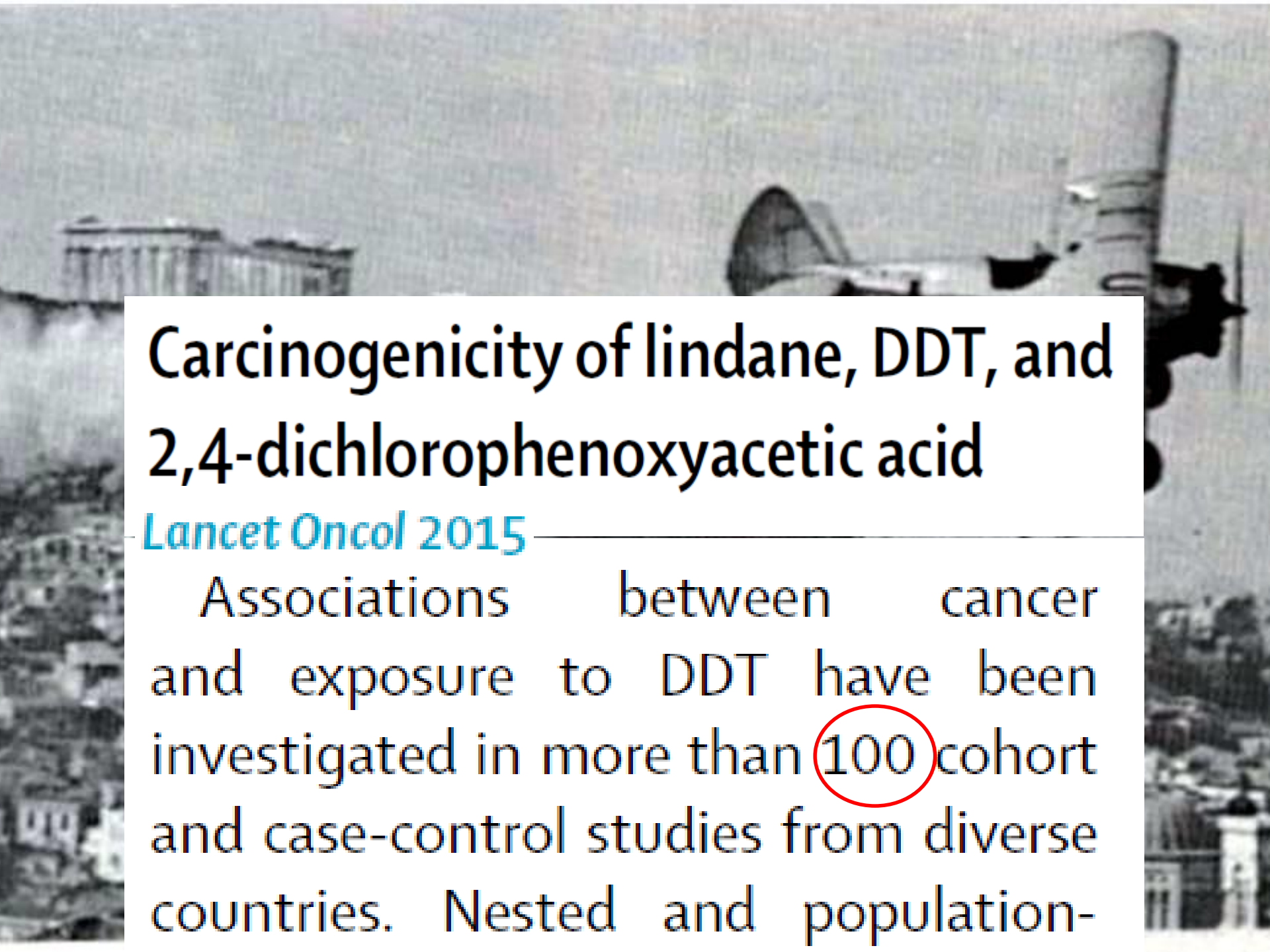
NATURE 1995; 375: 538-9.

Blood Levels of Organochlorine Residues and Risk of Breast Cancer

*Mary S. Wolff, Paolo G.
Toniolo, Eric W. Lee, Marilyn
Rivera, Neil Dubin**

JNCI 1993





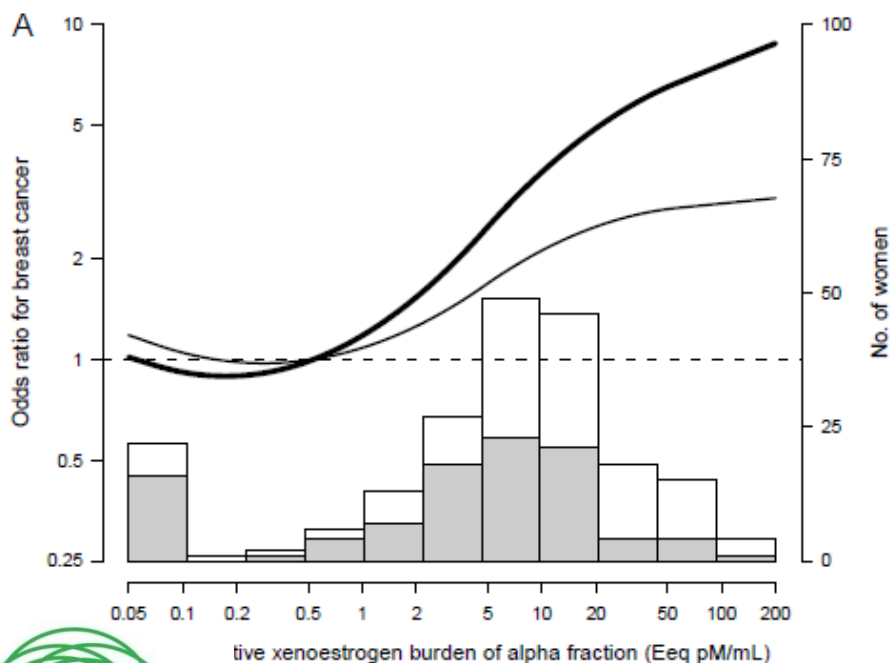
Carcinogenicity of lindane, DDT, and 2,4-dichlorophenoxyacetic acid

[Lancet Oncol 2015](#)

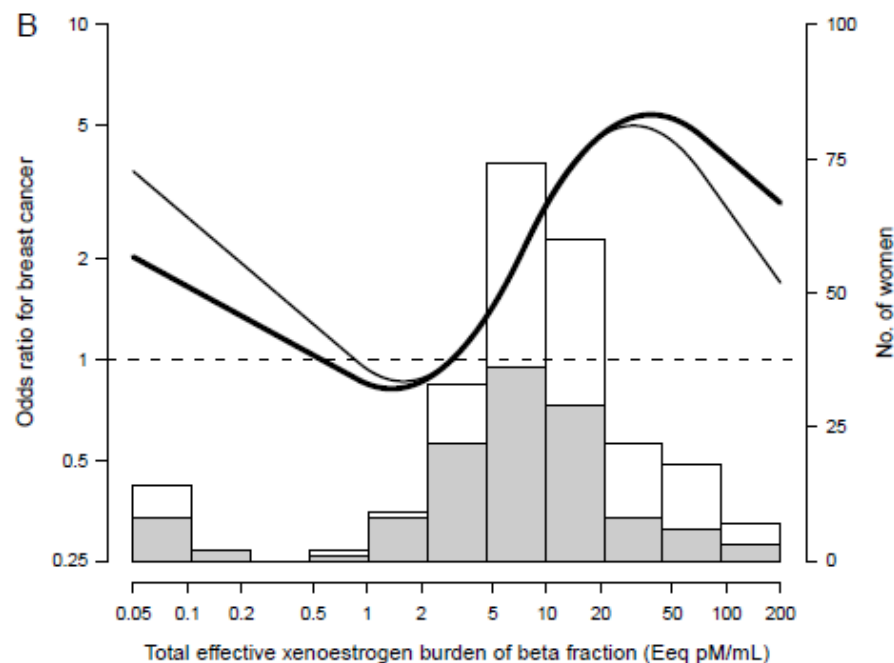
Associations between cancer and exposure to DDT have been investigated in more than 100 cohort and case-control studies from diverse countries. Nested and population-

MCC-Spain. Breast cancer and endocrine disruption (TEXB assay measuring serum levels of total effective xenoestrogen burden)

Alpha fraction- xenoestrogens organohalogenated



Beta fraction- mainly endogenous and polar xenoestrogens

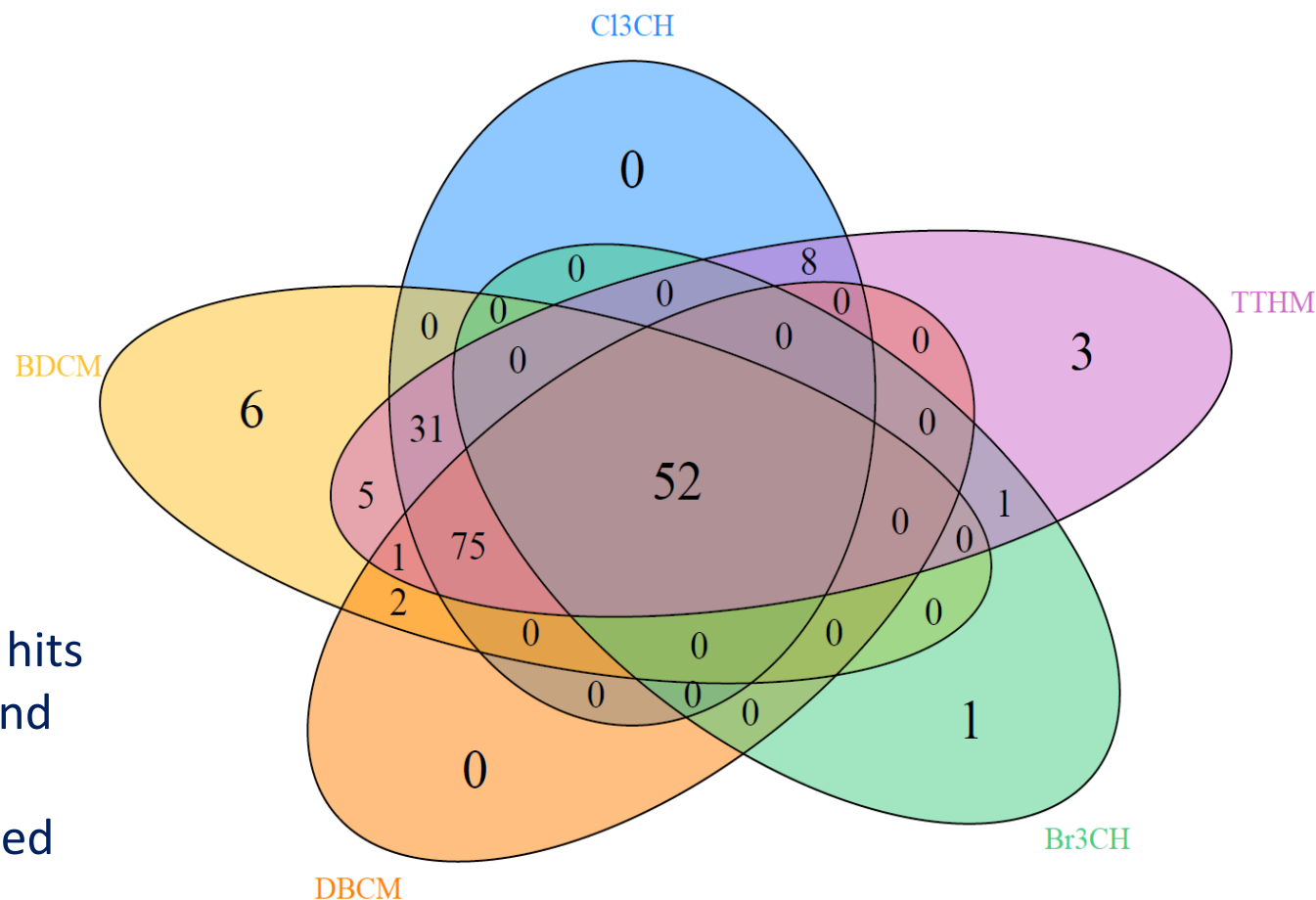


Conclusions

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- Rapid technological developments improve exposure assessment
- Difficulties in the evaluation of widespread low level exposures (note that “low” is a relative concept)
- Serious difficulties in the evaluation of mixtures



EXPOSOMICS project. The impact of short term exposure to water disinfection by-products on the metabolome – a metabolome-wide association study
(Karin van Veldhoven, *this conference*)



Venn diagram of
Bonferroni significant hits
by exposure, before and
after swimming 40
minutes in a chlorinated
pool

Conclusions

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- Difficulties in the evaluation of widespread low level exposures (note that “low” is a relative concept)
- Serious difficulties in the evaluation of mixtures
- Rapid developments in biotechnology provide new evidence on mechanisms in population studies



Global consumption of fossil fuels

- 50% of the energy is consumed by the richest billion population
- 25% from the second billion
- 12.5% from the third billion



Global consumption of fossil fuels

- 50% of the energy is consumed by the richest billion population
- 25% from the second billion
- 12.5% from the third billion
- More than half of the total world's population consumes slightly more than 10%



**Gas pumps are dangerous for
your health**



thank you

