

The importance of children's environmental health in international perspective

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Different perspectives

I, as child

I, as scientist

I, as policy maker

Children as environmental refugees

I, as child



My parents' exposure

DES

Di-ethylstilbestrol

Des son

Effects



"Really?"

Yes...
des-plex[®]
to prevent ABORTION, MISCARRIAGE and
PREMATURE LABOR

recommended for routine prophylaxis
in ALL pregnancies . . .

54 per cent live delivery with des-plex
in one series of 1000 patients*—
= bigger and stronger babies, too.†

No gastric or other side effects with des-plex
= in either high or low dosage.††

My parents' exposure to air pollution



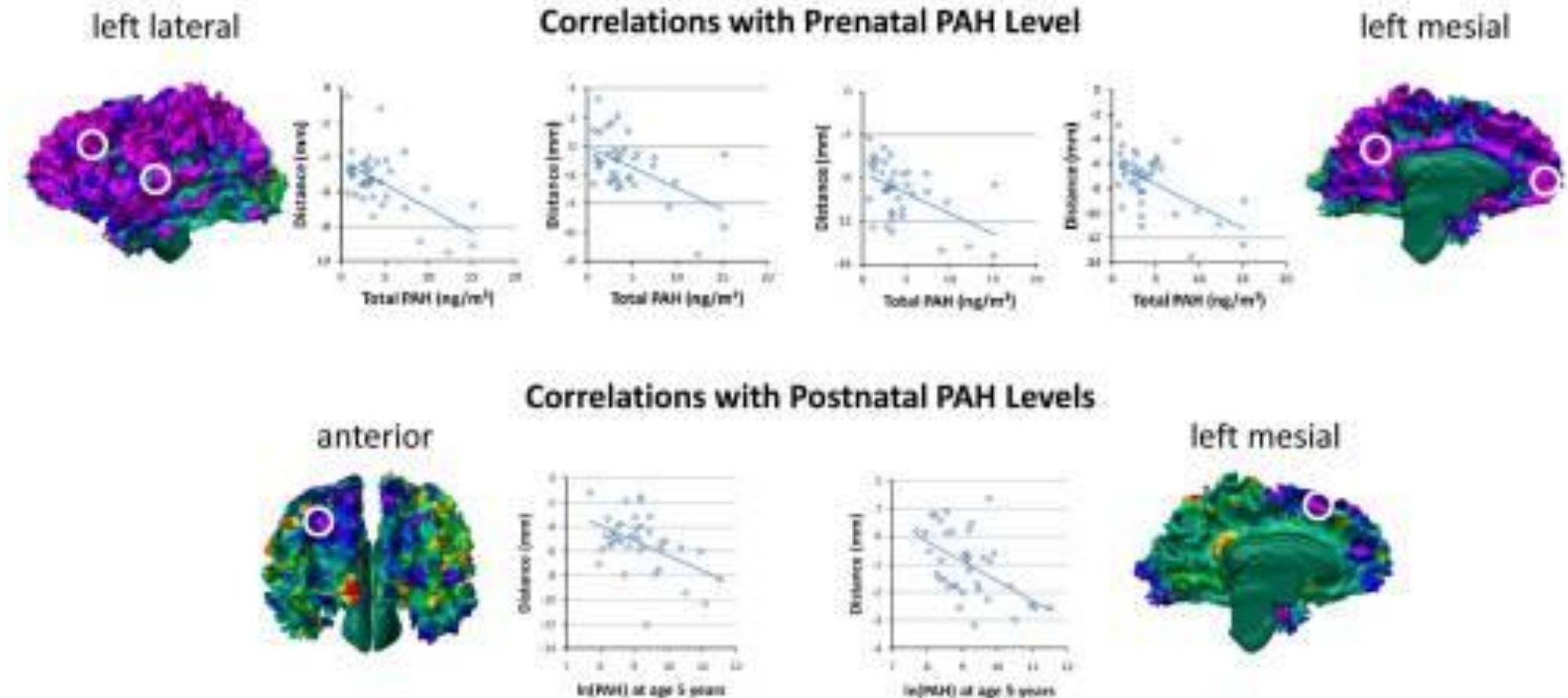
My parents' exposure

Air pollution

Pre- or postnatal exposure to ambient pollution, particularly polycyclic aromatic hydrocarbons, PM_{2.5}, and nitrogen oxides has a negative impact on the **neuropsychological development** of children.

Children exposed to traffic-related air pollutants during pregnancy or infancy, when the brain neocortex rapidly develops, show cognitive delays.

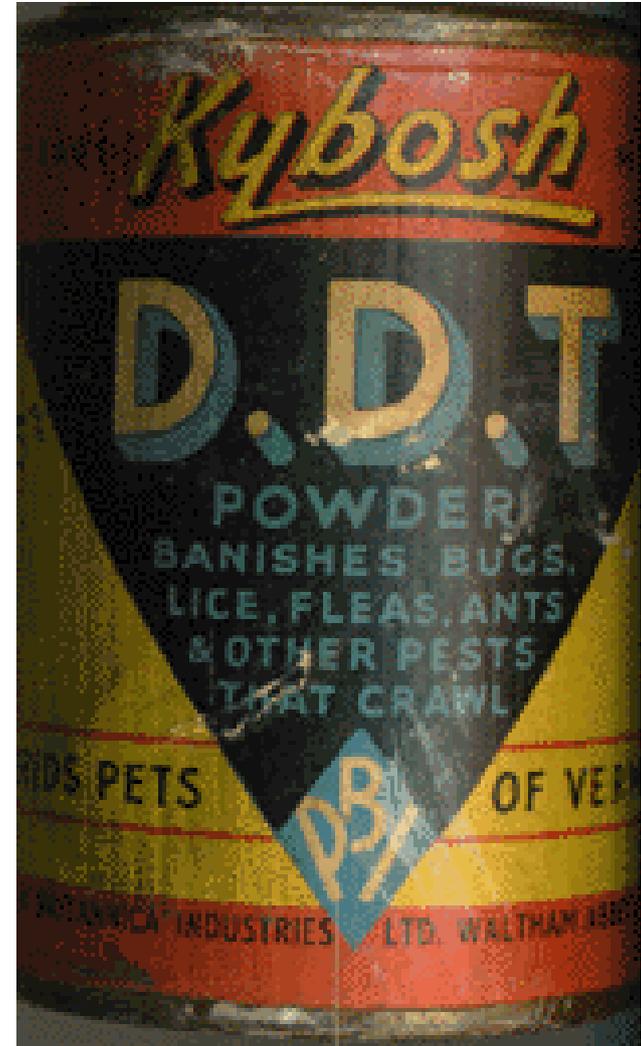
Exposure to PAH air pollutants contributes to slower processing speed, attention-deficit/hyperactivity disorder symptoms



Peterson BS. *JAMA Psychiatry*. 2015 Jun;72(6):531-40. Effects of prenatal exposure to air pollutants (polycyclic aromatic hydrocarbons) on the development of brain white matter, cognition, and behavior in later childhood.

My parents' exposure

DDT







Bundesarchiv, Bild 183-20820-0001
Foto: Krueger | 15. August 1953

DDT

Global use of the endocrine-disrupting chemical
DDT has decreased

Continued human exposure

Accumulating evidence suggests that DDT
exposure has long-term adverse effects on
development

(yet the impact on growth and
differentiation of adult stem
cells remains unclear)





DDT effects

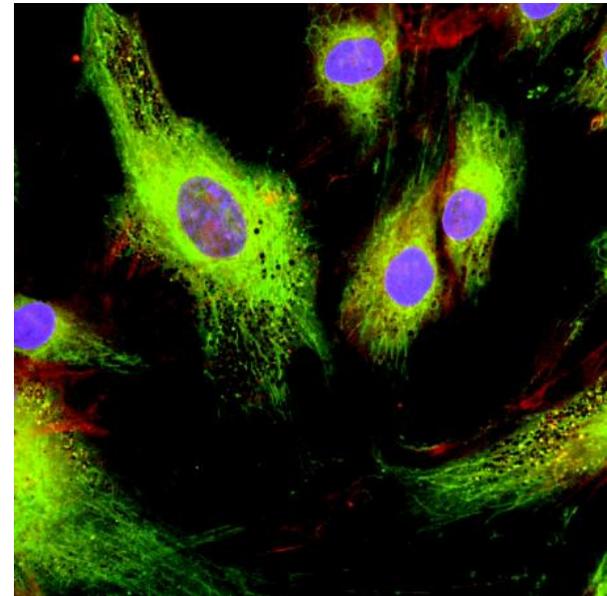
Maternal o,p-DDT predicted daughters' breast cancer (odds ratio fourth quartile vs first 3.7, 95% confidence interval 1.5–9.0).

Conclusions: prospective human study links measured DDT exposure in utero to risk of breast cancer.

Findings support classification of DDT as an endocrine disruptor, a predictor of breast cancer, and a marker of high risk.

Human **Mesenchymal stem cells** provide a powerful biological system to investigate and identify the molecular mechanisms underlying the effects of environmental agents on stem cells and human health.

MSCs exposed to DDT demonstrated profound alterations in self-renewal, proliferation, differentiation, and gene expression, which may partially explain the homeostatic imbalance and increased cancer incidence among those exposed to long-term EDCs.



Transgenerational

Publications showing developmental exposures to environmental chemicals including

DDT

tributyl tin

dioxin

vinclozolin and phthalates

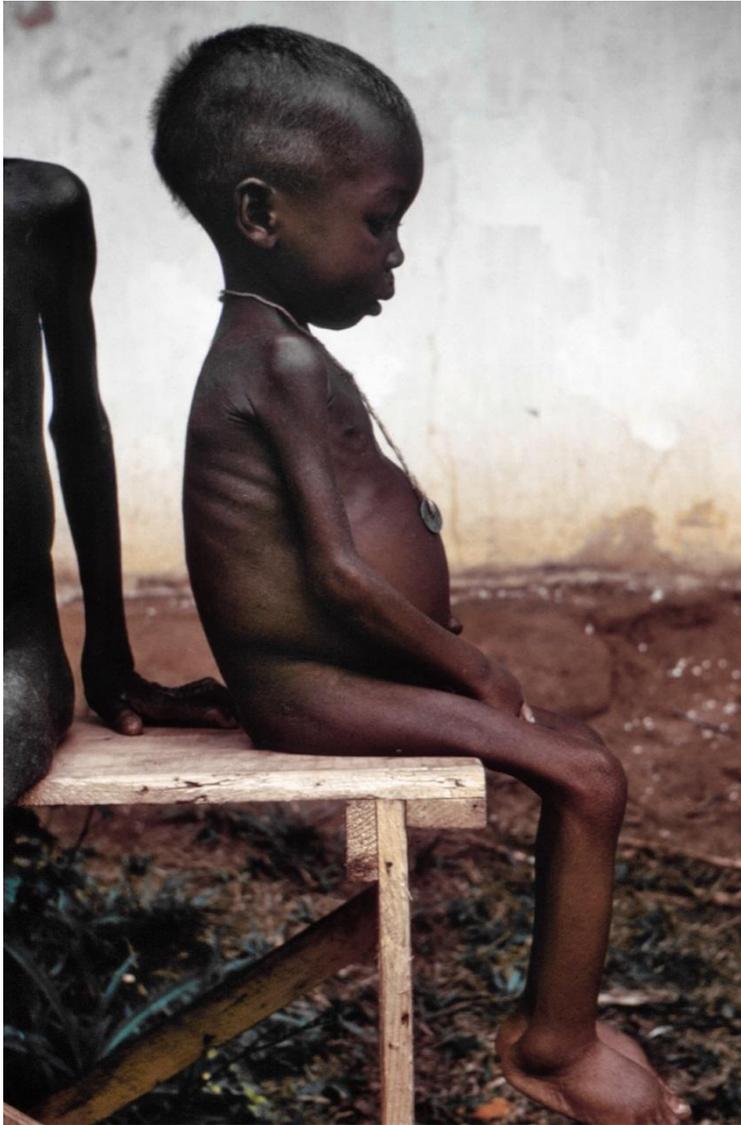
can lead to effects that are apparent in the F3 and F4 generations

My parents' exposure

Hungerwinter - stress







Famine in utero

Correlated increased risk to

- Cardio vascular disease
- Obesity
- Metabolic syndrome
- Diabetes

Other famine impacts

Excess central nervous system disorders (such as Neural tube defects)

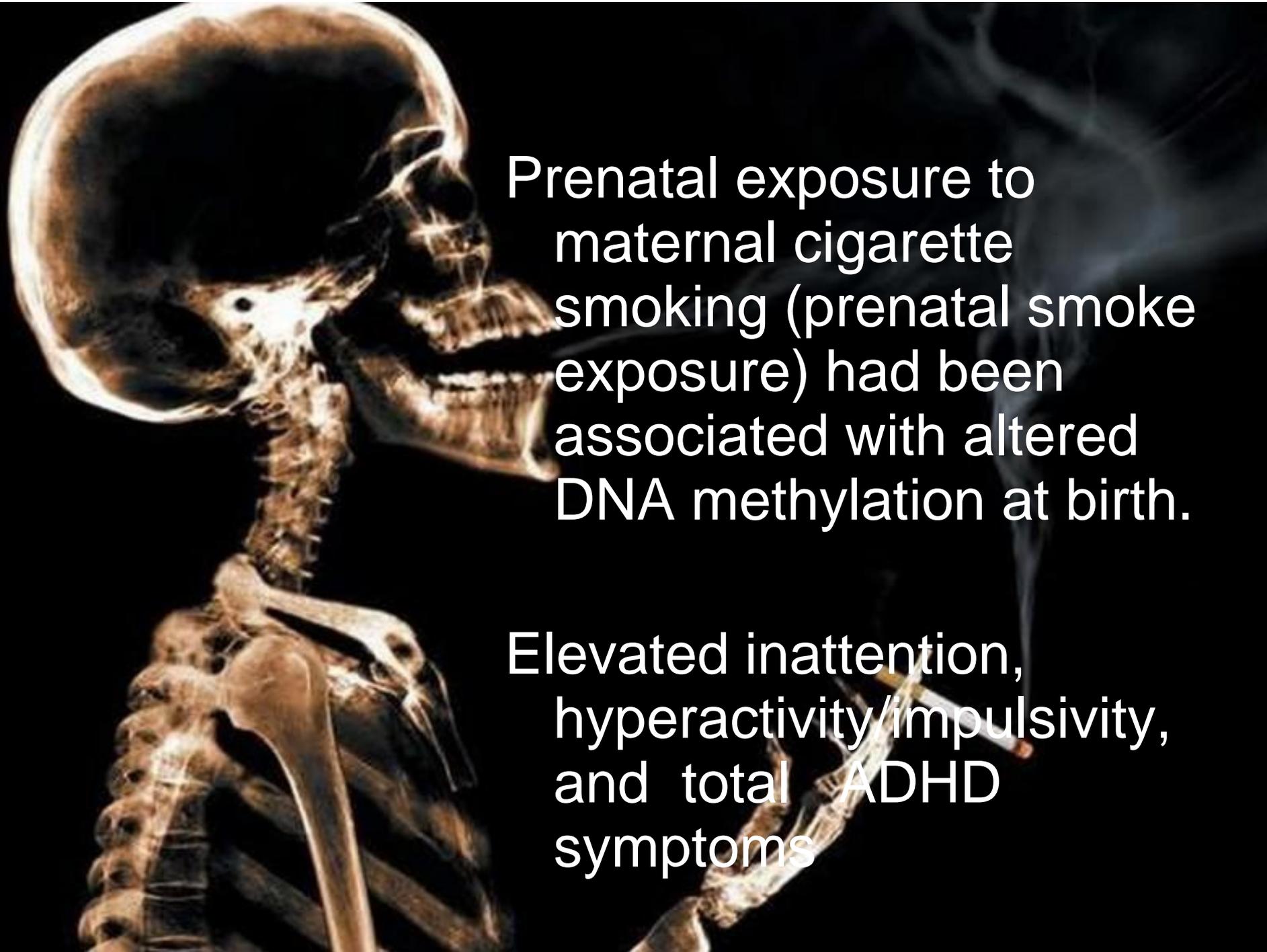
Schizophrenia (Hulshoff et al. J Psychiatry. 2000)

Famine exposure associated with twofold risk of schizophrenia in 50 year old women.

Prenatal famine exposure in patients with schizophrenia was associated with decreased intracranial volume.

Prenatal Hunger Winter exposure -> increase in brain abnormalities, predominantly white matter hyperintensities.

My parents' exposure: smoking



Prenatal exposure to maternal cigarette smoking (prenatal smoke exposure) had been associated with altered DNA methylation at birth.

Elevated inattention, hyperactivity/impulsivity, and total ADHD symptoms

Many more effects...

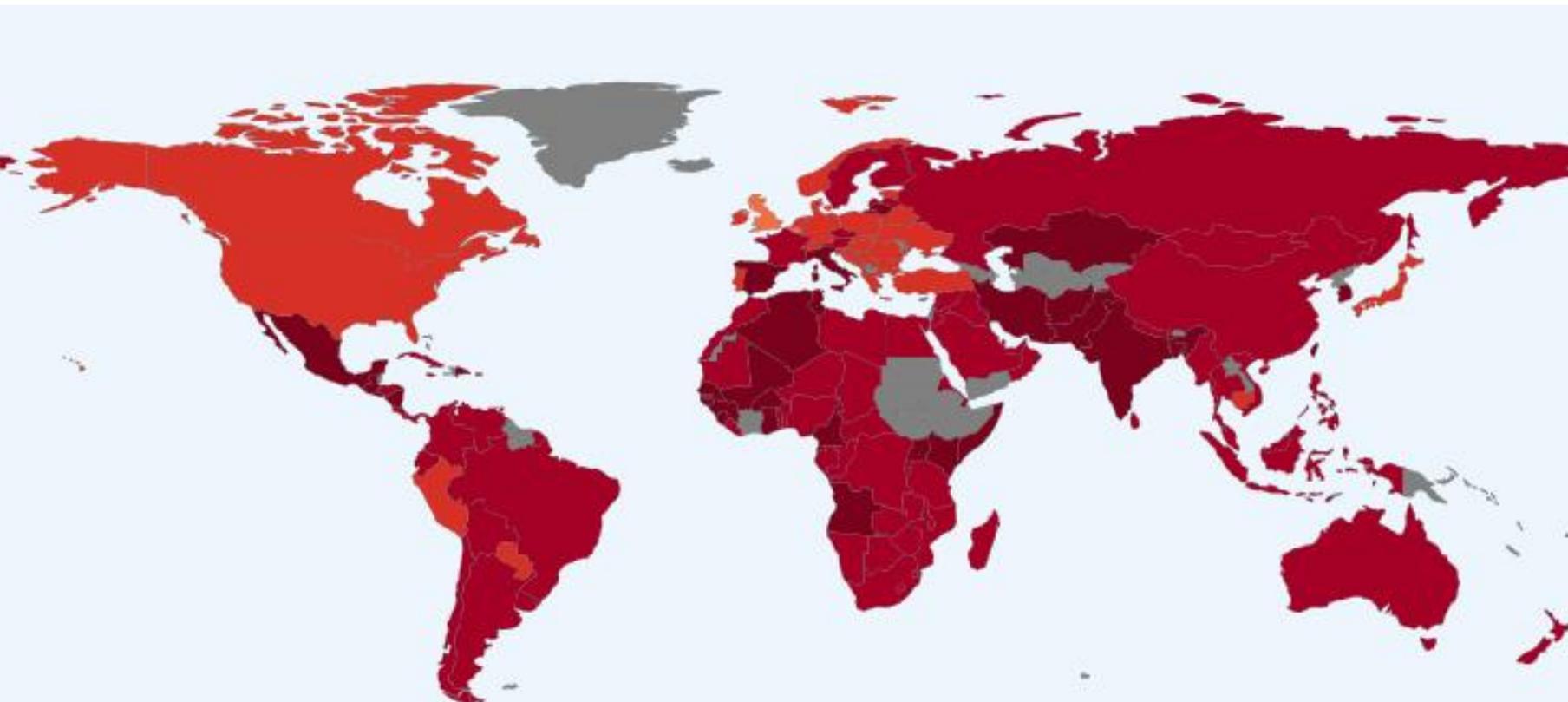
I, as scientist



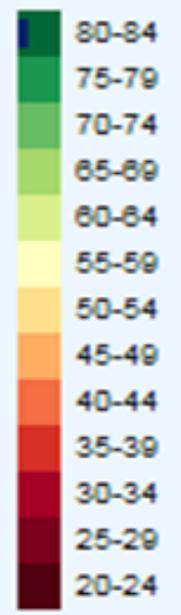
I, as scientist

What perspective do I choose?

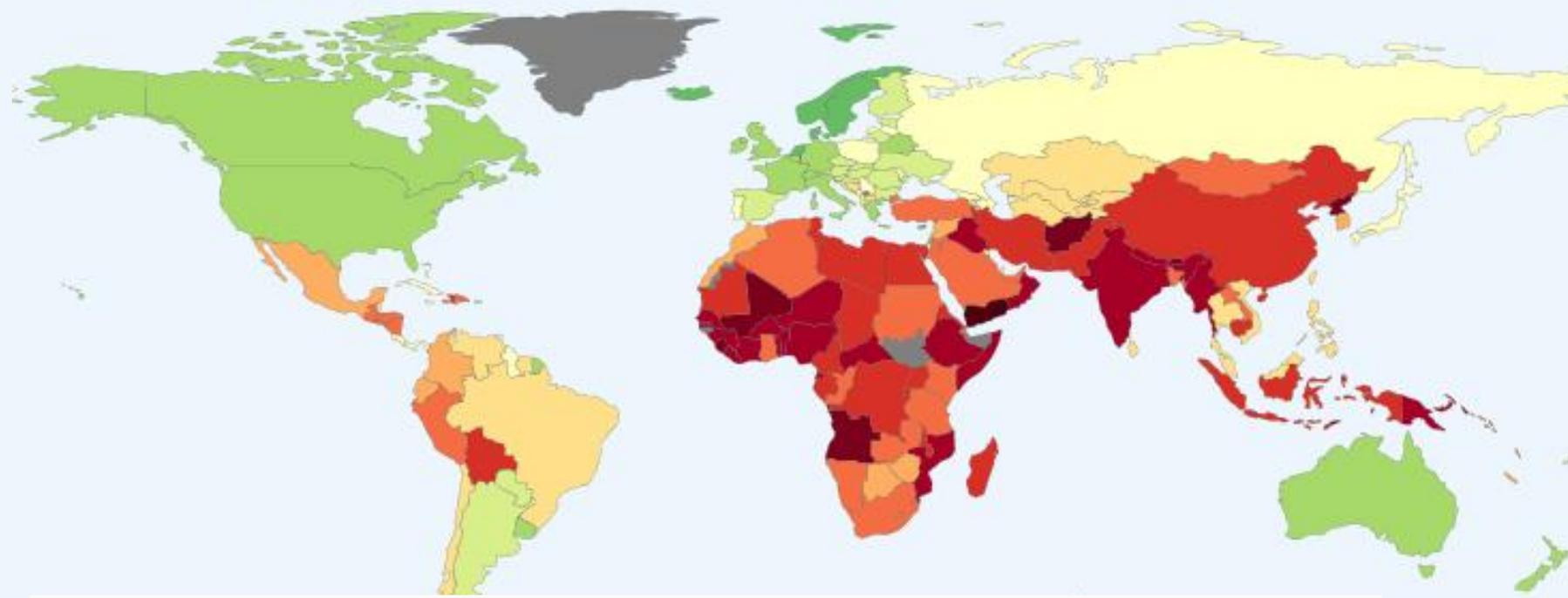
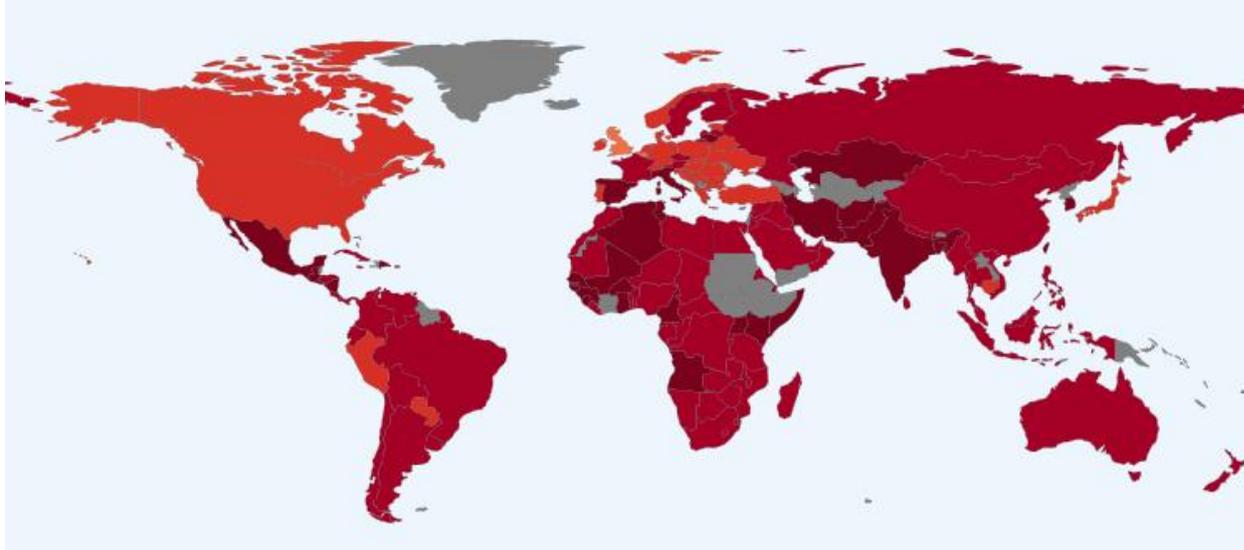




Life expectancy in 1800

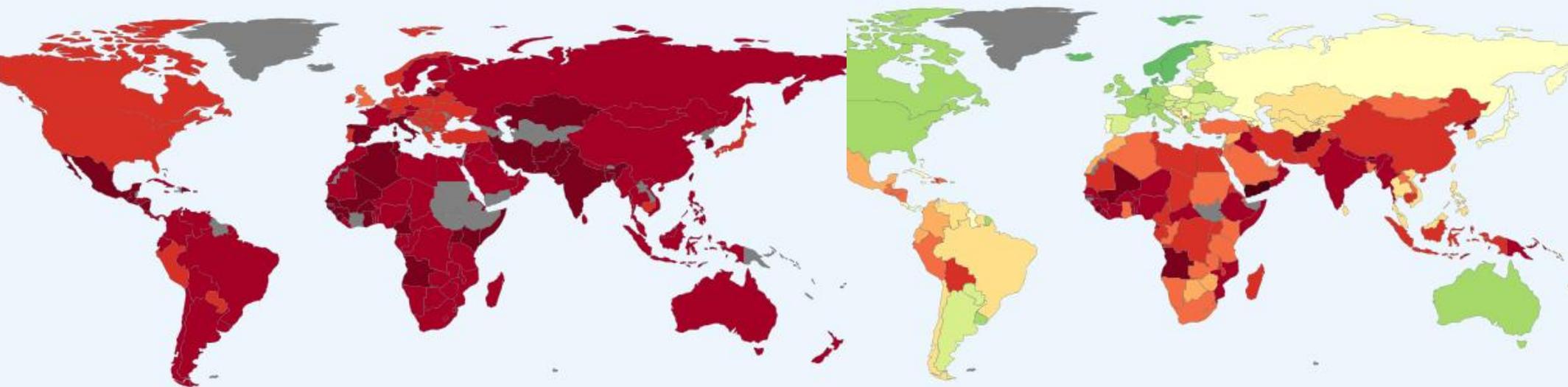


source where you find more information: www.OurWorldinData.org/data/population-growth-vital-statistics/life-expectancy Data source: Clio Infra Project Life Expectancy (at birth) – in 1800

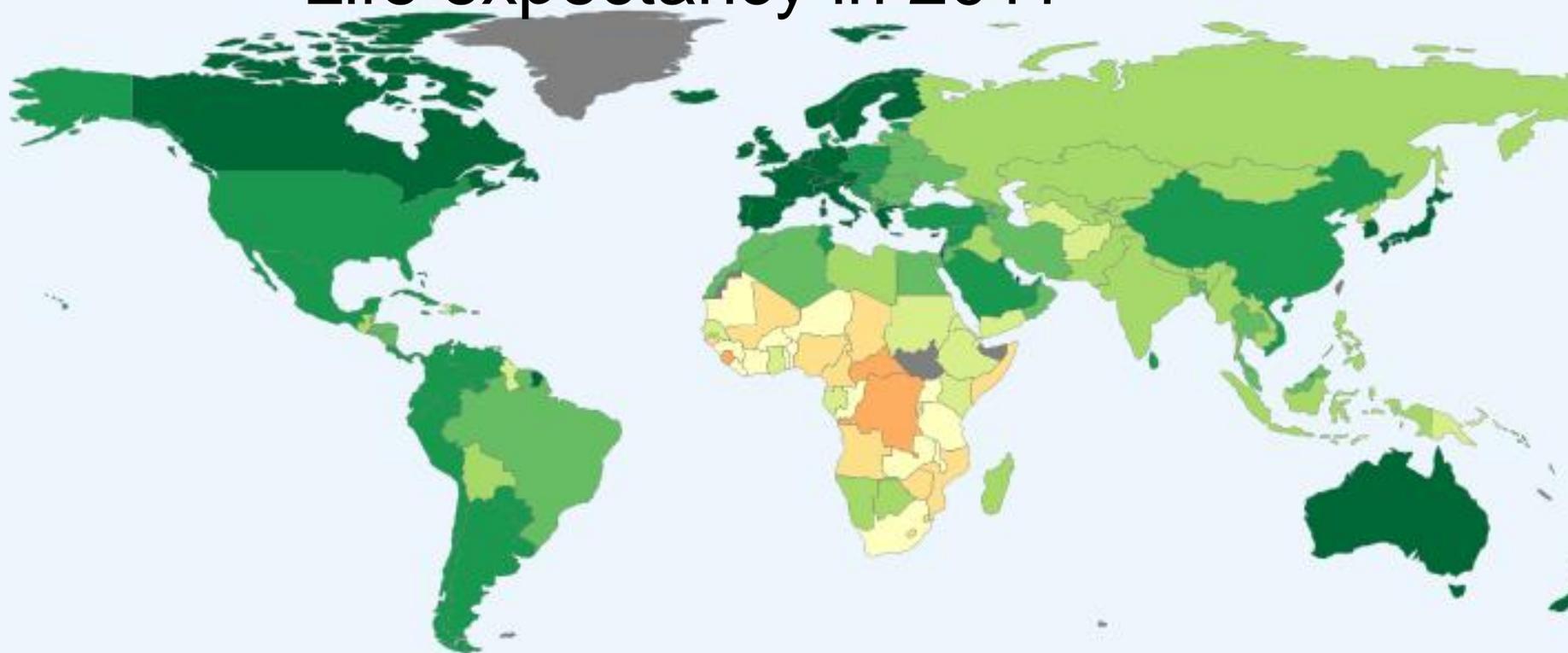
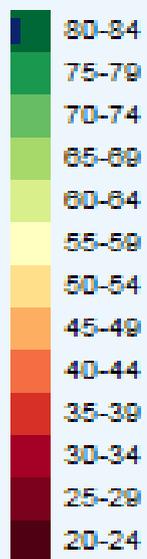


Life Expectancy (at birth) – in 1950

source where you find more information: www.OurWorldinData.org/data/population-growth-vital-statistics/life-expectancy Data source: Clio Infra Project Life Expectancy (at birth) – in 1950

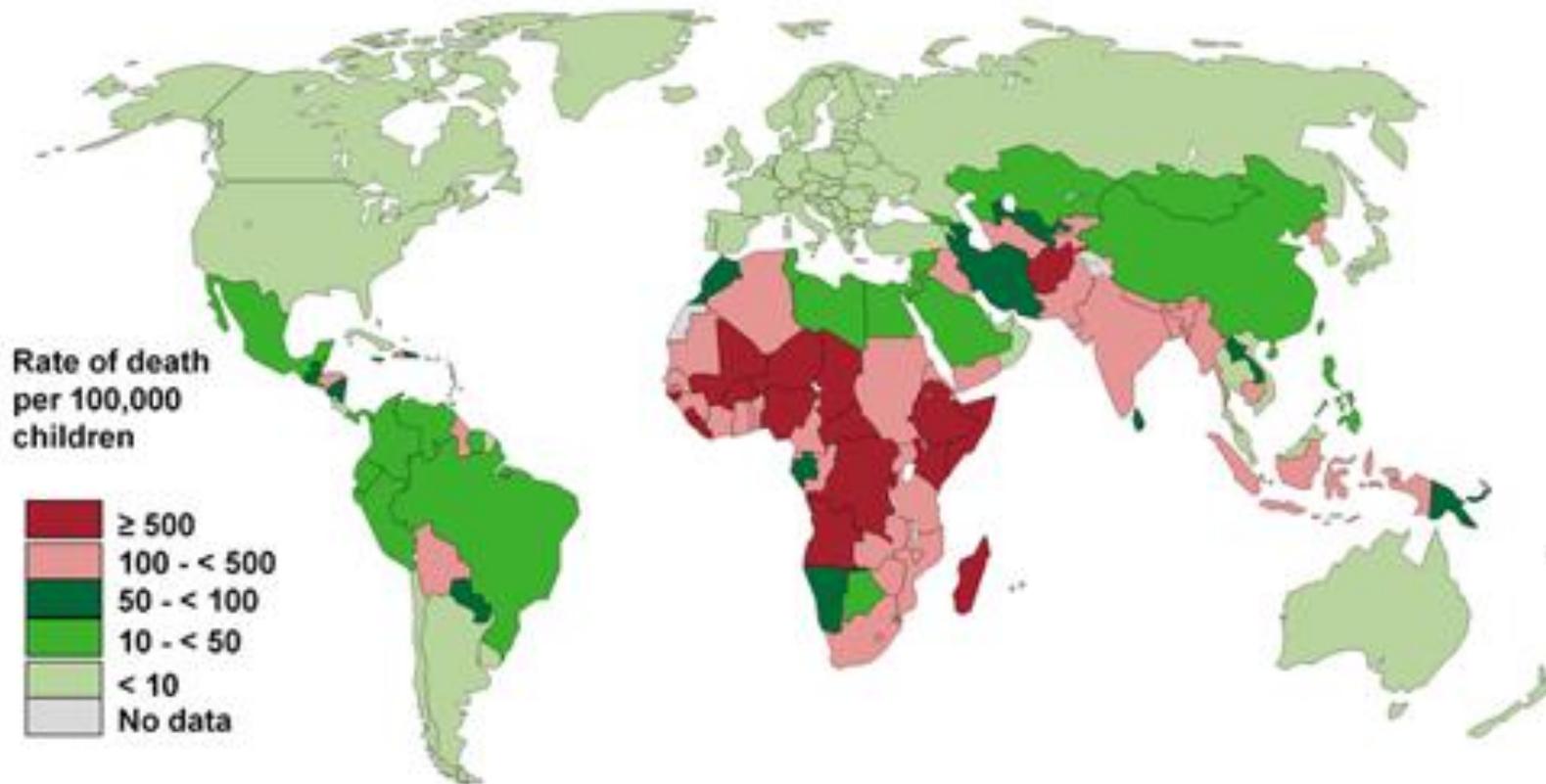


Life expectancy in 2011



Burden of disease perspective

Diarrhea-Related Deaths in Children Under 5 Years of Age, 2008



Santosham M, et al. *Lancet*. 2010;376:63-67.

Child mortality

6.3 million children died <5 years (2013)

51.8% (3.257 million) died of infectious causes

44% (2.761 million) died in the neonatal period.

Leading causes

- preterm birth complications 0.965 million
- pneumonia 0.935 million
- complications during labor and delivery or childbirth 0.662 million

Child mortality

Reductions in pneumonia, diarrhoea, and measles

Half of the 3.6 million fewer deaths recorded in 2013 versus 2000.

If trends continue, 4.4 million children < 5 years will still die in 2030.

If all goes well with our climate!



**Children are all potential
environmental refugees**

Children's Climate change

Increase children's exposure to extreme temperatures, polluted air and water, extreme weather events, wildfires, infectious disease, allergens, pesticides, and other chemicals.

Children carry the greatest disease burden.

Young vulnerable to heat-related illness and death.

Poor families lack the resources, adequate shelter and access to air conditioning.

I, as scientist

Global perspective

Mortality in children

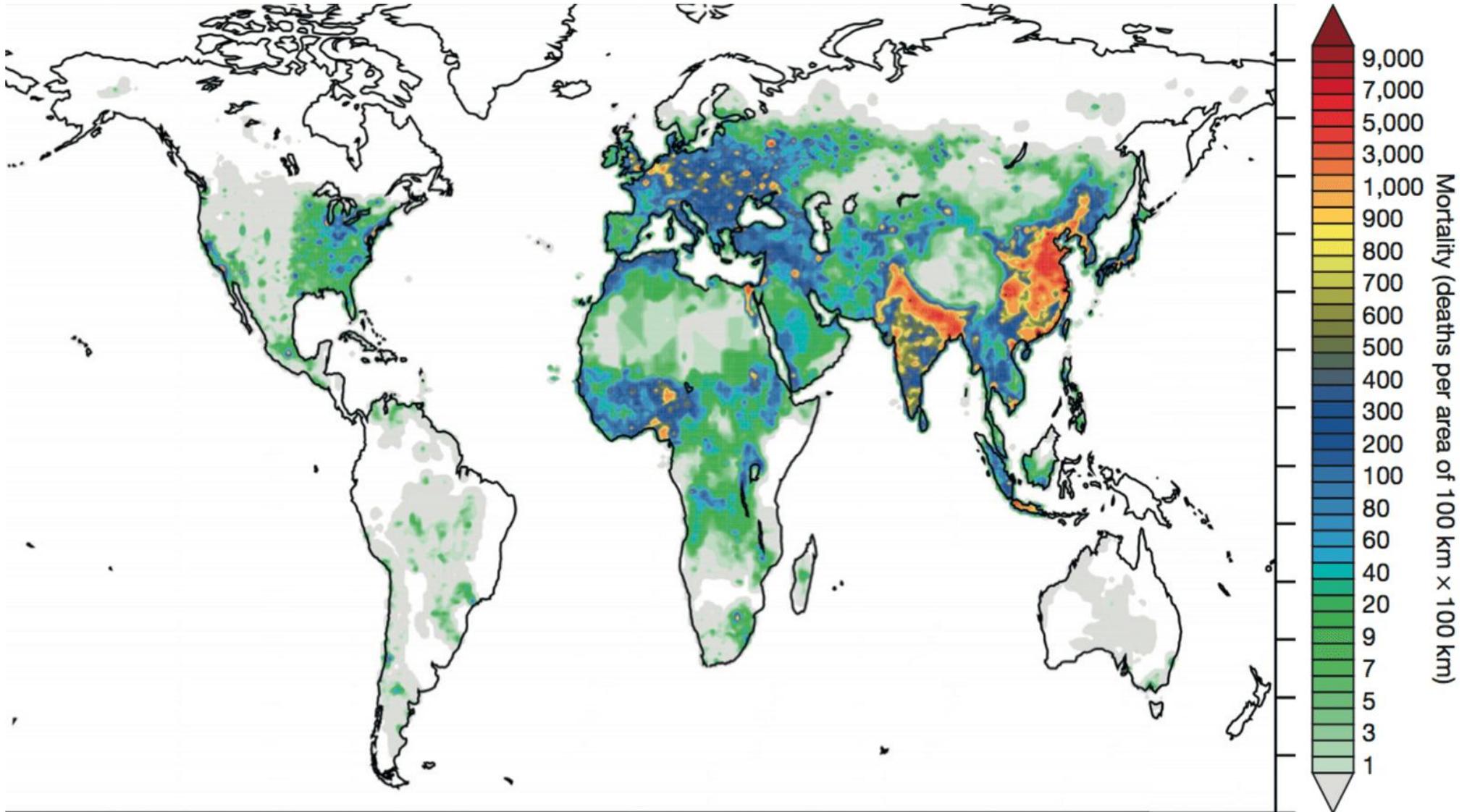


Shift in children's environmental health

Outdoor air

More industrialization

More polluting transport



Children and outdoor air

Shift to other countries

Extra burden on children



Millions of more children

How about occupational?



Did we improve in occupational exposure?



Lewis Hine: Breaker Boys 1880—1912
Photos for the National Child Labor Committee



Children and Indoor air

50% people use coal/biomass for domestic energy

Indoor air pollution may be responsible for nearly 2 million excess deaths in developing countries and for some 4% of the global burden of disease.

Is this going to increase with urbanization trends?



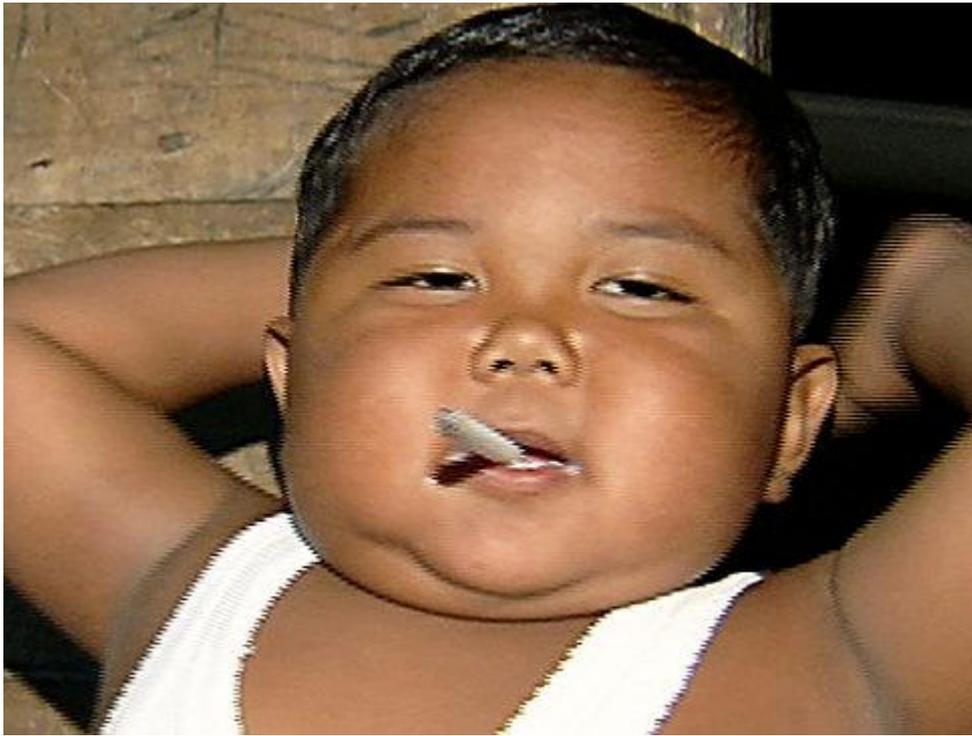
I, as scientist

Global perspective

Mortality in children

Shift in children's environmental health

Chronic or irreversible diseases or disorders



Prevention?

Do we?





Lead

143, 000 deaths per year, or 0.6% of the global burden of disease

Childhood lead exposure is estimated to contribute to **600,000 new cases globally** of children with intellectual disabilities every year.

Still levels as high as 234 $\mu\text{g}/\text{dL}$ in children

Recycling batteries, mining, smelting

More impact

Environmental impact on autism. ADHD

Childhood cancers

Obesity

.....



I, as policy maker

What do I see?

What do I want to see?

What does the scientist tell me?

Political and environmental stress

Wars
Water
Waste



Climate Change





War and conflicts



Children on the move - What reasons?

War

Water

Waste

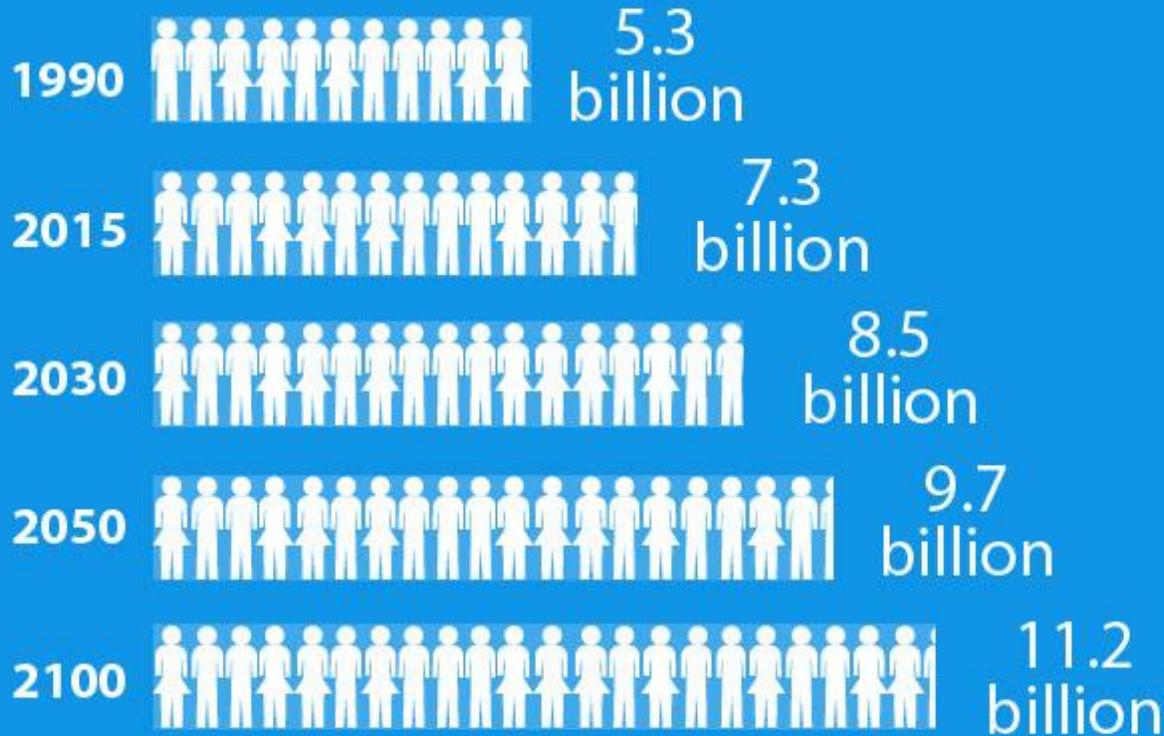
Poverty

Climate



World Population

Projected world population until 2100



Source: United Nations Department of Economic and Social Affairs,
Population Division, *World Population Prospects: The 2015 Revision*
Produced by: United Nations Department of Public Information

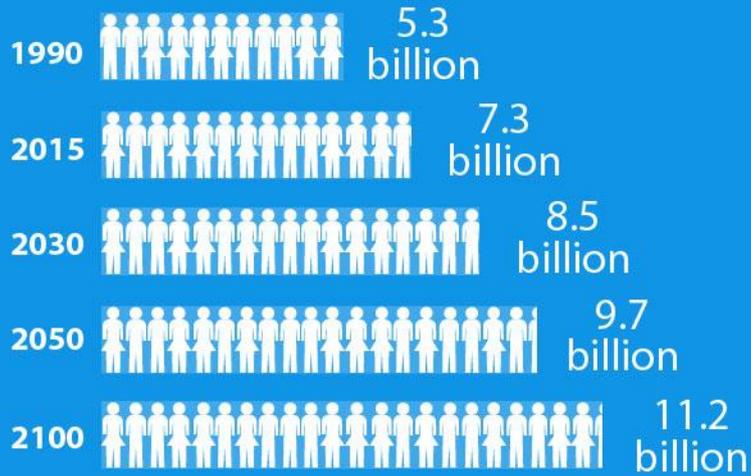


In 2030 1.2 billion more people

...about 2 billion children 0 – 14 years

World Population

Projected world population until 2100



Source: United Nations Department of Economic and Social Affairs,
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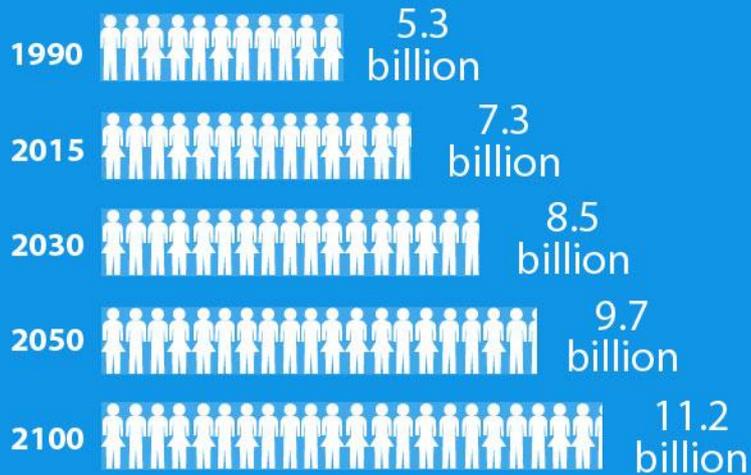


2015
TIME FOR
GLOBAL ACTION
CELEBRATING 70 YEARS

What if?

World Population

Projected world population until 2100



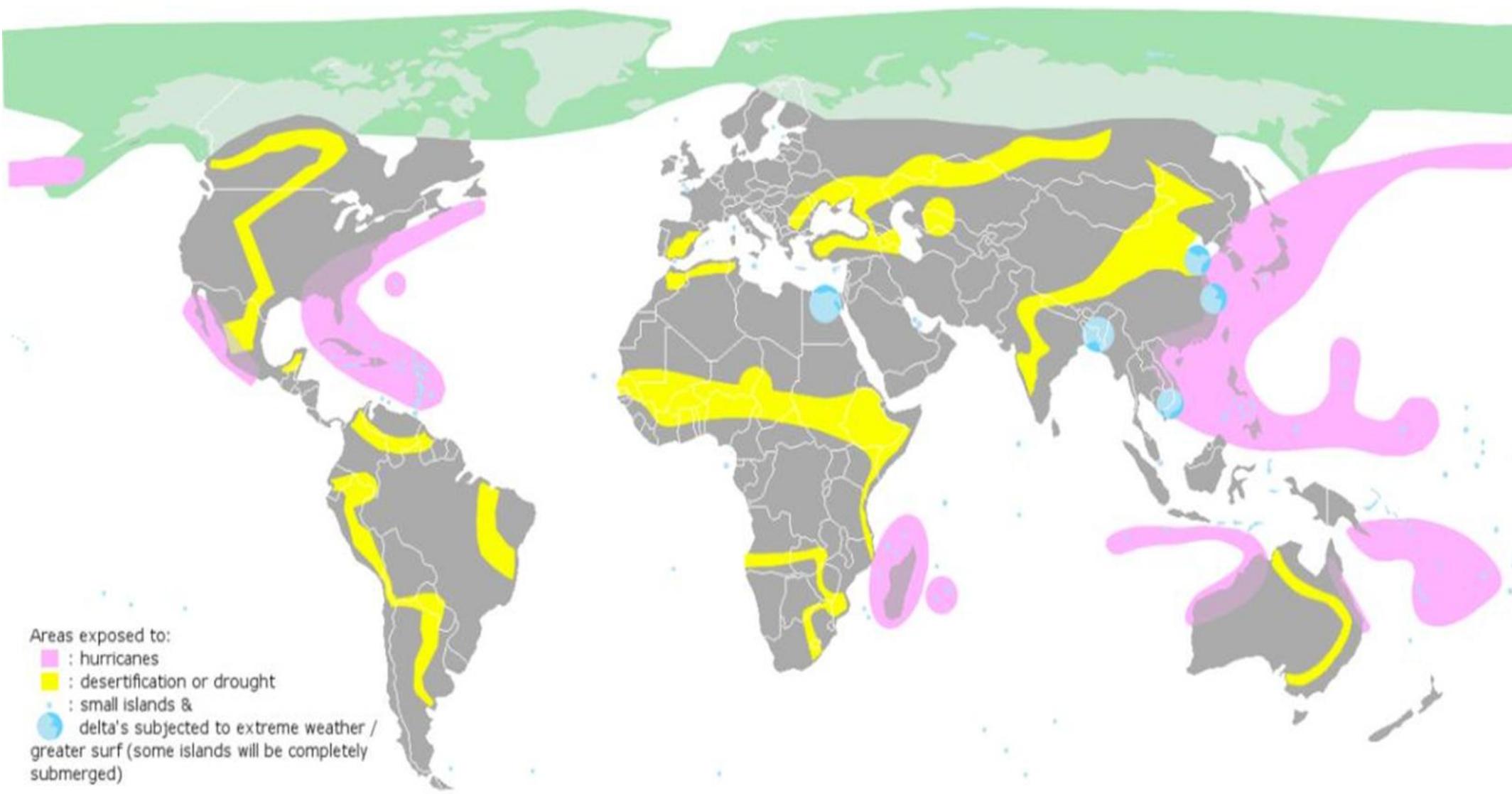
Source: United Nations Department of Economic and Social Affairs, Population Division, *World Population Prospects: The 2015 Revision*
Produced by: United Nations Department of Public Information



What if?

1 billion children in 2030 are potential environmental refugees





Children under influence

Who has the power?

Who controls the temperature?

Who needs all the plastic?

Focus on research

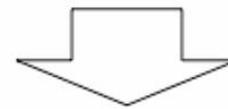


Exposome
research

Epigenetics



Normal Epigenetics



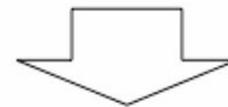
Environmental factors

- Malnutrition
- Drugs (side effect)
- Chemicals
- Mental stress



Neurodevelopmental disorders

Abnormal Epigenetics



Epigenetic restoration factors

- Appropriate nutrition
- Drugs
- Gene-specific epigenetic reagents
- Appropriate environment



Normal Epigenetics

Regulation or not?

DES tragedy = complete breakdown of the regulatory and scientific process.

Disregard for the patients' safety

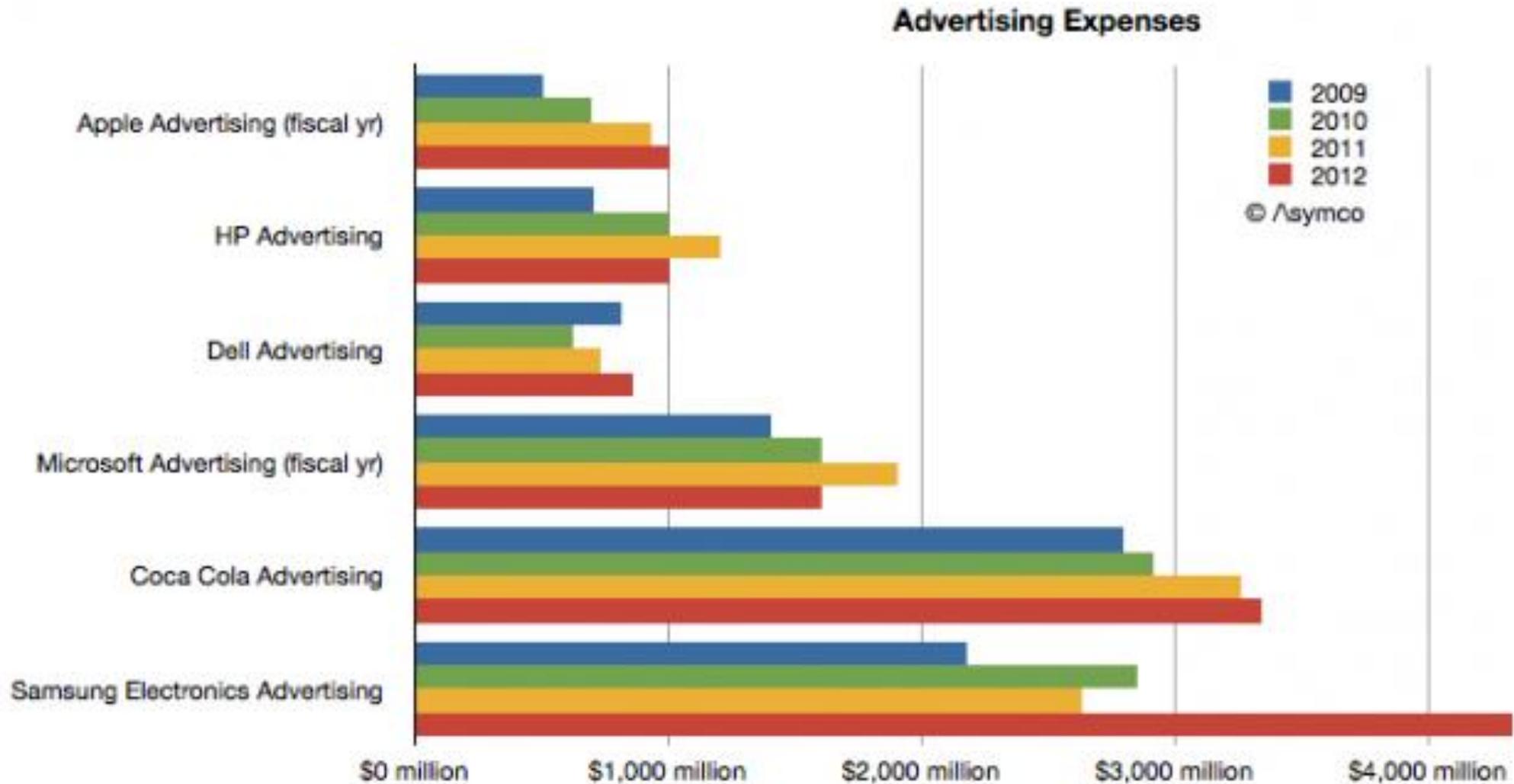
Data manipulated or disregarded

Monitoring by private firms

Conflicts of interest involving the researcher,
institution

The average marketing budget is twice that of the manufacturer's R&D budget.

One study reports more than a 3-fold increase in promotional meetings in a 6-year period, jumping from 120,000 in 1998 to 371,000 in 2004.



Focus on climate change



Climate change drives child poverty.

175 million children

Are hit by climate disasters every year.

I, as policy maker What I should do!

Physicians and scientists need to cooperate

Across disciplines

Across countries

Work across sectors (industry, agriculture)

Talk to politicians

My aim as policymaker

Tell physicians and epidemiologists

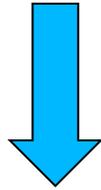
- environmental chemicals can cause diseases
- exposures may have occurred early during development.

Tell researchers need to work on long term prevention, looking at the bigger picture:

Prevent children to become refugees

Considerations

Health is a long term benefit to society



Children are our insurance for prosperity



Children's happiness lies in our hands and measures

Thousand problems
Thousands thoughts
Thousand cures

One wish

