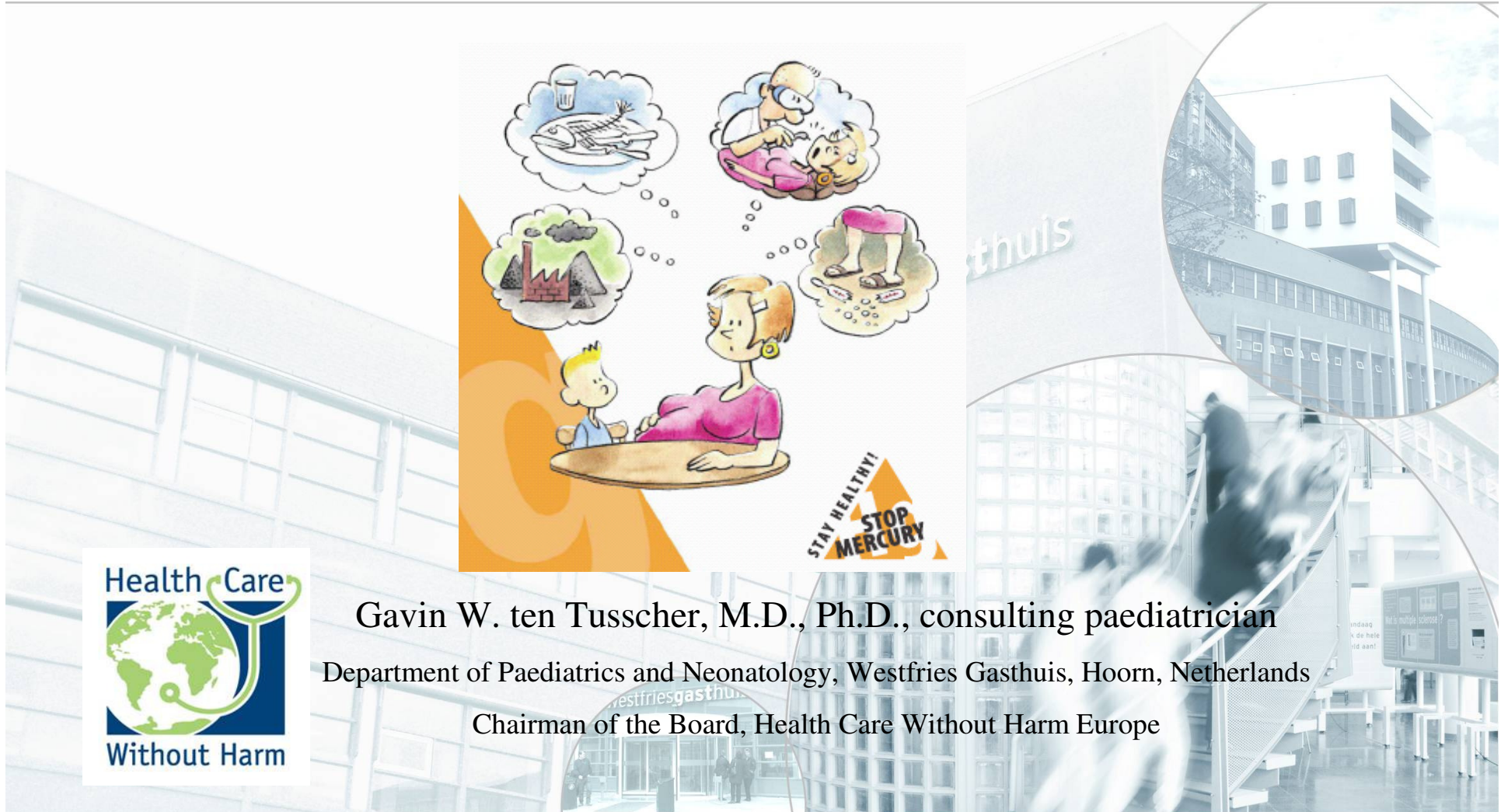


Low dose mercury and the developing brain of a child

Westfriesgasthuis



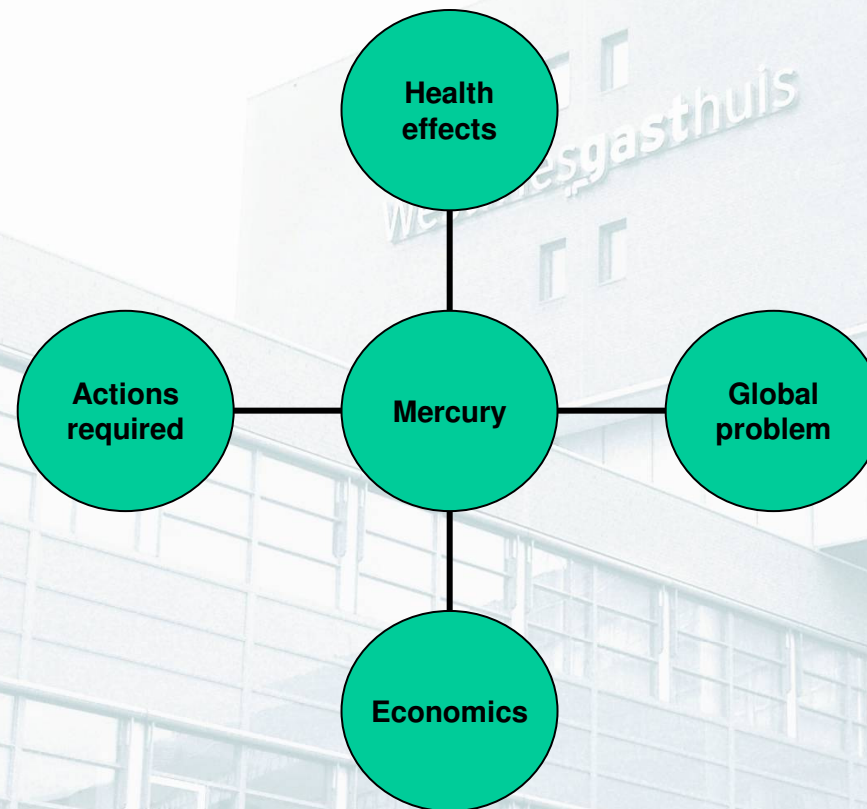
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Department of Paediatrics and Neonatology, Westfries Gasthuis, Hoorn, Netherlands
Chairman of the Board, Health Care Without Harm Europe



Overview



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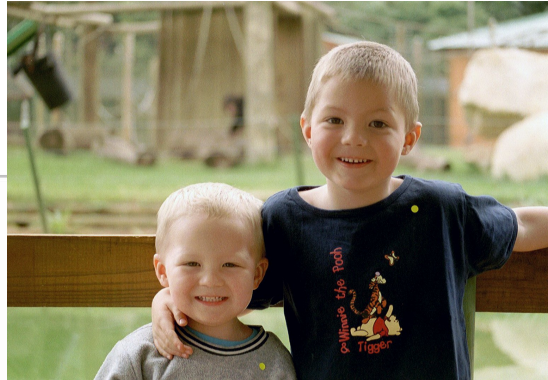
Mercury



- Naturally occurring metal
- Anthropogenic sources far exceed natural component
- EU produces 1000 tonnes of global 3600 tonnes per year
- Mainly surplus of electrochemical chloralkali industry and recycling of waste materials:
 - Dental amalgam, thermometers

Ronchetti et al. *Acta Paediatrica* 2006; 95 suppl 453: 36-44

Problematic



- Anthropogenic activities have increased atmospheric levels by factor 3
- Organic and inorganic mercury rapidly transformed by microorganisms in watery environment to mainly methylmercury (MeHg)
- MeHg very toxic to humans, especially developing children, bioaccumulates and biomagnifies

Health effects





- 2 “high” dose disasters:
 - Minamata Disease (Japan, 1950’s), fish consumption
 - Iraq 1971-72, grain seeds with fungicide
 - 50 000 exposed, 6350 hospitalised, 459 deaths
 - dose approx. 1 $\mu\text{g}/\text{kg}$ BW/day
 - Various chronic “low” dose exposures studied:
 - Faroe Islands (917 children): several neuropsychological deficits
- Grandjean et al, *Neurotoxicol Teratol* 1997;19:417-28
- Neurodevelopmental deficits and cardiovascular effects seen





Serious risk

- Exposures of 1 $\mu\text{g}/\text{kg}$ BW/day associated with:
Delayed auditory evoked potentials, psychomotor performances, abnormal findings on psychological tests, lower neurodevelopmental screening
- 5 point reduced I.Q. in population serious concern 
- “Acceptable” levels drastically reduced over last years, still too high 
- Foetal brain 10 times more sensitive than adult brain

Economics



- Current US blood MeHg levels and expected reduced I.Q. estimated to cost \$ 8.7 billion annually (range \$ 2.2 to 43.8 billion)

Trasande et al. *Environ Health Perspect* 2005;113:590-596

- EU no data but probably similar



Take home message ...

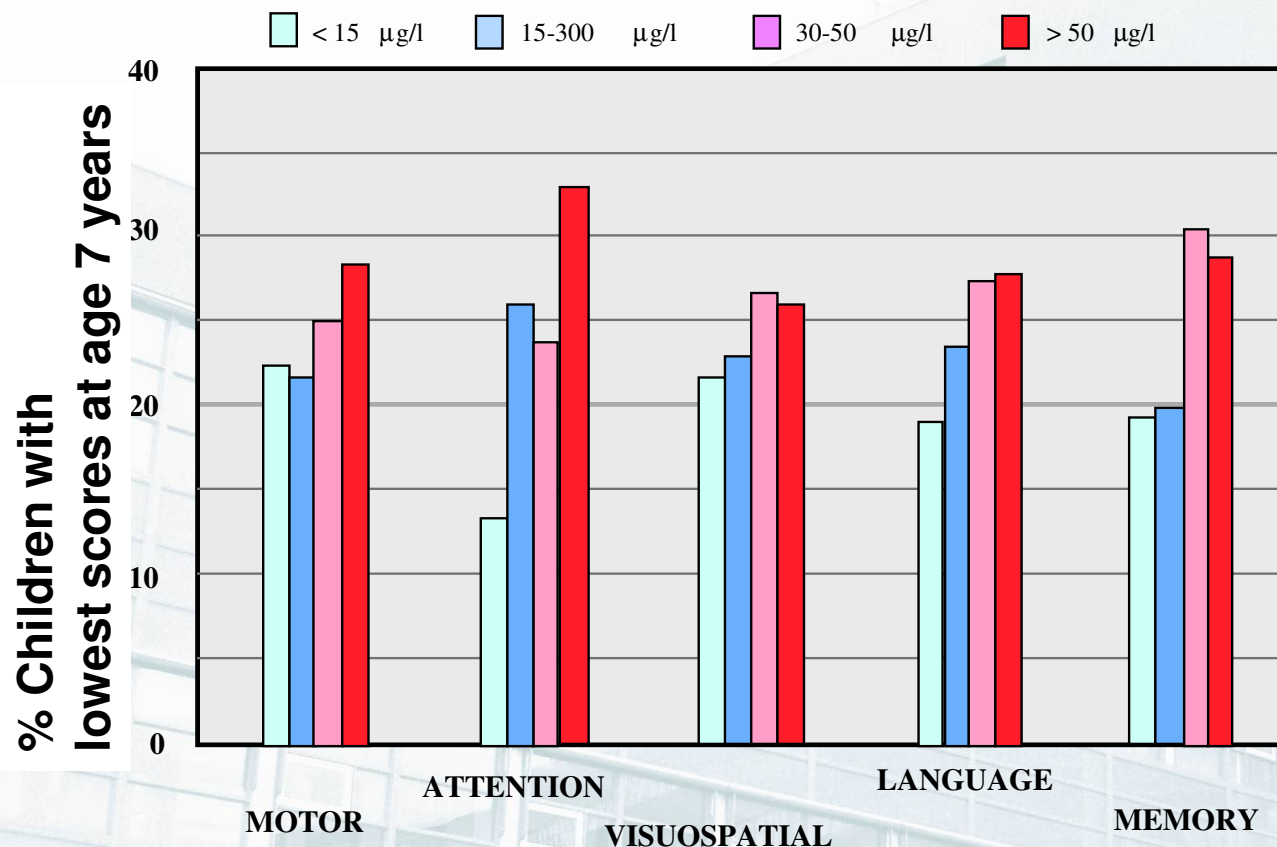
- Currently accepted levels of exposure are not safe enough
- Protecting future generations means even more stringent levels, non-existent levels in fish, etc should be our goal



Thank you for your attention

Mercury effects of “low” dose prenatal exposure

Children with prenatal mercury exposure



Grandjean, et. al., *Neurotoxicol Teratol* 1997;19:417-28

Figure shows prenatal mercury exposure levels of Faroese children with scores in the lowest quartile after adjustment for cofounders. For each of the five major cognitive functions, one neuropsychological test with a high psychometric validity was selected.



The Significance of Small Effects:

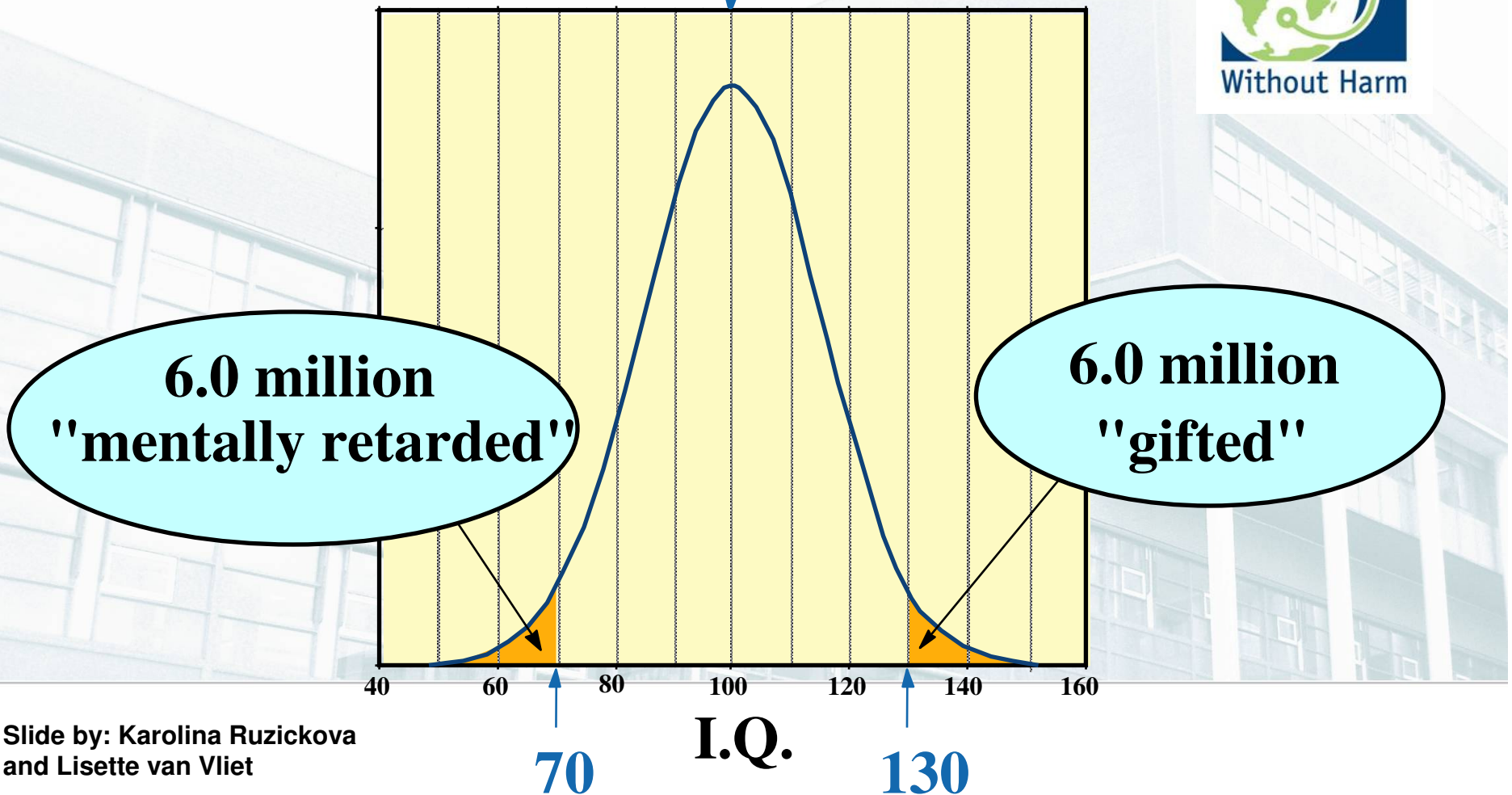
EFFECTS OF A SMALL SHIFT IN IQ DISTRIBUTION

Westfriesgasthuis

IN A POPULATION OF 260 MILLION



mean 100



Slide by: Karolina Ruzickova
and Lisette van Vliet

5 Point Decrease in Mean IQ

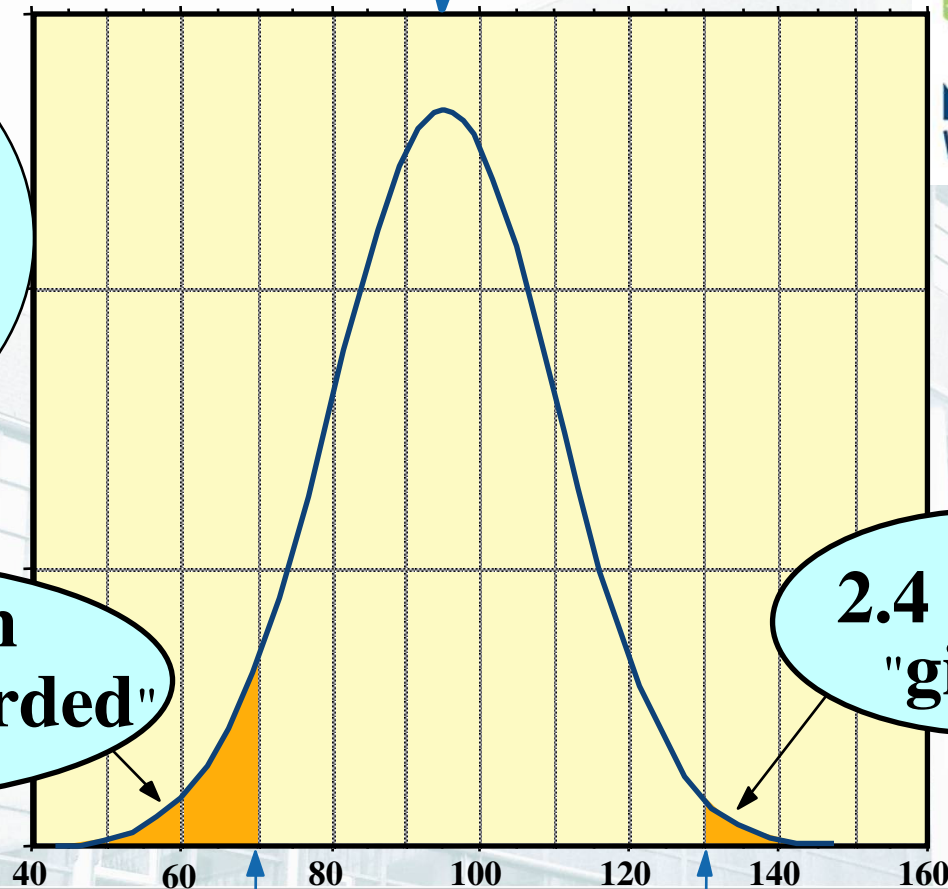


mean 95

57% INCREASE
IN
"Mentally Retarded"
Population

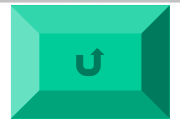
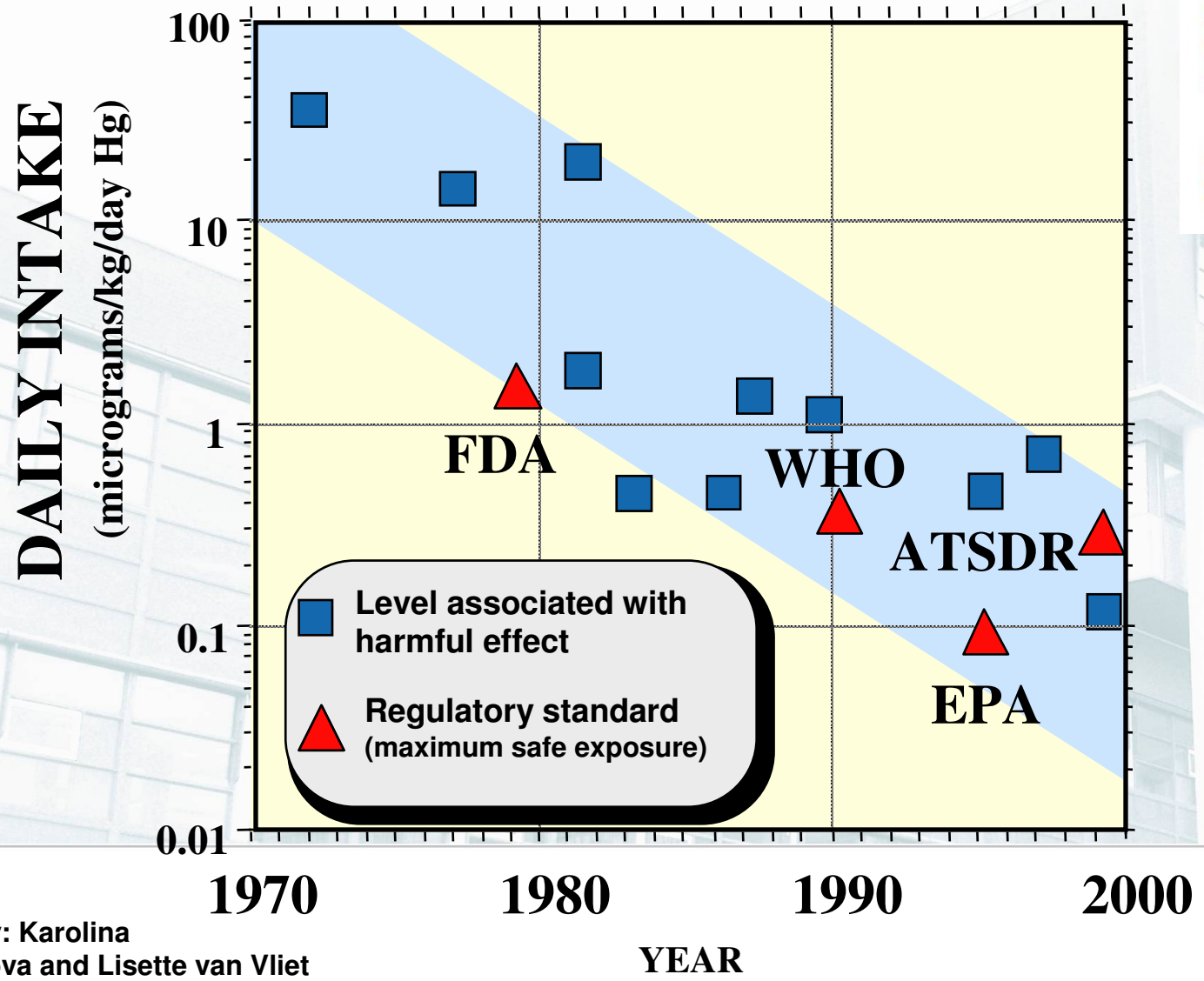
9.4 million
"mentally retarded"

2.4 million
"gifted"



Mercury

Declining Threshold of Harm



Global problem



- Emissions from outside Europe appear likely to grow in absolute and relative terms
- Overall emissions to air ↓ 60% from 1990 to 2000, global emissions ↑ 20% over same period
- However, still same global pool
- Dental amalgam 20% of EU Hg consumption
- Thimerosal-containing vaccines not (yet) forbidden in EU