

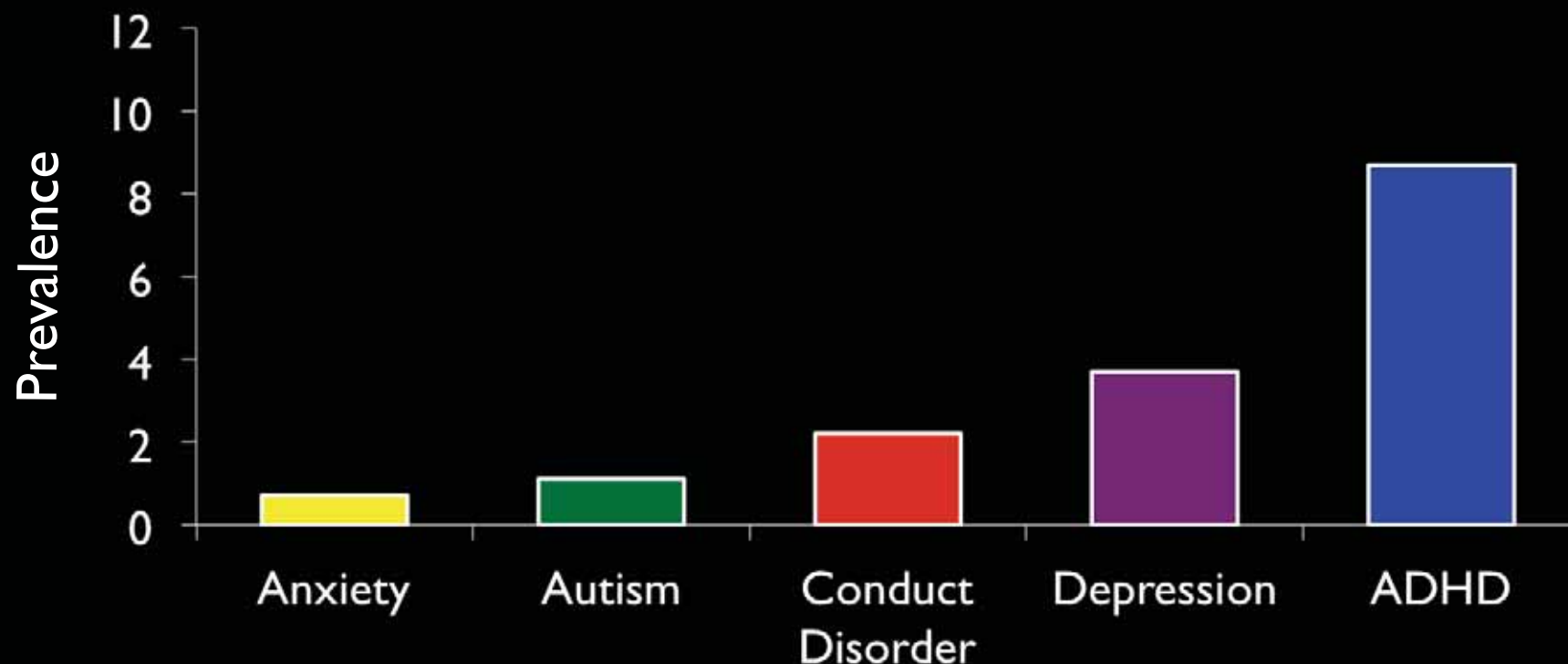
Little Things Matter



The Impact of Toxins on the Developing Brain

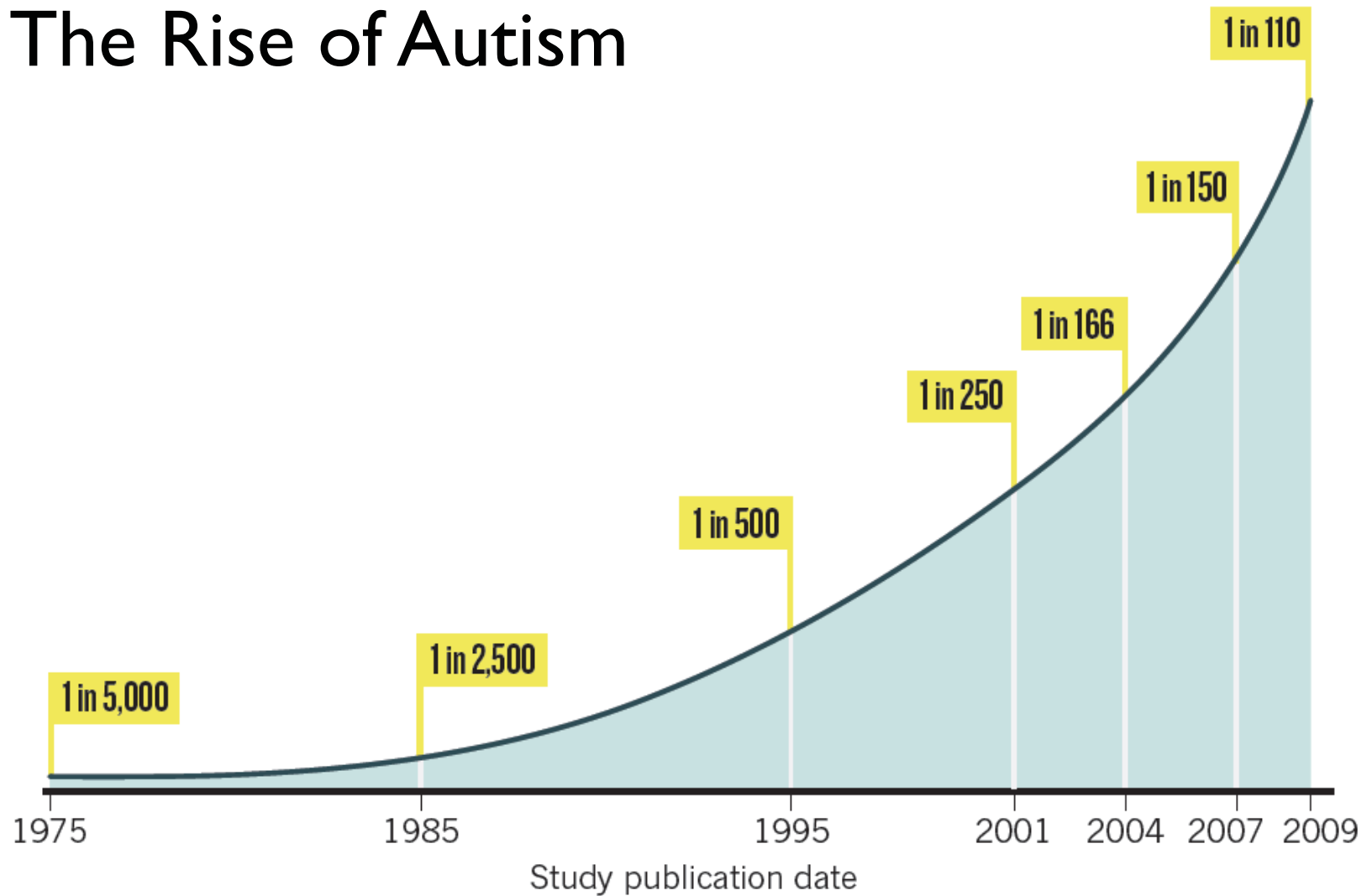
Bruce Lanphear, MD, MPH
Child & Family Research Institute, BC Children's Hospital
Faculty of Health Sciences, Simon Fraser University
Children's Centers' Annual Meeting, October 31, 2015

Brain-based Disorders in Children



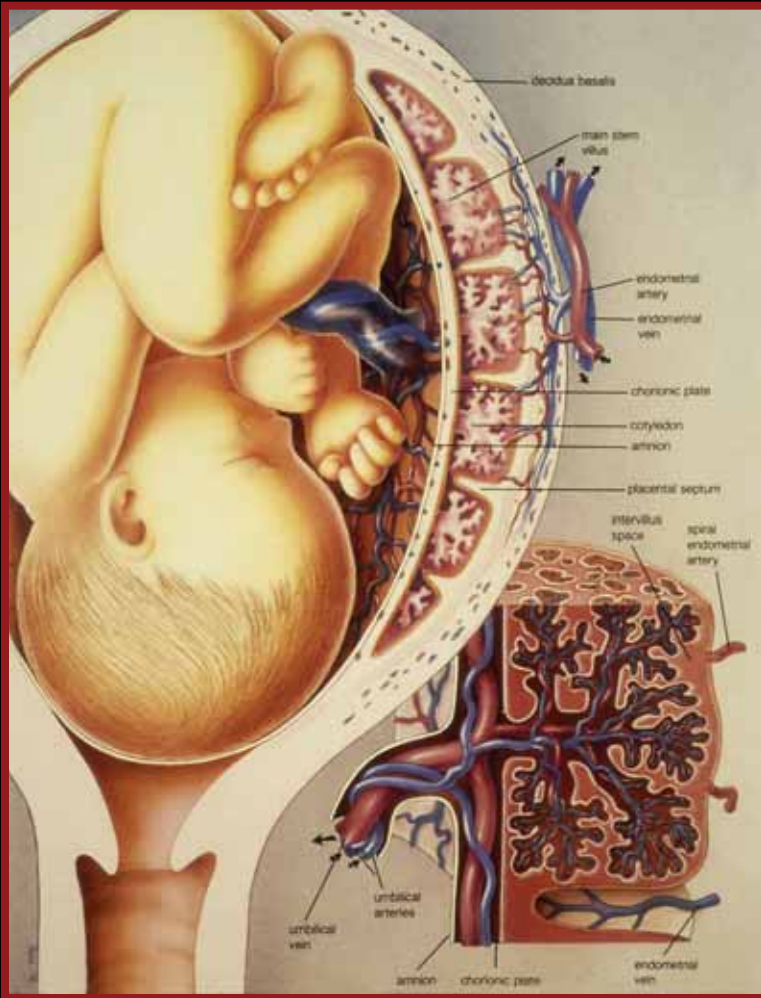
Merikangas KR, He JP, Brody D, et al. Prevalence and treatment of mental disorders among US children in the 2001-2004 NHANES. *Pediatrics* 2010;125:75-81. Centers for Disease Control and Prevention. Prevalence of autism spectrum disorders, United States, 2008. *MMWR Surveill Summ* 2012; 61:1-19. Boyle CA, Boulet S, Schieve LA, et al. Trends in the prevalence of developmental disabilities in US children, 1997-2008. *Pediatrics* 2011;127:1034-1042.

The Rise of Autism

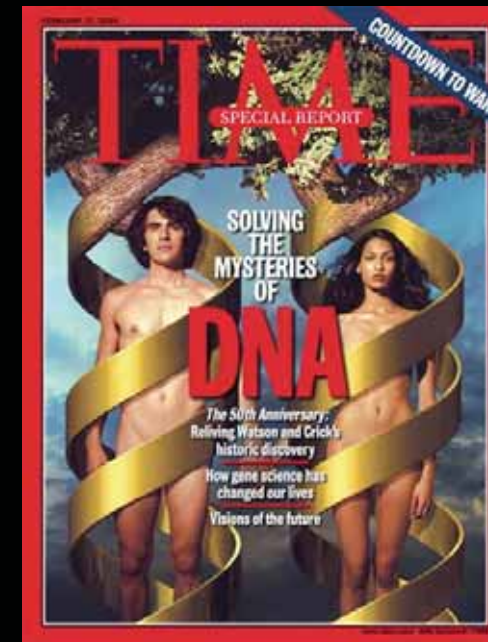
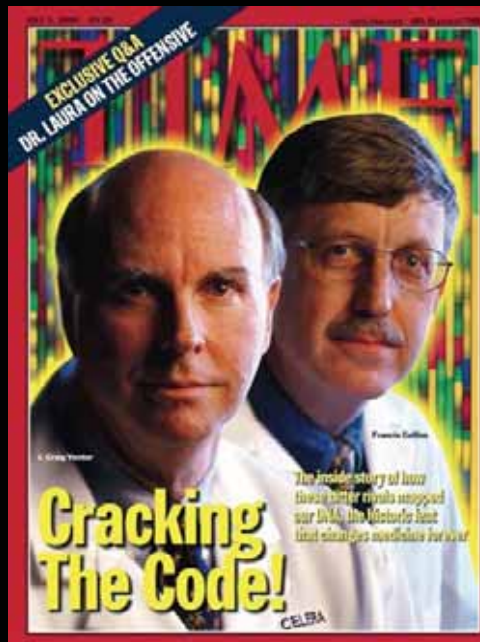
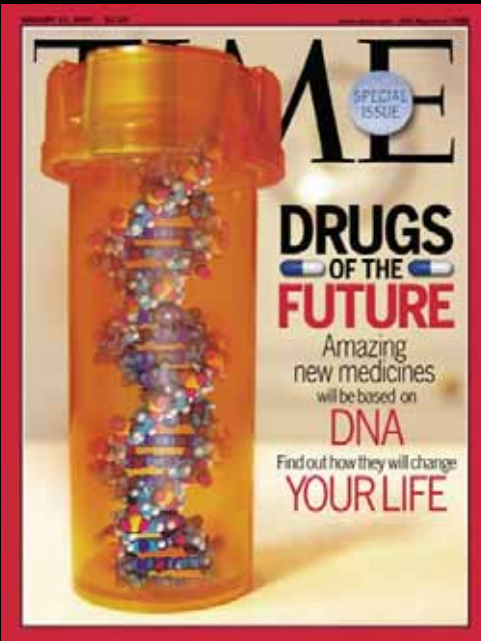


Weintraub K. Nature 2011;479:22-24.

Factors that Impact Brain Development



- Sex
- Nutrition
- Preterm Birth
- Social Stressors
- Built Environment
- Maternal Depression
- Genetic Susceptibility
- Preschool Attendance
- Environmental Toxins



US Expenditures on Autism Research

\$1 billion



Genes

\$40 million



Environment

Genes or Environment?

Genes



Environment



Genes or Environment?

Genes



Rett's
Syndrome

Genes and
Environment



Autism
ADHD
Depression

Environment



TBI

Genes or Environment?

Genes



Rett's
Syndrome

Genes and
Environment

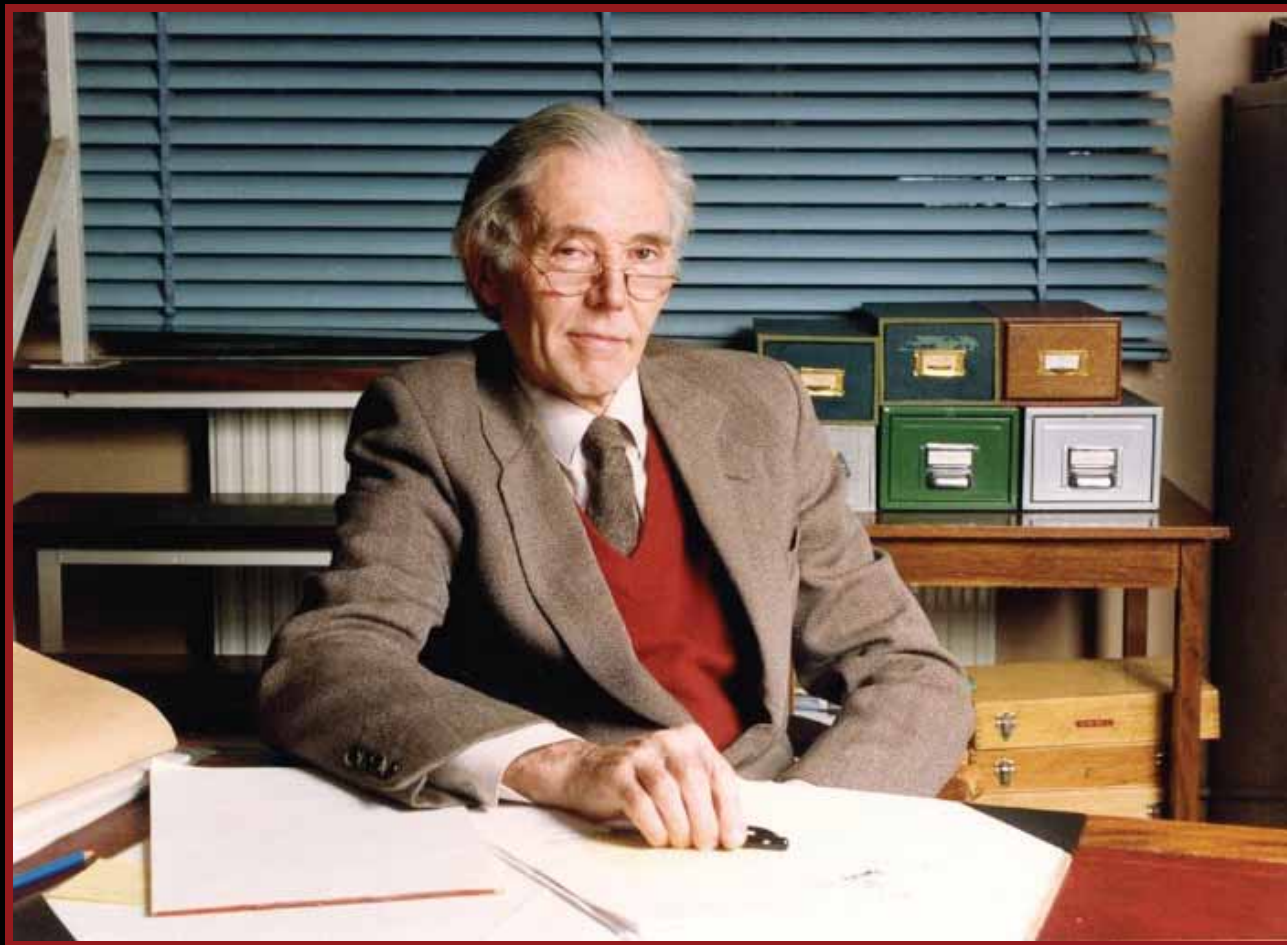


Autism
ADHD
Depression

Environment



TBI

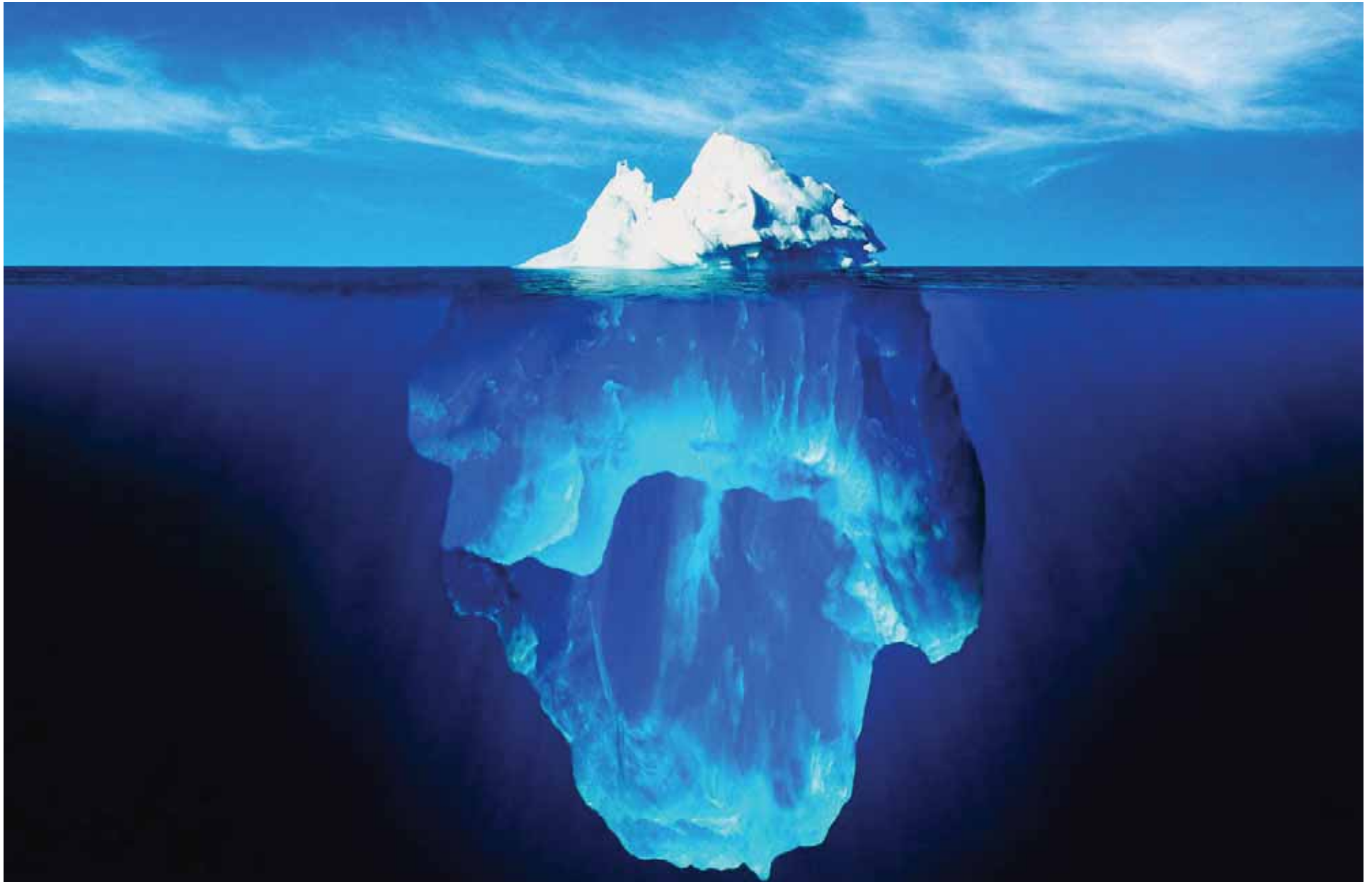


If causes can be removed, then susceptibility ceases to matter.”

Geoffrey Rose, MD

Environmental Disasters

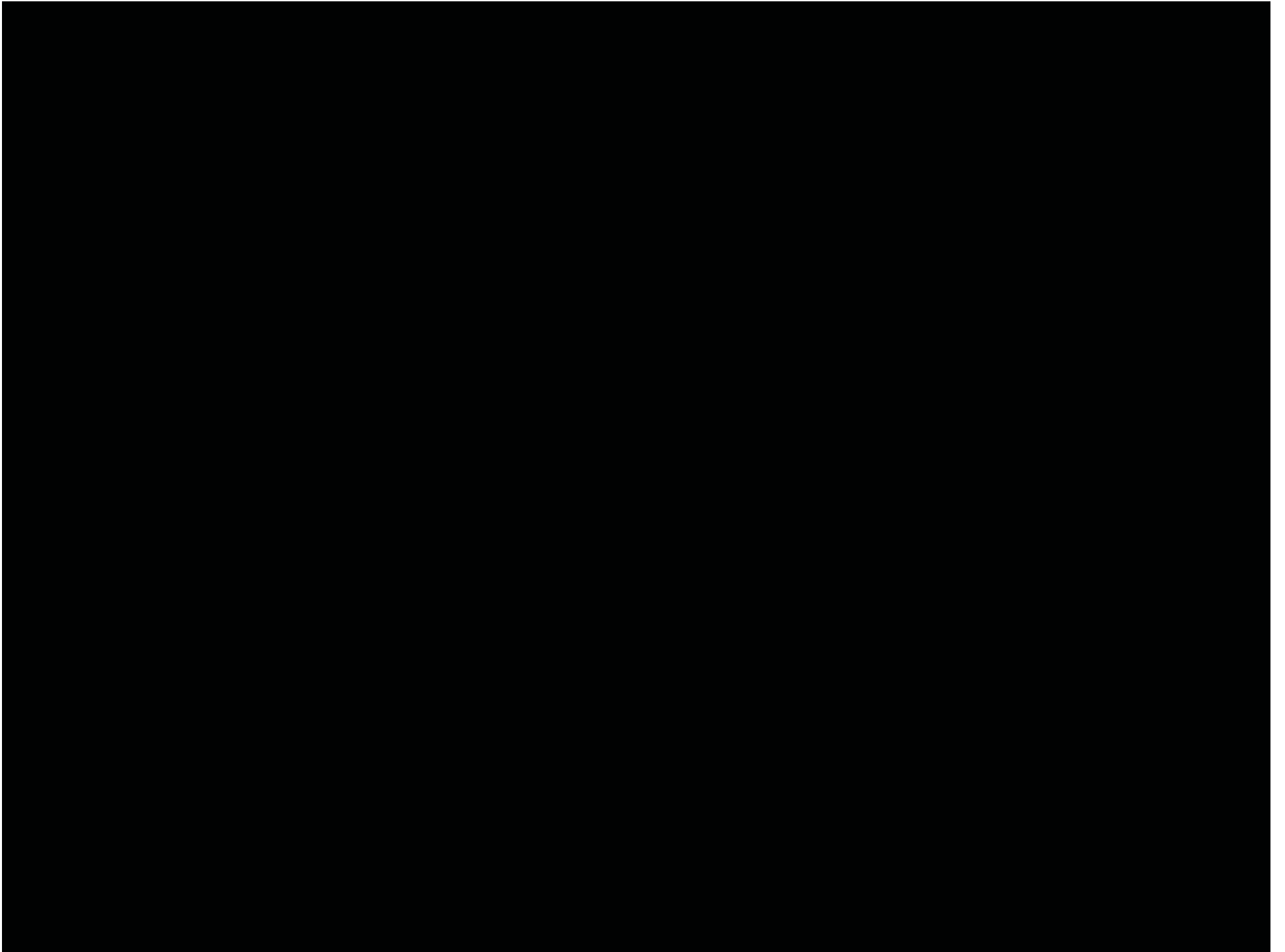




... are just the tip of the iceberg

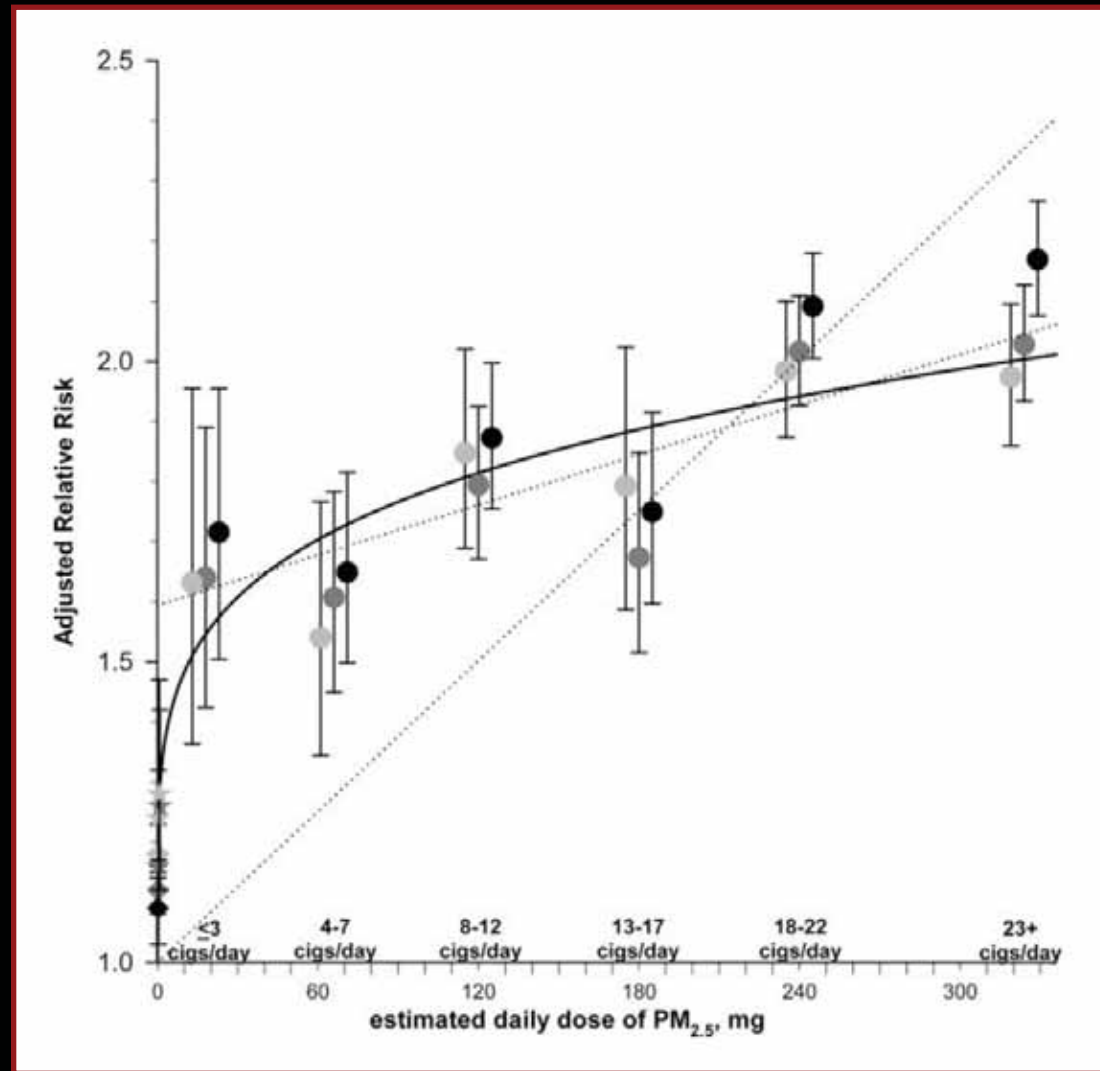
Vulnerability of the Developing Brain

- The blood brain barrier isn't fully formed; it is more permeable to toxins
- Rapidly growing cells are often more vulnerable to toxins than slowly growing cells
- Brain growth occurs over a longer duration than other organs
- The fetus and child may lack enzymes to detoxify contaminants
- Young children often more heavily exposed to contaminants than older children and adults



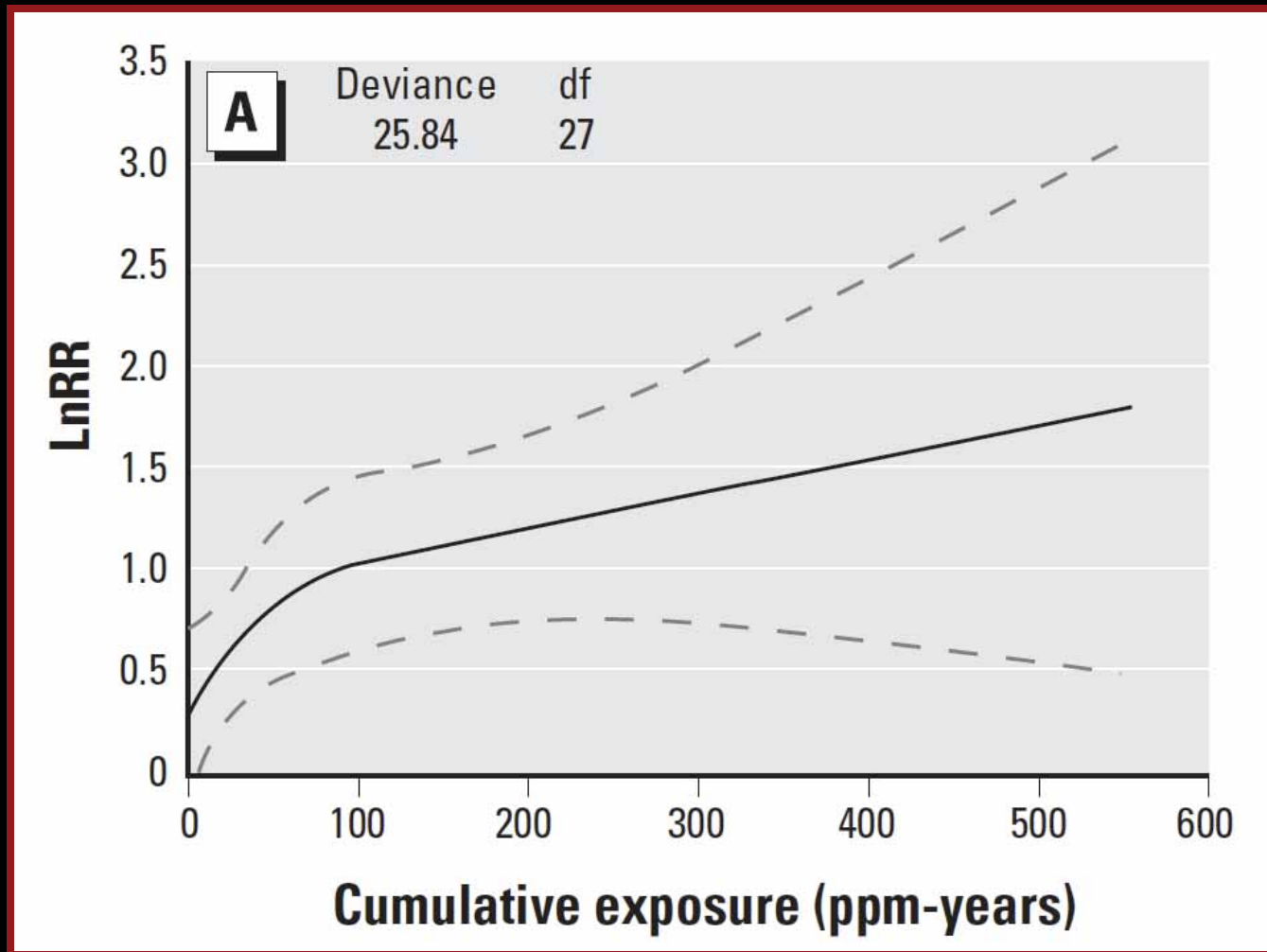
**NO ACCEPTABLE
LEVEL?**

Cardiovascular Disease Mortality by Cigarette Smoke (PM_{2.5})

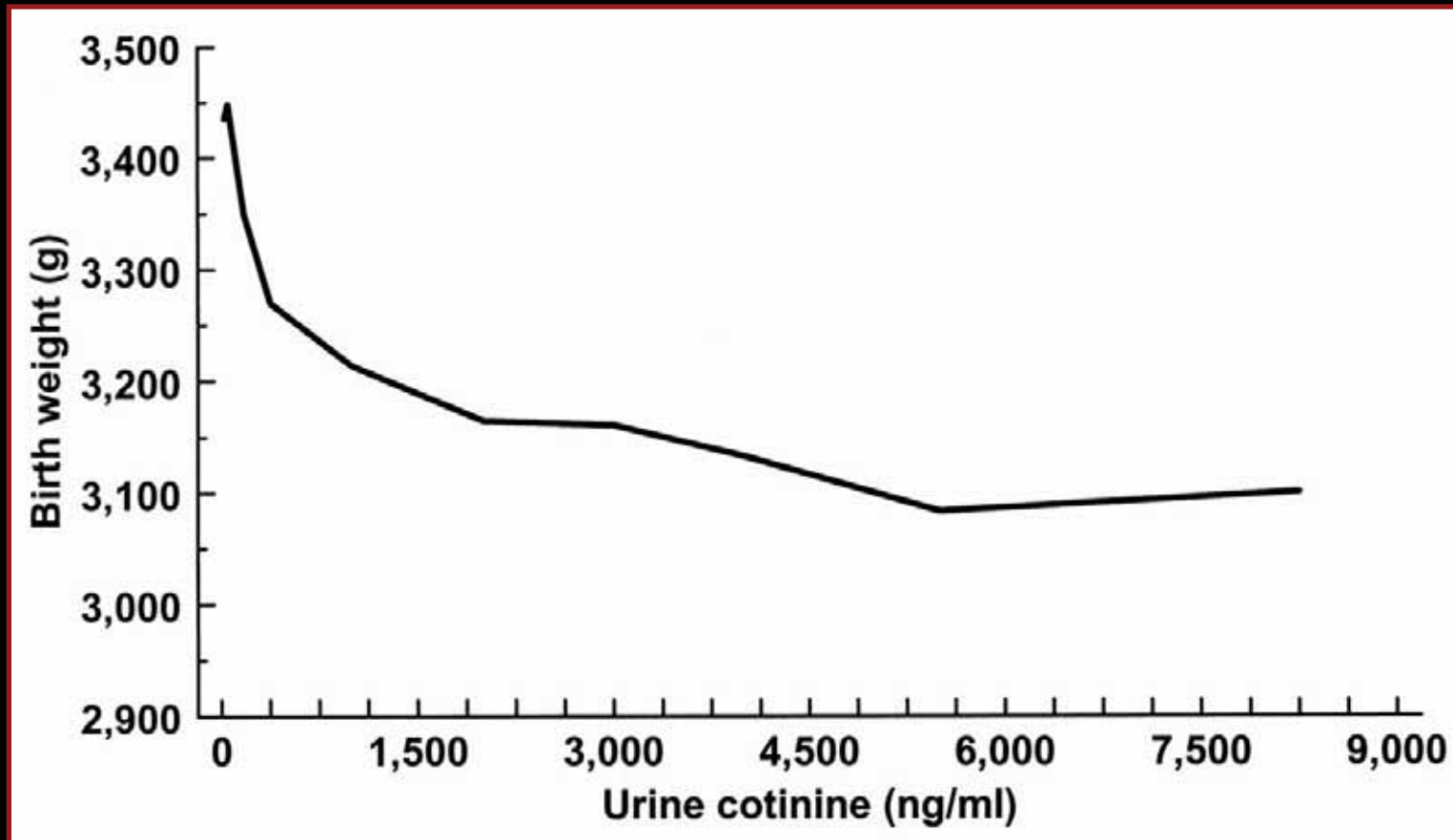


Pope CA, et al. Circulation. 2009;120:941-948. (IHD=gray, CVD=dark gray and CPD=black)

Benzene and Leukemia



Tobacco Exposure and Birthweight



England, L. J. et al. Am. J. Epidemiol. 2001 153:954-960; doi:10.1093/aje/153.10.954



ETS Ban





ETS Ban



15% Reduction PTB

Mackay DF, et al. PLoS Medicine 2012: e1001175. doi:10.1371/journal.pmed.1001175

Impact of Lead on PTB

OR=1.9



Taylor CM, et al. BJOG 2014; DOI 10.1111/1471-0528.12756

10x OPs



-151 grams



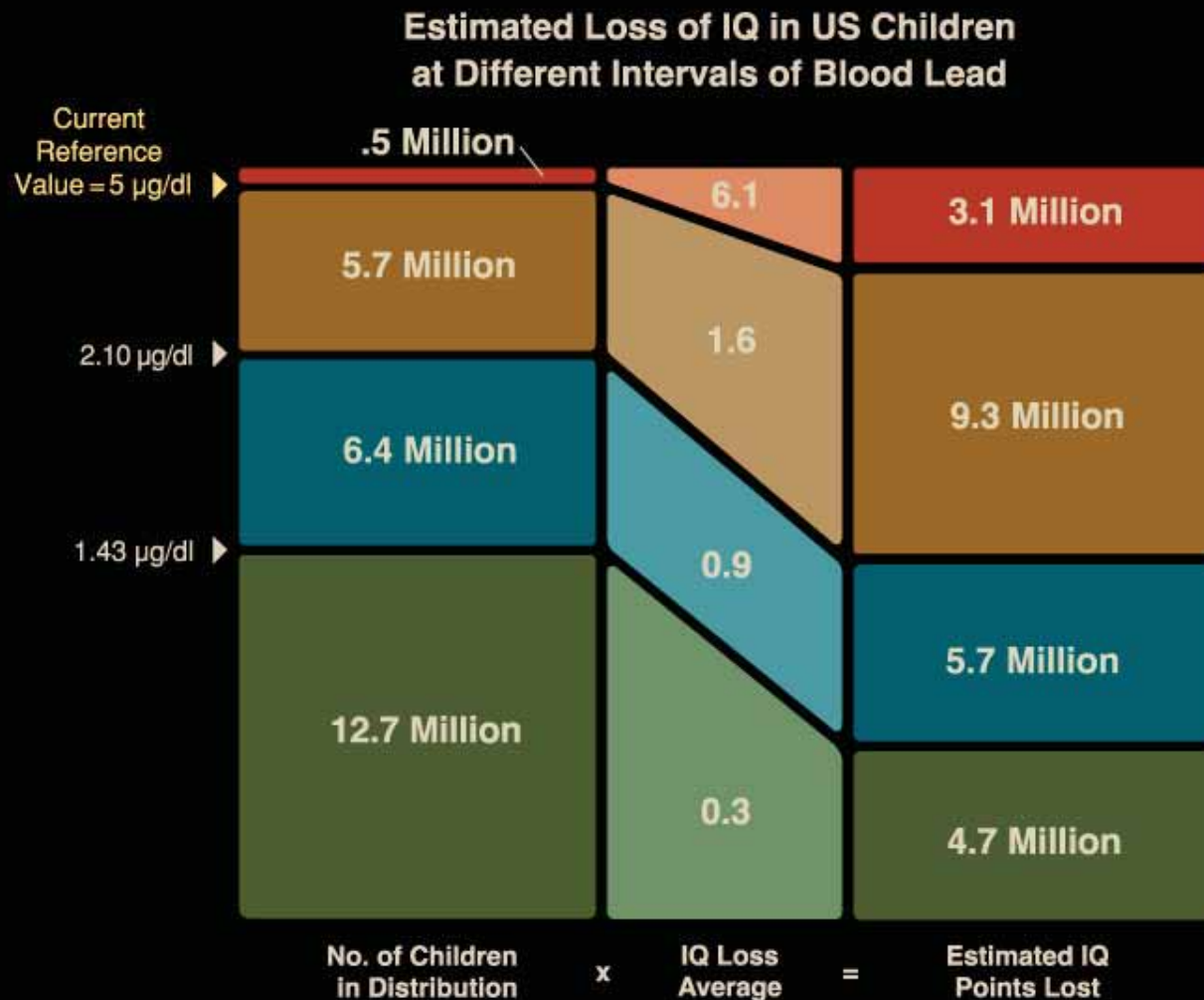
-0.5 week

Rauch SA, et al. EHP 2012;120:1055-1060.

The Prevention Paradox

The majority of disease and disability occurs in those who are at low to moderate risk

The Prevention Paradox



Using the current reference value of 5 g/dl we will only protect 3.1 million IQ points (about 18% of the total). Adapted from Bellinger D. EHP 2011;120:501-507.

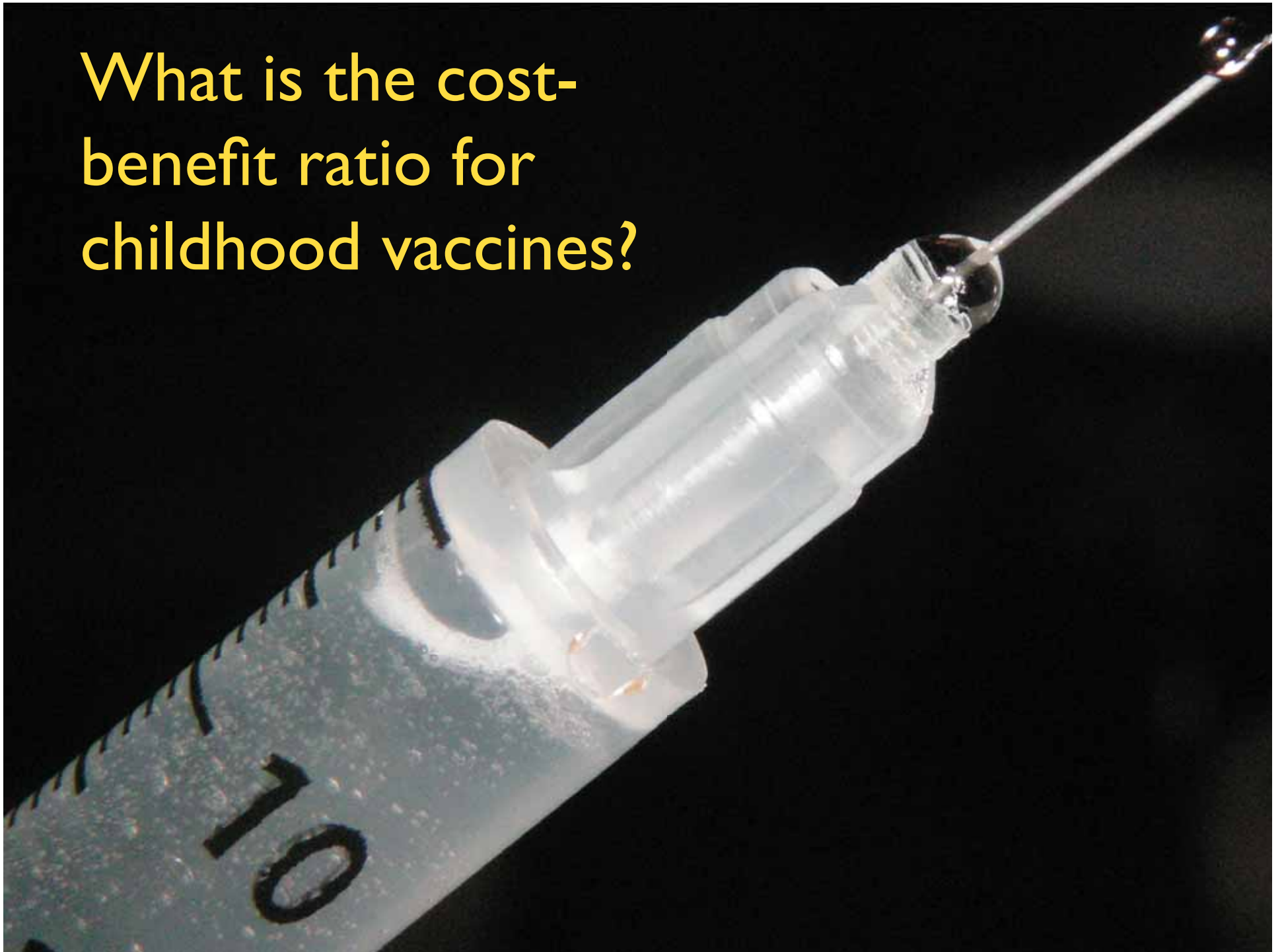
High Risk

Low-Risk

\$1 = \$17 to \$220

Gould E. EHP 2009;117:1162-1167.

What is the cost-benefit ratio for childhood vaccines?



\$1 = \$16.5

Zhou F, et al. APAM EHP 2005;159:1136-1144.

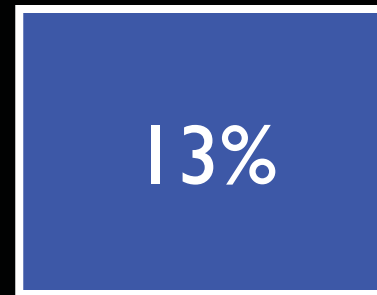
Cost Saving Preventive Interventions



Environmental



Clinical

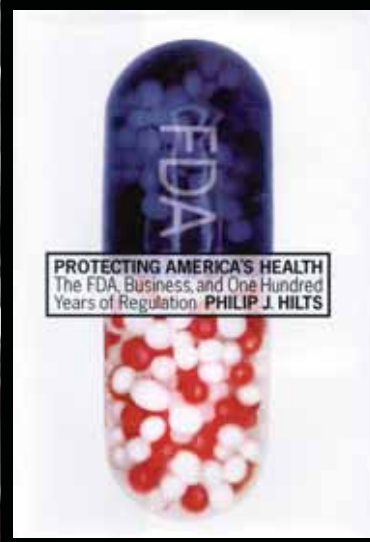


Non-clinical
person-directed

PANDEMIC OF CONSUMPTION

**Time to Give
Prevention a Chance?**

Lessons from the FDA







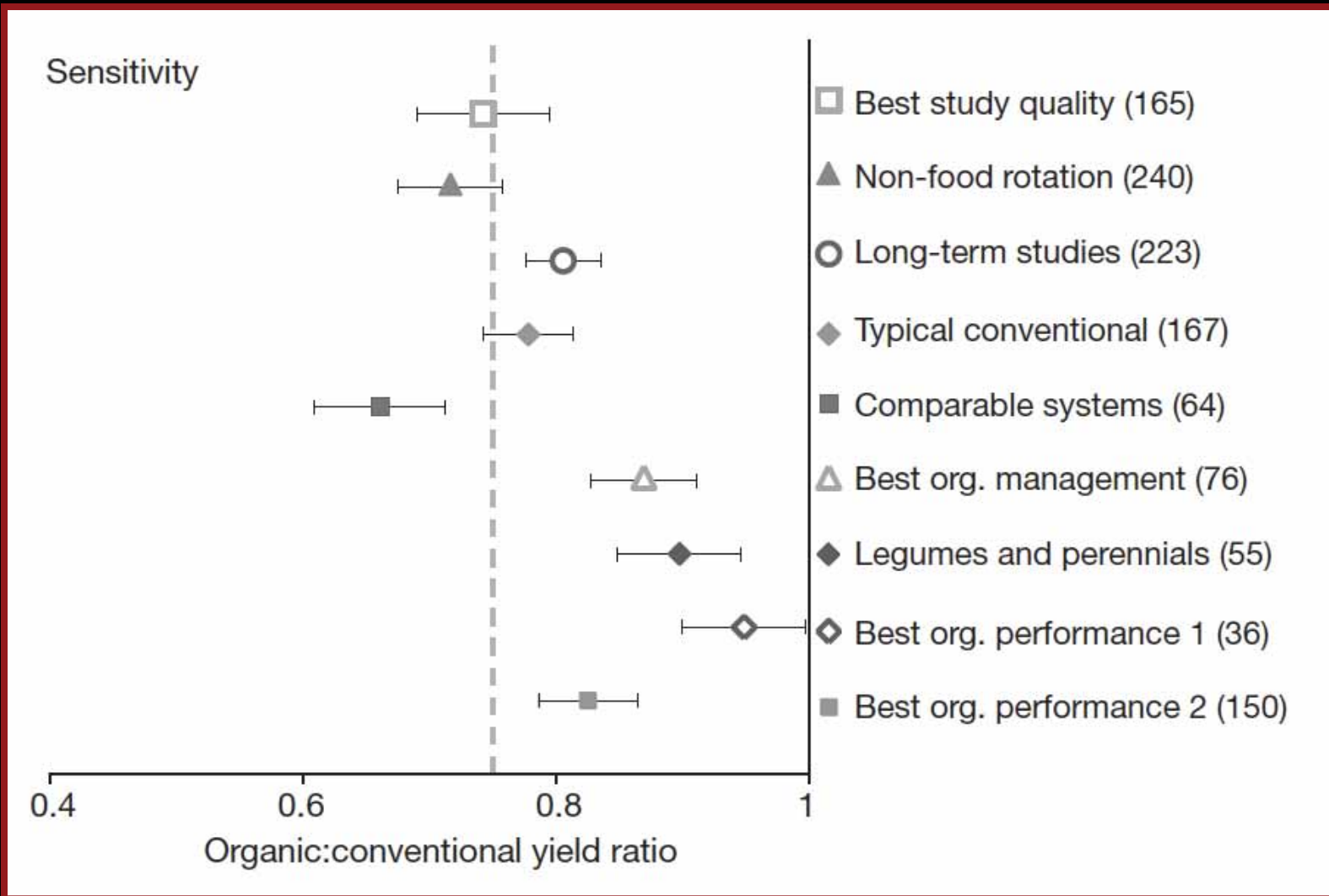
If we didn't evolve
with it ...

avoid it.

How to Avoid Exposures to Toxins

- Eat fresh, organic and unpackaged foods; avoid canned foods
- Minimize use of pesticides around the home
- Avoid cosmetics, fingernail polish and lotions
- Support bans on smoking in public places and cosmetic pesticides
- Support efforts to update chemical management policies and reduce industrial pollutants

Organic to Conventional Yield Ratios



Seufert V, et al. Nature 2012;485:229.

“We can’t live in a state of perpetual doubt, so we make up the best story possible and we live as if the story were true.”

Daniel Kahneman

