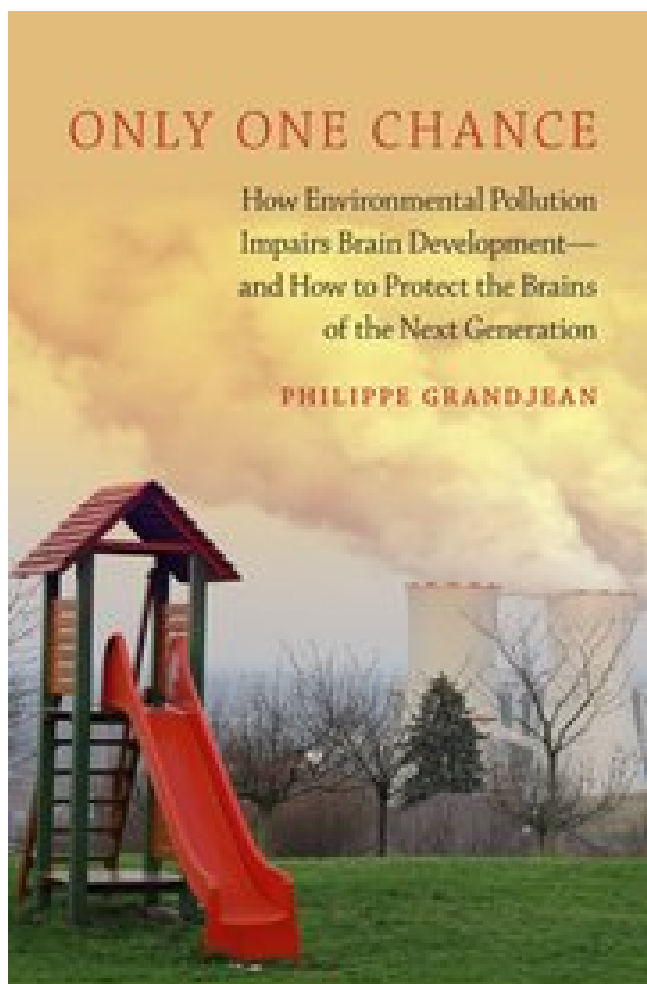


# EDC Strategy

## CHE partnership call

### Wednesday, April 16<sup>th</sup>, 2014



Dr. Philippe Grandjean  
on **Chemical Brain Drain:**  
How the Next Generation's  
Brain Functions are  
Endangered by EDCs and  
Other Environmental Chemicals

[www.chemicalbraindrain.info](http://www.chemicalbraindrain.info)



## **Erroneous and dangerous assumptions:**

- The placenta protects the fetus
- Children are just little adults
- Poisonings are reversible
- Proof is needed for regulation
- Testing is too expensive

# Sensitive brain development

- **Cell division**

In third trimester about 12,000 nerve cells are formed every minute

- **Differentiation**

- **Migration**

Distances up to 1,000 times the size of the cell

- **Axon formation**

Total length by age 20 years: 176,000 / 149,000 km (m/f)

- **Generation of synapses**

Up to 1,000 new synapses per second early postnatally

- **Weeding of synapses**

# Brain development gone astray

...in every case the mother was healthy,  
and it was not until more than three  
months after birth that the symptoms  
were recognized

Shoji Kitamura (1959)



Photo: W. Eugene Smith

Focal

Widespread

Diffuse

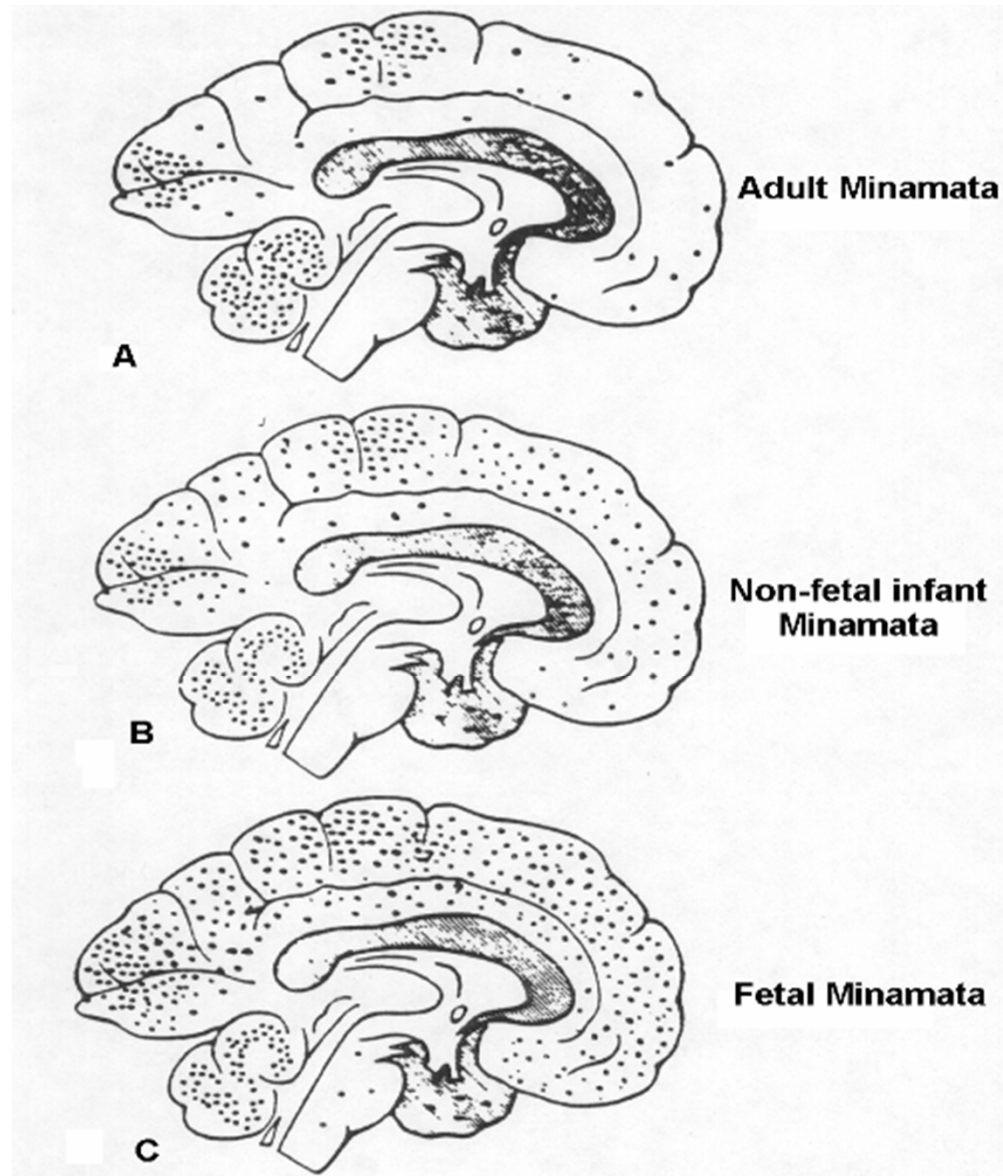
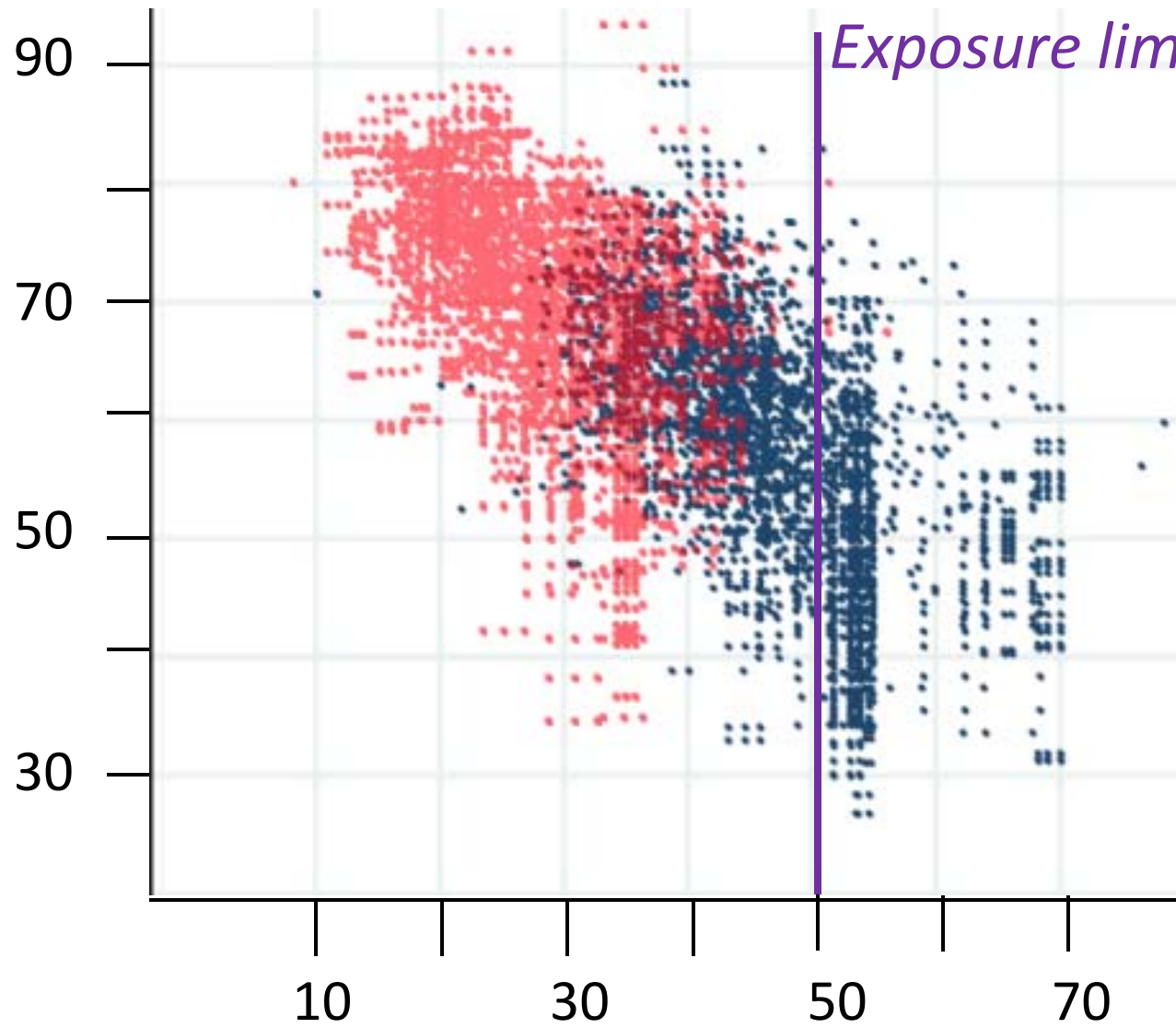


FIG 1: Comparison of the distribution of lesions among the adult (A), non-fetal infantile (B), and fetal infantile (C) Minamata disease. Takeuchi (67), with permission.

From: Choi, BH. Progress in Neurobiology, 32: 447-490, 1989.

# Percent correct responses on MCAS math test in 4th grade



Averages for 351 Massachusetts municipalities:  
Children born in **1992** and **1999**

(Jessica W. Reyes, 2012)

Average blood-lead (µg/L) at preschool age

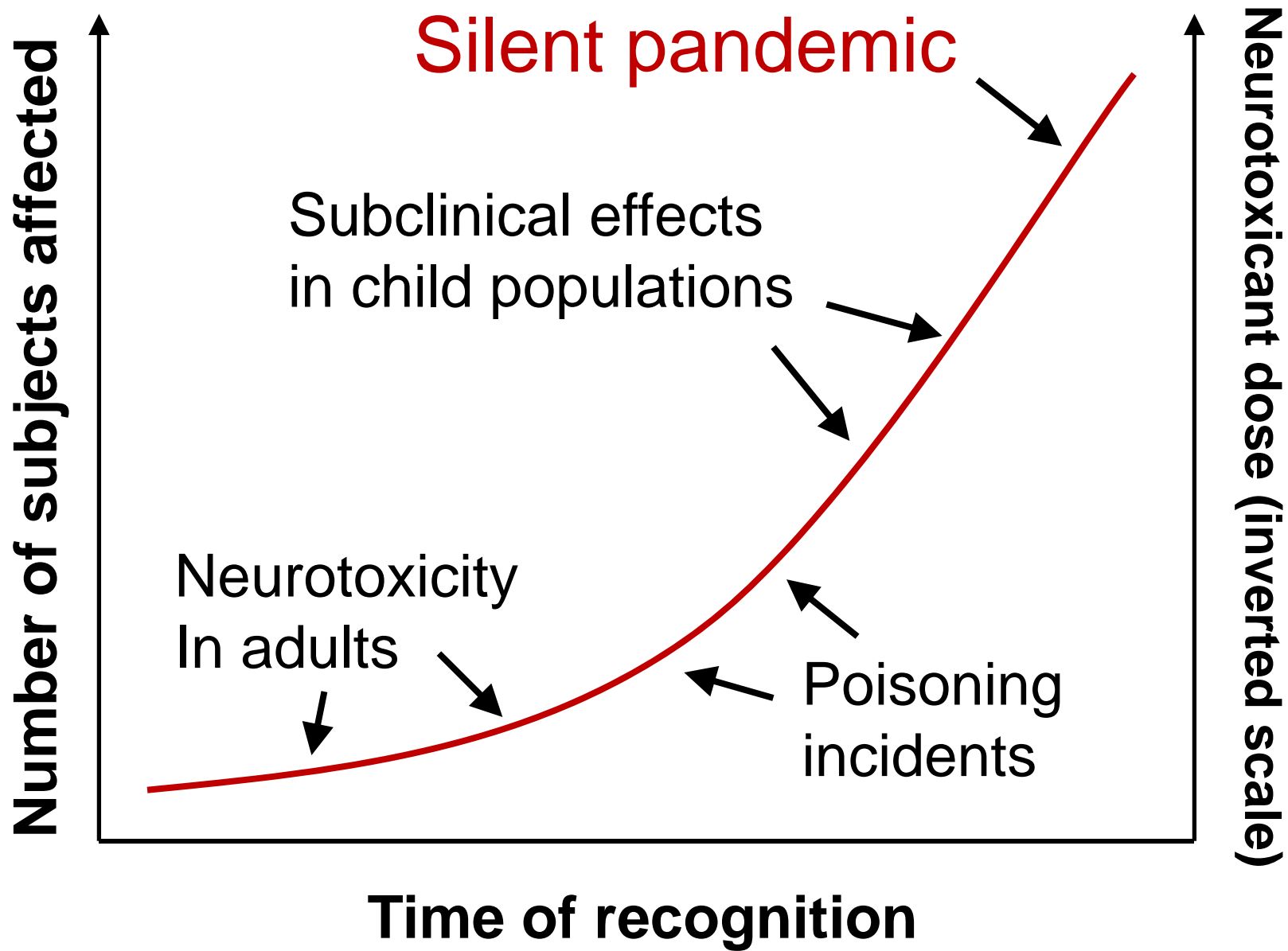
# Chemical brain drainers

<i>Chemical group</i>	<i>Known in 2006</i>	<i>Newly identified</i>
Metals/inorganic compounds	Arsenic* Lead* Methylmercury*	Fluoride* Manganese*
Organic solvents	(Ethanol) Toluene*	Tetrachloroethylene*
Pesticides		Chlorpyrifos* DDT/DDE*
Other organic compounds	Polychlorinated biphenyls (PCBs)*	Brominated diphenyl ethers*
<b>Total</b>	<b>6</b>	<b>6</b>

\*Endocrine disruptor, according to TEDX

(Grandjean & Landrigan, *Lancet Neurology*, 2014)





(Grandjean and Landrigan, *The Lancet*, 2006)

**Known neurotoxic to humans  
during development,  $N > 10$**

**Neurotoxic to humans**

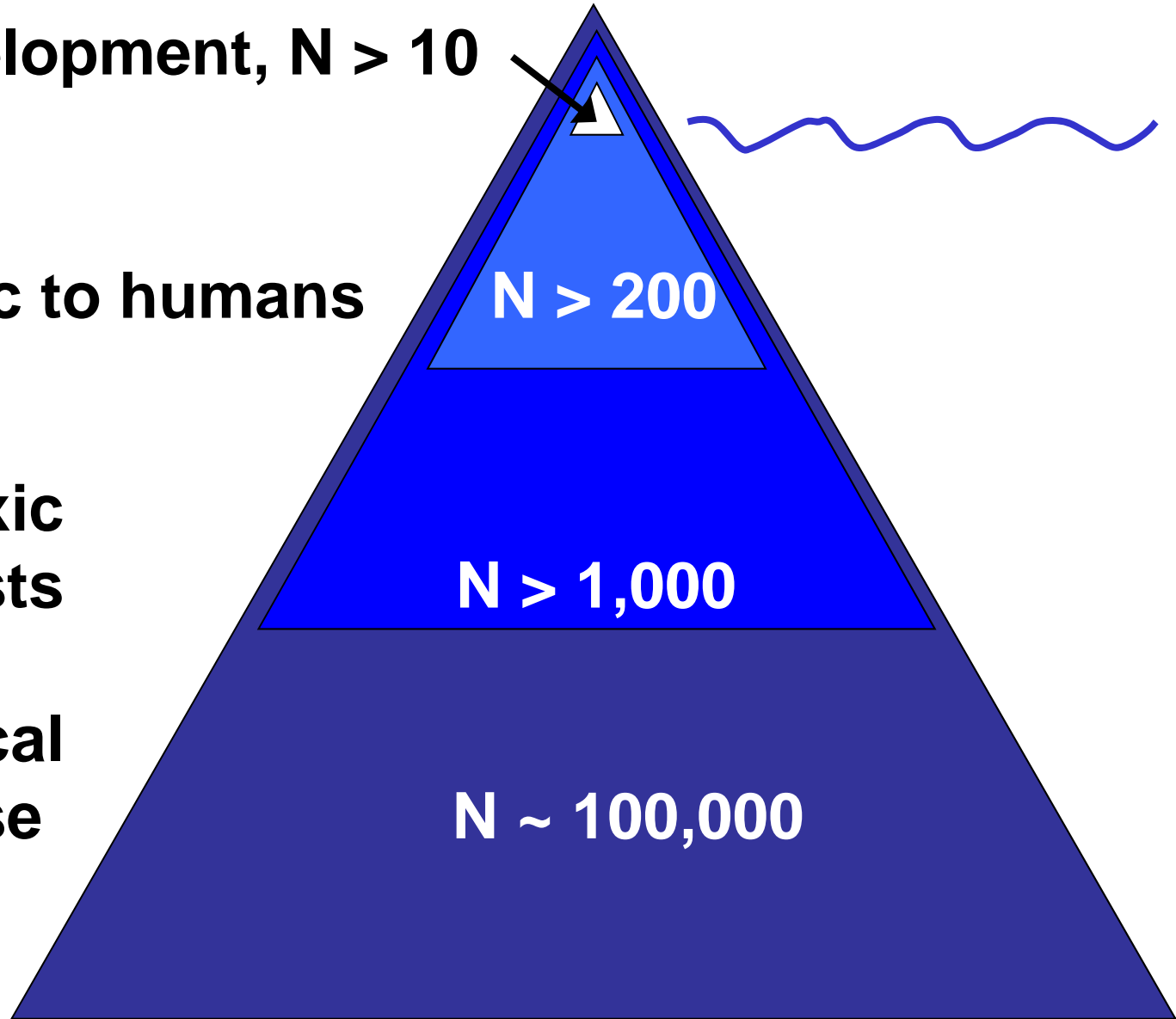
**$N > 200$**

**Neurotoxic  
in lab tests**

**$N > 1,000$**

**Chemical  
universe**

**$N \sim 100,000$**



*(Updated from Grandjean and Landrigan, The Lancet, 2006)*

**The goal: Full integrity of the brain  
to allow optimal brain functions**

**We need it:**

The brain  
determines  
behavior, IQ,  
*endocrine  
functions...*  
**and who we are**



# What can be done?

- Mothers, consumers can make *choices* to decrease exposures
- An *OECD test protocol* is available to test for developmental neurotoxicity
- New *cell-based tests* are faster, cheaper
- *Regulation of EDCs*
- Chemicals control needs to include *focus on brain development*
- International *clearinghouse*

