

# Childhood Exposure

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\*Funded by US Agency for Toxic Substances Disease  
Registry and USEPA through AOEC



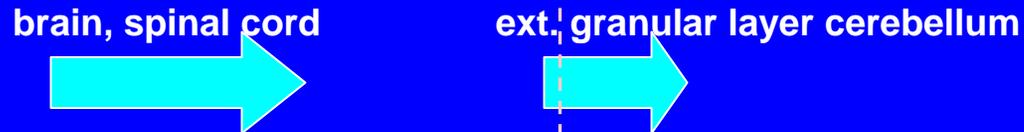
# Time Line of Developmental Processes in Human Brain

Prenatal Period (Months)      Postnatal Period (Years)  
 0 1 2 3 4 5 6 7 8 9 Birth 1 2 3 4 5 6 7 8 9 10

**Cell Proliferation**



**Migration of Neurons**



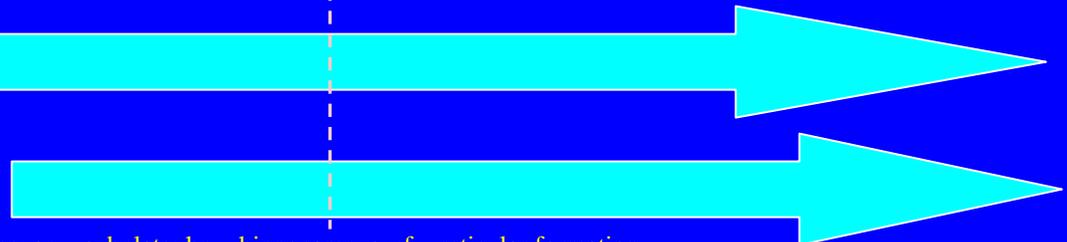
**Gliogenesis**



**Synapse Formation**



**Myelination (see text)**  
**Apoptosis**



Key: mz – marginal zone; sp – subplate; hp – hippocampus; rf – reticular formation

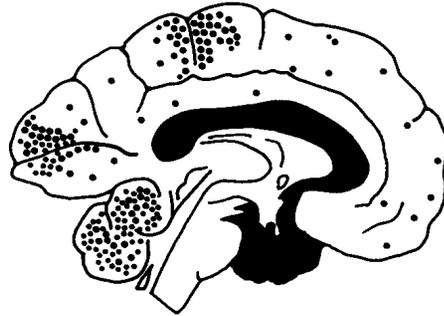
# Specific processes disrupted by neurodevelopmental toxicants

proliferation	radiation, ethanol, mercury, cholinesterase inhibitors, <b>thyroid</b>
migration	radiation, mercury, ethanol, <b>thyroid</b>
differentiation	ethanol, nicotine, mercury, lead, <b>thyroid</b>
synaptogenesis	radiation, ethanol, lead, triethyl tin, parathion, PCBs, <b>thyroid</b>
gliogenesis & myelination	thyroid, ethanol, lead, <b>thyroid</b>
apoptosis	ethanol, lead, mercury
signaling	ethanol, <b>cholinesterase inhibitors</b> , mercury, lead, PCBs, <b>thyroid</b> , <b>neurotransmitters</b>

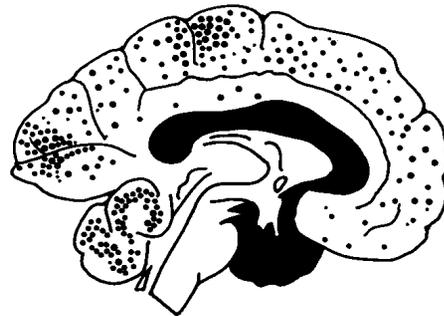


From Minamata  
Eugene and Aileen Smith  
H,R,W 1975

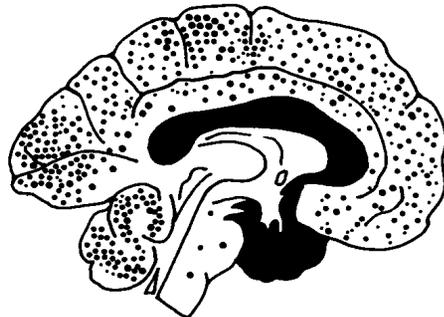
Comparison of the distribution of lesions among the adult, infant, and congenital infant victims of Minamata Disease.



*Adult Minamata Disease*



*Non-congenital infantile  
Minamata Disease*

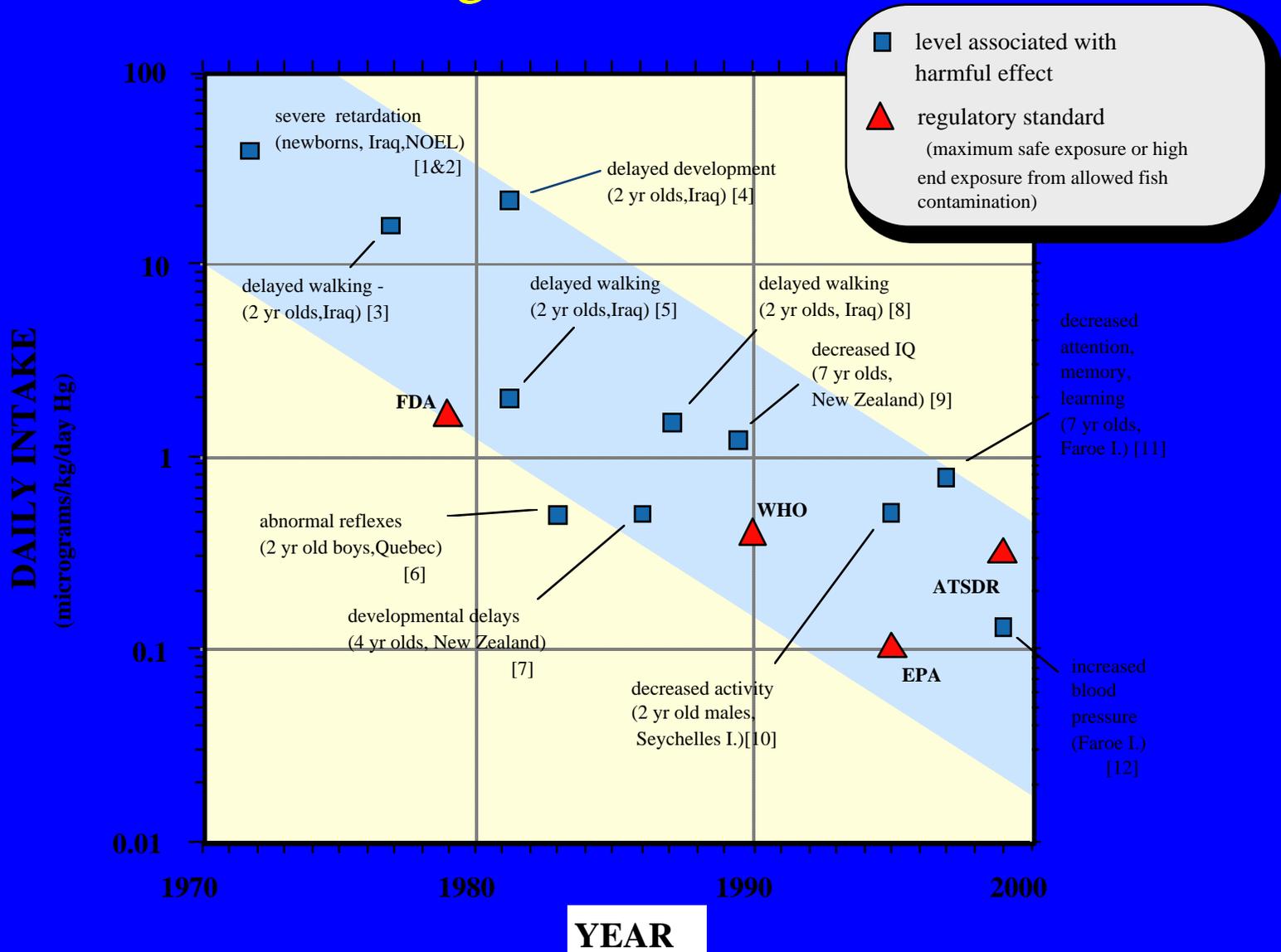


*Congenital Minamata Disease*

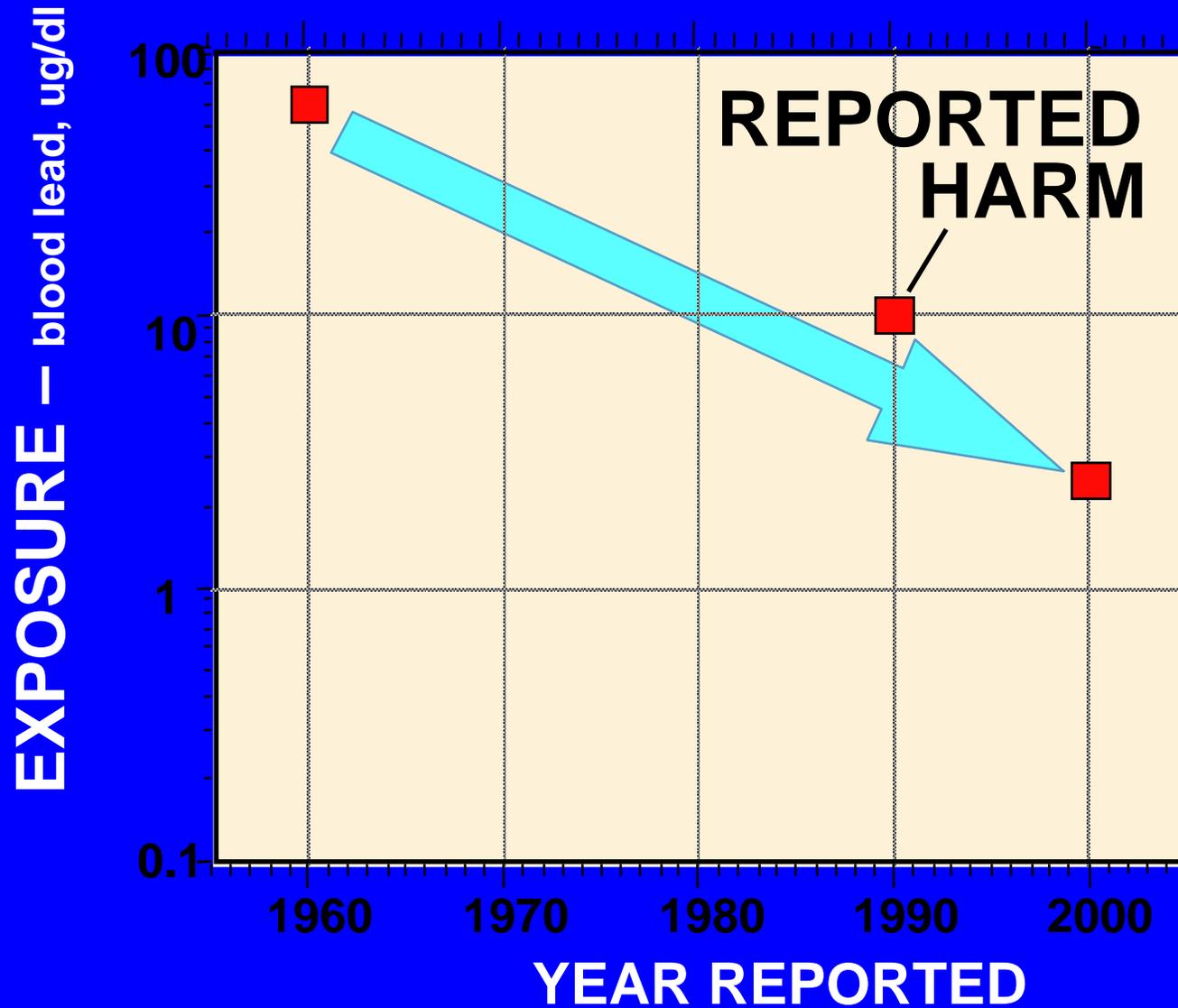
Takeuchi: From Minamata  
Eugene and Aileen Smith  
H,R,W 1975

# Mercury

## Declining Threshold of Harm

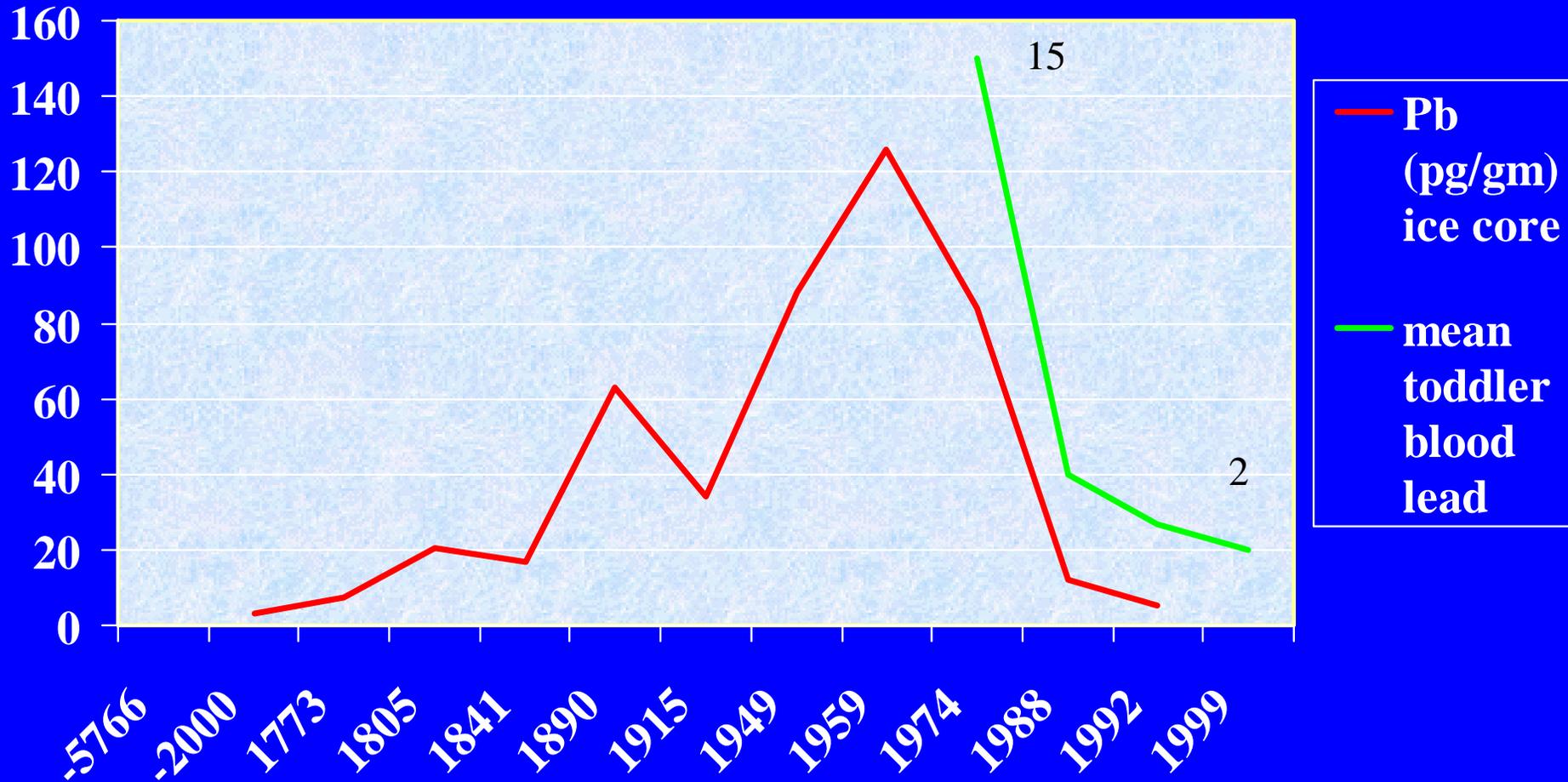


# Lead Disrupts Synaptogenesis, Gliogenesis, Apoptosis, Neurotrophic Signaling



Note: Exposures expressed in milligrams/deciliter (blood lead)

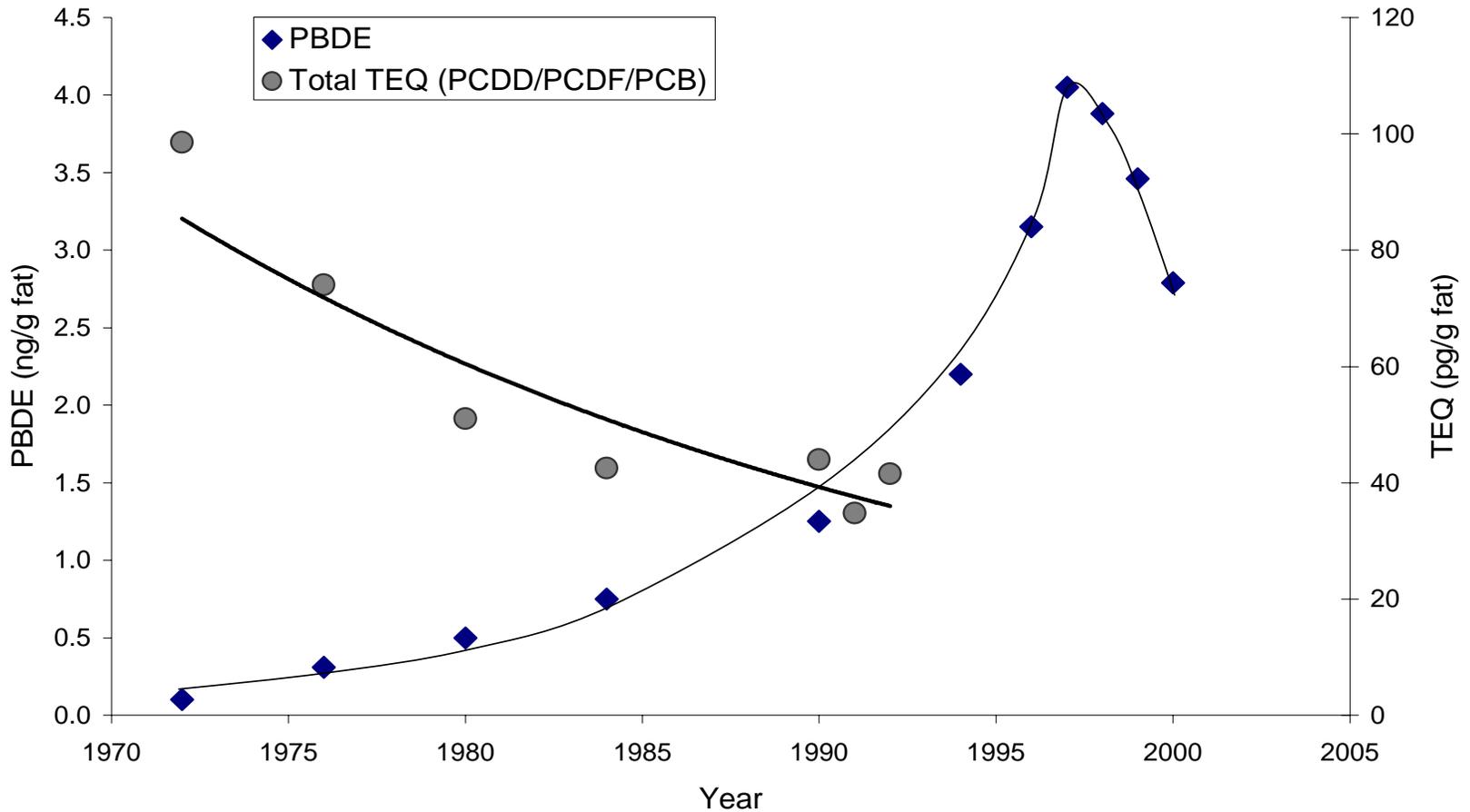
# Greenland Snow and Ice Lead



Derived from Candelone Et Al. 1995 J of Geophysical Research Vol.100 No. D8 and  
CDC, NHANES 2 and 3

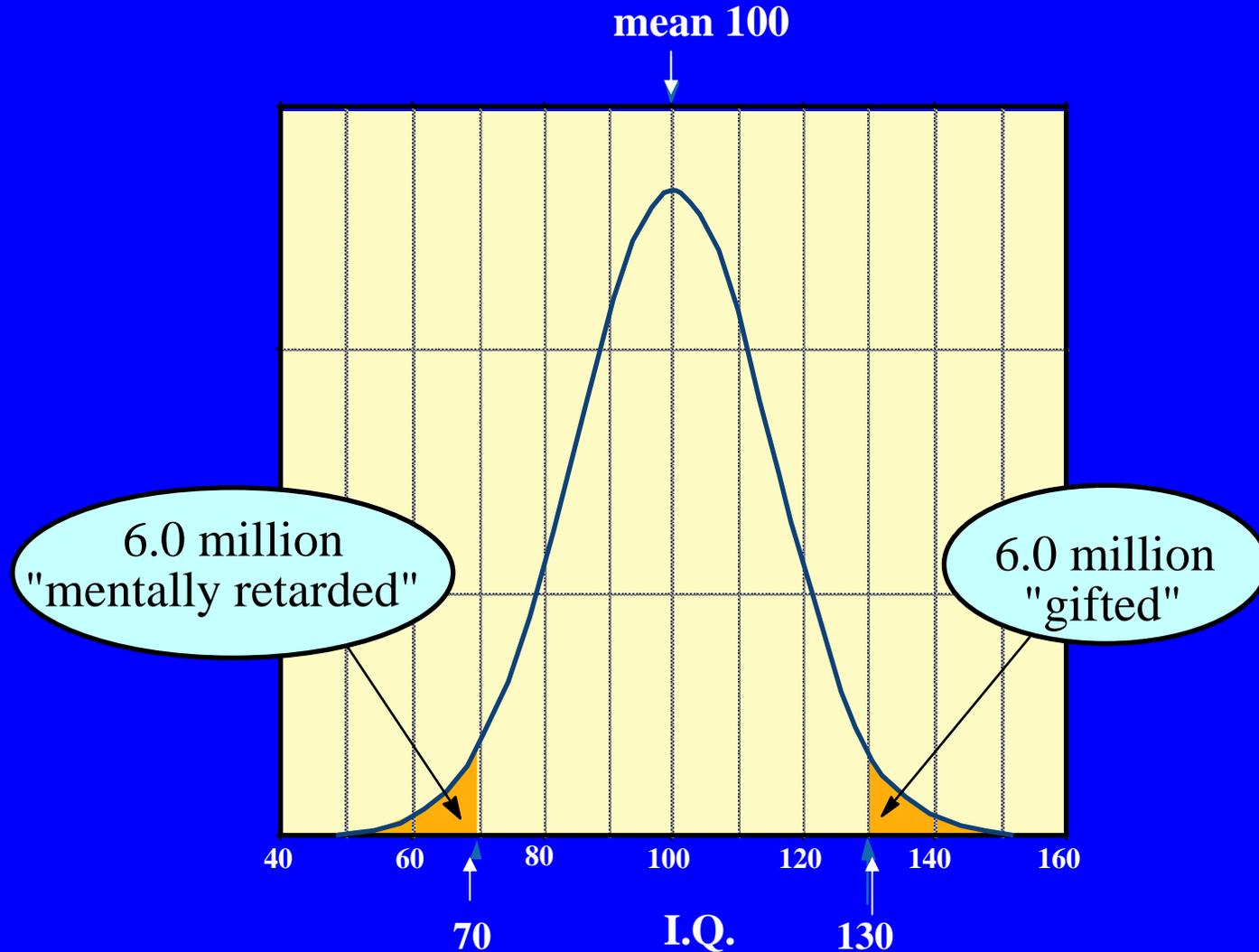
# Organohalogen Compounds in Breast Milk in Sweden

PCB, polychlorinated biphenyl; PCDD, polychlorinated dibenzo-*p*-dioxin; PCDF, polychlorinated dibenzofuran; PBDE, polybrominated diphenylether; TEQ, toxic equiv.



# The Significance of Small Effects in a Population

## Effects of A Small Shift in IQ Distribution



# 5 Point Decrease in Mean IQ

