

Children's Health and the Environment - The Problem and the Solution

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THE ENVIRONMENT IS A POWERFUL DETERMINANT OF HEALTH AND DISEASE, ESPECIALLY FOR CHILDREN

As Nations Develop, Patterns of Disease in Children Change Profoundly

- Infectious diseases decline in frequency and severity (AIDS, tuberculosis notwithstanding)
- Infant mortality decreases
- Life expectancy increases
- Chronic diseases increase

In industrially developed Nations,
chronic diseases include:

- Asthma
- Cancer
- Birth defects
- Neurodevelopmental disorders
- Obesity

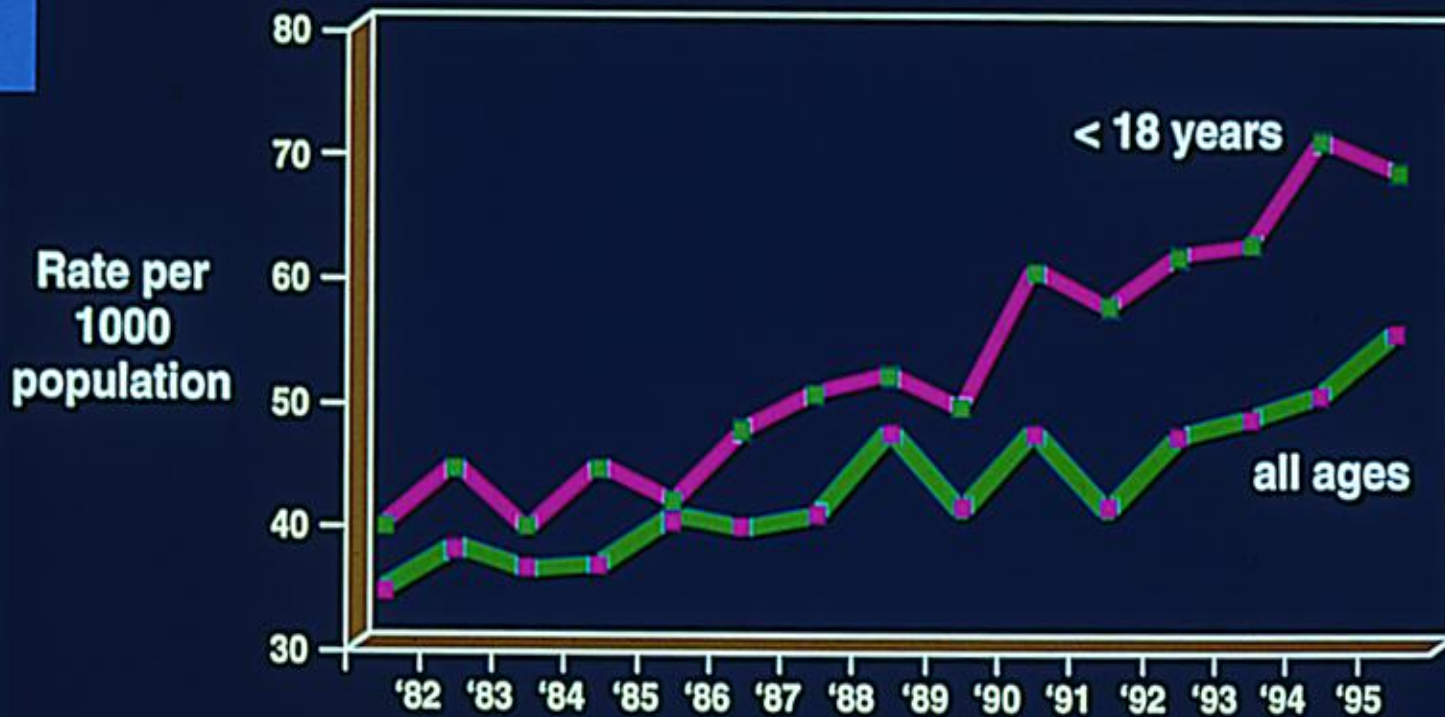
These are the principal causes of illness, hospitalization, and death in children.

Evidence for Environmental Causation of Asthma

- Known indoor triggers such as house dust, second-hand tobacco smoke, mold and mildew, cockroach droppings, certain pesticides
- Ambient air pollution – ozone and particulates.
- Genetic susceptibility is important and candidate genes have been identified



Prevalence Rates for Asthma by Age and Year, United States, 1984-1994



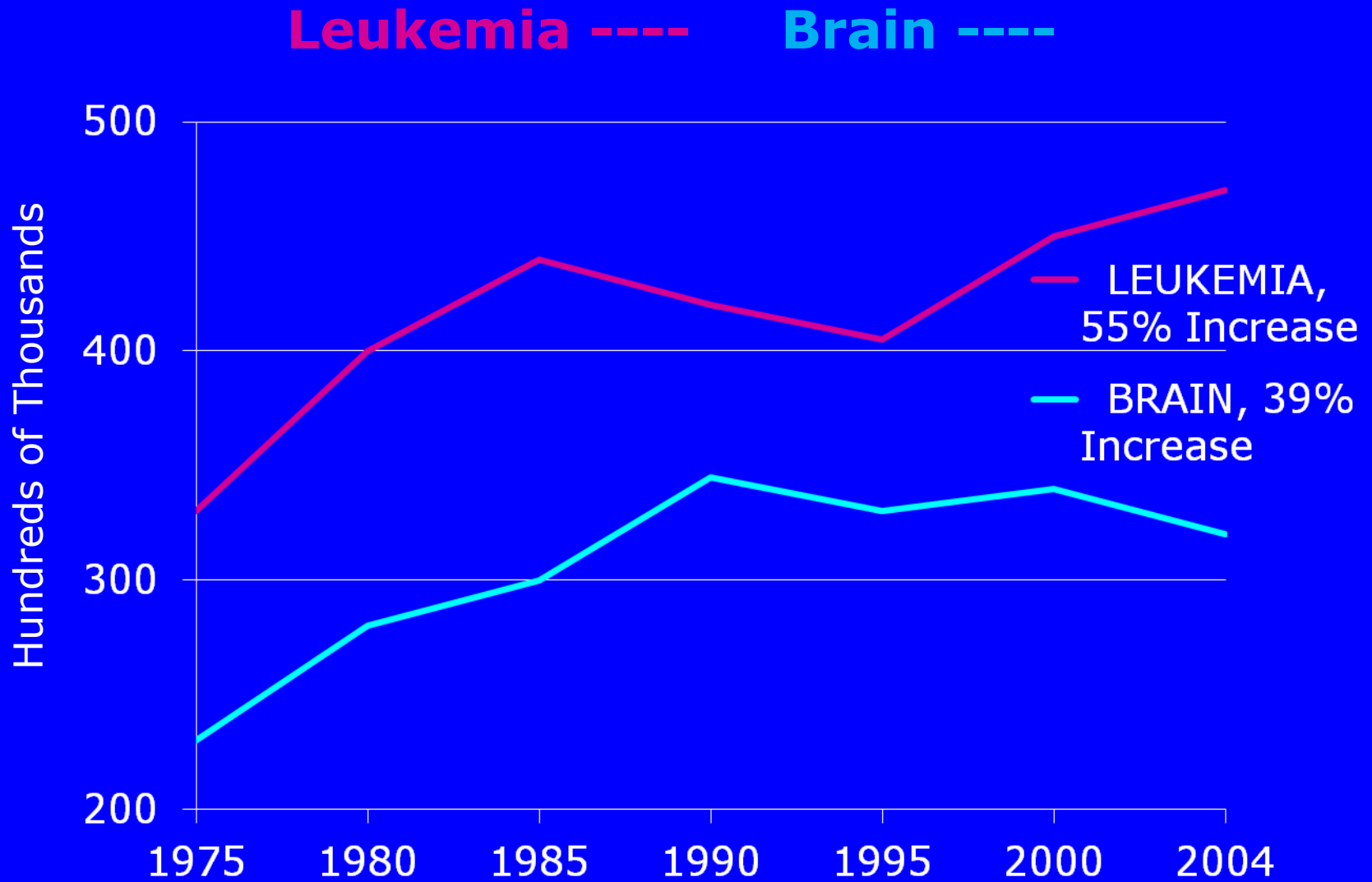
Source: Centers for Disease Control & Prevention

Children: Increase from 40 to nearly 70/1000
All ages: Increase from 35 to 55/1000

Environmental Causation of Childhood Cancers

- Radiation
- Solvents, especially benzene
- Parental employment in industries that use solvents – painting and printing
- Pesticide exposure, especially prenatally

Incidence of Childhood Cancers, 1975 – 2004:



Evidence for Environmental Caustation of Male Reproductive Disorders

- Falling sperm counts – cause not known
- Rising testicular cancer – cause not known
- Increasing hypospadias – cause not known

*Are Endocrine Disrupting Chemicals
responsible? We do not know.*

Developmental Disabilities

- Effect 3-8% of all children
- Include:
 - Dyslexia
 - Attention deficit hyperactivity disorder (ADHD)
 - Autism
 - Mental Retardation
- Possibly increasing in incidence

Overweight and Obesity

- Prevalence has nearly quadrupled in American children and can result in:
- 2.5-fold increased risk of overall mortality
- 4-fold risk of cardiovascular mortality
- 5-fold risk of diabetes
- Risk of hypertension, gall bladder disease, and some cancers



Source: Willet et al., *New Eng J Med*, 1999

Children are Uniquely Vulnerable to Toxic Chemicals

- Greater exposure:
 - *Children take in 7 times more water/Kg/day;*
 - *Hand-to-mouth activity markedly increased*
- Diminished ability to detoxify & excrete chemical toxins
- Heightened biological vulnerability:
thalidomide, DES, fetal alcohol syndrome
- Children have many more years of future life

--US National Academy of Sciences, 1993

“Children are not Little Adults”

Children today are exposed to thousands of synthetic chemicals. Most have not been tested for toxicity.

- 80,000+ chemicals are in use in commerce**
- Most have been invented in the past 30-40 years**
- 3,000 are high production volume (HPV) chemicals**
- No basic toxicity information is publicly available for nearly half of HPV chemicals**
- Information on developmental toxicity is available for less than 20% of HPV chemicals**
- Many HPV chemicals are detectable in adult blood, breast milk, and infant cord blood**

The Spectrum of Neurotoxicity is not Limited to Clinically Obvious Conditions

Widespread subclinical neurotoxicity can affect the health, well-being, intelligence, and even the security of an entire nation

Evidence for Environmental Caustation of Neurodevelopmental Disorders

- Lead
- Methyl Mercury
- Polychlorinated Biphenyls (PCBs)
- Organophosphate Pesticides
- Arsenic
- Manganese
- Others?

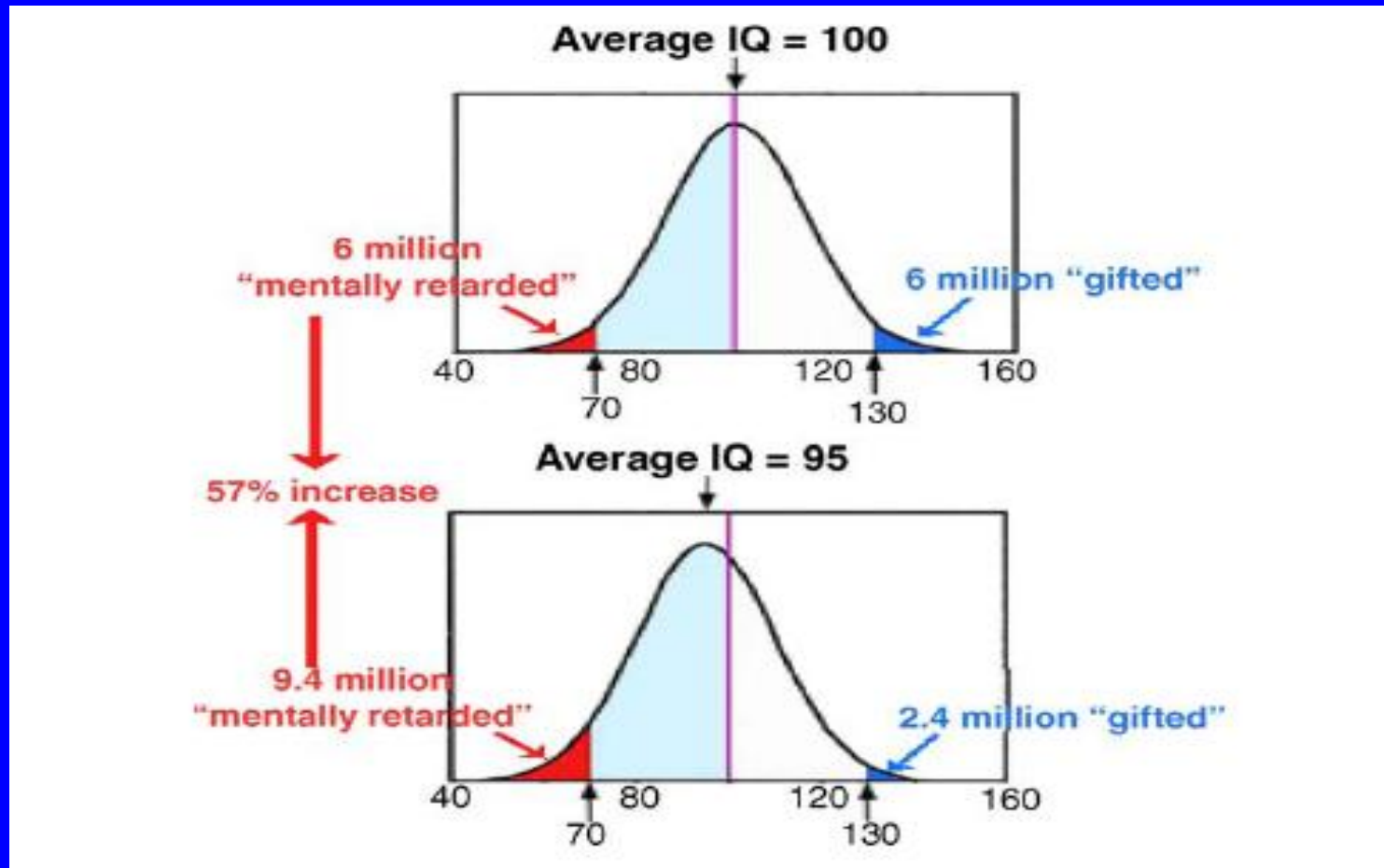
Lead and Behavior – Lead Affects more than Intelligence

- Needleman et al. found a borderline association between teachers' ratings for aggression, delinquency, social problems and lead levels in children at age seven.
- By age 11, increased delinquent and aggressive behaviors were clearly evident in children with higher lead levels.
- By age 18, young adults with higher lead levels at age 7 were more likely to be dyslexic and to have quit school.

Estimated Total Costs of Pediatric Disease of Environmental Origin

Disease	Best Estimate	Low Estimate	High Estimate
Lead Poisoning	\$43.4 billion	\$43.4 billion	\$43.4 billion
Asthma	\$2.0 billion	\$0.7 billion	\$2.3 billion
Cancer	\$0.3 billion	\$0.2 billion	\$0.7 billion
Neurobehavioral Disorders	\$9.2 billion	\$4.6 billion	\$18.4 billion
Total	<u>\$54.9 billion</u>	\$48.8 billion	\$64.8 billion

Societal impact of 5-point loss in IQ score



There is a Solution

- **Testing chemicals for toxicity**
- Disease tracking
- **Research**
- Training of health care providers
- Patient care
- **Prevention**

Research: The National Children's Study



<http://www.nationalchildrensstudy.gov/>

RESEARCH

The National Children's Study

- A multi-year prospective epidemiological study that will examine the influences on health, disease, and development of exposures in early life
- 100,000 children will be followed from early in pregnancy to at least 18 years of age
- Will explore simultaneous impacts of many risk factors – chemical, social, behavioral

Critical Research Questions for the National Children's Study

- Contribution of indoor and ambient air pollution to the origins of asthma
- Environmental causes of developmental disabilities
- Effects of endocrine disruption
- Causes of the rising incidence of certain pediatric cancers

<http://www.nationalchildrensstudy.gov/>

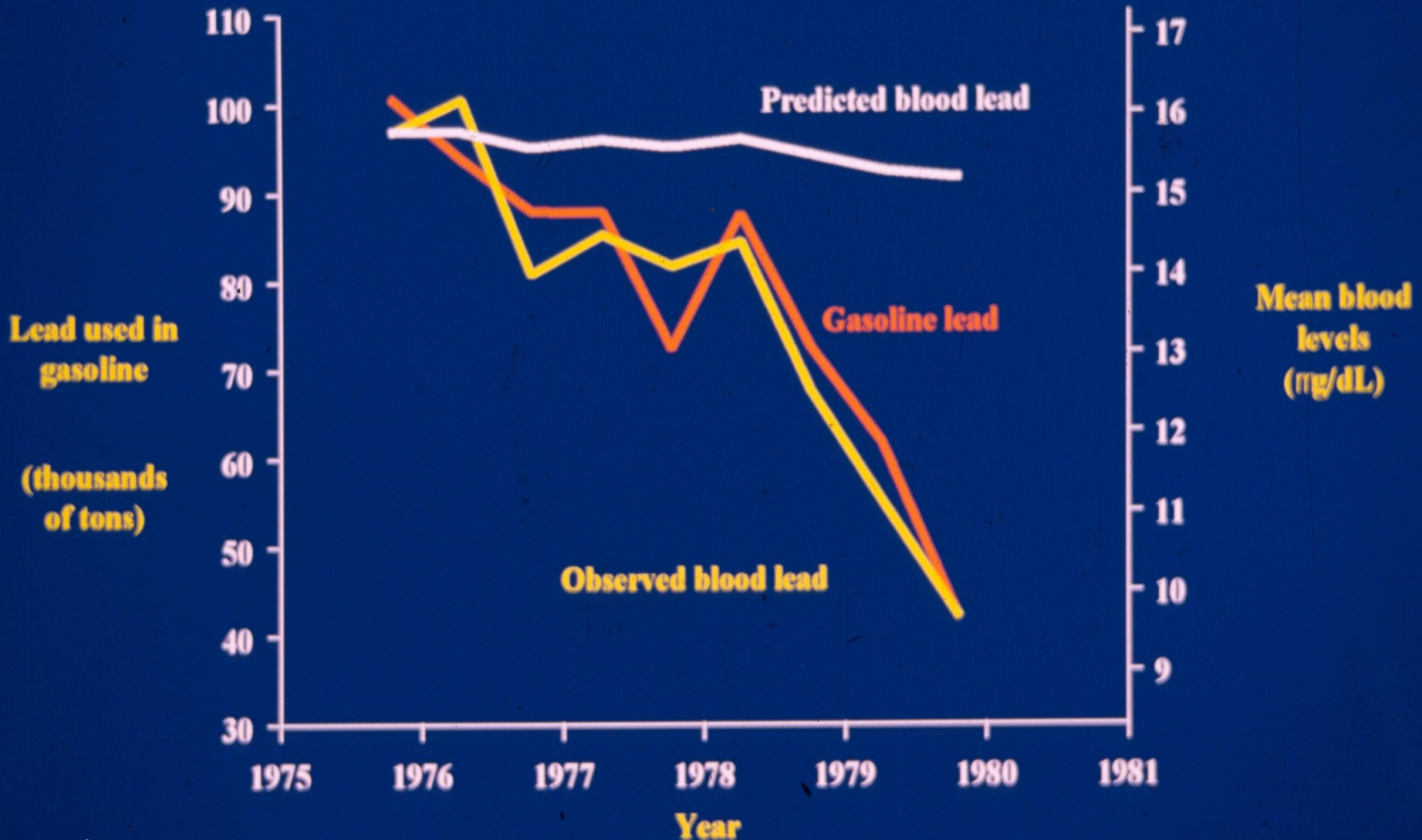
Who will be enrolled?

- Household recruitment
 - Women who are in the first trimester of pregnancy
 - Women who are planning a pregnancy
 - Women of child-bearing age who are not planning pregnancy but could become pregnant during the enrollment period
- Supplemental recruitment
 - Prenatal care providers
 - Community based recruitment of eligible women

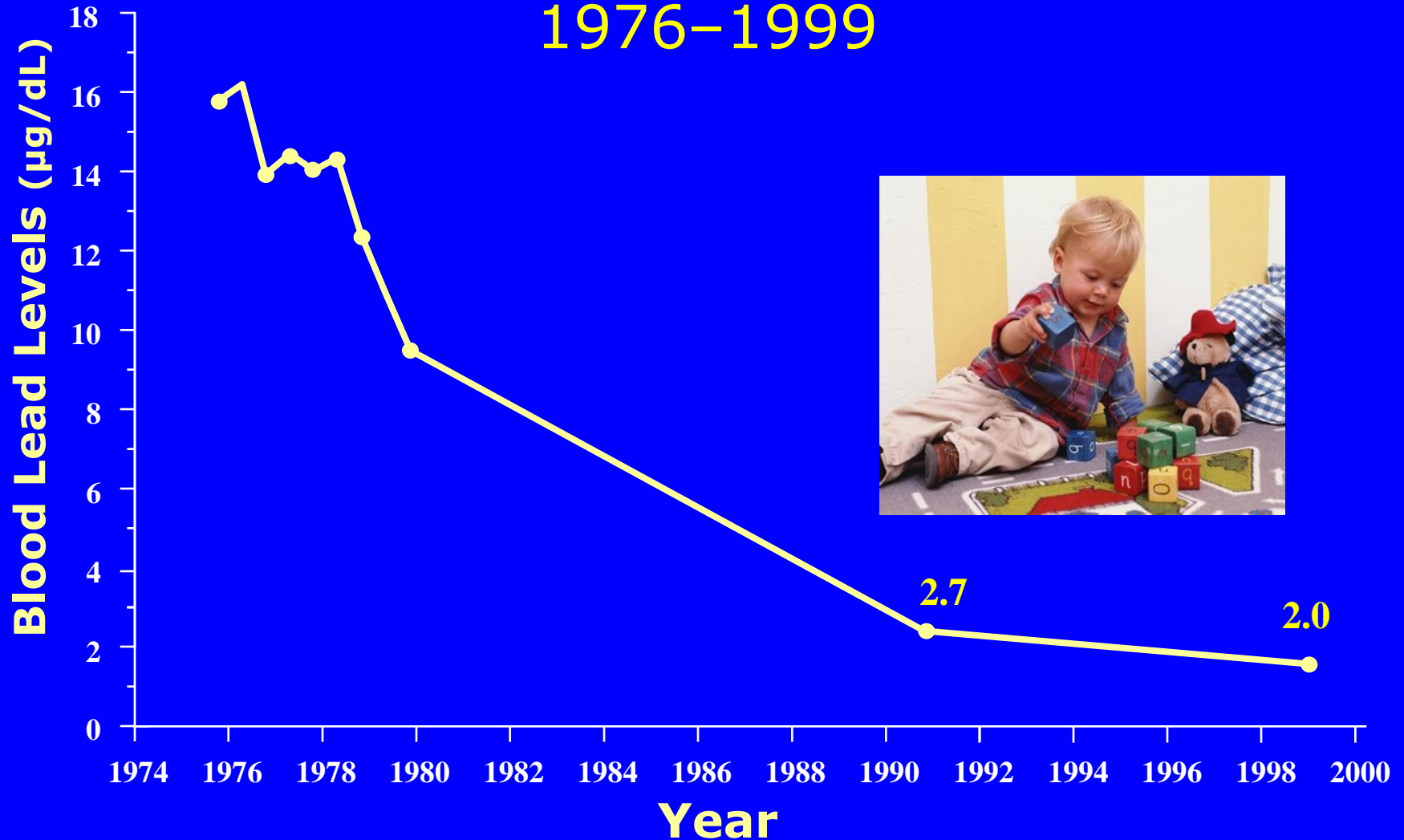
Prevention Works

Example: The removal of lead from gasoline

The EPA Decision on Lead in Gasoline: Decline in Blood Lead Levels Greatly Exceeded Expectation



Environmental Disease is Preventable - Declining Blood Lead Levels in the U.S. 1976-1999



Thank You!



Protecting Children against Environmental Threats to Health



WHO Collaborating Centre in Children's Environmental Health