

# THE HEALTH CASE FOR REPLACING HAZARDOUS CHEMICALS WITH SAFER SOLUTIONS

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**THE GLOBAL OBSERVATORY ON PLANETARY HEALTH**

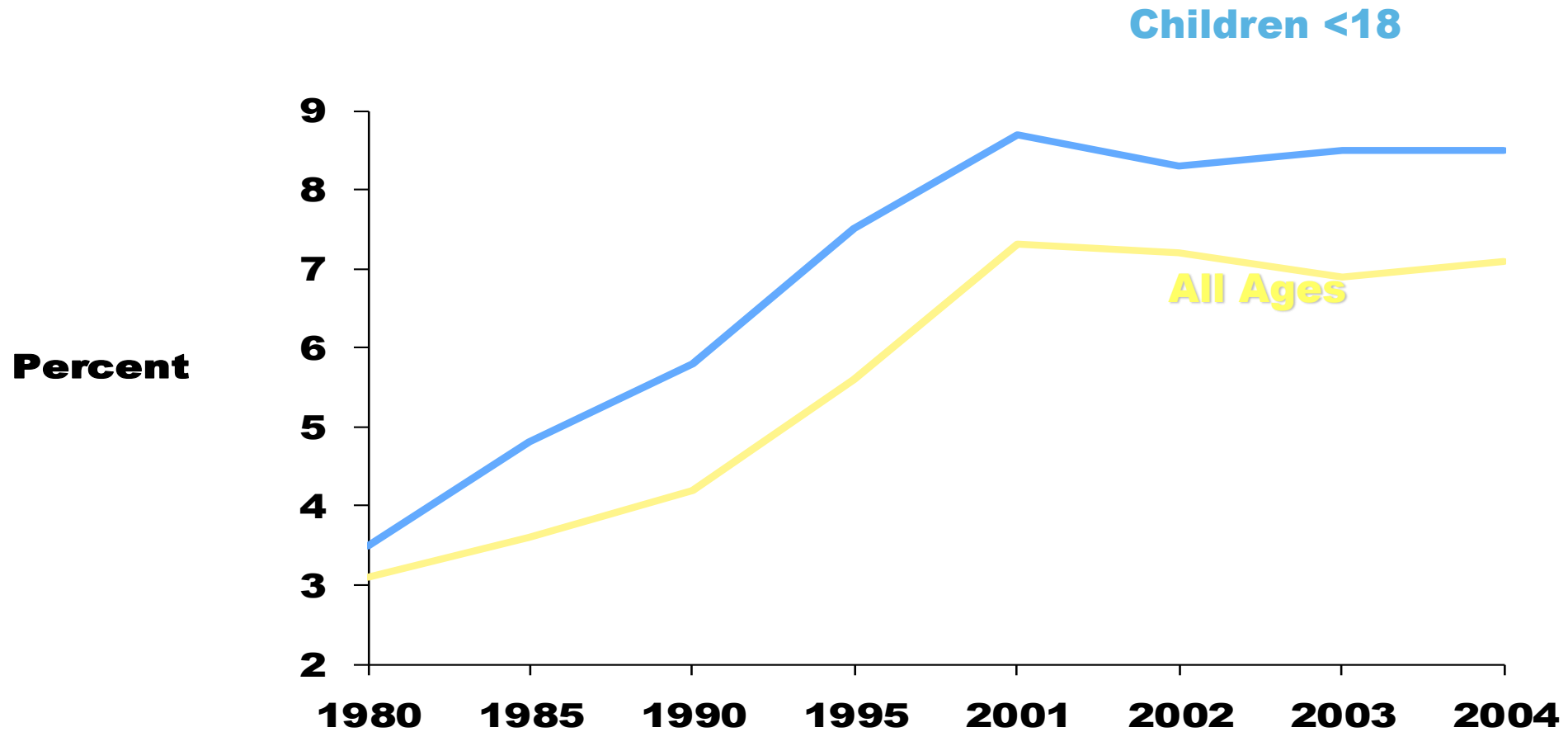
# CHANGING PATTERNS OF DISEASE IN CHILDREN

In the past century, patterns of health and disease in children have changed profoundly:

- Infant mortality has fallen by 90%
- Life expectancy has nearly doubled from less than 50 years in 1900 to over 80 years today
- The ancient infectious diseases – smallpox, cholera, yellow fever, tetanus, pertussis and measles - no longer kill thousands of children each year
- Chronic, non-communicable diseases are now the major causes of illness, disability and death in children. **These diseases are on the rise.**



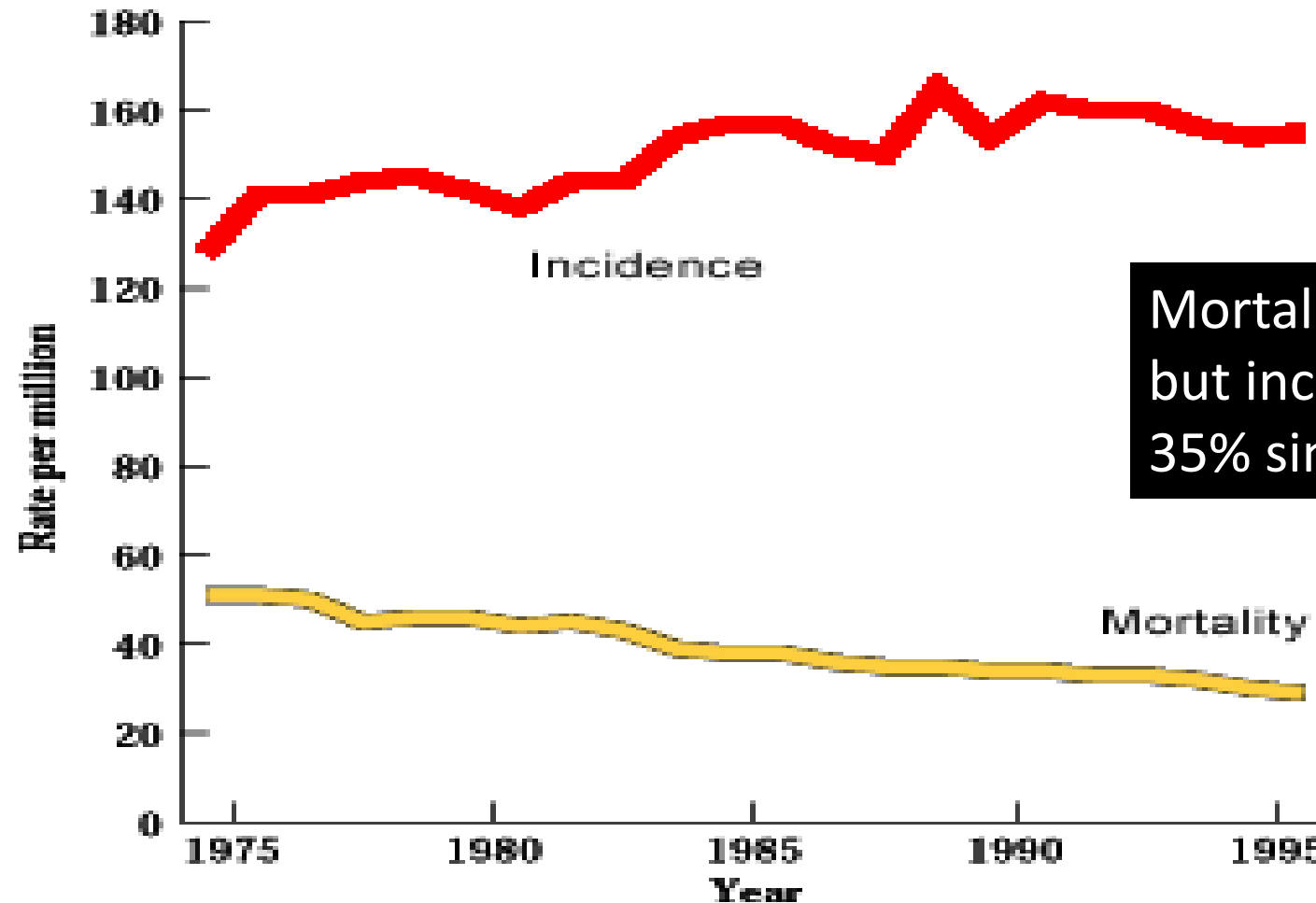
# Estimated Percent Prevalence of Asthma by Age and Year, 1980-2004



Source: CDC MMWR, October 19, 2007 / 56(SS08);1-14;18-54



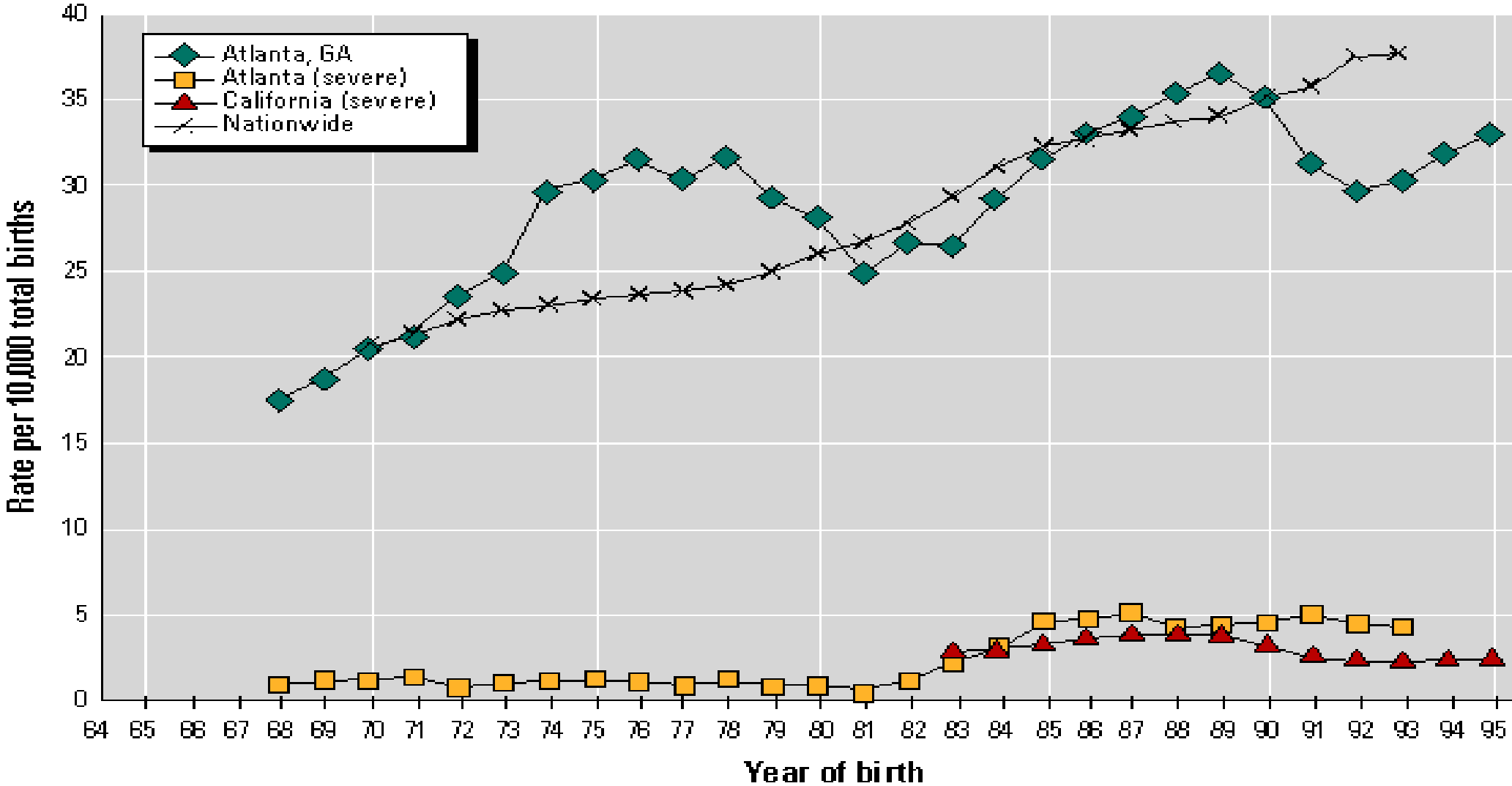
# CHILDHOOD CANCER, INCIDENCE AND MORTALITY, USA, 1975-1996



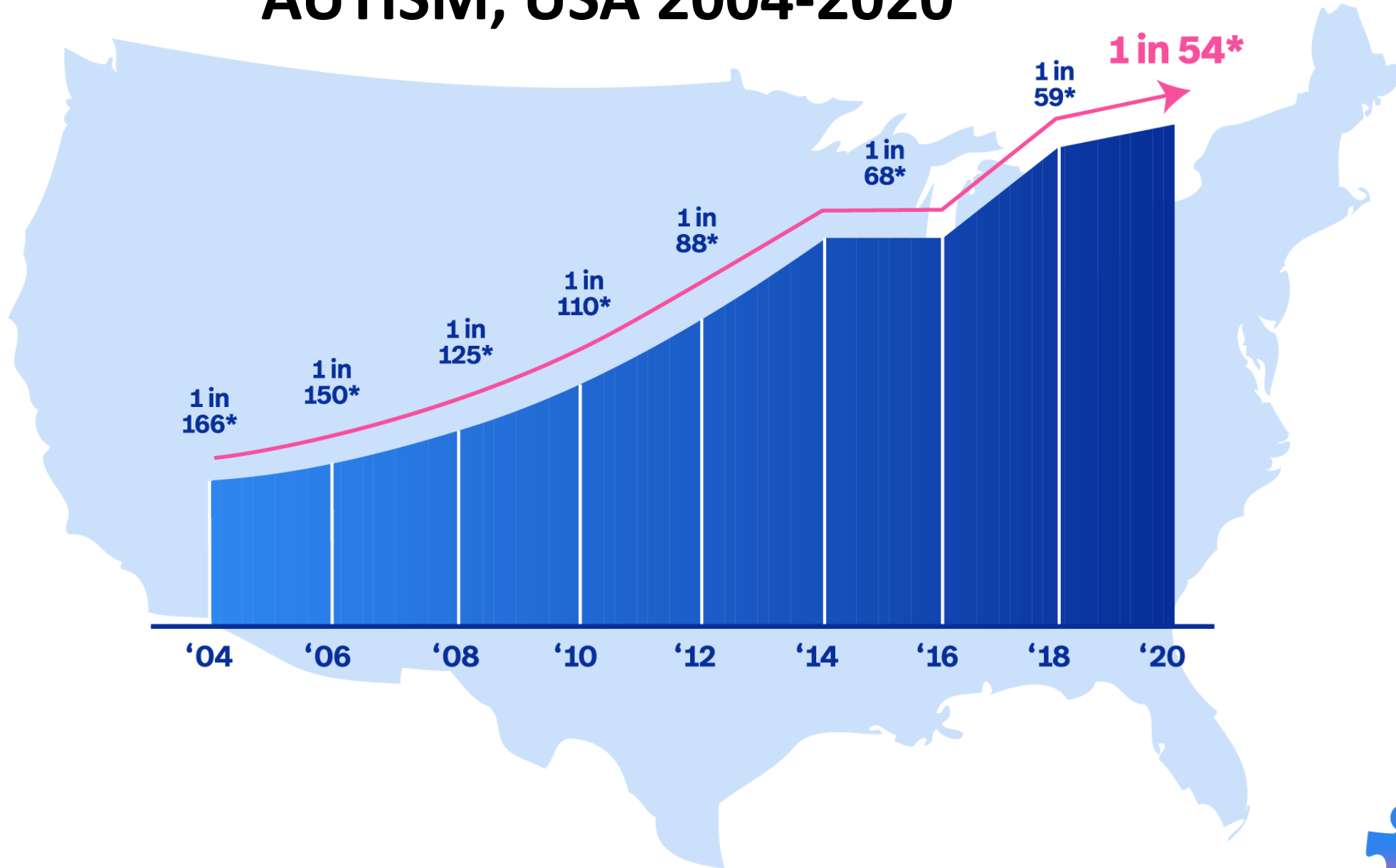
Mortality is down,  
but incidence is up  
35% since 1970



# MALE REPRODUCTIVE BIRTH DEFECTS, USA



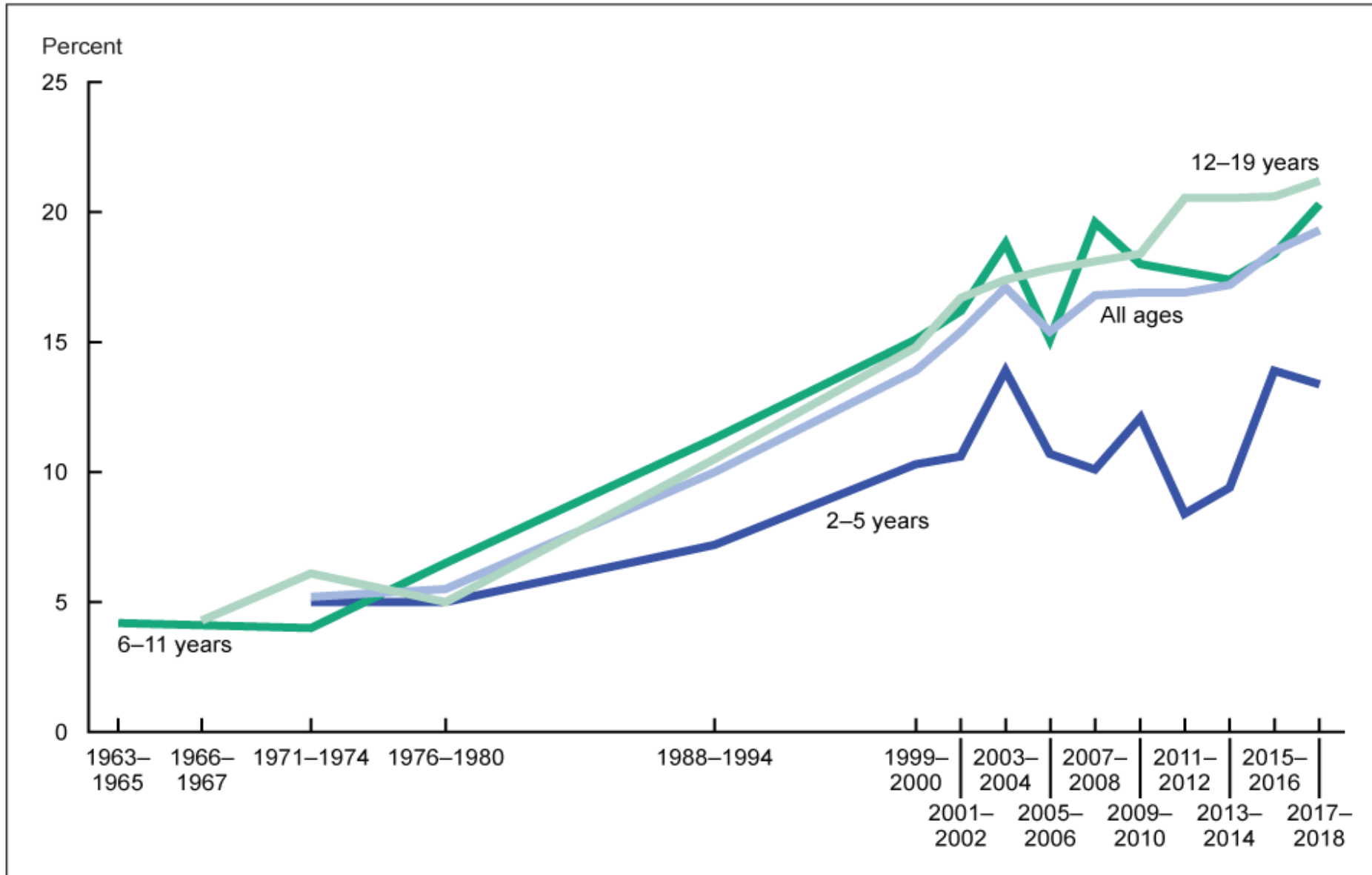
# AUTISM, USA 2004-2020



autism speaks



# CHILDHOOD OBESITY, USA, 1963-2018



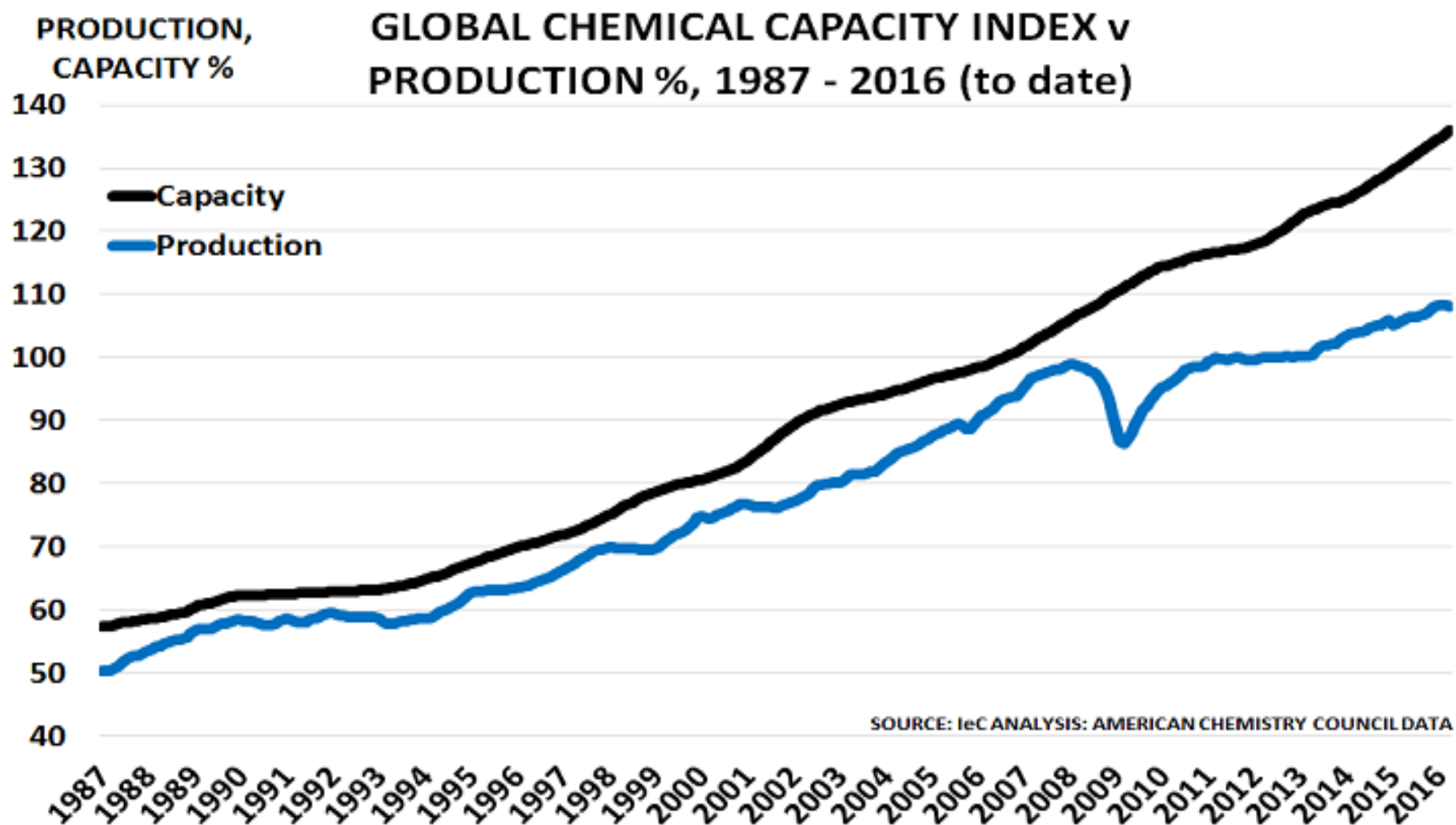
# THE CHEMICAL REVOLUTION

SINCE THE 1950'S,  
THOUSANDS OF NEW  
CHEMICALS AND PLASTICS  
HAVE BEEN MANUFACTURED AND  
RELEASED TO THE ENVIRONMENT





# GLOBAL CHEMICAL PRODUCTION, 1987- 2016

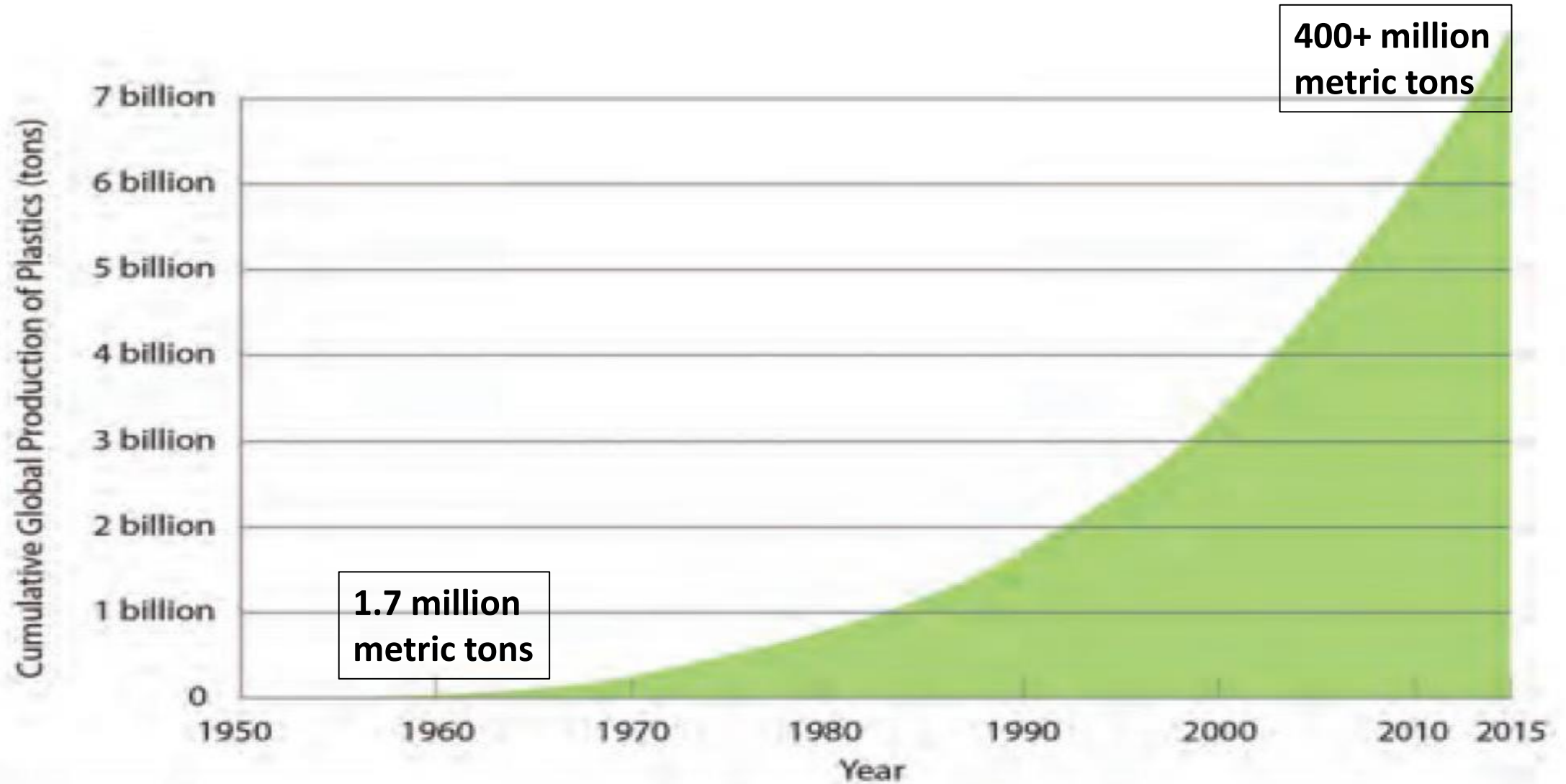


# THOUSANDS OF MANUFACTURED CHEMICALS TODAY

- More than 350,000 chemicals, chemical mixtures and plastics have been invented since 1950
- Novel materials. Never before existed on earth
- Used in millions of consumer products
- Widely disseminated in the environment – from the high Arctic to the ocean depths.
- Biomonitoring surveys document nearly universal human exposure – including pregnant women and newborn infants
- Disproportionately heavy exposure of the poor and minorities – environmental injustice
- **The great majority of chemicals in commerce have never been tested for safety or toxicity**

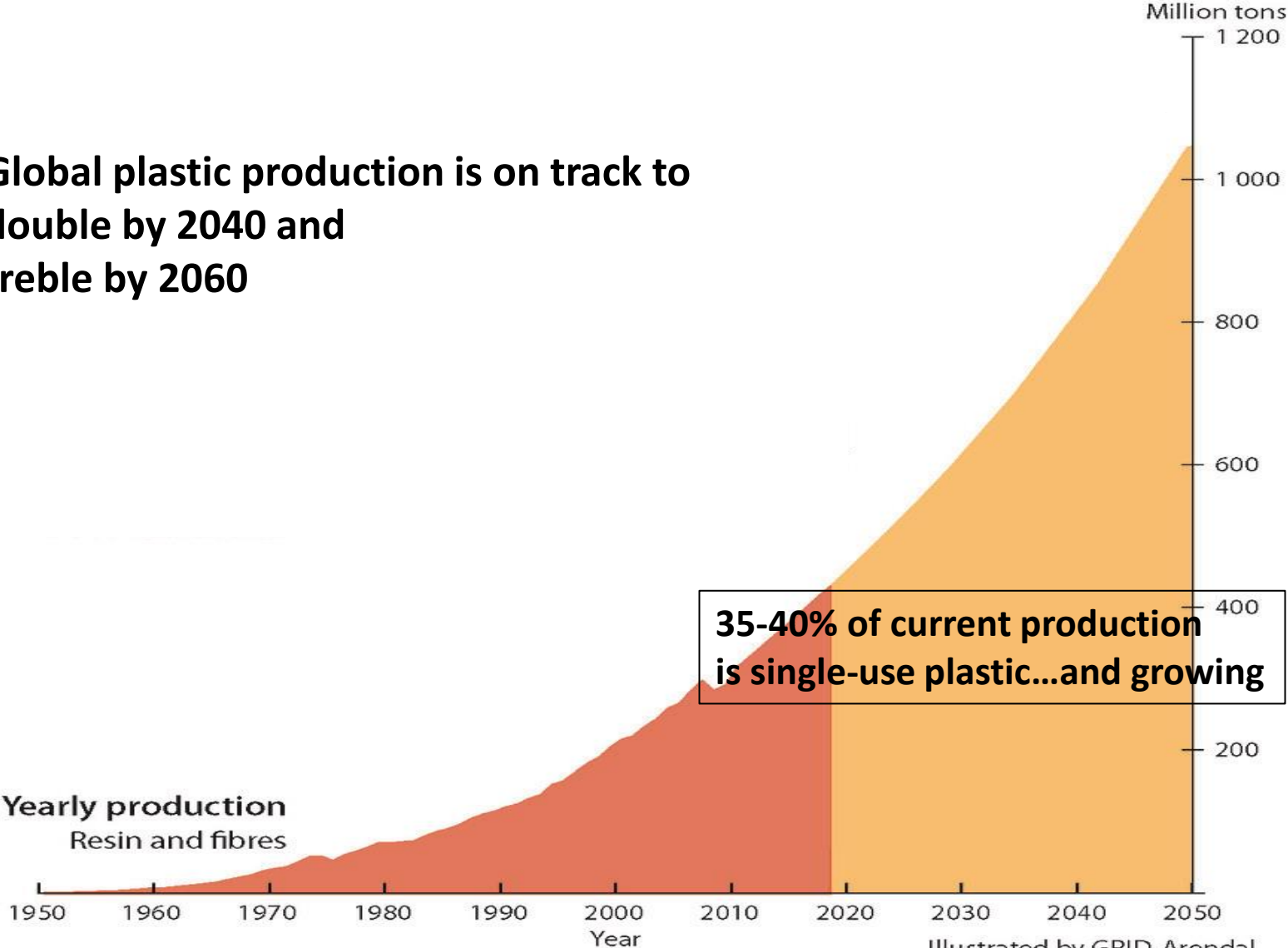


# GLOBAL PLASTIC PRODUCTION, 1950-2015



# PROJECTED PLASTIC PRODUCTION, 2018-2050

**Global plastic production is on track to double by 2040 and treble by 2060**

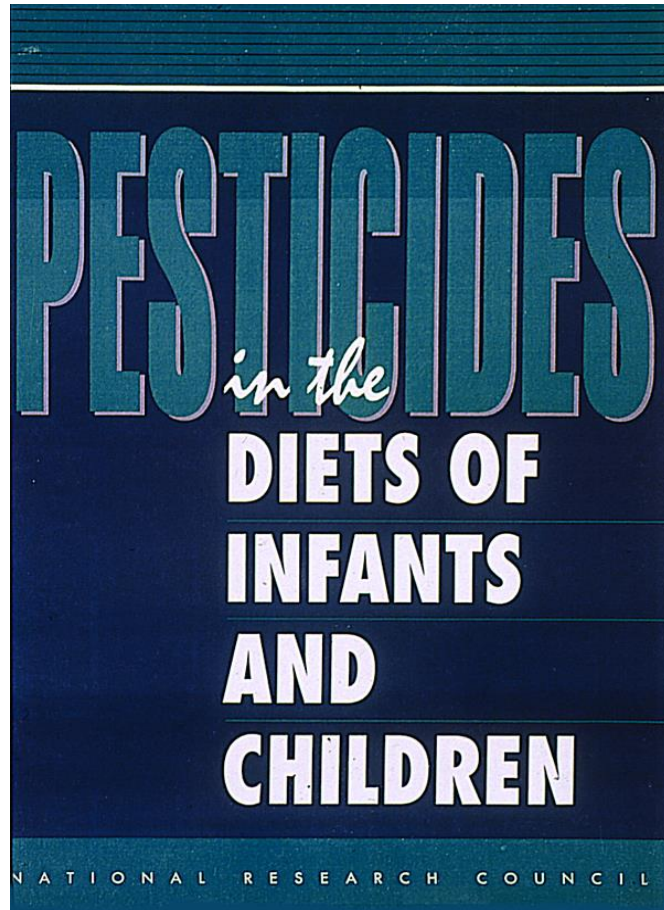


**Less than 10% of plastic is recycled**

UNEP (2021). From Pollution to Solution: A global assessment of marine litter and plastic pollution. Nairobi.



# INFANTS AND CHILDREN ARE HIGHLY SENSITIVE TO TOXIC CHEMICALS



- Greater exposure relative to body weight—*4 times more food and 7 times more water per Kg bw per day; Hand-to-mouth activity*
- Diminished ability to detoxify and excrete many chemicals
- Heightened biological vulnerability — *thalidomide, DES, fetal alcohol syndrome*
- More years of future life

***CHILDREN ARE NOT LITTLE ADULTS***



# THE THALIDOMIDE TRAGEDY

## INITIAL RECOGNITION OF INFANTS' UNIQUE VULNERABILITY TO MANUFACTURED CHEMICALS



**The thalidomide tragedy led to strict regulation of chemicals intended for use as pharmaceuticals**



# PRENATAL CHEMICAL EXPOSURES ARE ESPECIALLY DANGEROUS



- Toxic chemicals can cause damage to infants and children at even the lowest levels detectable – levels far below those that harm adults
- These chemicals can cause brain damage, birth defects and cancer.
- The brain damage caused by chemicals can result in autism, ADHD and decreased intelligence (IQ loss)
- There are no safe exposure “thresholds” in prenatal life
- These effects can last lifelong
- **Prevention of exposure is the only truly effective treatment**



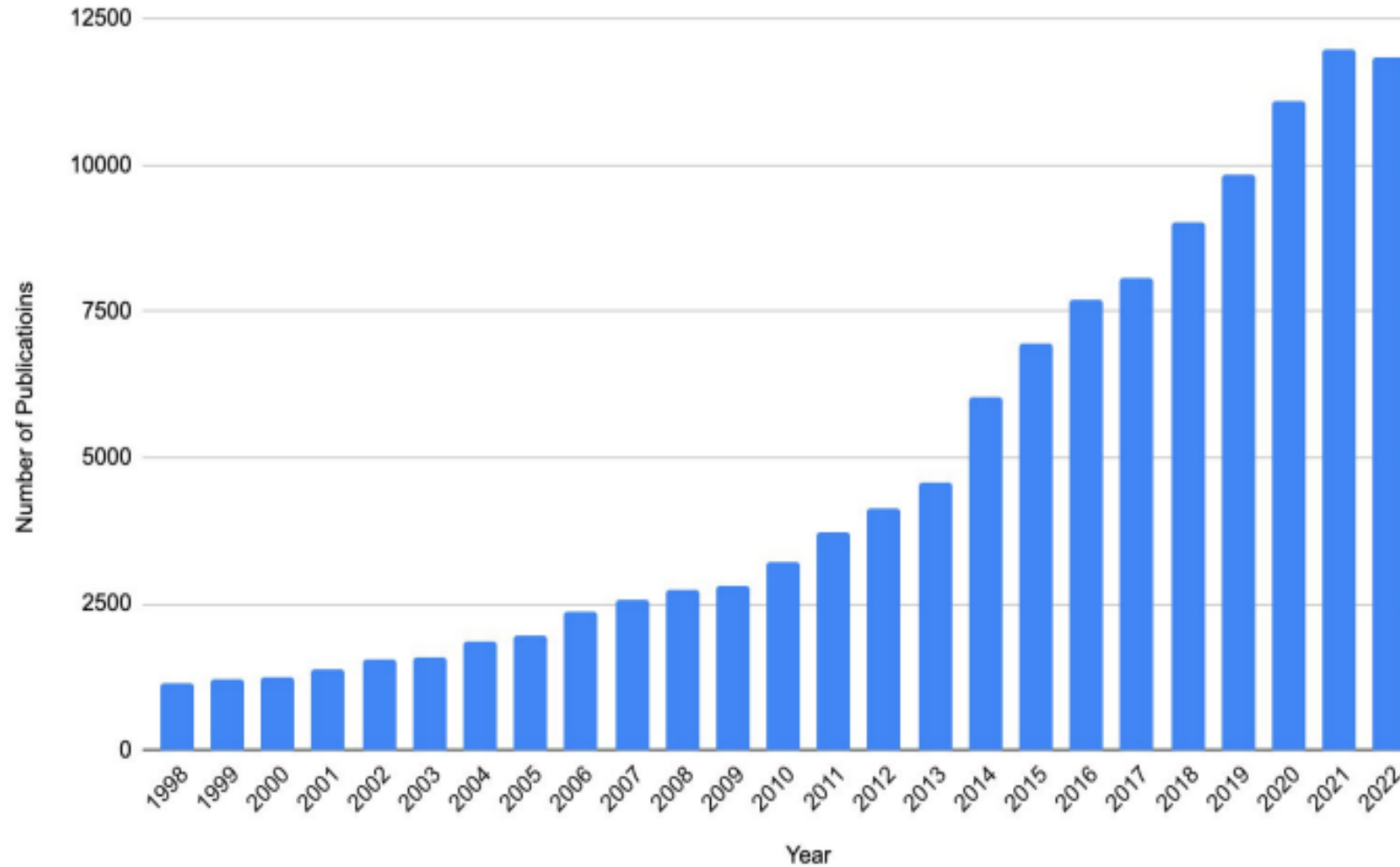
**EVIDENCE IS GREAT AND GROWING:**

**MANUFACTURED CHEMICALS  
CAUSE DISEASE IN CHILDREN**





# GROWTH OF KNOWLEDGE IN ENVIRONMENTAL PEDIATRICS, 1998–2022



**Prospective Birth Cohort Epidemiologic Studies**  
**Toxicological Studies**



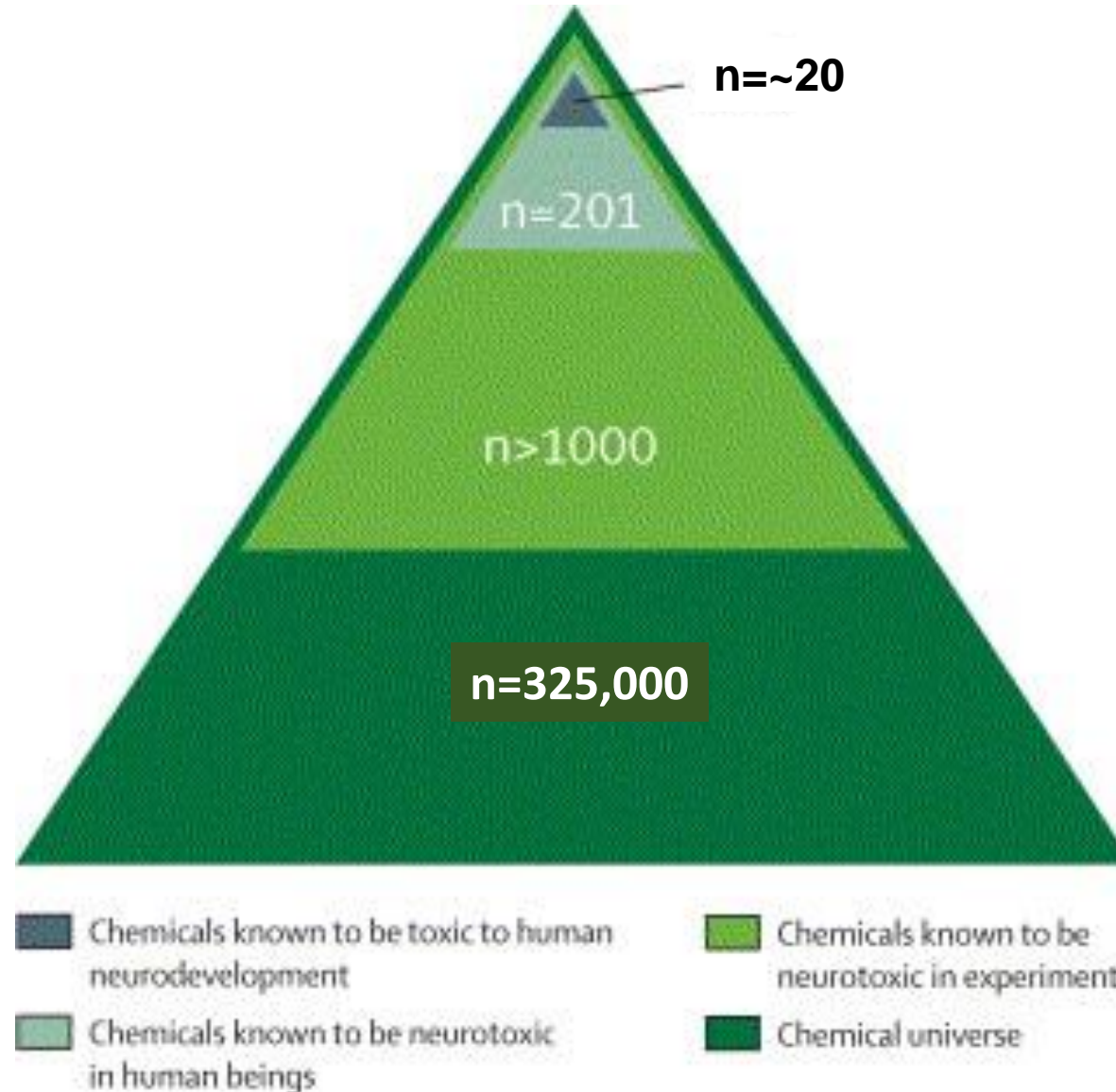
# MANUFACTURED CHEMICALS LINKED TO MULTIPLE DISEASES IN CHILDREN

- Benzene and 1,3-butadiene - leukemia and lymphoma
- PCBs - IQ loss
- DDT - female breast cancer decades following exposure *in utero*
- Phthalates - male reproductive birth defects and decreased fertility
- Phthalates - IQ loss
- Bisphenol A (BPA) – altered lipid profile, diabetes, obesity, increased risk for CVD and stroke
- Brominated flame retardants – IQ loss
- Organophosphate insecticides – IQ loss and behavioral disorders
- Per- and polyfluoroalkyl substances (PFAS) - immune dysfunction, dyslipidemia, thyroid disorders, cancers
- Emerging hazards
  - Glyphosate – lymphoma
  - Aspartame- leukemia and lymphoma
  - Micro and nanoplastic particles – CVD and stroke

**All of these hazards were discovered only after the chemicals had already been on the market for many years**



# ARE THERE STILL OTHER CHEMICALS WHOSE TOXICITY HAS NOT YET BEEN DISCOVERED?



# David Rall on Developmental Neurotoxicity



Suppose that thalidomide, instead of causing the birth of children with missing limbs, had instead reduced their intellectual potential by 10%.

Would we be aware, even today, of its toxic potency?



# THE GOOD NEWS: DISEASE CAUSED BY TOXIC CHEMICALS CAN BE PREVENTED

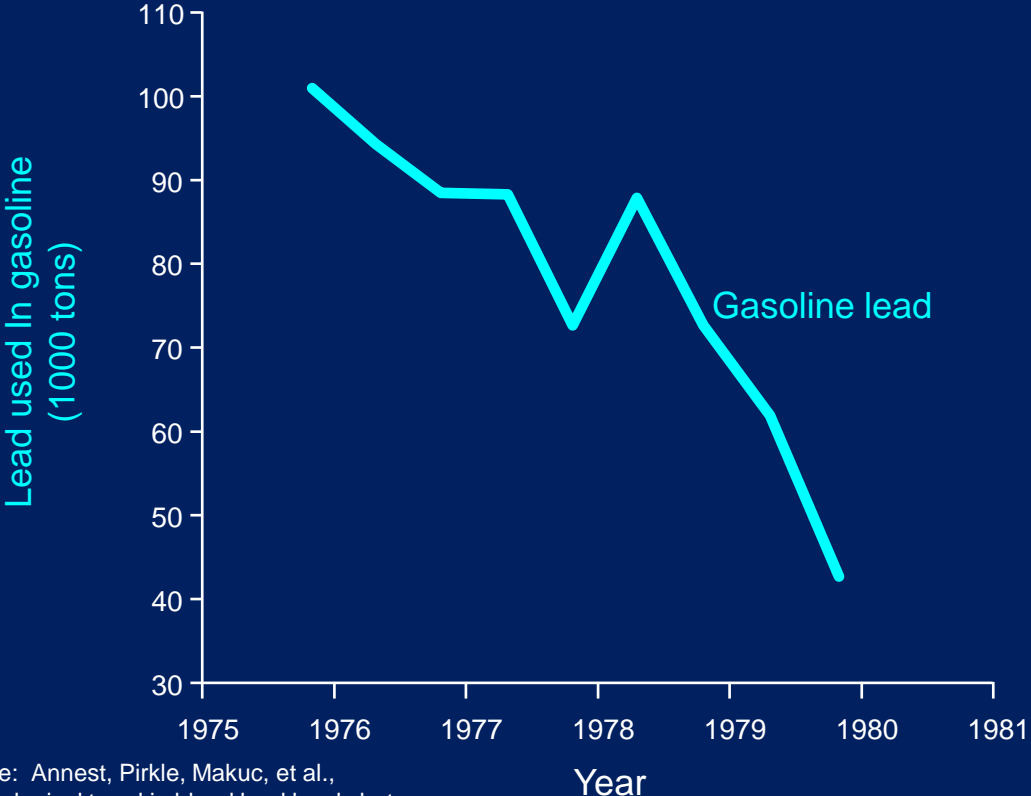
## THREE ESSENTIAL INGREDIENTS:

- Scientific discovery
- Willingness of scientists to translate science into policy
- Willingness of government officials and policy makers to act on and not ignore science and to confront powerful vested interests

## The case of lead in gasoline

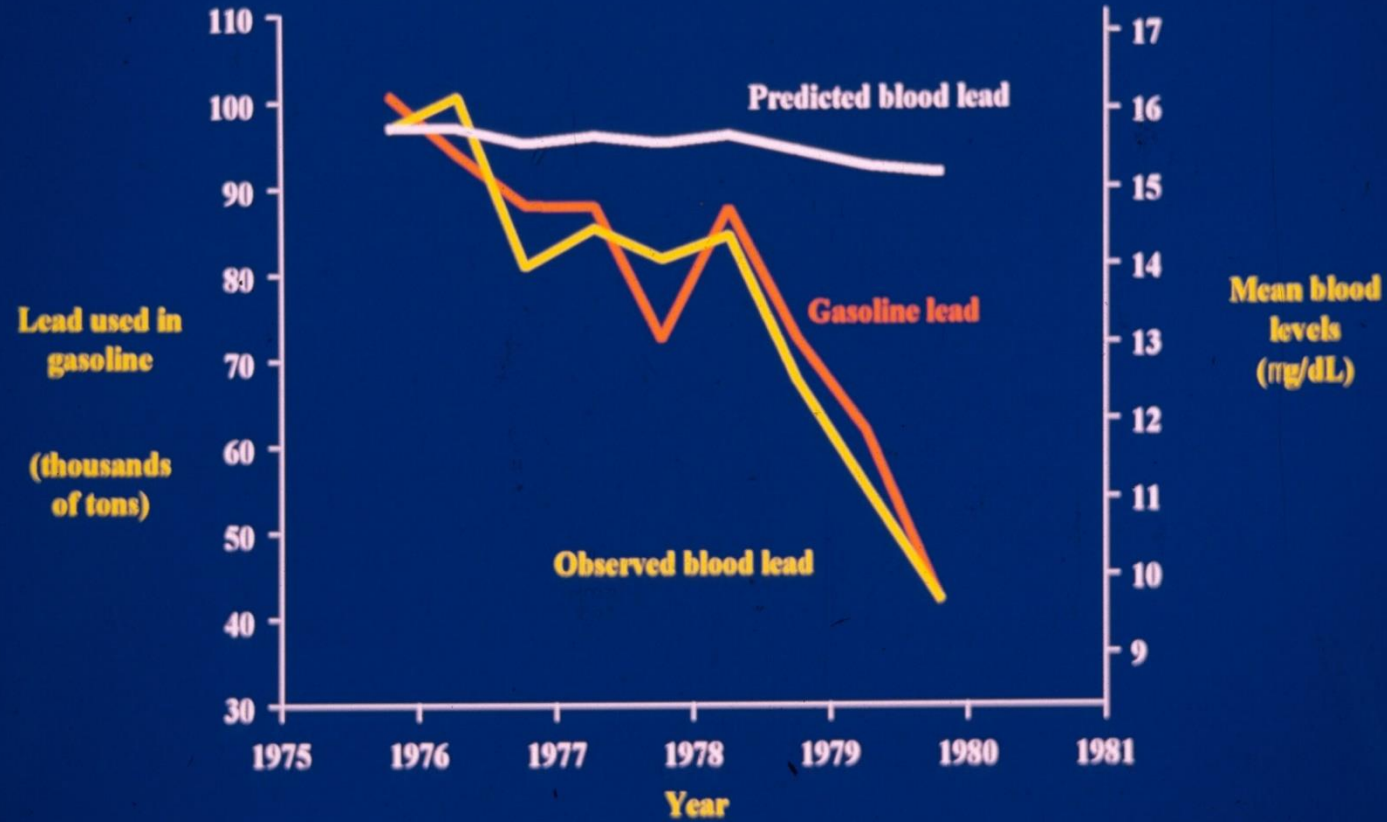


# THE EPA DECISION ON LEAD IN GASOLINE: LEAD USE IN GASOLINE DECLINED FROM 1976 THROUGH 1980

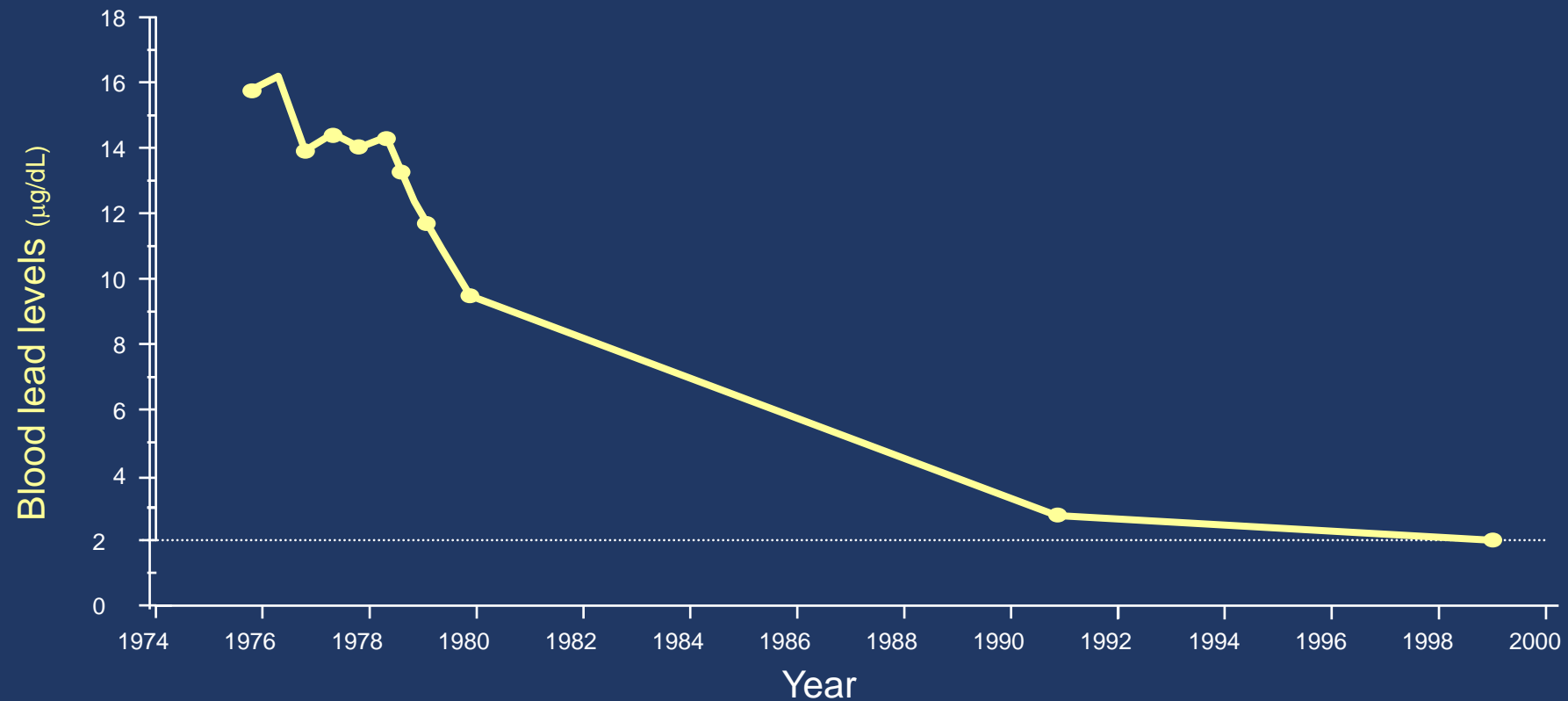


Source: Annest, Pirkle, Makuc, et al.,  
Chronological trend in blood lead levels between  
1976 and 1980. NEJM 1983; 308:1373-7.

# THE EPA DECISION ON LEAD IN GASOLINE: DECLINE IN BLOOD LEAD LEVELS GREATLY EXCEEDED EXPECTATION



# BLOOD LEAD LEVELS FOLLOWING REMOVAL OF LEAD FROM GASOLINE, USA, 1975-2000



Source: CDC. National Report on Human Exposure to Environmental Chemicals, March 2001



# THE BENEFITS OF REDUCING POPULATION BLOOD LEAD LEVELS

## Experience in the USA

- Between 1976 and 1999, the mean BLL of 1-5 y/o US children declined by 15.1 mcg/dl – a 95% decline
- Each decline of 1 mcg/dl is associated with an increase of 0.18-0.3 IQ points
- Mean IQ of US children therefore increased between 2 and 5 points
- Each IQ point increases lifelong economic productivity by 1.76-2.38% - about \$10,000
- The estimated economic benefit in each year's birth cohort is \$200 billion
- Aggregate economic benefit over 40 years = \$8 trillion
- And that does not include the benefits of reducing cardiovascular disease
- Algeria, the last country in the world to remove lead from gasoline, did so in 2021



# CHEMICAL LAW AND POLICY, USA

- U.S. chemical law — the Toxic Substances Control Act (TSCA) of 1977 – is failed legislation.
- Under TSCA, chemicals are presumed harmless until proven harmful
- Under TSCA, the chemical manufacturing industry has no responsibility to conduct premarketing toxicity testing of new chemicals or postmarketing surveillance for longer-term adverse events
- Under TSCA, the chemical manufacturing industry, is granted extensive trade secret protections
- Health hazards of chemicals are ignored and downplayed, and the chemicals are allowed to remain in use with few restrictions
- In the nearly 50 years since TSCA's passage, only a handful of chemicals have been banned or restricted in U.S. markets



# REVAMPING OF CHEMICAL LAW AND POLICY

## A KEY INTERVENTION AGAINST TOXIC CHEMICALS IN FOOD

- Today, chemicals and plastics are presumed innocent until proven harmful
- Chemicals are allowed to remain on markets and exposures to children are allowed to continue until danger is proven beyond any reasonable doubt
- We are, in essence, conducting a vast toxicological experiment in which our children and our grandchildren are the unwitting, unconsenting subjects
- This is not scientifically justified. It is not ethical
- There is urgent need for a new legal paradigm for chemicals management based on the Precautionary Principle
- To protect children's health, chemicals – like pharmaceuticals - must be proven safe before they are allowed to enter markets
- National chemical legislation needs to be modelled on pharmaceutical legislation and require both independent premarket toxicity testing and post-market surveillance
- Protection of children around the world against toxic synthetic chemicals will require a legally binding global treaty on chemicals under UN auspices





**THANK YOU!**