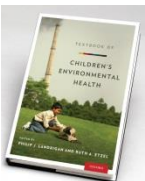


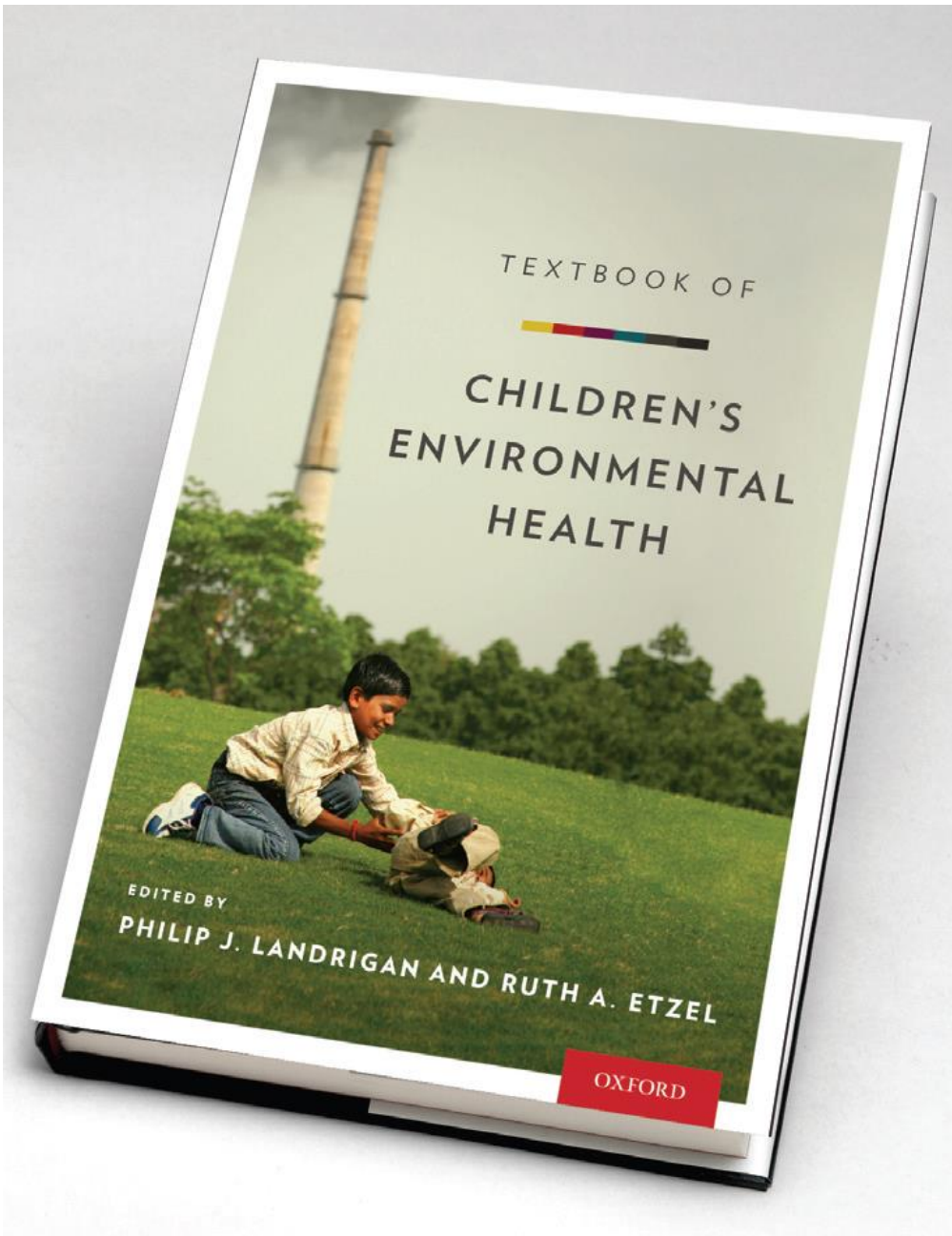
# **TEXTBOOK OF CHILDREN'S ENVIRONMENTAL HEALTH**

Philip J. Landrigan, MD and Ruth A. Etzel, MD  
Editors

Oxford University Press

CHE Café Call  
March 13, 2014





TEXTBOOK OF



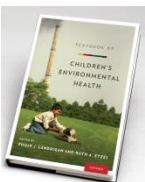
CHILDREN'S  
ENVIRONMENTAL  
HEALTH

EDITED BY  
PHILIP J. LANDRIGAN AND RUTH A. ETZEL

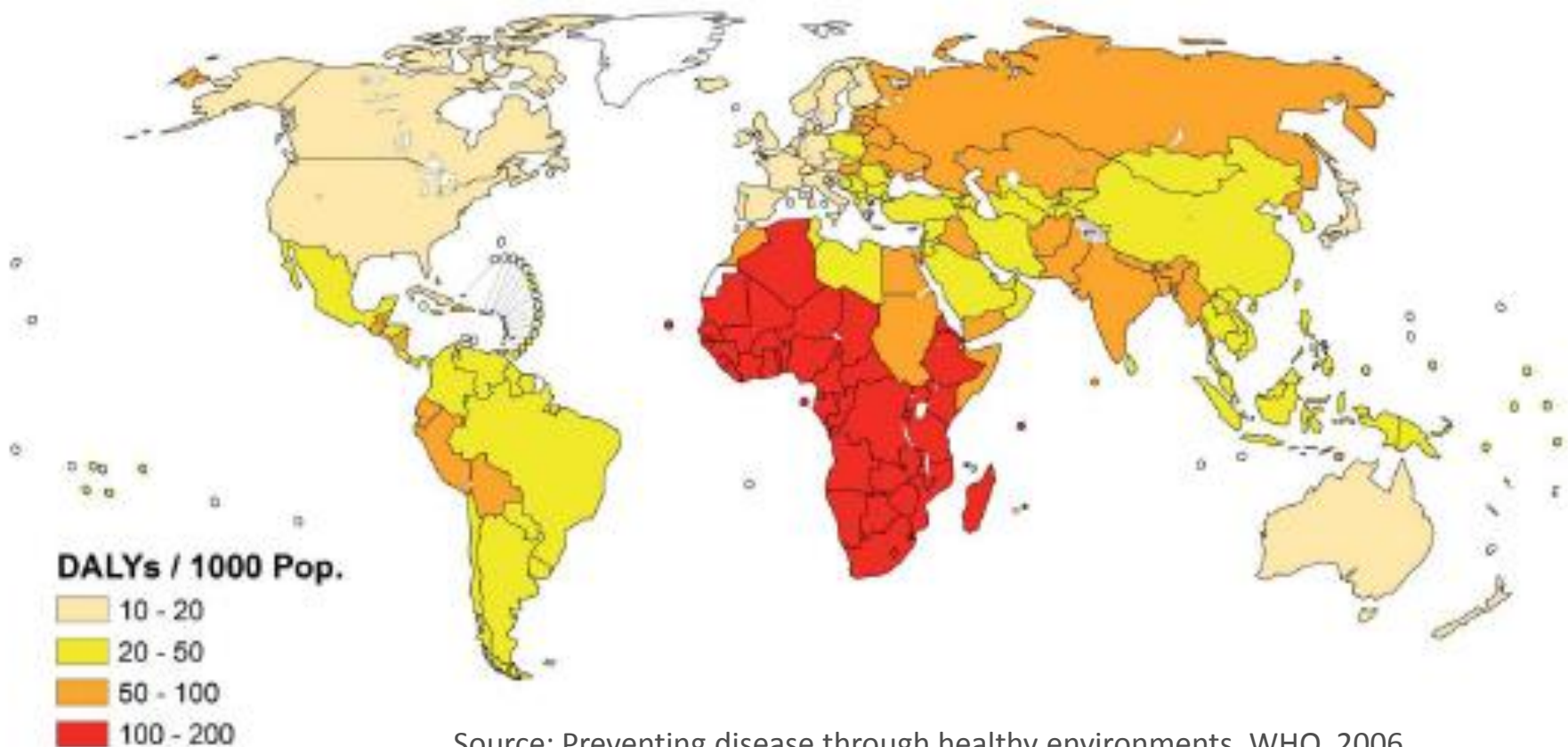
OXFORD

# WHY WRITE THIS BOOK?

- Children's environments and patterns of disease in children have changed profoundly over the past 5 decades.
- The prevalence of autism, asthma, ADHD, obesity, diabetes, and birth defects have increased substantially in children around the world.
- At the same time, more than 80,000 new chemicals have been developed and released into the global environment.
- Today the World Health Organization attributes 36% of all childhood deaths around the world to environmental causes.
- Children's environmental health has become an important area of research, practice and prevention.



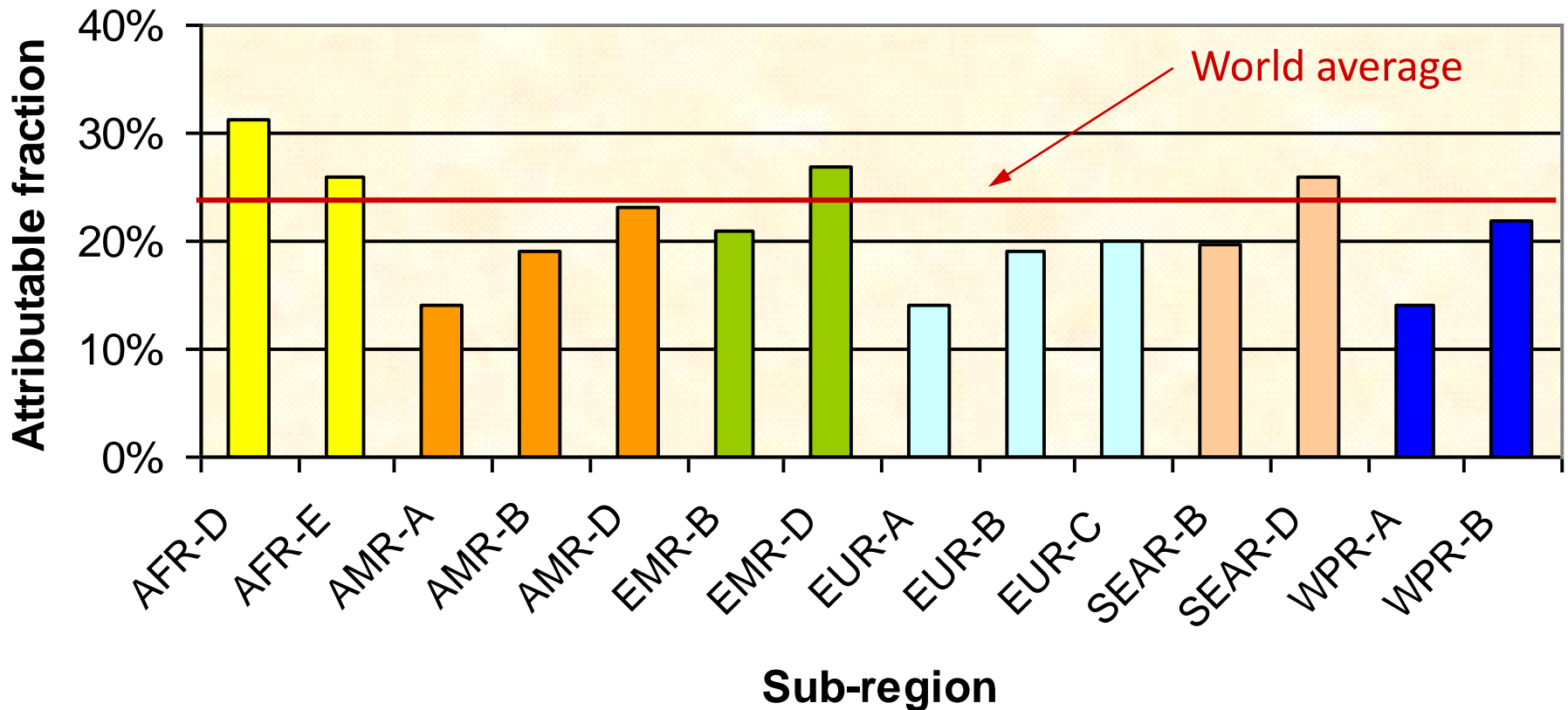
# THE GLOBAL BURDEN OF ENVIRONMENTAL DISEASE



Source: Preventing disease through healthy environments, WHO, 2006

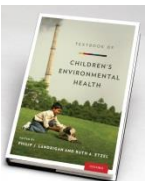
# HOW MUCH DISEASE COULD BE PREVENTED BY MODIFYING THE ENVIRONMENT ?

*Current evidence - best conservative estimate 24%*

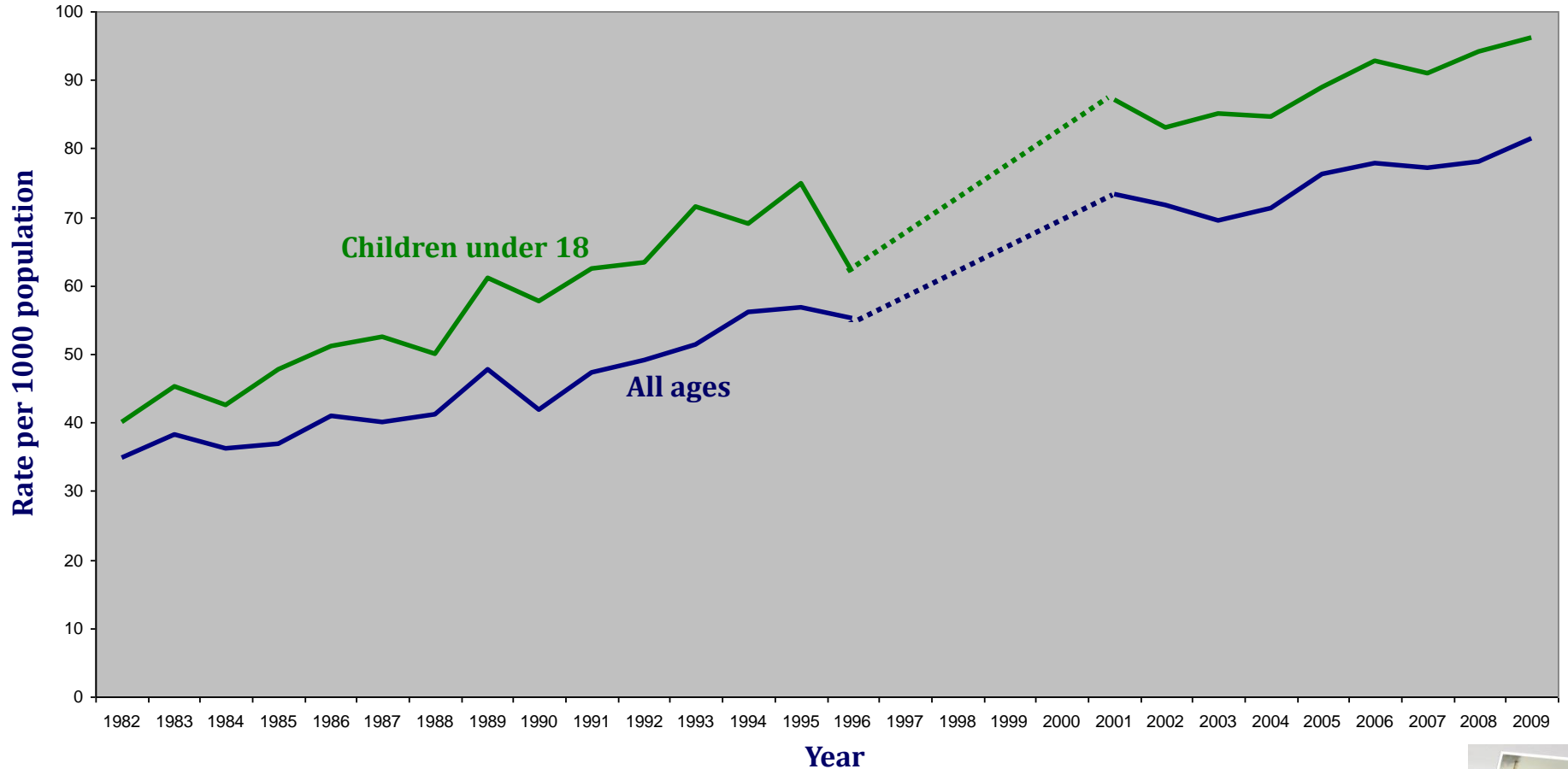


# ENVIRONMENTAL DISEASE IN NORTH AMERICAN CHILDREN

- Predominantly chronic diseases
- These diseases are on the rise
- Evidence is strong and building for causation by toxic chemicals



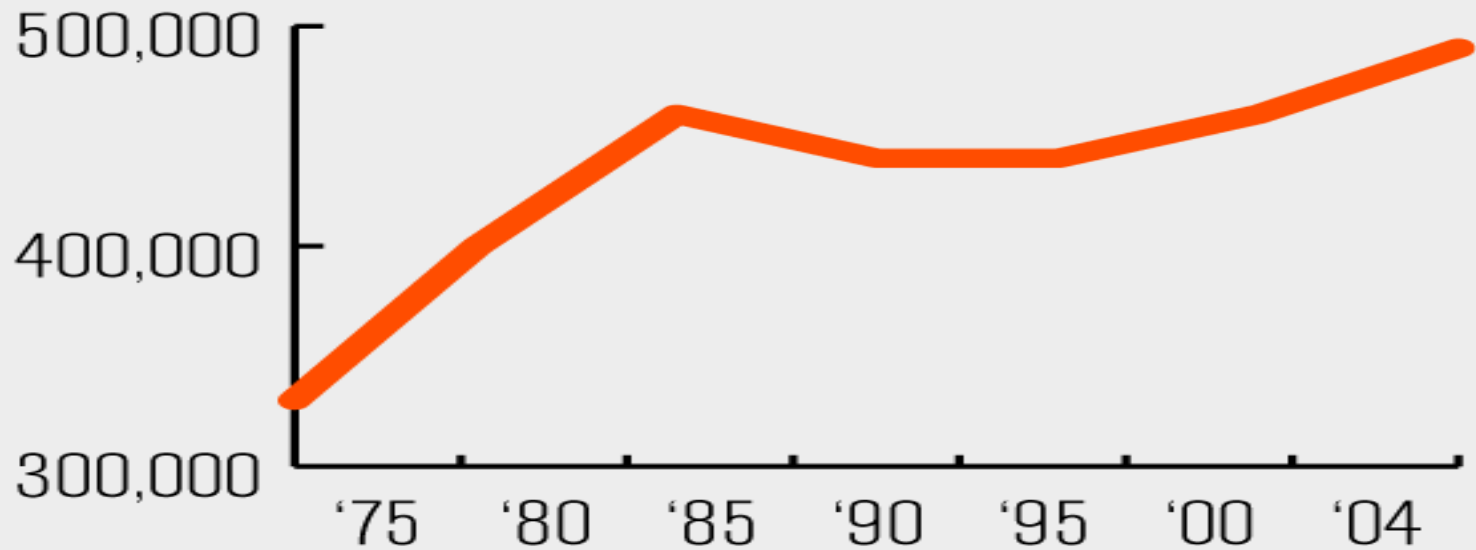
# ASTHMA – US PREVALENCE BY AGE AND YEAR, 1982–2009



Source: Centers for Disease Control and Prevention



# Incidence of Childhood Leukemia 1975-2004

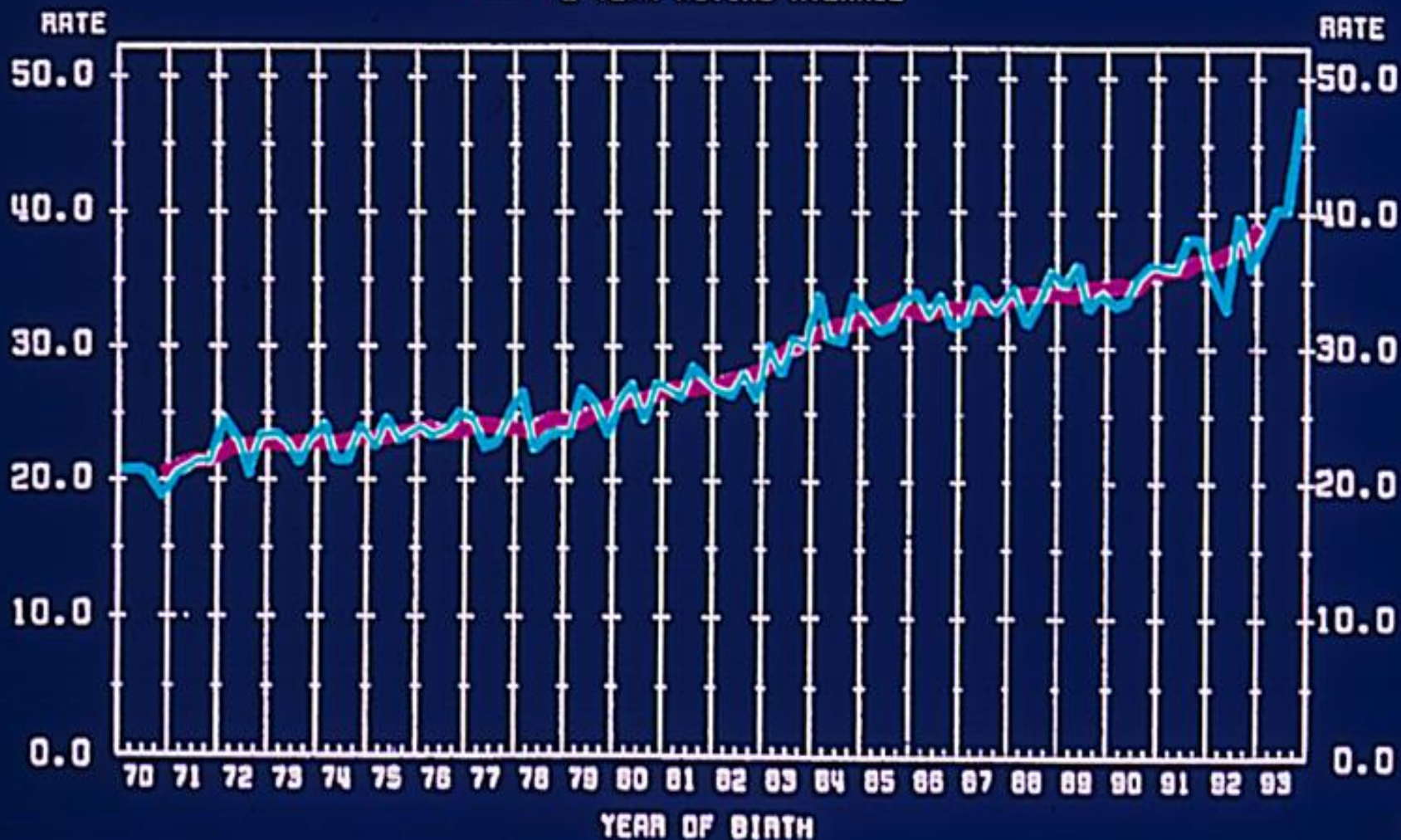




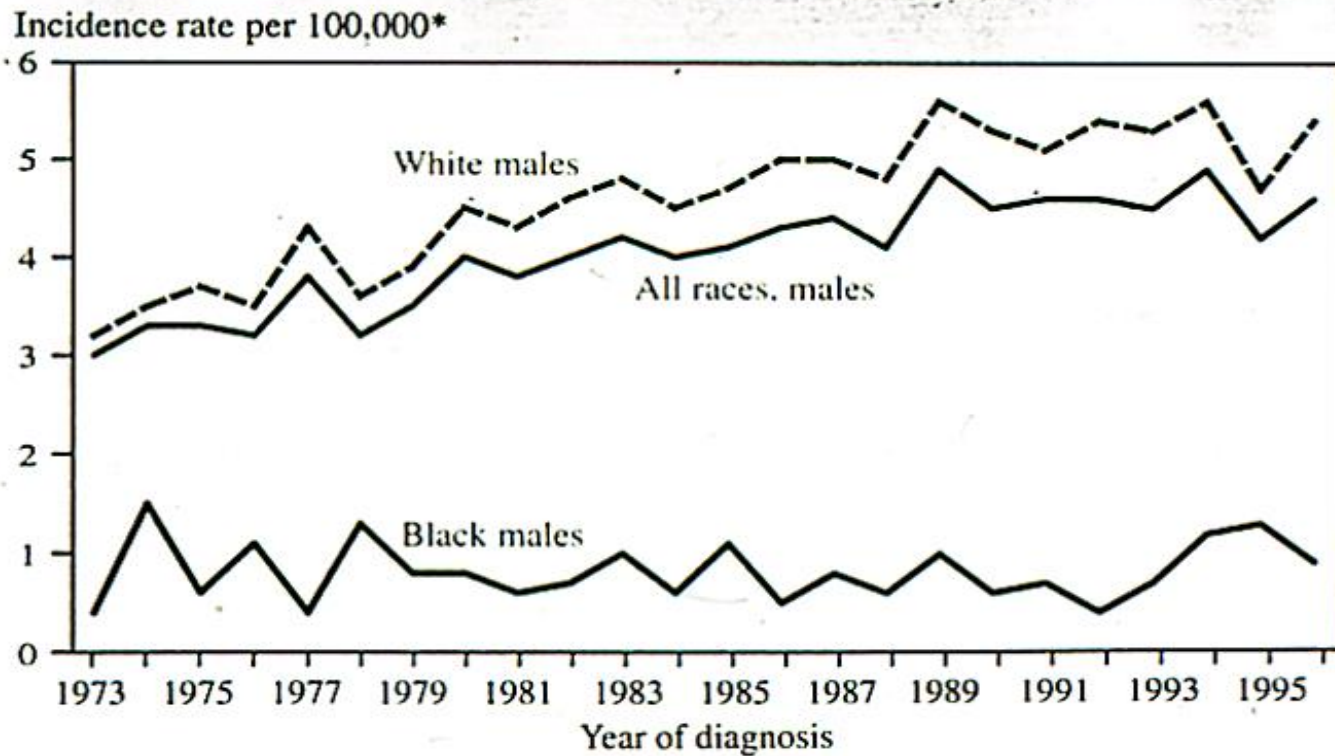
# HYPOSPADIAS/EPISPADIAS

TRENDS IN REPORTED INCIDENCE, BY QUARTER OF BIRTH,  
BIRTH DEFECTS MONITORING PROGRAM / CPHA  
JAN 1970 - DEC 1993  
(RATES PER 10,000 TOTAL BIRTHS)

— QUARTERLY RATES  
— 2-YEAR MOVING AVERAGE

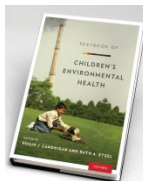


# US INCIDENCE OF TESTICULAR CANCER



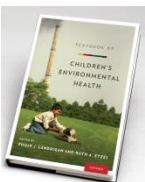
\*Age-adjusted to the 1970 U.S. standard population.

Sources: *SEER Cancer Statistics Review, 1973-1996* (NCI 1999) and *Cancer Rates and Risks, 4th edition* (NCI 1996); access at <http://www-seer.ims.nci.nih.gov>



# DEVELOPMENTAL DISABILITIES

- Affect 10-15% of all children
- Include: Dyslexia  
ADHD  
Mental Retardation  
Autism
- Reported incidence is increasing



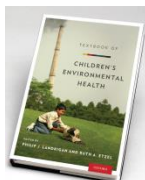
# OVERWEIGHT AND OBESITY

Prevalence has more than tripled in American children in 30 years from 5% in the 1970s to 17% today

Stark disparities by socioeconomic status, race and ethnicity

Serious consequences for child health: 2.5-fold increased risk of overall mortality ; 4-fold risk of cardiovascular mortality; 5-fold risk of diabetes

Terrible demographic consequences: This could be the first generation of US children in a century to have shorter life expectancy than their parents



# CHEMICAL PRODUCTION UNITED STATES, 1947-2007

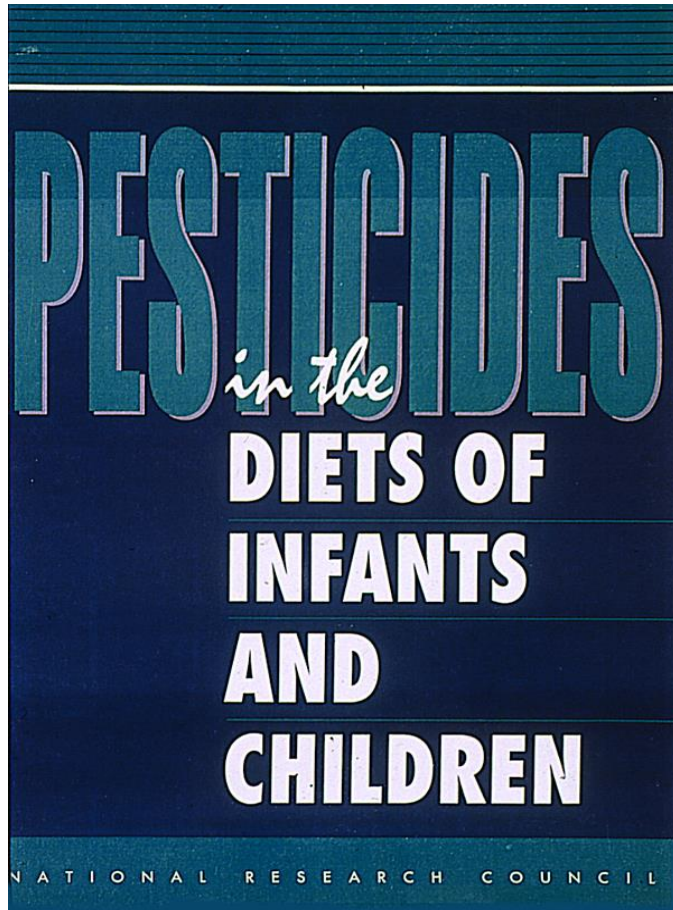


# CHILDREN TODAY ARE EXPOSED TO THOUSANDS OF SYNTHETIC CHEMICALS. MOST HAVE NOT BEEN TESTED FOR TOXICITY

- 80,000 + chemicals in commerce
- Most invented in the past 30- 40 years
- 3,000 are high production volume 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

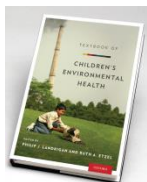


# CHILDREN ARE ESPECIALLY VULNERABLE TO TOXIC CHEMICALS IN THE ENVIRONMENT

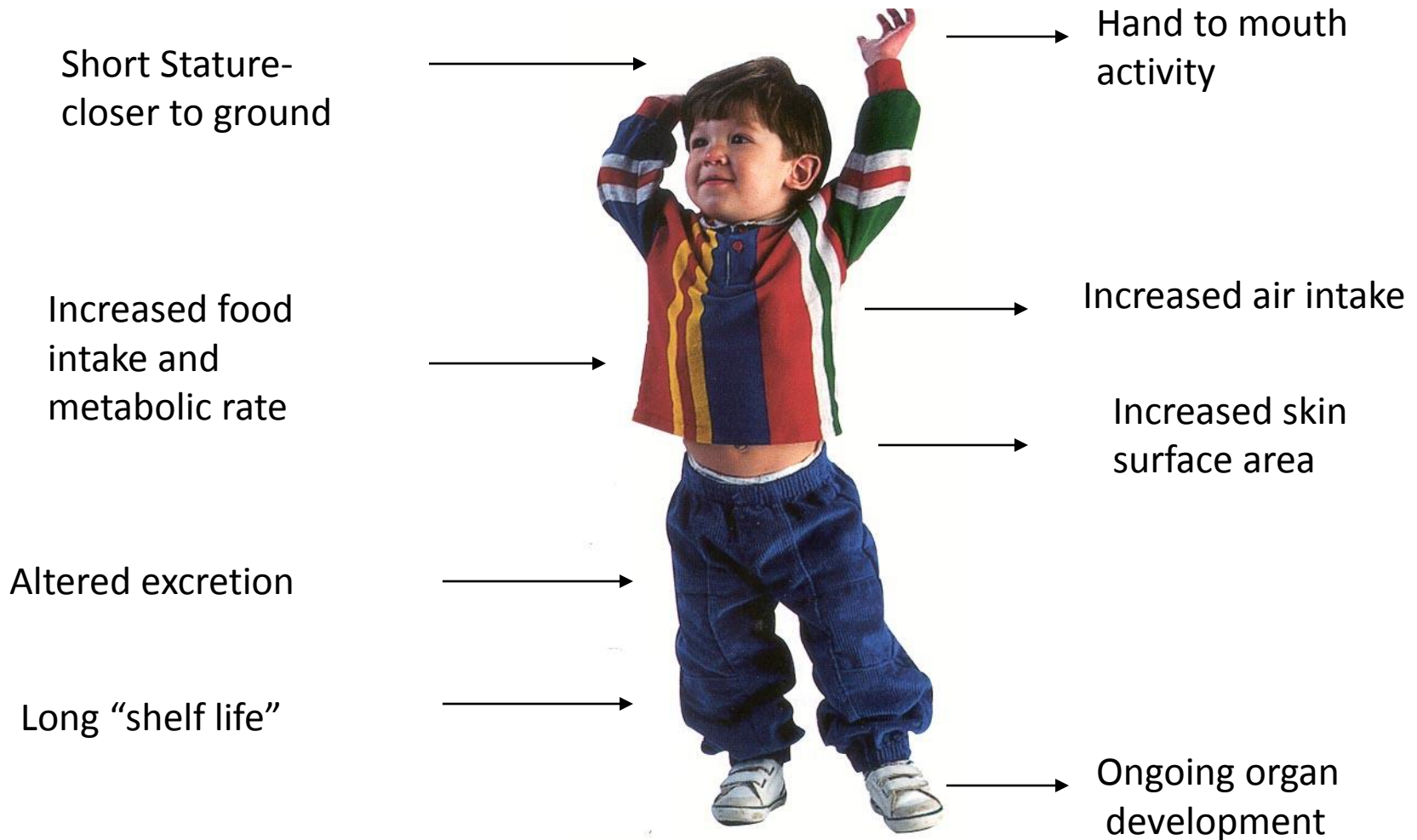


- Greater exposure proportionate to body mass—  
*7 times more water per Kg per day; Hand-to-mouth activity*
- Diminished ability to detoxify many chemicals
- Heightened biological vulnerability  
*—thalidomide, DES, fetal alcohol syndrome*
- More years of future life

**CHILDREN ARE NOT LITTLE ADULTS**



# CHILDREN ARE NOT LITTLE ADULTS

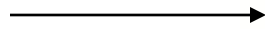




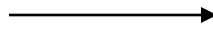
# CHILDREN LIVING WORLDS APART

## Philadelphia

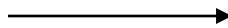
Lead in tap water



Pesticide residues in foods

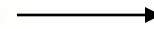


Mercury in sneakers



## Philippines

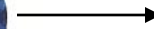
No tap for running water



Deaths from drinking pesticides



Mercury from small-scale gold mining



# STRONG AND GROWING EVIDENCE OF LINKS BETWEEN TOXIC CHEMICALS AND DISEASE

Air pollution and asthma –

Indoor and outdoor triggers

Environmental exposures and pediatric cancer –

Ionizing radiation, DES, pesticides, benzene

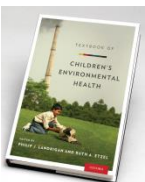
Endocrine disruptors and male reproductive problems –

Emerging evidence for phthalates. Still early stage

Neurodevelopmental disorders –

Lead, Methylmercury, PCBs, PBDEs, Phthalates,

BPA, PAH, Fluoride, Solvents, Organophosphates



# WHY WRITE THIS BOOK NOW?

- Large and rapidly expanding body of knowledge in children's environmental health
- Growing number of trainees in the field
- These trainees will need certification in the specialty of children's environmental health if they are to pursue careers
- Before a new medical specialty or subspecialty can be certified, it must have a foundational textbook that codifies the base of knowledge in the field
- There is no other text book currently in press



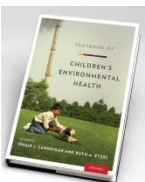
# CHILDREN'S ENVIRONMENTAL HEALTH

**Children's Environmental Health** is the academic discipline that studies how environmental exposures in early life – chemical, nutritional and social exposures – influence health and development in childhood and across the entire human life span.

The focus of children's environmental health is on the discovery, diagnosis, treatment and prevention of diseases in children that are associated with harmful exposures in the environment.

Children's environmental health also studies how healthy environments protect children's health and nurture growth and development.

Children's environmental health is sometimes referred to as "*environmental pediatrics*".



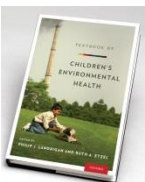
# CHILDREN'S ENVIRONMENTAL HEALTH

Children's environmental health is based on a very inclusive definition of childhood.

It is concerned with environmental exposures that occur during pregnancy as well as in infancy, childhood and adolescence.

It considers parental exposures prior to conception that may influence the health of children.

It traces the influence of early environmental exposures on health and development across the entire life span - from conception, through the embryonic and fetal periods, into infancy, childhood and adolescence and on into adulthood and even to extreme old age.



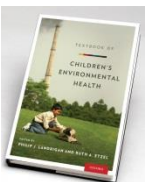
# CHILDREN'S ENVIRONMENTAL HEALTH

Children's environmental health considers the environment broadly. It recognizes that children's environments are complex, are comprised of many layers and change over time.

It therefore studies the influences on children's health of chemical exposures in early life, the nutritional environment in the mother's womb, the built environment, stress and the social environment. It studies interactions among these multiple environments at different life stages.

It examines interactions between environmental exposures, poverty and social injustice.

It examines the influences of the environment on the human genome and epigenome.

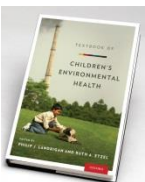


# CHILDREN'S ENVIRONMENTAL HEALTH

Children's environmental health is highly interdisciplinary.

It spans and brings together general pediatrics and numerous pediatric subspecialties as well as epidemiology, occupational and environmental medicine, medical toxicology, industrial hygiene and exposure science.

Beyond medicine, the discipline of children's environmental health links to architecture, urban planning, social work, education, ecology, economics and political science.



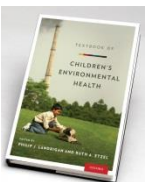
# CHILDREN'S ENVIRONMENTAL HEALTH

Research in children's environmental health seeks to discover the environmental causes of disease and dysfunction in children. It evaluates the benefits to children's health of positive changes in the environment.

Advocacy and practice in children's environmental health translates research findings into evidence-based blueprints for the prevention of disease and the protection of children's health.

The ultimate goals of children's environmental health are to safeguard children's health and to improve the environments where children live, learn and play.

Children's environmental health honors children. It protects children. It advocates for the creation of healthy environments where children can live happily and achieve their highest potential.





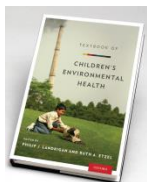
# ORGANIZATION OF THE BOOK

- 60 chapters by 85 authors on 5 continents
- Introductory/Overview chapters
- Chapters on children's environments
- Chapters on environmental hazards
- Chapters on the major diseases of environmental origin in children
- Chapters on prevention and control of diseases of environmental origin in children



# INTRODUCTORY/OVERVIEW CHAPTERS

- Chapter 1: Children's Environmental Health – A New Branch of Pediatrics
- Chapter 2: Children's Exquisite Vulnerability to Environmental Exposures
- Chapter 3: The Chemical Environment and Children's Health
- Chapter 4: Intrauterine Nutrition and Children's Health
- Chapter 5: Social and Behavioral Influences on Child Health and Development
- Chapter 6: Epidemiology – A Tool for Studying Environmental Influences on Children's Health
- Chapter 7: Exposure Science to Protect Children's Health
- Chapter 8: Geographic Information Systems (GIS) in Children's Environmental Health
- Chapter 9: Developmental Toxicology and Children's Environmental Health
- Chapter 10: Genetics, Epigenetics and Children's Environmental Health
- Chapter 11: Economics and Children's Environmental Health
- Chapter 12: The Global Dimension of Children's Environmental Health

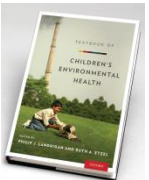


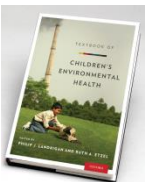
# CHAPTERS ON CHILDREN'S ENVIRONMENTS

- Chapter 13: The Intrauterine Environment and Early Infancy
- Chapter 14: The Home Environment
- Chapter 15: The School/Child Care Environment
- Chapter 16: The Shape of the Built Environment Shapes Children's Health
- Chapter 17: The Play Environment
- Chapter 18: The Benefits of the Green Environment
- Chapter 19: The Farm Environment
- Chapter 20: Workplace Safety for Young Workers
- Chapter 21: The Changing Global Environment and Children's Health









# CHAPTERS ON ENVIRONMENTAL HAZARDS

- Chapter 22: Outdoor Air Pollution
- Chapter 23: Indoor Air Pollution
- Chapter 24: Tobacco Smoke: Active and Passive
- Chapter 25: Water Pollution
- Chapter 26: Sanitation and Hygiene
- Chapter 27: Hazardous Waste and Toxic Hotspots
- Chapter 28: Lead
- Chapter 29: Mercury
- Chapter 30: Arsenic
- Chapter 31: Other Metals



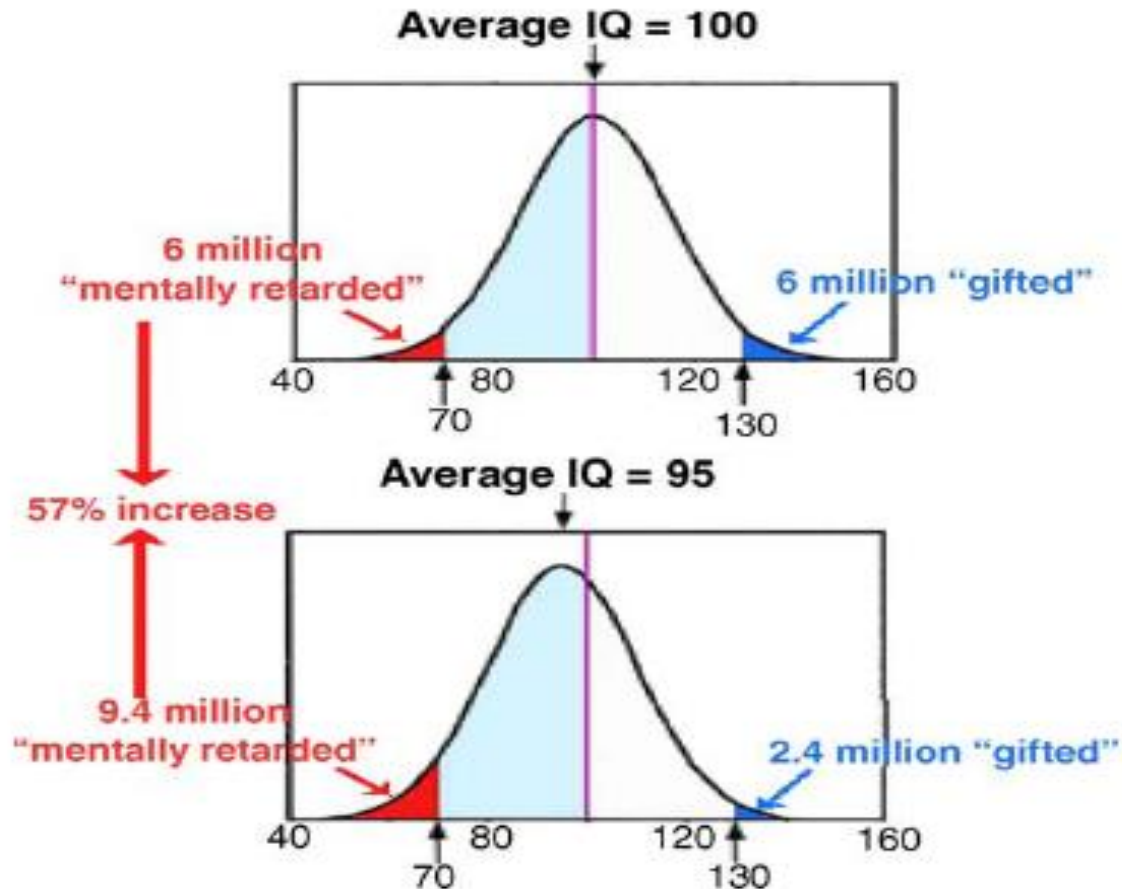
# CHAPTERS ON ENVIRONMENTAL HAZARDS

- Chapter 32: Pesticides
- Chapter 33: PCBs, Dioxins, Furans, DDT, Polybrominated Compounds, Polyfluorinated Compounds and other Halogenated Hydrocarbons
- Chapter 34: Volatile Organic Chemicals
- Chapter 35: Endocrine Disruptors
- Chapter 36: Chemical Obesogens and Obesity
- Chapter 37: Environmental Carcinogens and Childhood Cancer
- Chapter 38: Mold
- Chapter 39: Physical Hazards
- Chapter 40: Ionizing Radiation
- Chapter 41: Electromagnetic Fields



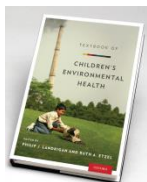


# SOCIETAL IMPACT OF A 5-POINT LOSS IN POPULATION MEAN IQ SCORE



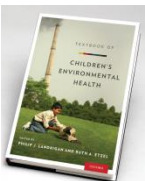
[www.preventingharm.org/execsum.html](http://www.preventingharm.org/execsum.html) Schettler,

2000



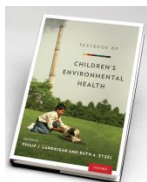
# THE ENVIRONMENT AND DISEASE IN CHILDREN

- Chapter 42: Prematurity, Low Birth Weight and the Environment
- Chapter 43: Asthma, Allergy and the Environment
- Chapter 44: Neurodevelopmental Disorders and the Environment
- Chapter 45: Birth Defects and the Environment
- Chapter 46: Obesity, Diabetes, Cardiovascular Disease and the Environment
- Chapter 47: Liver Disease in Children and the Environment
- Chapter 48: Kidney Disease in Children and the Environment
- Chapter 49: Injuries, Trauma and the Environment
- Chapter 50: Acute Pediatric Poisoning

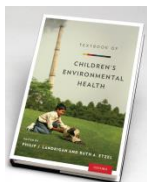
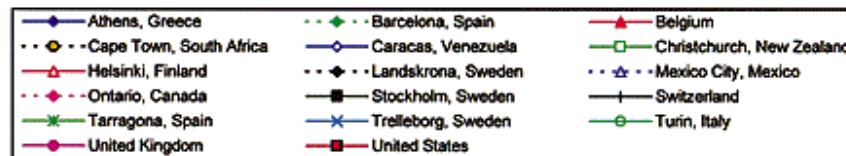
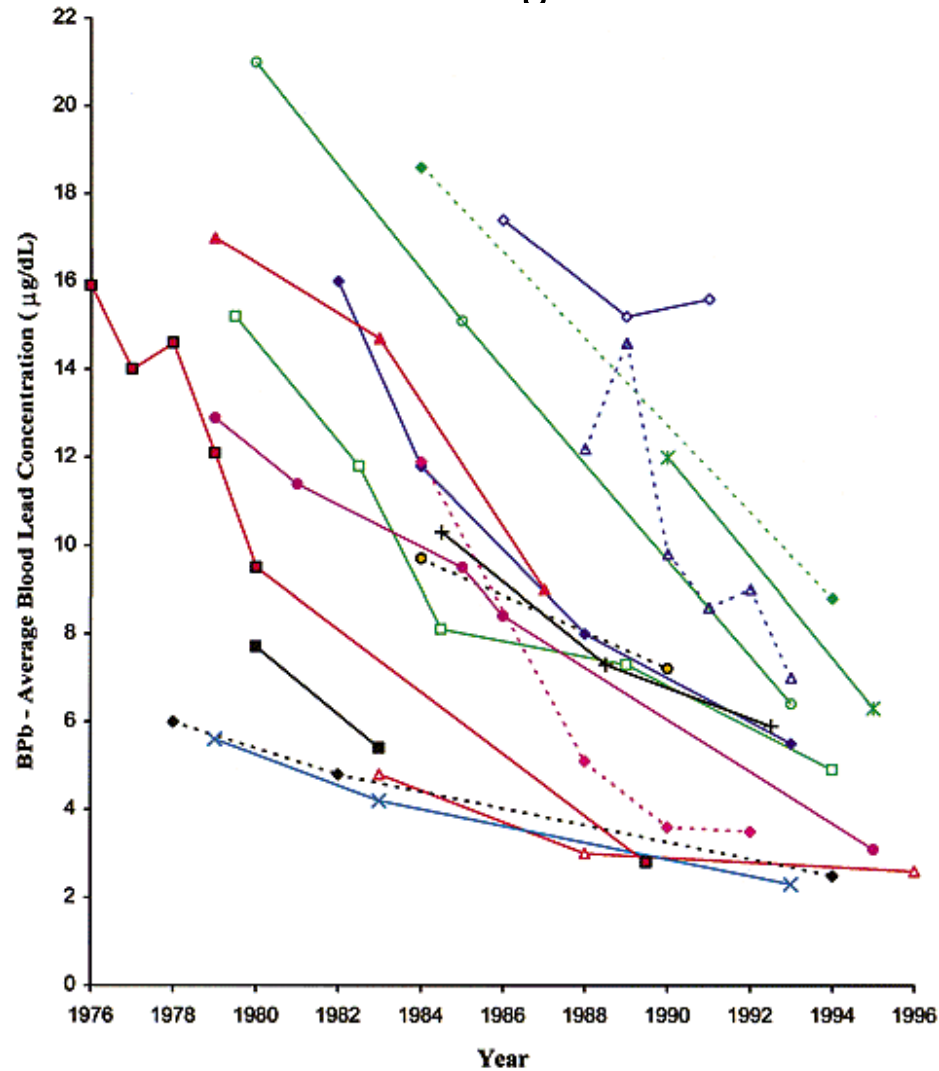


# PREVENTION AND CONTROL OF DISEASES OF ENVIRONMENTAL ORIGIN IN CHILDREN

- Chapter 51: The Environmental History & Examination: The Key to Diagnosis of Environmental Diseases
- Chapter 52: Clinical Practice of Environmental Pediatrics around the World
- Chapter 53: Public Policy on Children's Environmental Health in the United States
- Chapter 54: Public Policy on Children's Environmental Health in the Europe
- Chapter 55: Public Policy on Children's Environmental Health in Asia
- Chapter 56: Global Treaties and Children's Environmental Health
- Chapter 57: The Impact of Poverty, Disparity and Injustice on Children's Environmental Health
- Chapter 58: War, Terrorism, and Children's Health
- Chapter 59: Natural Disasters, Environmental Emergencies and Children's Health
- Chapter 60: New Frontiers in Children's Environmental Health



Multiple countries around the world have phased lead out of gasoline and shown similar reductions in average blood lead concentrations

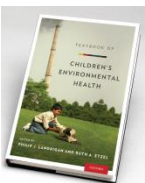
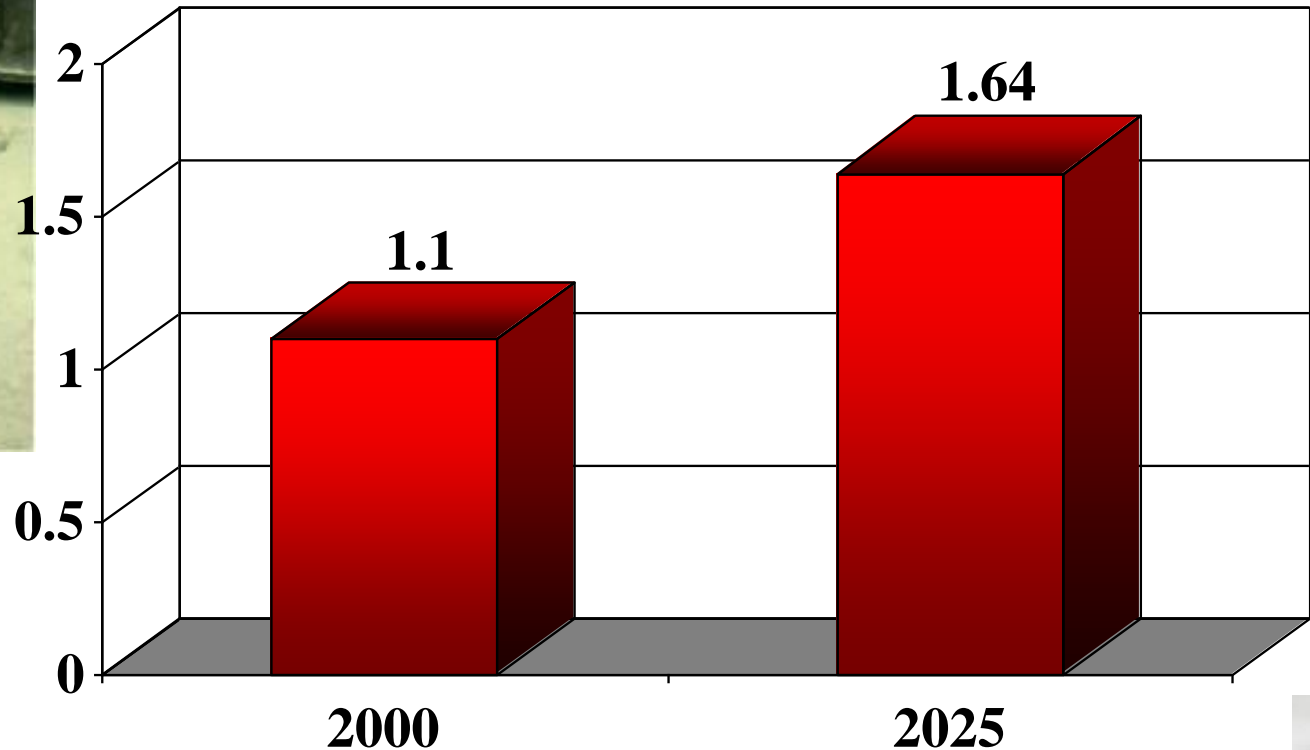


# THE COMING EPIDEMIC

## Rise in Smokers Worldwide



billions of smokers



# ANTICIPATED AUDIENCES

- Pediatricians
- Pediatric residents and trainees
- Family physicians
- Obstetricians, especially specialists in Maternal-Fetal Medicine
- Nurses
- Medical and nursing students
- Developmental psychologists
- Graduate students in the life sciences, especially in developmental biology and the neurosciences
- Public health and environmental health researchers and practicing professionals
- Pediatric and clinical toxicologists
- Health economists
- Health and environmental decision makers and risk assessors in ministries of the environment and public health
- Civil society organizations concerned with providing information and advice on protecting children against environmental threats to health, *and*
- Elected officials at all levels of government who seek information to help them better protect children.



# REVIEWS

“It’s hard to imagine a more comprehensive, thorough resource on children’s environmental health than this book. It ranges from cutting-edge science to trenchant policy analysis, with a dream team of expert editors and authors. This is the definitive work on the subject.”

— *Howard Frumkin, MD, DrPH, Dean and Professor of Environmental and Occupational Health Sciences, University of Washington School of Public Health*

“Phil Landrigan and Ruth Etzel have compiled an authoritative review of pediatric environmental health information that moves the field ahead clinically and in the policy arena. This book provides the fundamental information in environmental health for the early 21st century.”

— *Judith Palfrey, MD, Boston Children’s Hospital, Harvard Medical School*



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