Children's Health and the Environment:

A Health Canada Perspective



Children First: Moving to Implementation
New Brunswick Children's Environmental Health Strategy

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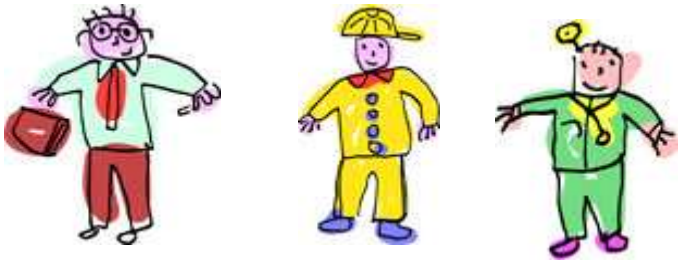
Outline

- Why focus on children?
- Scope of children's environmental health issues
- What makes children more vulnerable?
- Health outcomes with environmental association – state of the science
- Ongoing work and resources



Why focus on children?

- Those 0-19 yrs of age account for roughly 25% of the Canadian population;
- “Childhood” as a developmental stage (not a discrete sub-population);
- Child health is an important determinant of adult health;
- Collective responsibility to protect children;
- Public concern;
- Vulnerable sub-populations of children

Why focus on the environmental risk factors of diseases?

- Environmental exposures are preventable;
- Relationship to other determinants of health;
- Etiology of many of those diseases and conditions is not well understood;
- Environmental burden of disease in Canada likely very high

  (and expensive).

Children's Environmental Health
Scope of the issue

- Children – includes pregnant women
- Physical environment
- Environmental hazards

  Biological, physical, chemical and radiological hazards
- Health outcomes

Windows of Vulnerability

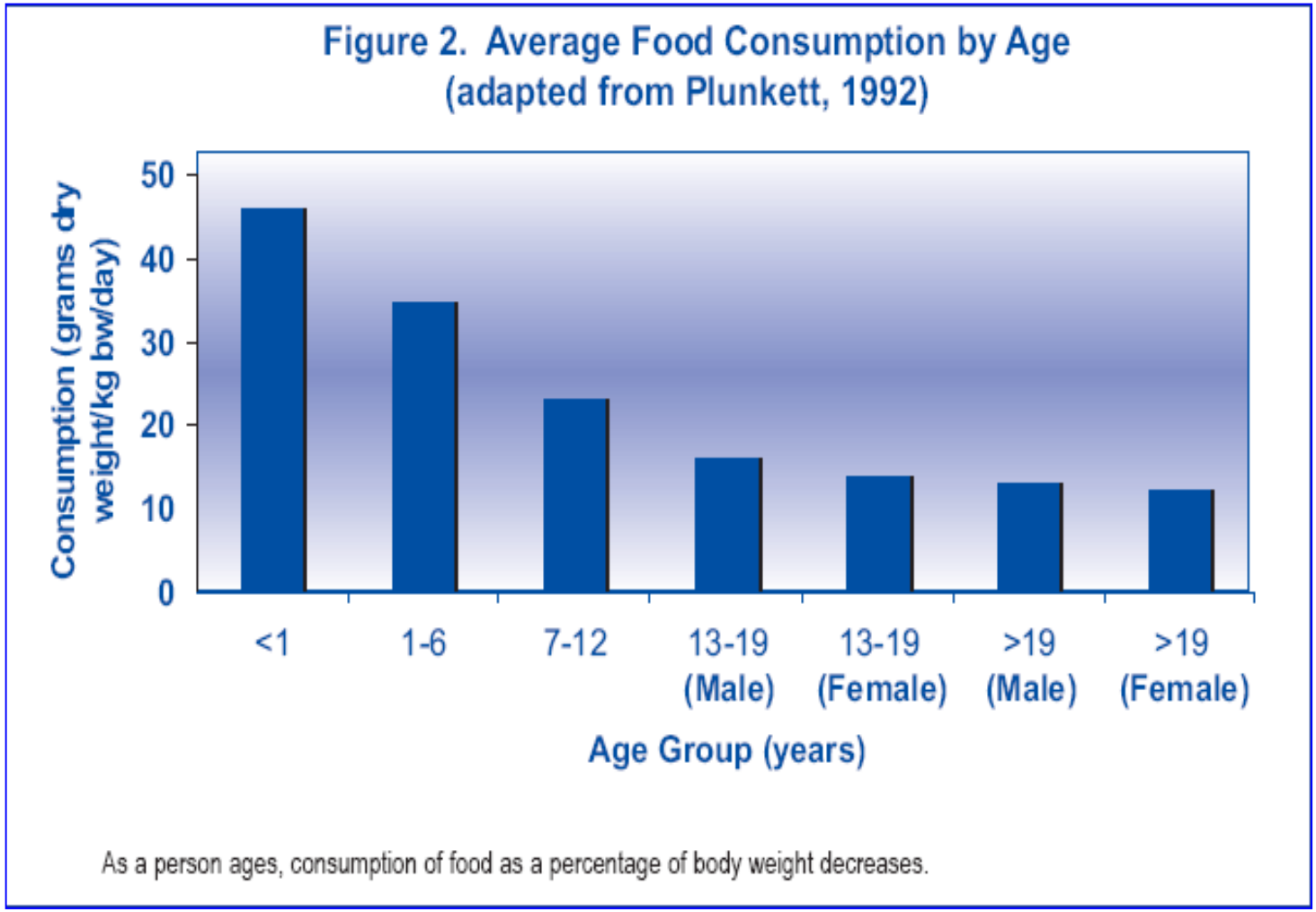
- Prior to conception and during pregnancy
  - Periods of rapid cell growth means cells vulnerable to damage from toxic substances
  - Mothers can pass toxic substances on to children via the placenta or breast milk
- Newborns
  - Organs and tissues undergo rapid growth, highly permeable gastrointestinal tract, highly permeable skin, lung growth and development.
- Young children
  - Lung growth and development continues, higher rates of respiration and calorie intake per kilogram of body weight, hand-to-mouth behaviour
- Adolescents
  - Lung growth and development continues, rapid growth of skeleton and muscles, reproductive system development

What makes children more vulnerable ?

Physiological differences:

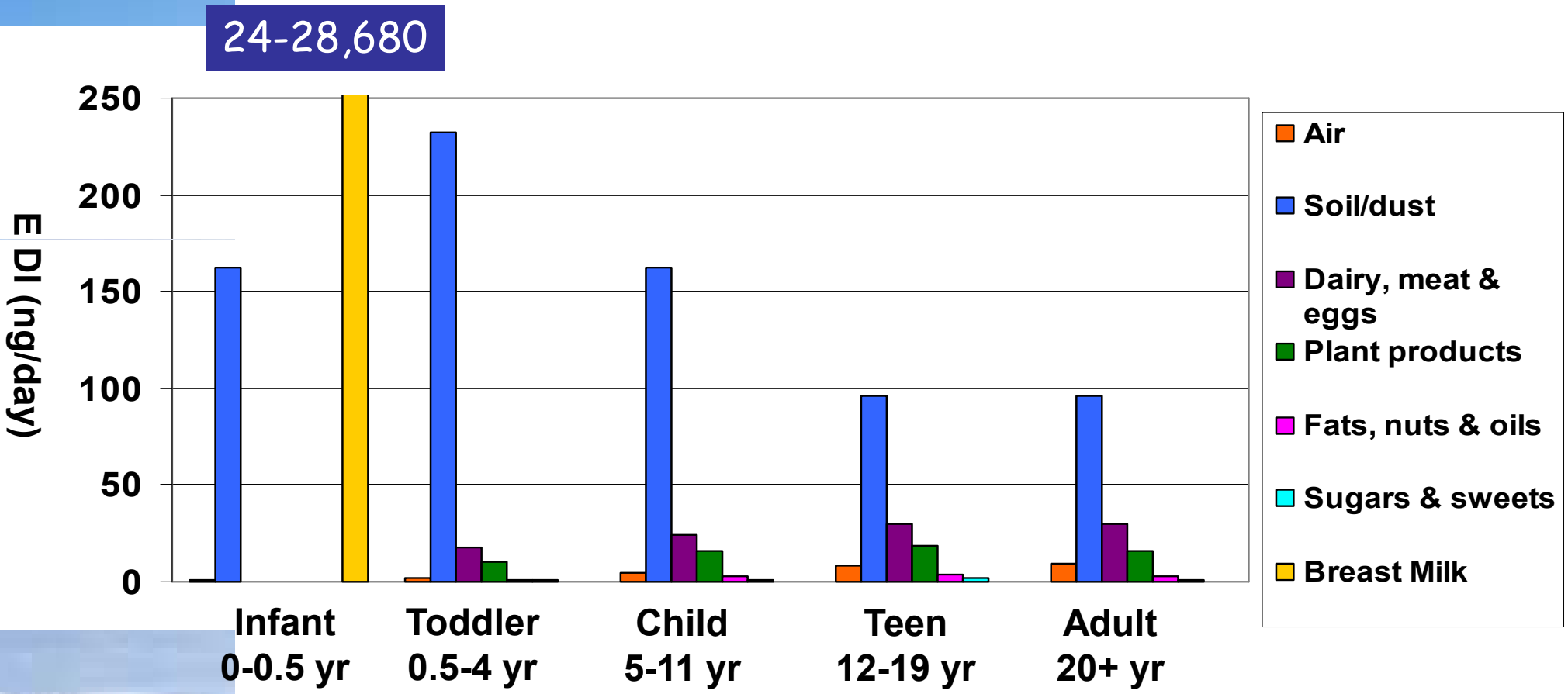
- Rapid growth and high metabolic rate
- Immature organs and systems
- High GI absorption of certain toxicants
- Per unit body weight, consume more food, breath in more air, drink more liquids.
- Unique pathways of exposure (placenta, human breast milk, diet)
- Long life expectancy (high cumulative exposures, latent effects)

What makes children more vulnerable ?
Diet



What makes children more vulnerable ?

Estimated Daily Intake PBDEs Canadian population

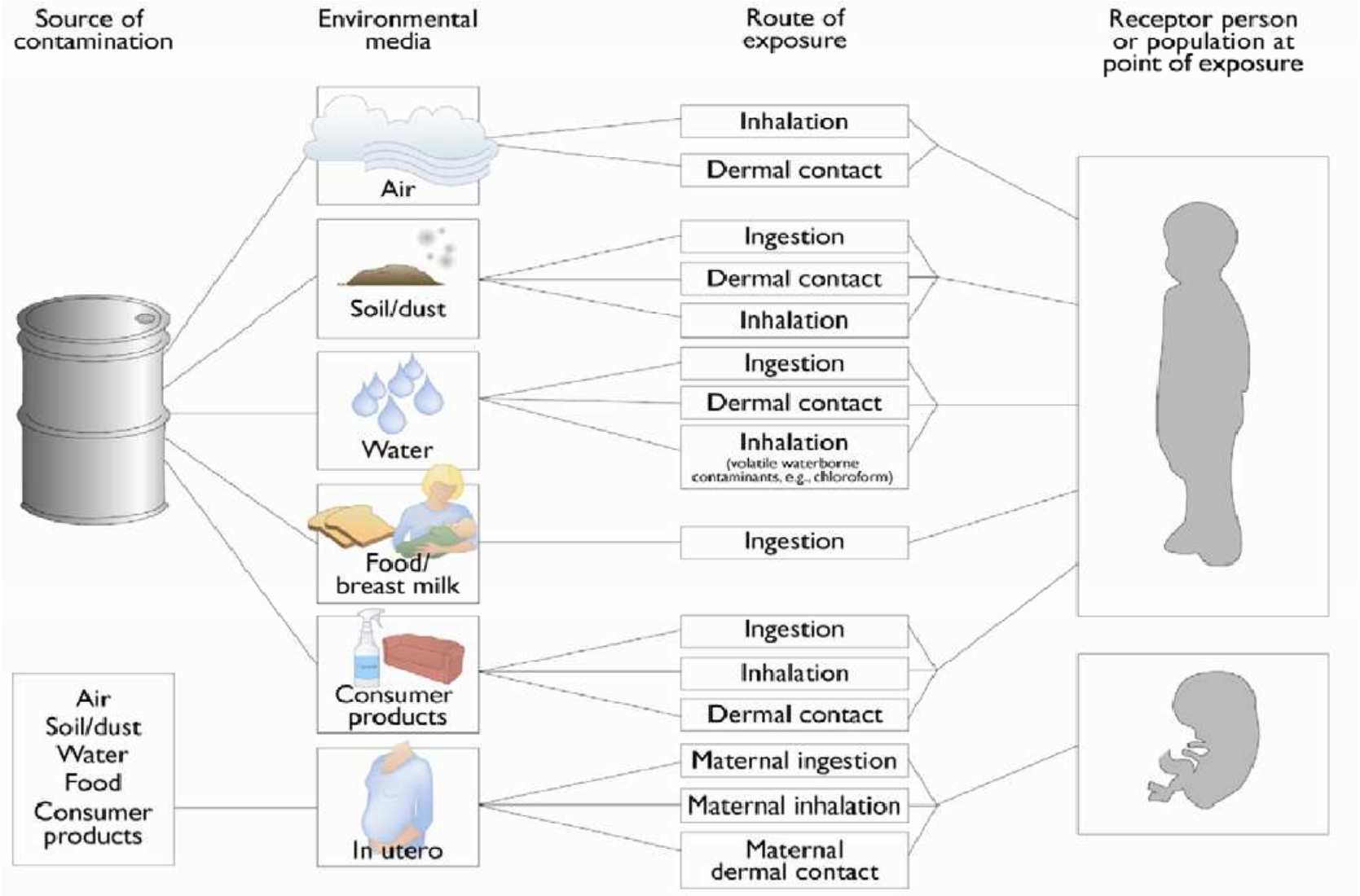


Jones-Otazo et al. 2005 *ES&T* 39: 5121-5130

What makes children more vulnerable ?

Behaviour:

- Hand-to-mouth (ingestion of soil, house dust, mouthing of objects and surfaces etc)
- Crawling, close to the ground
- Time spent outdoors and in specific settings
- Less knowledge of environmental risks



Source: Child Health and the Environment – A Primer, Canadian Partnership for Child Health and the Environment

Health outcomes with environmental association – state of the science

- Adverse pregnancy outcomes
- Asthma and other respiratory diseases
- Birth defects
- Cancer
- Gastrointestinal diseases
- Health impacts of climate change
- Neurodevelopmental disorders
- Obesity
- Poisonings
- Others (sudden infant death syndrome, hearing loss, endocrine disruptors effects, immune system effects, reproductive health)

Health outcomes with environmental association – state of the science

Adverse pregnancy outcomes

- Leading cause of infant deaths, potential environmental contributions poorly understood.
- Drugs, ionizing radiation, second-hand smoke, high exposure to metals (mercury).
- Prenatal lead exposure, outdoor air pollution, role of endocrine disruptors?

Birth defects

- Major congenital anomalies are detected in 2% to 3% of births in Canada.
- Environmental contribution poorly understood (maternal exposure to organic solvents)

Asthma and other respiratory diseases

- 12% of children in Canada affected by asthma, and prevalence increased by 4X in the past 20 years.
- Causal versus contributing factors and exacerbation asthma symptoms and attacks.
- Outdoor air pollution, indoor air contaminants, second-hand smoke, in utero origins.

Health outcomes with environmental association – state of the science

Cancer

- Cancer is the second leading cause of death among Canadian children aged 1-14 years.
- Certain pesticides, radon and risk of lung cancer later in life.
- Increased prevalence of certain cancers in young adults (with potential environmental links)

Gastrointestinal diseases

- Endemic gastro enteritis and outbreaks.
- Foodborne versus waterborne illness?
- Examples of bacterial contaminants: Giardia, Campylobacter, *Cryptosporidium* E Coli, Shigellosis.
- Higher prevalence in First Nations communities.

Health impacts of climate change

- Intense severe weather events: hurricanes, tornadoes, thunderstorms, hail, floods and droughts.
- Direct physical injury or death, as well as psychological distress due to the loss or injury of loved ones and property, mass evacuations, and moving into shelters.
- Children more at risk to heat stress than adults.

Health outcomes with environmental association – state of the science

Neurodevelopmental and behavioural effects

- Learning disabilities, ADHD, autism spectrum disorders.
- No national prevalence data.
- 1994 NLSCY: 26 % of children living in Canada aged 6-11 years old have at least one, identifiable learning or behavioural problem;
- 14-16% of children living in Canada had cognitive deficits, and another 17-22% had “behavioural problems” defined as hyperactivity and ADHD.
- Lead, methylmercury, PCBs, manganese, certain pesticides, arsenic, toluene, PBDEs, second-hand smoke.
- 24% children < 5 in housing built prior to 1960 (2001) placing them at risk for exposure to lead paint chips and lead in house dust
- 43% Inuit mothers exceed health “level of concern” for PCBs in blood
- Prenatal exposure to methylmercury, aboriginal populations relying on traditional/country foods, fish eating population.

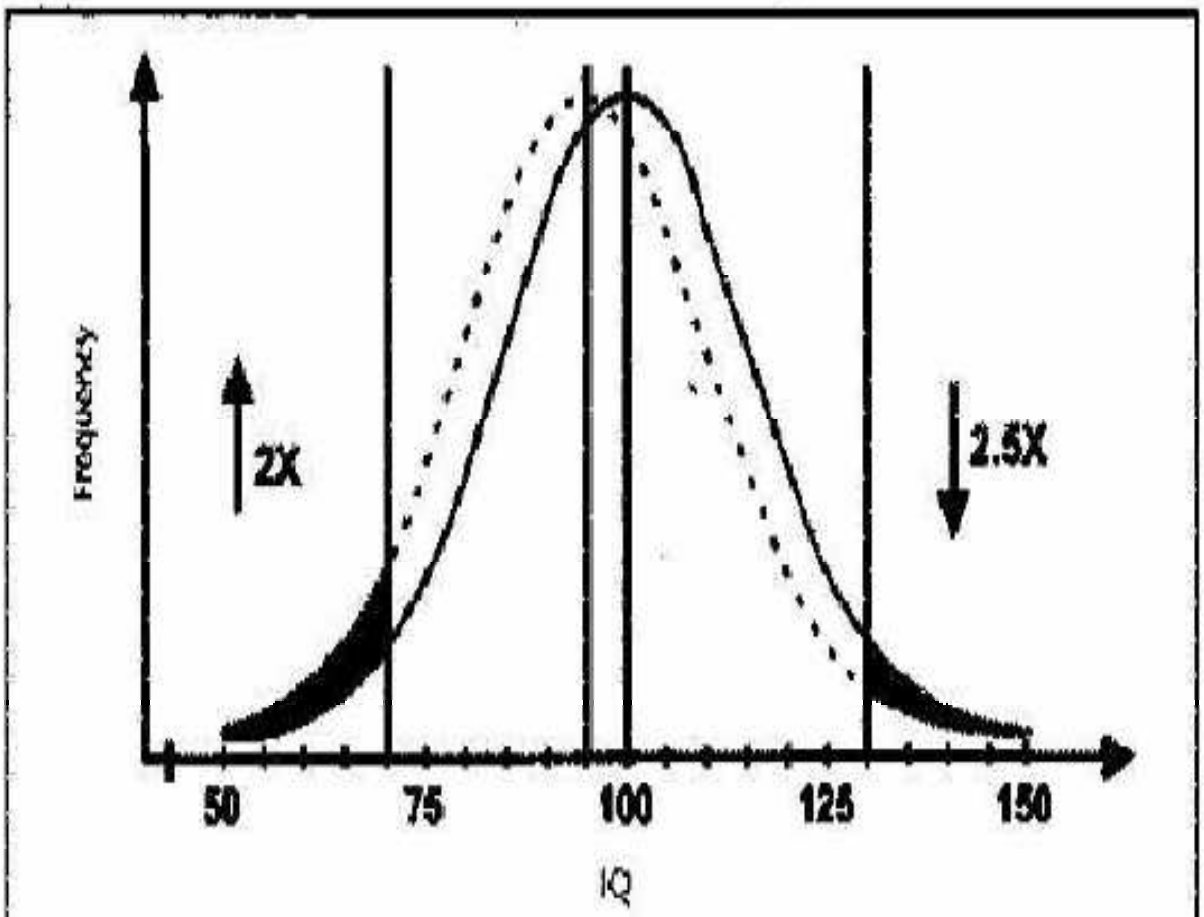


Figure 1. Normal distribution of IQ with a mean of 100 (solid curve) and decreased by five points (dashed curve). The filled area on the right tail of the distribution represents a decrease in the number of individuals with IQs greater than 130 by a factor of 2.5, while the filled area on the left tail represents a doubling of the number of persons with IQs less than 70 (defined clinically as mental retardation). (Adapted from Ref. 5)

Source:
Rice DC. CJPH 1998; 89: S31-36

Health outcomes with environmental association – state of the science

Childhood obesity

- 26% of Canadian children and adolescents aged 2 to 17 were overweight or obese in 2004.
- Known cause: lack of spaces for physical activity (i.e. urban planning, transport).
- Environmental chemicals (endocrine disruptors, in utero exposure)

Poisonings

- Hospitalization rates highest for 1-4 age group
- 90% of poisonings happen in the home
- Environmentally-related poisonings (household products, lead, nitrates, pesticides, fluoride)

Other health outcomes

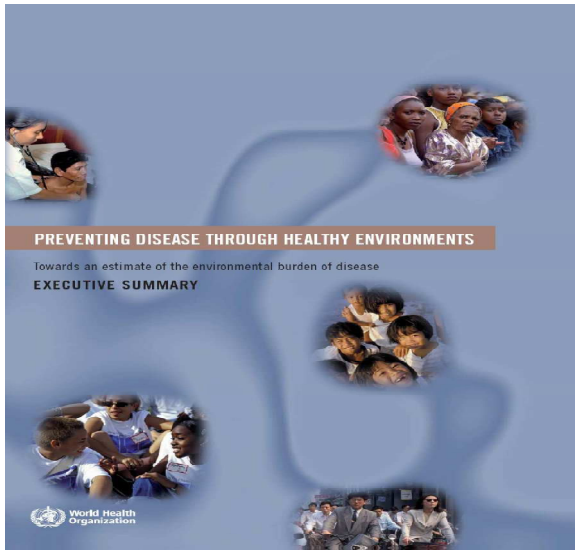
- Reproductive health effects (phthalates, endocrine disruptors)
- Sudden infant death syndrome (ETS)
- Hearing loss (noise), ear infections (outdoor air pollution)
- Allergies (pollen, spores)

Health outcomes with environmental association

What is the contribution of the environment to the overall burden of childhood diseases and conditions in Canada?

WHO Global estimates, environmental factors responsible for 24% of the global disease burden

- In developing regions: 25%
- In industrialized regions: 17%



Health outcomes with environmental association

Environmental Burden of Disease Analysis

U.S. Panel of experts estimated the contribution of environmental pollutants to the incidence, prevalence, mortality and costs of four categories of pediatric diseases in U.S. children:

EAF for lead poisonings = 100%

EAF for asthma = 30%

EAF for cancer = 5%

EAF for neurobehavioral disorders = 10%

Total costs of EAF = $US 54.9 billion annually or 2.8% of U.S. health care expenditures

Health outcomes with environmental association - Conclusion

- Strength of evidence varies by health outcomes and by environmental hazards
- There exists tools/criteria for analysing scientific evidence
- Need for environmental burden of disease analysis
- Research can drive effective interventions
- Address major data gap – level of exposure of Canadian children

Conclusion

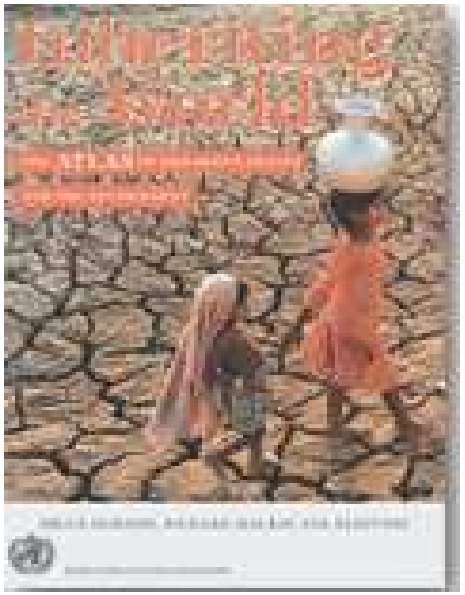
Lessons for Strategy Development

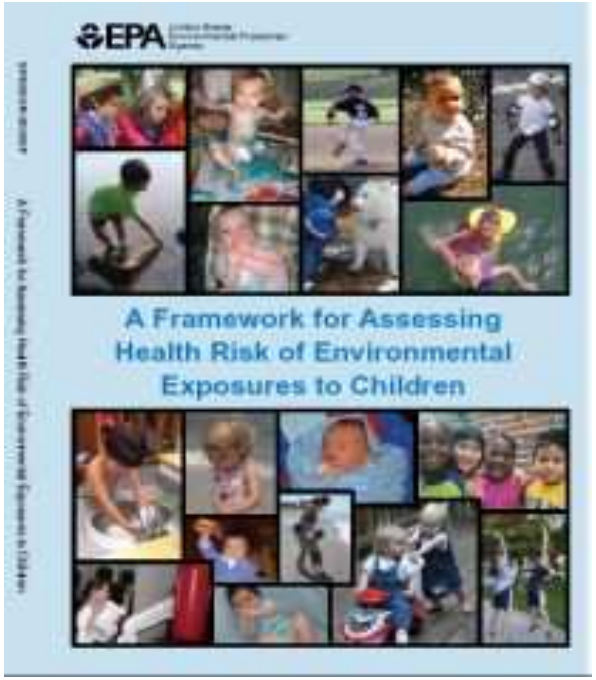
- Evidence-based decisions and application of the precautionary principle
- Sufficient evidence to warrant action on many environmental risks
- Environmental risks are preventable
- Scope the issues & Set priorities
- Multidisciplinary partnerships across all sectors are critical

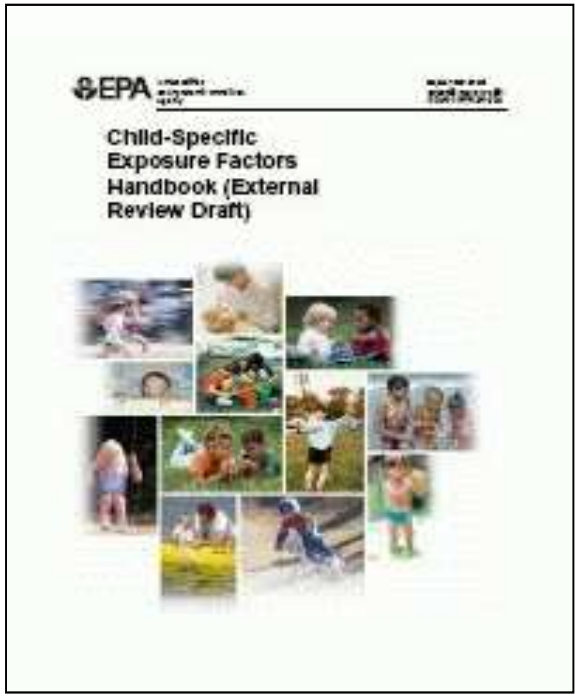
Conclusion

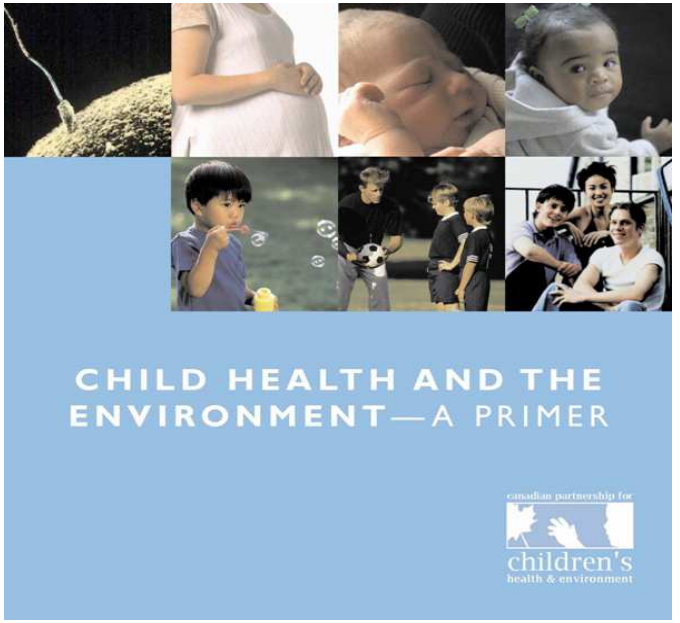
- Children deserve (moral obligation) and require special consideration
- Allowing environmental exposures to continue is costly to society
- Addressing environmental risk factors can make huge contribution to reducing burden of disease
- Lots to learn from other jurisdictions and international guidance


EUROPE
The Budapest collection




EPA
A Framework for Assessing Health Risk of Environmental Exposures to Children


EPA
Child-Specific Exposure Factors Handbook (External Review Draft)


CHILD HEALTH AND THE ENVIRONMENT—A PRIMER
canadian partnership for children's health & environment

For more information

- Canadian Partnership for Children's Health and the Environment

www.healthyenvironmentsforkids.ca
www.pollutionprobe.org (events)

- Government of Canada Chemicals Management Plan

www.chemicalsubstanceschimiques.gc.ca

- Maternal-Infant Research on Environmental Chemicals (MIREC) study
- Canadian Health Measures Survey (biomonitoring component)

Thank you

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