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Biomonitoring of Environmental Chemicals in the Canadian Health Measures Survey

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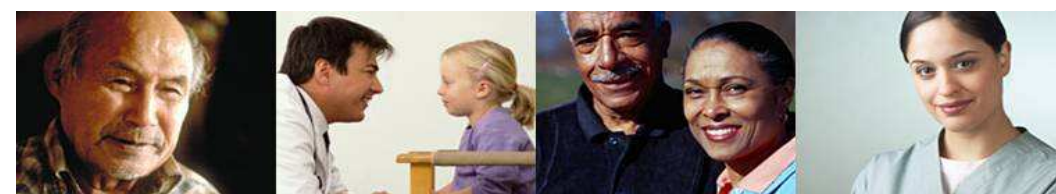
Healthy Environments & Consumer Safety Branch



Canada 

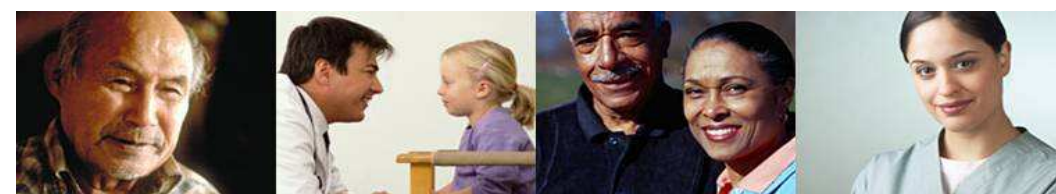
Purpose

- Define biomonitoring and describe its uses
- Describe the biomonitoring component of the Canadian Health Measures Survey (CHMS)
- Highlight the CHMS preliminary biomonitoring results



Chemicals Management Plan

In 2006, the Government of Canada launched the Chemicals Management Plan to advance and improve the management of chemical substances and safeguard the health of Canadians.



Health Canada's Monitoring and Surveillance Activities Under the Chemicals Management Plan

Monitoring and
Surveillance
Initiatives

Theme 1: National Biomonitoring Initiatives

Theme 2: Targeted Population Biomonitoring Initiatives

Theme 3: Biomonitoring Supportive Research

Theme 4: Targeted Environmental Monitoring to Support the Chemicals Management Plan

Themes 2, 3, and 4 include projects solicited via internal Health Canada Requests for Proposals

Monitoring and Surveillance Activities Under the Chemicals Management Plan

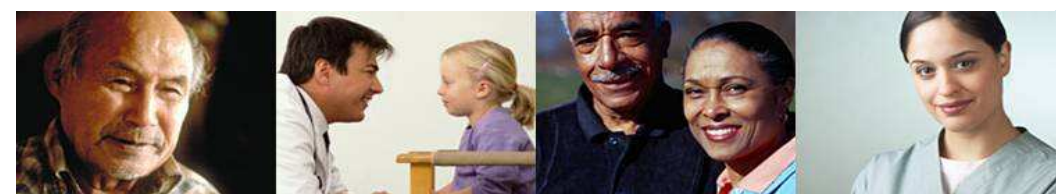
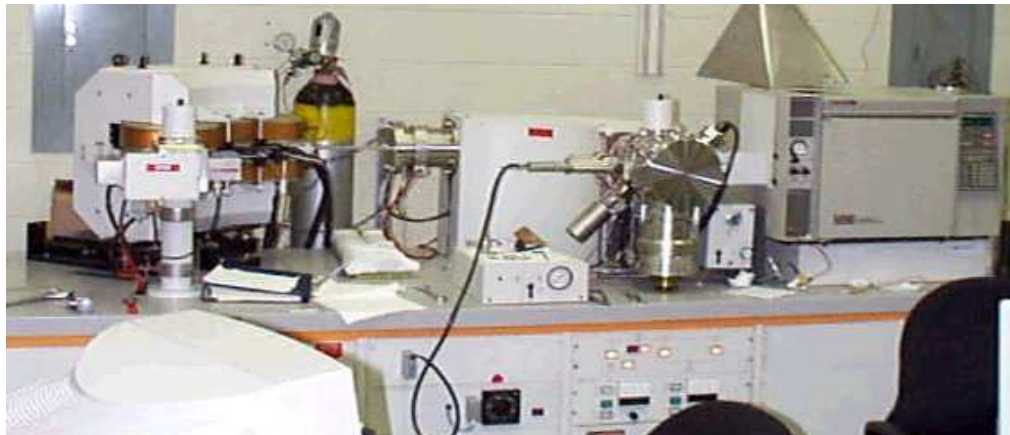
Theme 1: National Biomonitoring Initiatives

- Canadian Health Measures Survey
- Maternal-Infant Research on Environmental Chemicals
- Northern Contaminants Program



Biomonitoring of Environmental Chemicals

- The direct measurements of environmental chemicals, their metabolites or reaction products in people, usually in blood, urine, hair or milk.



Applications of Human Biomonitoring Data

Assessing Risk

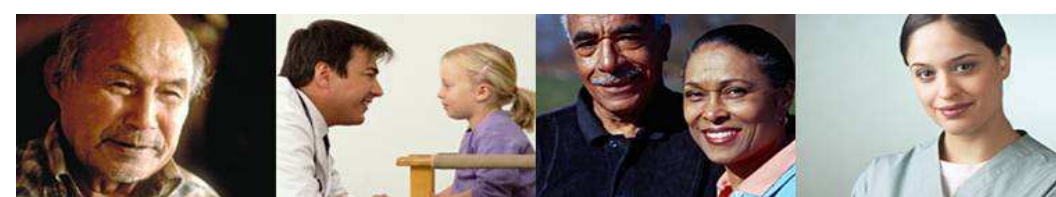
- Detect exposure
- Assess health risk (reference ranges, populations at risk, epidemiology and health investigations)

Managing Risk

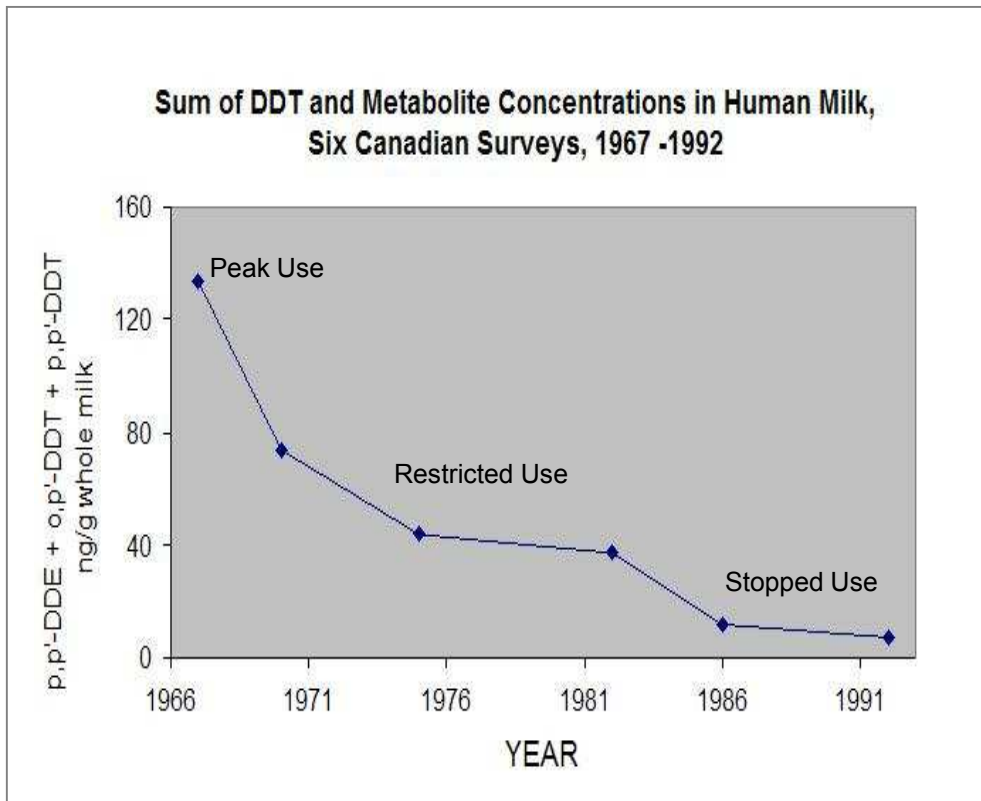
- Develop and apply interventions (inform and focus priorities)
- Ensure interventions are effective (tracking time and geographic trends, surveillance)

Informing Research

- Identify substances not previously thought to be a concern or to accumulate in people
- Help to focus future research efforts on links between exposure and health

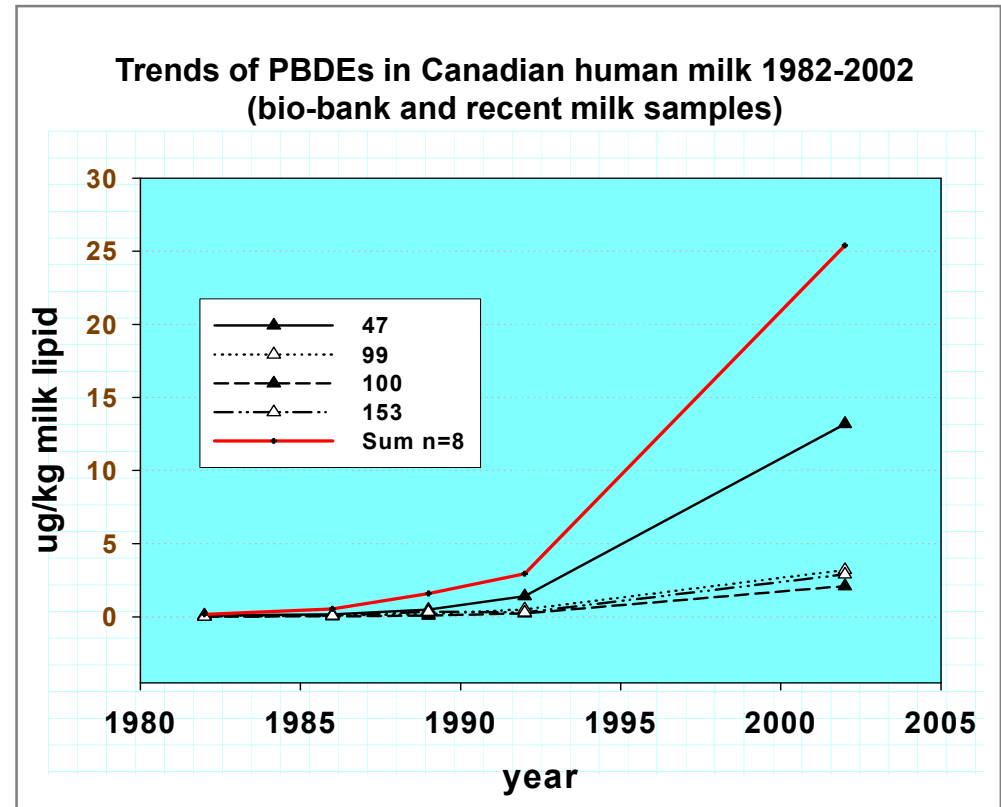


Track Effectiveness of Control Actions



Source: Craan and Haines, 1998

Detect Exposure and Emerging Trends



Source: J. J. Ryan, Health Canada, 2004



Canadian Health Measures Survey (CHMS) Cycle 1 (2007-2009)



Partners

Statistics Canada
Health Canada
Public Health Agency of Canada

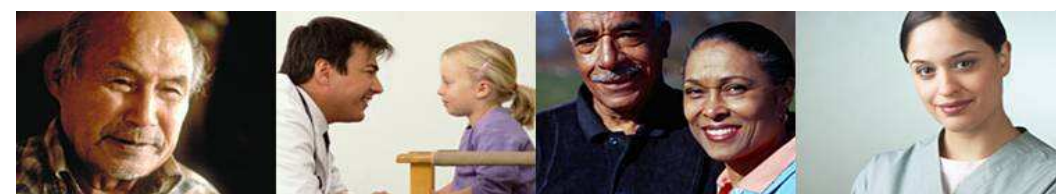
A general health survey of Canadians to provide benchmark data on indicators of environmental exposures, chronic diseases, infectious diseases, fitness, and nutritional status, as well as related risk factors and protective characteristics.



CHMS Biomonitoring Component

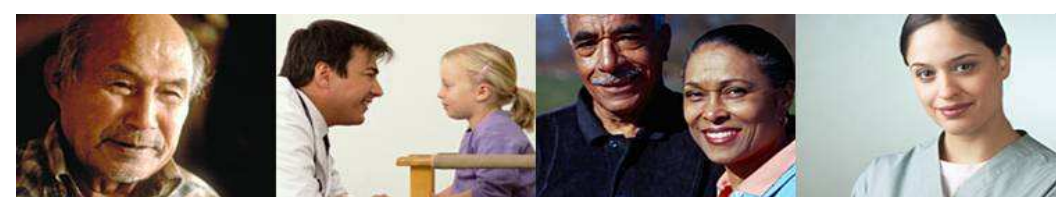
Objectives

- Establish nationally-representative values for a range of environmental chemicals
- Provide baseline data to track trends and to allow for comparisons with sub-populations in Canada and with other countries
- Provide data to explore relationships between environmental chemicals, other physical measures, and self-reported information



CHMS Cycle 1: Survey Parameters

- Cross-sectional survey design - atypical design (cost, logistics)
- National estimates, target n = 5,000 over 2 years (2007-2009)
- Ages 6-79 yrs (6-11, 12-19, 20-39, 40-59, 60-79)
- Health questionnaire - home interview
- Direct measures - mobile clinic
- Informed consent for all components

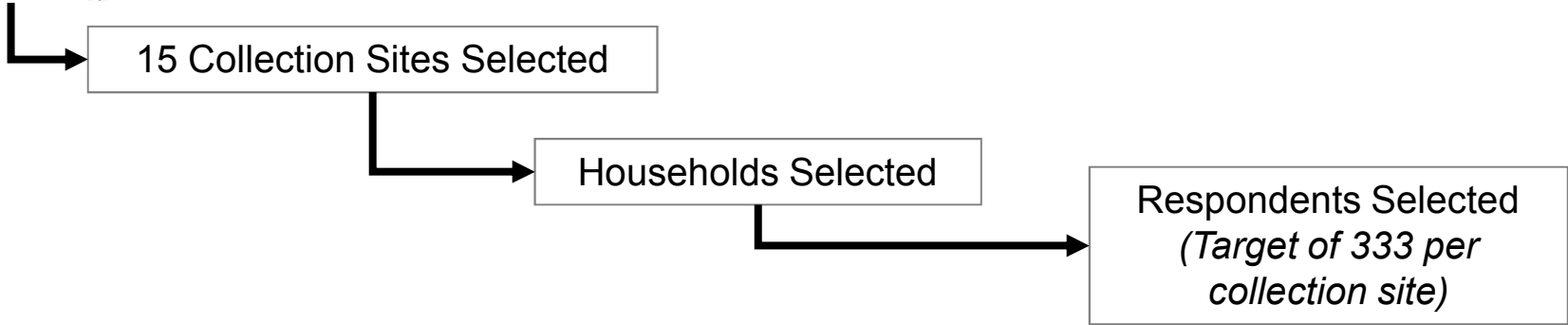


CHMS Cycle 1 Sampling Strategy

National Sampling Frame
(257 eligible collection sites)



- Collection sites stratified in 5 regions
- Covers 96% of population
- Sample size (n = 5,000) to yield national estimates by sex/age group at 10% prevalence with CV of 16.5%

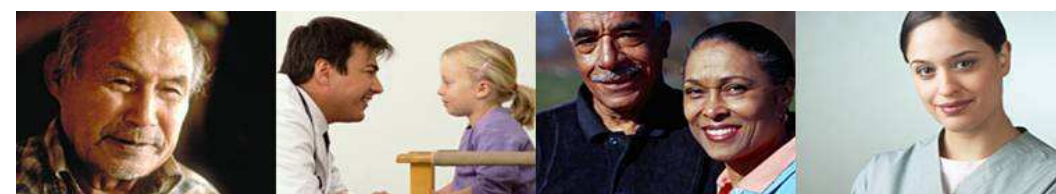


Selection of Environmental Chemicals (CHMS Cycle 1)

Expert workshop (2003) + program priorities

Criteria

- Public health considerations
 - Known or suspected health risk or effects
 - Need for public health action
 - Public concern
- Evidence of population exposures
- Feasibility of field collection of biospecimens / respondent burden
- Availability and efficiency of laboratory analytical methods
- Consistency with other surveys
- Cost



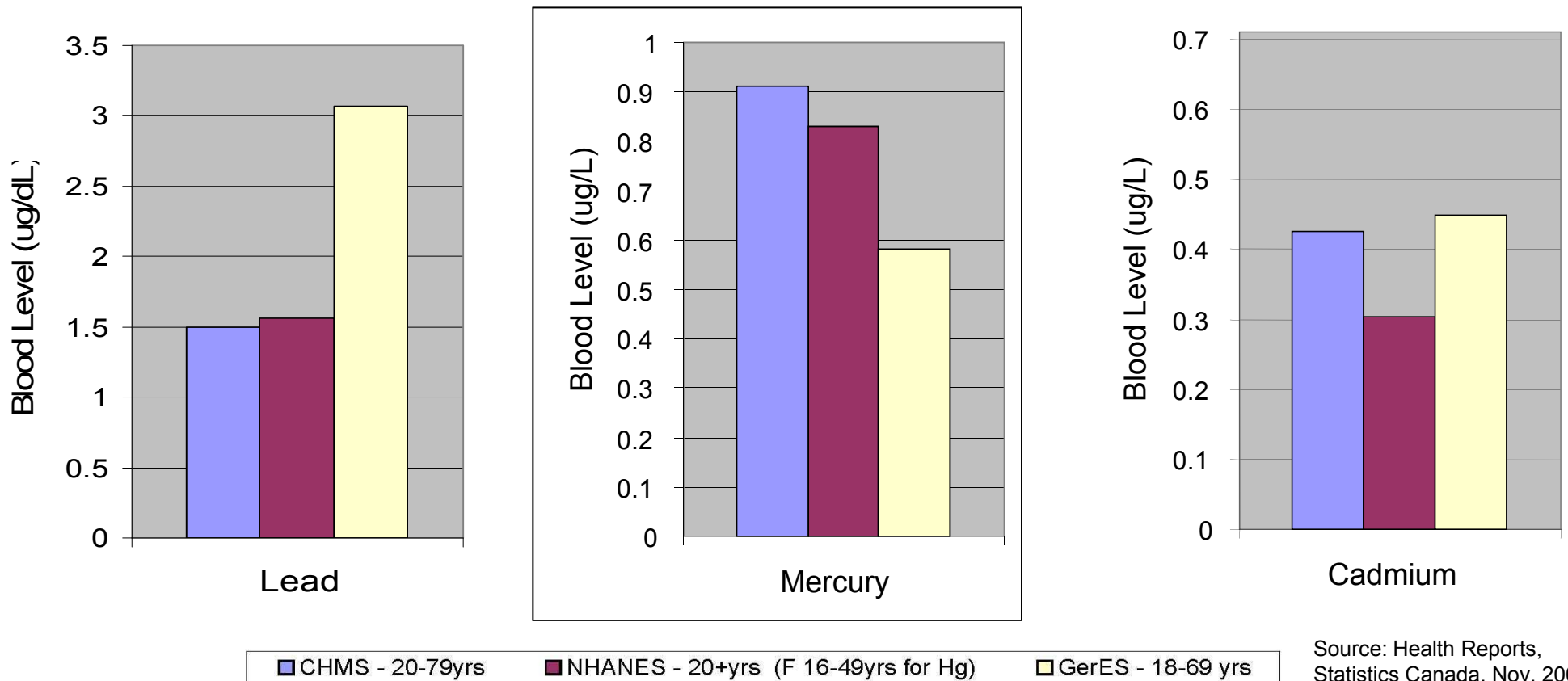
Environmental Chemicals (CHMS Cycle 1)

Measure	Matrix	Sample Size	Age (years)				
			6-11	12-19	20-39	40-59	60-79
Metals (Pb, Cd, Hg, Mn, As, Cu, Mo, Ni, Se, U, Zn, Sb, V)	Blood & Urine	5200	✓	✓	✓	✓	✓
PCB (24 congeners, Arochlor 1260)	Plasma	1500			✓	✓	✓
Organochlorine pesticides (14)	Plasma	1500			✓	✓	✓
Polybrominated compounds (10 congeners)	Plasma	1500			✓	✓	✓
Perfluorinated compounds (PFOS, PFOA, PFHxS)	Plasma	1500			✓	✓	✓
Cotinine	Urine	5200	✓	✓	✓	✓	✓
Bisphenol A	Urine	2400	✓	✓		✓	
Organophosphate pesticides (6 Dialkyl phosphate metabolites)	Urine	2400	✓	✓		✓	
Phenoxy herbicides (2,4-D and 2,4-dichlorophenol)	Urine	2400	✓	✓		✓	
Pyrethroid pesticides (5 metabolites)	Urine	2400	✓	✓		✓	
Phthalates (11 metabolites)	Urine	3000	✓	✓	✓ *		

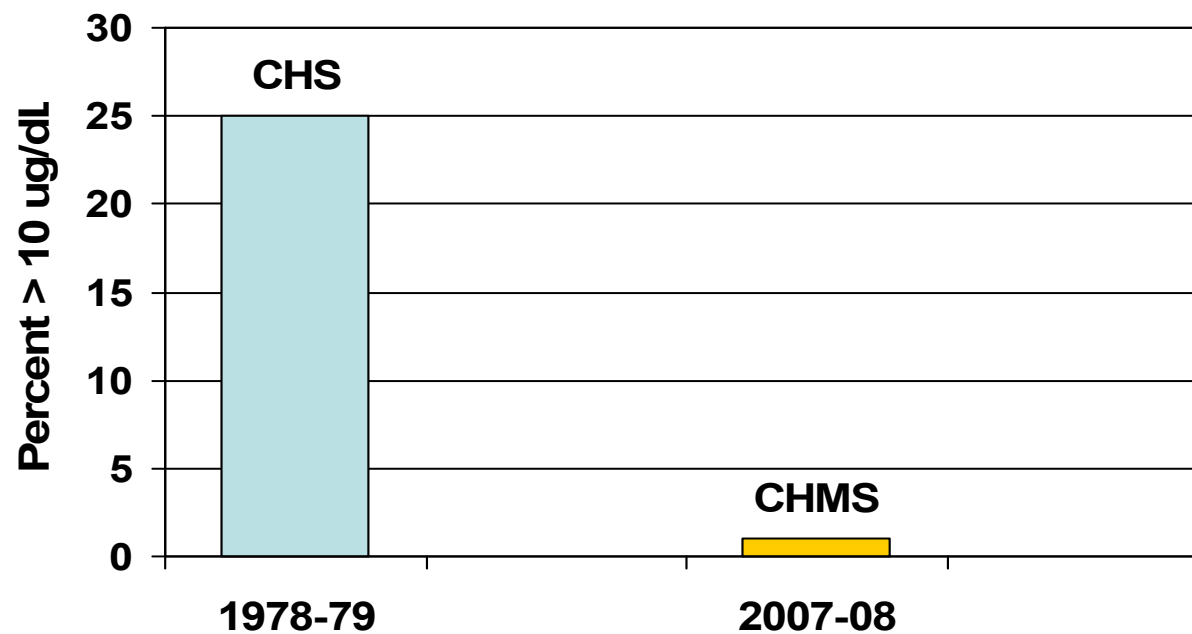
* 20-49 age group



CHMS Preliminary Results - International Comparisons: Blood Lead, Mercury and Cadmium



Proportion of Canadians, ages 6 and older, with blood lead concentrations above 10 µg/dL



CHS: Canada Health Survey

CHMS: Canadian Health Measures Survey

Benefits / Limitations of Biomonitoring in National Surveys

Benefits

Provide general population exposure data from all sources

Useful for tracking trends over time

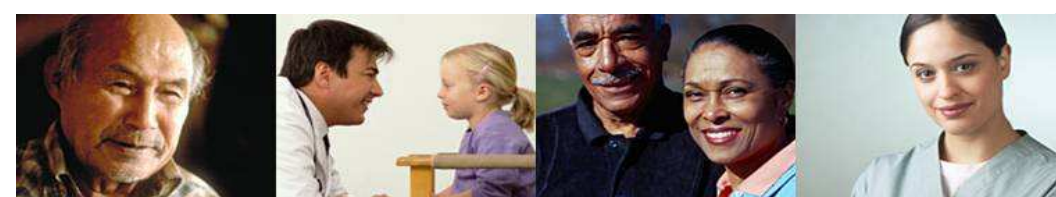
Limitations

Not targeted on specific exposure scenarios or high exposure populations

Not designed to study cause-effect relationships (e.g. between pesticide exposure and cancer)

Costs – survey operations and laboratory costs can be high

Few health-based tissue guidance values available to help interpret biomonitoring data



Future Directions

- CHMS Cycle 1 (2007-2009)
 - National Biomonitoring Exposure Report
 - Summer 2010
 - Normative data for all environmental chemicals measured in the CHMS
- CHMS Cycle 2 (2009-2011)
 - In progress
 - 16 sites across Canada
 - Includes children 3-5 years of age
 - Approximately 90 substances



For more information

Chemical Substances Website

www.chemicalsubstanceschimiques.gc.ca/en/

Canadian Health Measures Survey

www.statcan.gc.ca/chms

www.statcan.ca/english/freepub/82-003-SIE/82-003-SIE2007000.htm

