

BIOMONITORING OF ENVIRONMENTAL CHEMICALS IN THE CANADIAN HEALTH MEASURES SURVEY



**California Biomonitoring Workshop
June 9, 2008**

**Douglas Haines
Safe Environments Programme
Health Canada**

Policy Context For Health Canada

- **Regulatory**

- Chemicals Management Plan
- Canadian Environmental Protection Act

- **Public Health**

- Surveillance / Indicators
- Federal Contaminated Sites Program
- Tobacco Control Strategy
- First Nations and Northern Health

- **International**

- Stockholm Convention on Persistent Organic Pollutants
- North American Agreement for Environmental Cooperation
- Arctic Monitoring and Assessment Program (8 circumpolar nations)

Biomonitoring at Health Canada

National Surveys and Studies	Targeted Population Studies (selected)	Supporting Research (selected)
<p>Canadian Health Measures Survey (CHMS)</p> <p>Maternal-Infant Research on Environmental Chemicals (MIREC)</p>	<p>Northern Contaminants Program</p> <p>Impact of drinking water lead levels on the exposure of young children to lead</p> <p>Monitoring inorganic arsenic exposure in a population that uses water from private wells</p> <p>First Nations – community specific biomonitoring studies</p>	<p>Biomonitoring Equivalents and PBPK models</p> <p>Measuring chronic exposure to lead across the lifespan (bone – blood – serum)</p> <p>Temporal variation in urinary phthalates and Bisphenol A in pregnant women</p> <p>Identification of biomarkers of contaminant toxicity – Analysis of MIREC samples</p>

Canadian Health Measures Survey (CHMS)



Statistics Canada survey in partnership with Health Canada
and the Public Health Agency of Canada

The CHMS aims to advance health information needs:

- by addressing important data gaps and limitations in existing health information that cannot be obtained through proxy or self-reports
- through direct physical measures of Canadians' health
 - physical fitness, height, weight, etc.
 - blood and urine specimens

CHMS Survey Parameters

- National estimates, n = 5,000 over 2 years
- Atypical sample design (cost, logistics)
- Ages 6-79 yrs (6-11, 12-19, 20-39, 40-59, 60-79)
- 2007-2009 in the field
- 15 sites, 333 respondents per site

- Health questionnaire – home interview
- Direct measures - mobile clinic

- Budget \$35 million over 6 yrs
 - Biomonitoring component - \$6.2 M
 - \$0.5 M core content, \$5.7 M “buy-in”
 - ≈ 90% costs for laboratory analysis



Health Canada

Public Health Agency of Canada

Lab Committee

Expert Advisory Committee

Privacy Commissioners

NHANES

Statistics Canada
Policy Committee
CHMS Steering Committee
CHMS Team

Analysis Advisory Committee

Physician Advisory Committee

Research Ethics Board

Stakeholders
➤ **Researchers**
➤ **Agencies**



Select a sampling frame



Select clusters

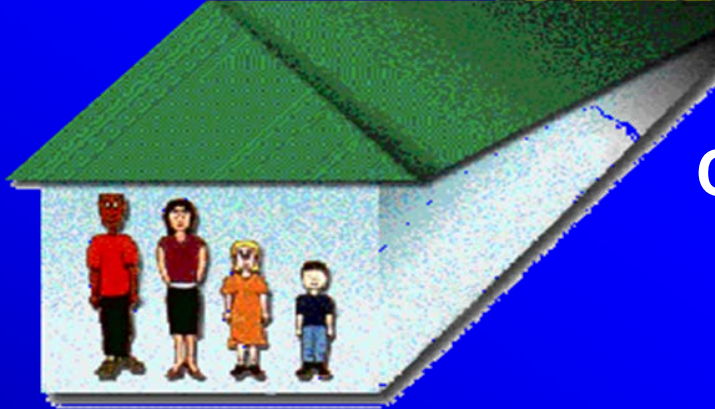


Set stand schedule; advanced stand preparation & public relations

Select households



Contact household



Select respondent



Book in-home interview



In-home interview & book clinic visit



Clinic measures

Informed consent





Questionnaire (in-home)

- Health Status
- Nutrition and Food
- Medication Use
- Health Behaviours
- Environmental Factors
- Socio-Economic Information

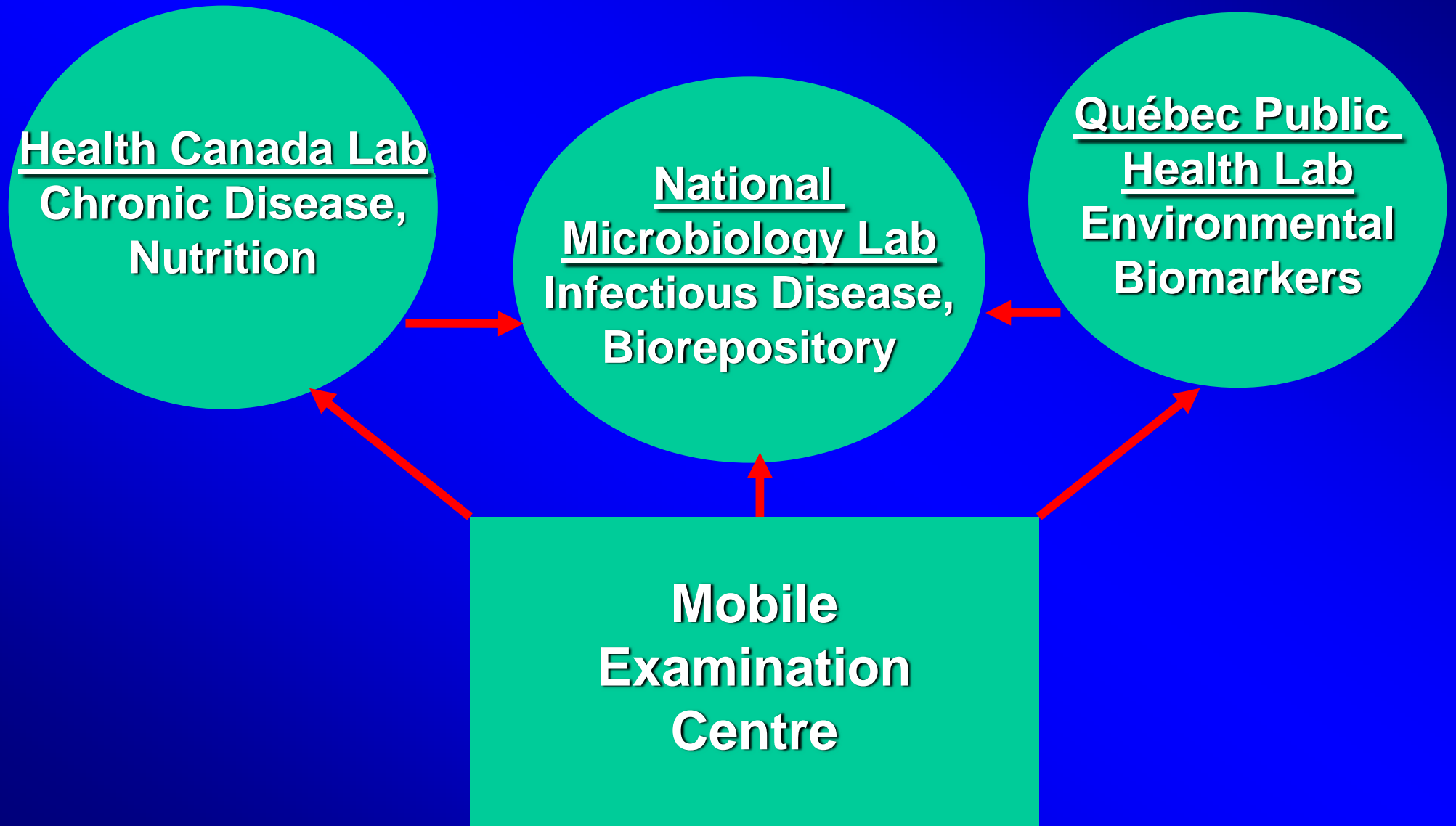
Physical Measures (clinic)

- Anthropometry
- Cardiorespiratory and musculoskeletal fitness
- Physical activity
- Oral health exam

- Blood measures
 - environmental exposures, nutritional status, diabetes, cardiovascular disease, infectious disease, blood chemistry, DNA sample (stored)

- Urine measures
 - environmental exposures, iodine, microalbumin, creatinine

Biological Specimen Flow



Reporting to Respondents

- At end of clinic visit, respondents receive results of their physical tests
- Selected laboratory results sent to respondents 12 weeks after clinic visit (with prior consent)
- Early reporting protocol in place for laboratory results beyond threshold values

CHMS 2007-09 (Cycle 1) Biomonitoring Component



Objectives of CHMS Biomonitoring Component

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

Selection of Environmental Chemicals (CHMS Cycle 1)

Expert workshop (2003) + programme 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)

Chemical Class	Rationale
Metals (e.g. Pb, Hg)	Known health risks; national baseline data required
Phthalates	Exposure data related to consumer products required
Polychlorinated Biphenyls	Stockholm Convention priority chemical
Organochlorine Pesticides	Stockholm Convention priority chemical
Polybrominated Diphenyl Ethers	Detected in North Americans; exposure data needed to inform risk management decisions
Organophosphate Pesticides	High volume use; exposure data needed for regulatory re-assessment
Phenoxy Herbicides	Concern about widespread residential use; data required for exposure and risk assessment
Pyrethroid Pesticides	Detected in general population; data needed for regulatory re-assessment
Perfluorinated Compounds	Persistent global contaminants; national baseline data required
Bisphenol A	High volume use; exposure data needed for risk assessment
Cotinine	Data needed to assess side-stream tobacco smoke exposure

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

Proposed Data Analysis

- **Nationally representative data**
 - Normative data for environmental chemicals measured in the CHMS
- **Trends and comparisons**
 - Temporal / geographic trends using past studies
 - International comparisons
- **Relationship between measures**
 - Between exposure sources and blood/urine concentrations
 - Between biomonitoring measures and health outcomes
- **Quality assurance**

CHMS Cycle 2 Consultation Timeline and Process (2008)

May

June

July

August

Initiate Consultations - questionnaire

Health Canada, Other Departments

Fed/Prov/Territorial Committee on
Health and the Environment

Chemicals Management Plan
Stakeholder Advisory Council

Academics, industry groups,
NGOs

Review and assess results of
questionnaire using selection criteria

Finalize candidate substances
for CHMS Cycle 2

Final priority list to
Statistics Canada

CHMS Cycle 2 to include children under 6 years of age (2 or 3 to 5 yrs)

Conclusions

- First comprehensive national biomonitoring study in Canada
- Provides a baseline for temporal / geographic trends and allow for comparisons with sub-populations in Canada and with other countries
- Significant resource for future research and monitoring
- Multiple uses and applications of data and results
- CHMS Cycle 2 in planning phase

For more information

- **Canadian Health Measures Survey**

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

www.statcan.ca/english/survey/household/measures/research.htm

- **Maternal-Infant Research on Environmental Chemicals**

www.hc-sc.gc.ca/ewh-semt/contaminants/mirec/index_e.html

- **Northern Contaminants Program**

www.ainc-inac.gc.ca/ncp/pub/helttoc_e.html