

# The Ontario Health Study (OHS): Occupational and Environmental Research Priorities, Exposure Assessment Strategies, Challenges, and Opportunities.

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November 19, 2009

# What is the OHS?

- Large population-based, longitudinal cohort study *to advance knowledge of the major risk factors for cancers, cardiovascular and other chronic diseases*
  - 150,000 participants in Ontario, with 30-year follow up
  - contributing to the Canadian Partnership for Tomorrow Project (n=300,000)
- Prospective collection of data from individual participants and communities



# Design Features

Who

**Sample Size:** 150,000; **Sex:** women & men; **Age:** 35-69 years;  
**Representing:** Ethno-cultural diversity (e.g., South Asian, Chinese, Aboriginal Communities) of Ontario;

When

**Recruitment:** 2009-2012

What

**Comprehensive Data:** Self-report, physical measures (blood pressure), community level measures, biospecimens, environmental and occupational measures

How

**Sampling Frame:** Within selected communities using multiple approaches: direct mail/phone; volunteers from public awareness campaign; future options

**Follow-up:** To 2025 and beyond; **Both active and passive**



# Follow-Up and Outcomes

**Follow-up:** to 2025 and beyond

## Active

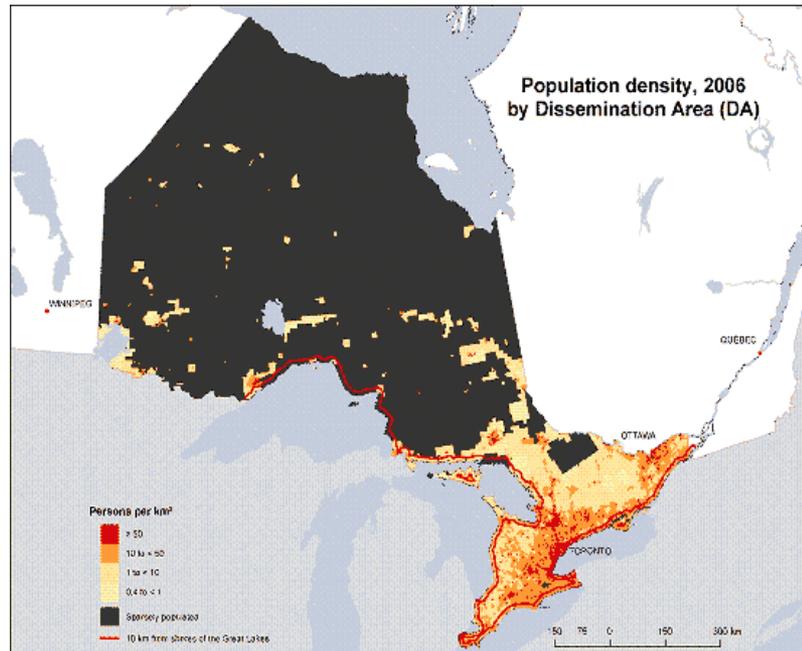
- *Annually:* via newsletter, supplemental questionnaires
- *Every 4-5 years:* community measures, and aim to repeat biospecimens, general risk factor and nutritional data, physical measures

## Passive via record linkage

- Ontario Cancer Registry (incident cancers)
- Cancer screening programs
- Hospital Discharge Abstract Database (hospitalizations)
- Death certificates ....etc.



# Demographic Characteristics - Ontario



Population: 12 160 282

Total area: 1 076 395 km<sup>2</sup>

Population density: 13.4 persons  
per km<sup>2</sup>

Northern Ontario: 1.1  
persons per km<sup>2</sup>

Southern Ontario: 115.3  
persons per km<sup>2</sup>

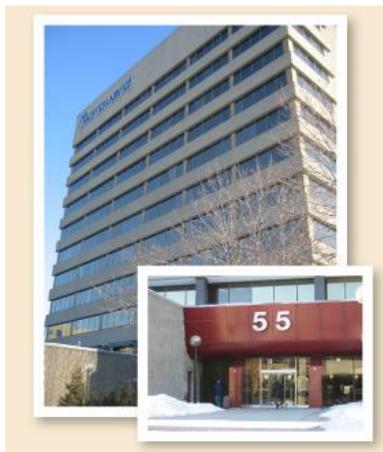
Percentage of Canadians who live  
in Ontario: 38.47%

Census data sourced from: Statistics Canada. 2007. *Ontario* (table). *2006 Community Profiles*. 2006 Census. Statistics Canada Catalogue no. 92-591-XWE. Ottawa. Released March 13, 2007



# Assessment Centres - Pilot Sites

Centre	Opening Date	Completed Assessments *
Mississauga	Mar 26, 2009	2,156
Owen Sound	May 27, 2009	692
Sudbury	Sep 24, 2009	166



**3,014**

1,500 assessments were completed for the Pilot by August 7, 2009. \* as of Nov. 2

# Assessment Centre Locations

## **Pilot:**

Mississauga

Owen Sound

Sudbury

## **Under consideration:**

Richmond Hill

Kitchener/Waterloo

Barrie

St. Catherines

Toronto (downtown site)

Toronto (suburban site)

Ottawa

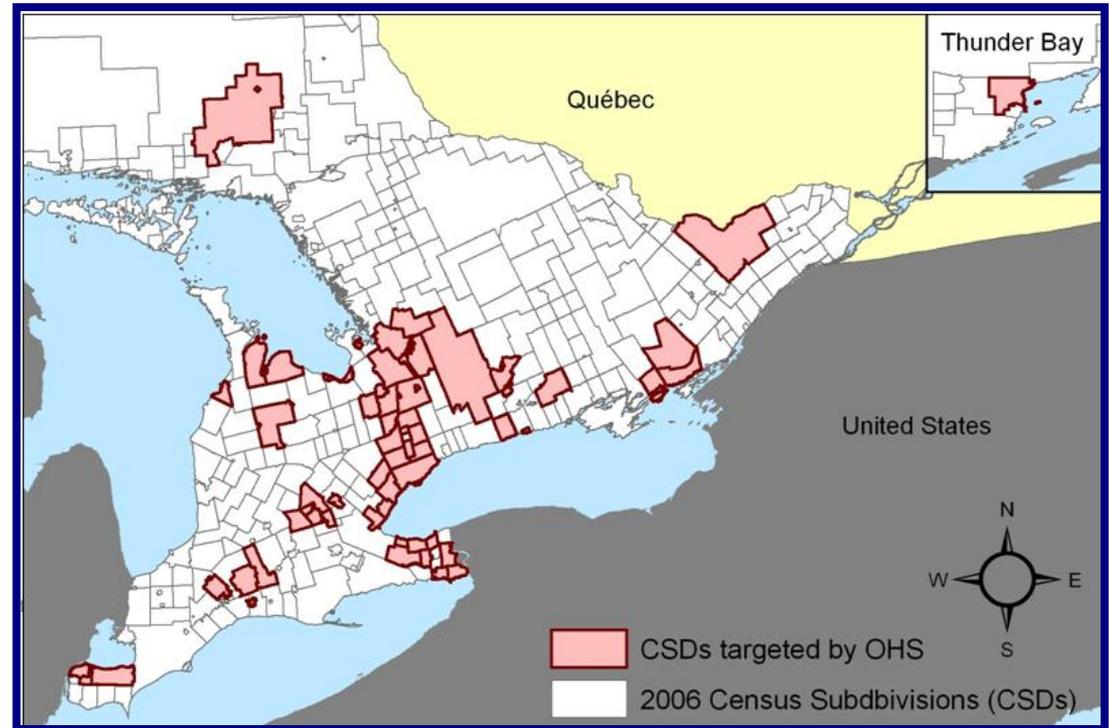
London

Peterborough

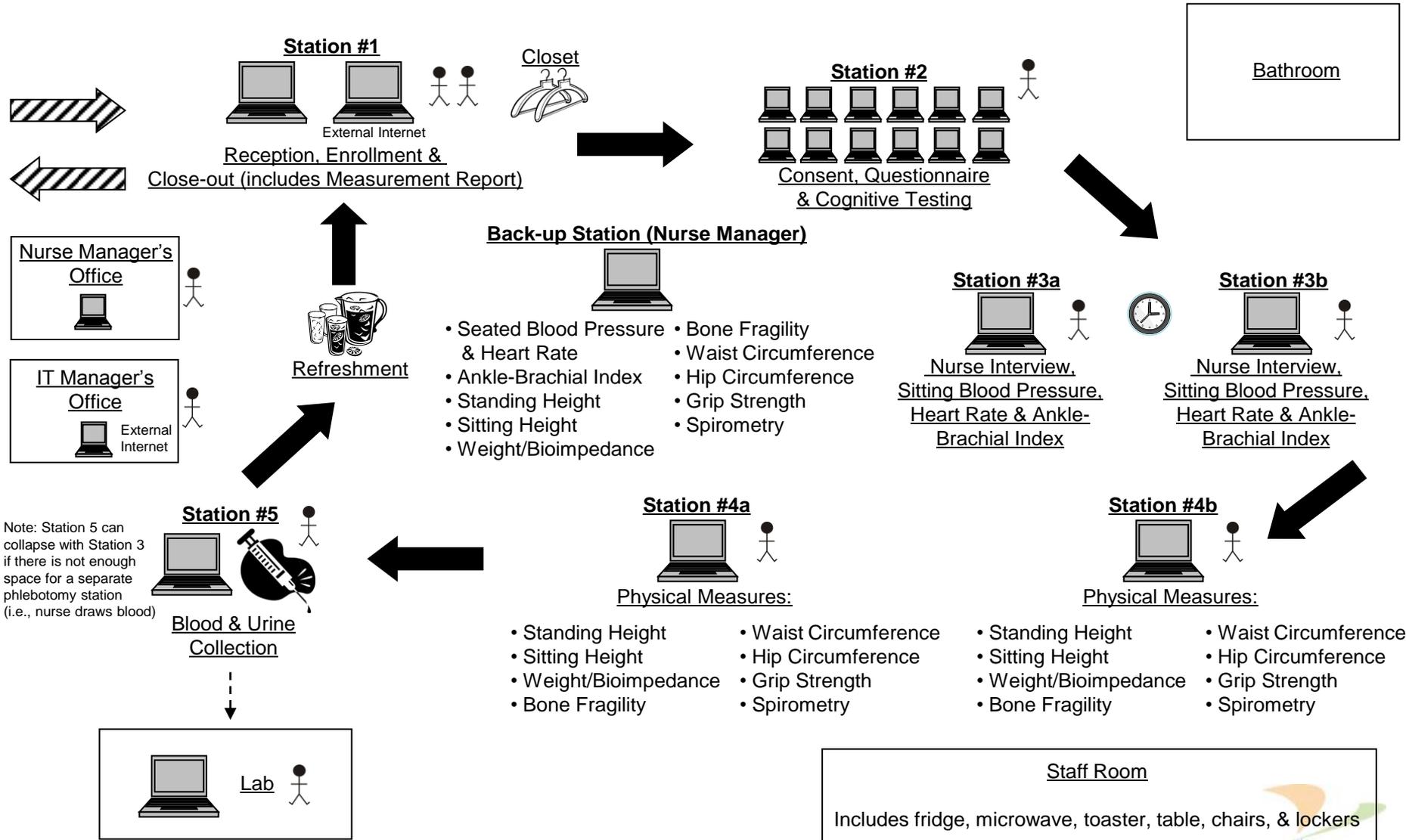
Windsor

Kingston

Thunder Bay

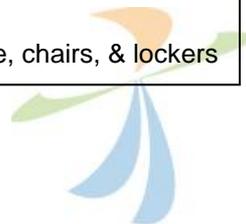


# Assessment Centre Flow

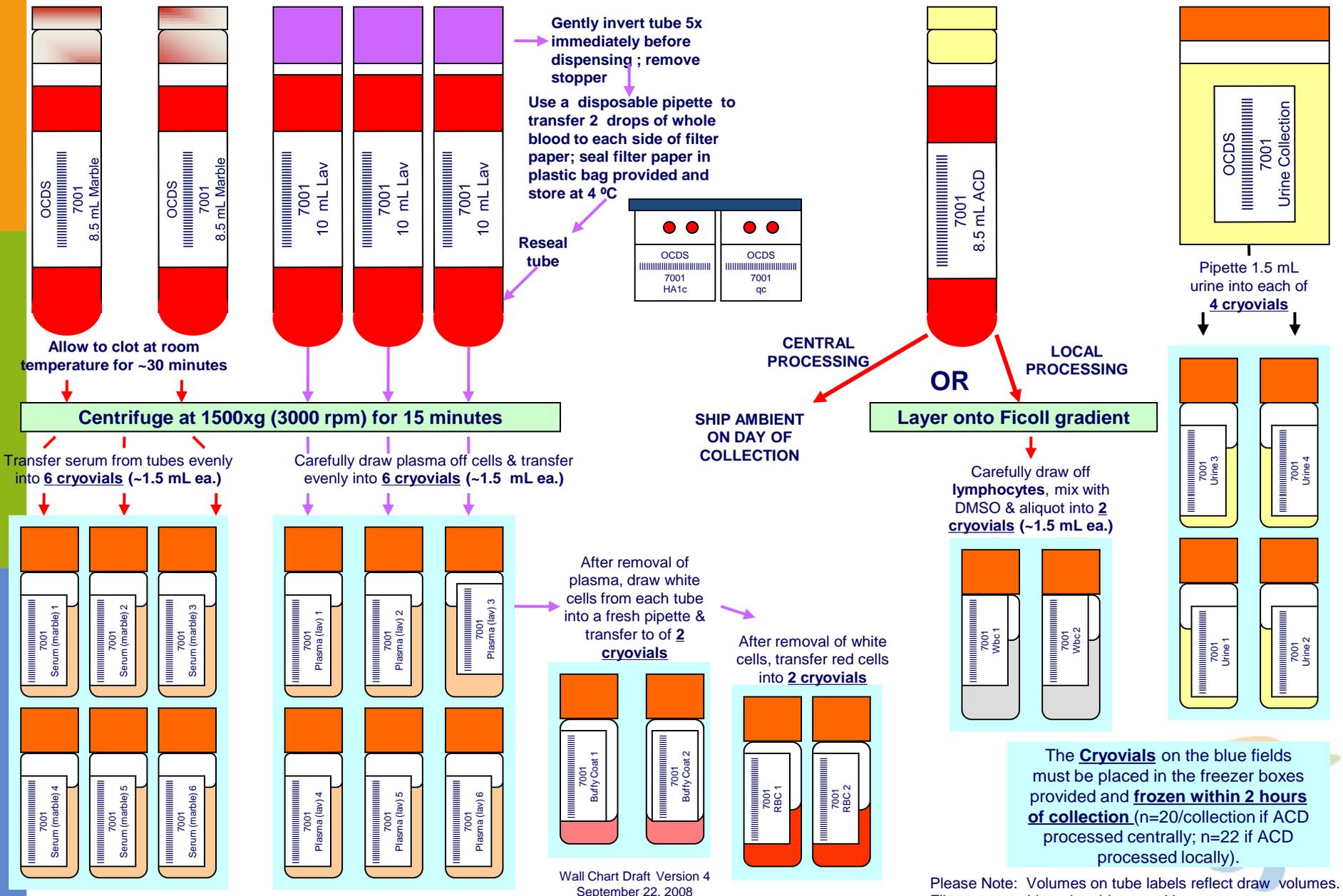


Note: Station 5 can collapse with Station 3 if there is not enough space for a separate phlebotomy station (i.e., nurse draws blood)

- 23 computers (all are connected via an internal intranet; two have external connection capabilities)
- 2 printers (one at reception, one at IT Manager's Office)
- 11 staff



# Biospecimen Processing for the OHS



# Baseline Data Collection

- ***Biospecimens***
  - Blood
  - Urine
- ***Physical Measures***
  - Weight
  - Height, standing and sitting
  - Waist and hip circumference
  - Bioimpedance
  - Blood pressure
  - Resting heart rate
  - Bone density
  - Spirometry
  - Grip strength
- ***Questionnaire/Interview***
  - Personal medical history
  - Family medical history
  - Socio-demographic information
  - Health/lifestyle behaviours
  - Psychosocial factors
  
  - Diet (FFQ)
  - Community features (NEWS)
  
  - Residential history
  - Environmental exposures
  - Occupational history



# OHS Environmental and Occupational (E-O) Working Group - Ontario



Harris, S.A. (1, 2,7), Ritter, L. (3, 4)

Arbuckle, T. (5, 6), Blair, A.E. (7), Bus, J. (8), Hall, J.C. (4), Mabury,  
S. (9), Marrett, L.D. (1,2), Miller, A.B. (2), Rasmussen, P.E.  
(10,11), Villeneuve, P .J. (2,5), Wheeler, A. (12),  
McLaughlin, J. (1, 2)

- 1- Population Studies and Surveillance, Cancer Care Ontario;
- 2- Dalla Lana School of Public Health, University of Toronto;
- 3- Canadian Network of Toxicology Centres;
- 4- Department of Environmental Biology, University of Guelph;
- 5- Population Studies Division, Environmental Health Sciences and Research Bureau, Health Canada;
- 6- Department of Epidemiology and Community Medicine, University of Ottawa;
- 7- Occupational Cancer Research Center, Toronto, ON;
- 8- Toxicology and Environmental Research and Consulting, Dow Chemical Company, Midland, MI, USA;
- 9- Department of Chemistry, University of Toronto;
- 10- Department of Earth Sciences, University of Ottawa;
- 11- Environmental Exposures and Biomonitoring Division, Environmental Health Sciences and Research Bureau, Health Canada;
- 12- Air Health Science Division, Water, Air and Climate Change Bureau, Health Canada.



# E-O Working Group Objectives

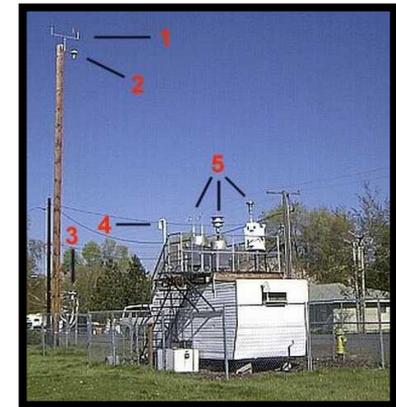
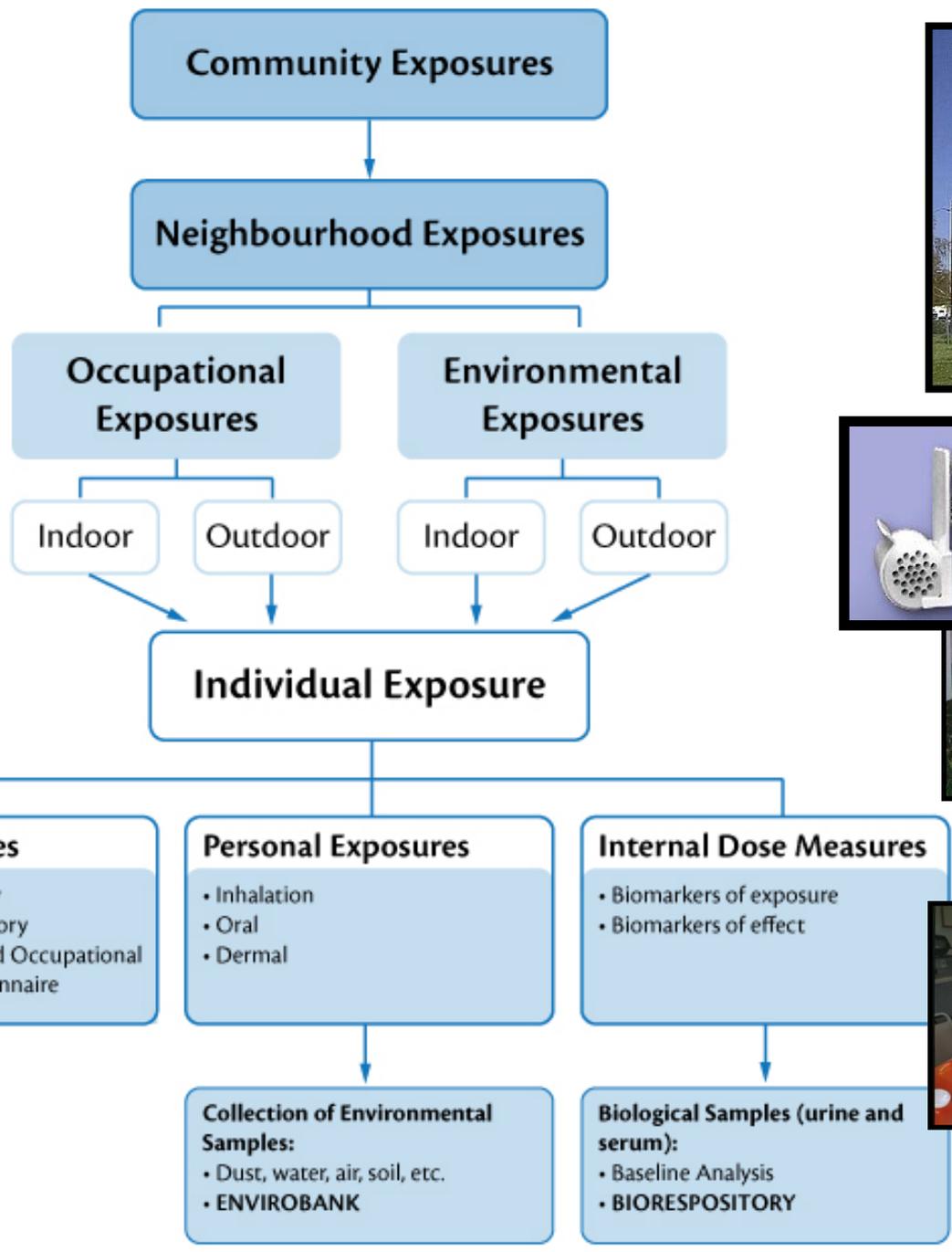
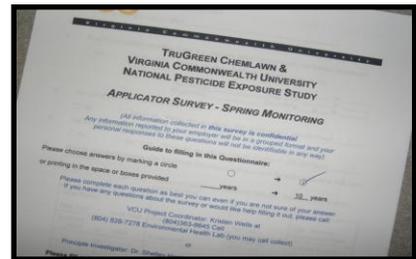
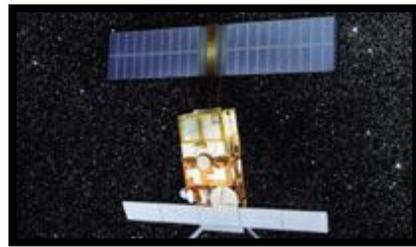
- To prioritize the environmental and occupational exposures for the OHS for measurement at baseline and follow-up.
- To evaluate the methods and tools required to measure exposures.
- To identify and develop sampling protocols for environmental and/or biological samples that will be collected and stored for future analysis (i.e. EnviroBank).



# OHS E-O Workgroup Priorities

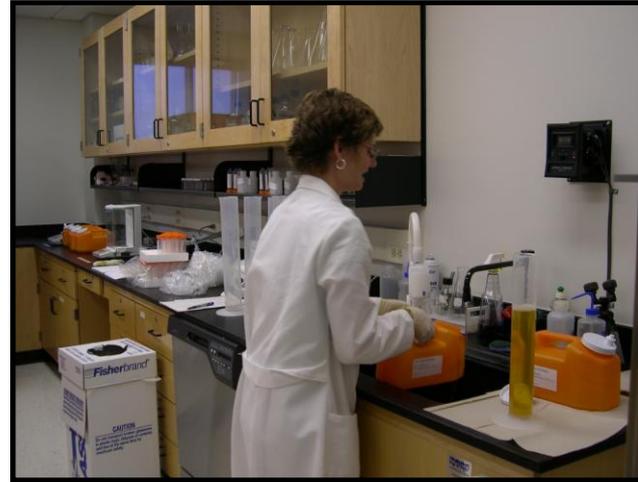
- Air Pollutants (NO<sub>x</sub>, ozone, particulates etc.)
- Brominated Flame Retardants (PBDEs)
- Electromagnetic Fields (EMFs)
- Metals (As, Ni, Pb, Hg)
- Nanomaterials
- Organic and Local Food Consumption
- Polycyclic Aromatic Hydrocarbons
- Perchlorate
- Perfluorochemicals
- Pesticides (select)
- Pharmaceutical Estrogens
- Phenols (nonylphenol, bisphenol-A)
- Phthalates
- Radon
- Shift Work
- Water Chlorination Byproducts
- WiFi (wireless technologies)
- Personal Care Products





# Absorbed Dose - Biological Monitoring - Direct

- Blood
- Urine
- Adipose, Bone
- Perspiration
- Hair
- Nails
- Saliva
- Feces



# Residential History

*The Canadian Partnership for Tomorrow Project*

## Residential History Questionnaire (Pre-test)

Gender:  Male  
 Female

Age: \_\_\_\_\_

Province of residence: \_\_\_\_\_

Length of time  
to complete questionnaire: \_\_\_\_\_



### Residential History Questionnaire

To the best of your ability, please tell us the address and following information for each home you have lived in for at least 12 months or longer. Begin with your most recent address, even if you have lived there for less than 12 months, and continue backward to the first address that you can remember. Please estimate the time period if you cannot remember the exact number of years or months you lived in one location. If you cannot recall your exact street address, please tell us the name of the nearest cross-street (or the nearest town if you lived in a rural location). If you lived outside of Canada for 12 months consecutively, please provide the City and Country. Please attach additional pages if you require more space.

Time Period (Mo/Yr to Mo/Yr)	Street & Number (including suite or apt no.) If you can't remember exact address, please give the nearest cross-streets or intersection.	City, Town or Municipality (If rural, please indicate county or nearest town)	Province	Postal Code	Country	How many people normally lived in this house?	Approximately when was this house built?
06/98 to 08/09	1689 East 4 <sup>th</sup> Avenue	Vancouver	BC	V5N 1J7	Canada	3	1965
09/90 to 05/98	close to Sherbrooke St & Lacordaire Blvd.	Montreal	Quebec		Canada	2	1950
<u>Residence 1:</u>							
to							
<u>Residence 2:</u>							

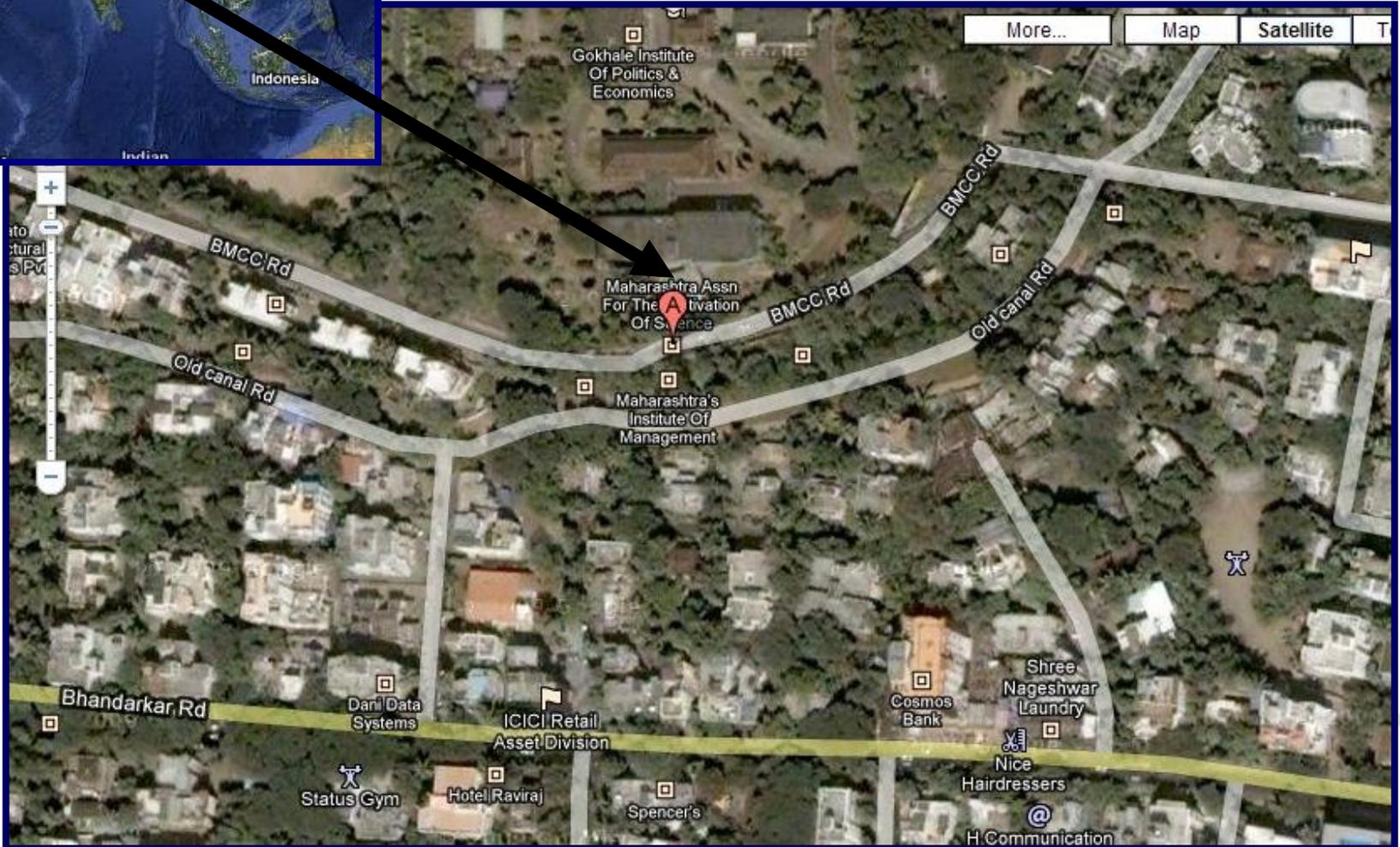
### Residential History Questionnaire

Please answer, to the best of your ability, the following questions for each residence that you listed in the table above.

Residence #	What was the <u>main</u> source of heat in this home?	What was the source of water coming into this home?	In this home, did you: (Please check all that apply.)	How many bedrooms did this home have?	In this home, where was your bedroom located?	Did you normally share your bedroom with someone else?	Do you normally park your car in a garage attached to your residence?
1	Electric <input type="checkbox"/> Gas <input type="checkbox"/> Oil furnace <input type="checkbox"/> Wood-burning fireplace or stove <input type="checkbox"/> Coal <input type="checkbox"/> Other please specify: _____ <input type="checkbox"/> Don't know <input type="checkbox"/>	Municipal treated water <input type="checkbox"/> Private well (dug well) <input type="checkbox"/> Private well (drilled well) <input type="checkbox"/> Other, please specify _____ <input type="checkbox"/> Don't know <input type="checkbox"/>	Open your windows? <input type="checkbox"/> Use central air conditioning? <input type="checkbox"/> Use window or wall air conditioning units? <input type="checkbox"/> Use fans for cooling? <input type="checkbox"/> Use an air exchanger? <input type="checkbox"/> Use storm windows? <input type="checkbox"/> Use a gas fireplace? <input type="checkbox"/> Use a humidifier? <input type="checkbox"/> Use a dehumidifier? <input type="checkbox"/>		Basement <input type="checkbox"/> Ground floor <input type="checkbox"/> Other please specify floor # _____ <input type="checkbox"/> Don't know <input type="checkbox"/> Did bedroom face the street? Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/> Can't recall <input type="checkbox"/> If yes, please specify how many people: _____	No <input type="checkbox"/> Yes (1 car garage) <input type="checkbox"/> Yes (2 car garage) <input type="checkbox"/> Yes (3 car garage) <input type="checkbox"/> Yes (underground) <input type="checkbox"/>







# Environmental Questionnaire Development

- Food/Beverages/Water
- Characteristics of the home (not captured on residential history)
- Cleaning products
- Personal care products
- Hobbies
- Pesticides
- WiFi, EMF, cellphone use/exposure
- Time-activity data



# Questionnaire: Food and Beverages

## Food



## Source

- Local/Organic foods

## Packaging

- Perfluorochemicals - pizza boxes, popcorn bags, chips and snacks, fast foods
- Bisphenol A - canned foods

## Consumption

- Metals (particularly mercury & lead) as well as organochlorines, perfluorochemicals, brominated flame retardants - fish, shellfish and game meats
- Sweeteners, preservatives and food additives

## Cooking

- Polycyclic aromatic hydrocarbons – meat preparation
- Xenoestrogens, dioxins – microwaving plastic dishes
- Use of non-stick pans – perfluorochemicals





# Questionnaire: Water

<p>Water</p>	<p><b>Source</b></p> <ul style="list-style-type: none"><li>• tap, well, ground, bottled, filtered</li><li>• Home and work</li></ul> <p><b>Consumption</b></p> <ul style="list-style-type: none"><li>• quantity of water consumed through coffee, tea and pop</li><li>• Bisphenol A - exposure through use of polycarbonate reusable water bottles</li></ul>
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# Questionnaire: Household

Characteristics of the home



**Air Pollution** – eg. NO<sub>x</sub>, particulates, PAH

- Source of cooking heat
- Garage and whether vehicles are parked in the garage
- Use of air conditioning and heat source (including use of space heaters)
- Burning of incense in the home
- Air fresheners

**Lead – paint**

- Age of home

**Perfluorocarbons**

- Stain resistant chemicals used on furniture, carpeting and curtains

**Radiation**

- WiFi internet
- EMF exposure from electrical appliances

**Brominated Flame Retardants**

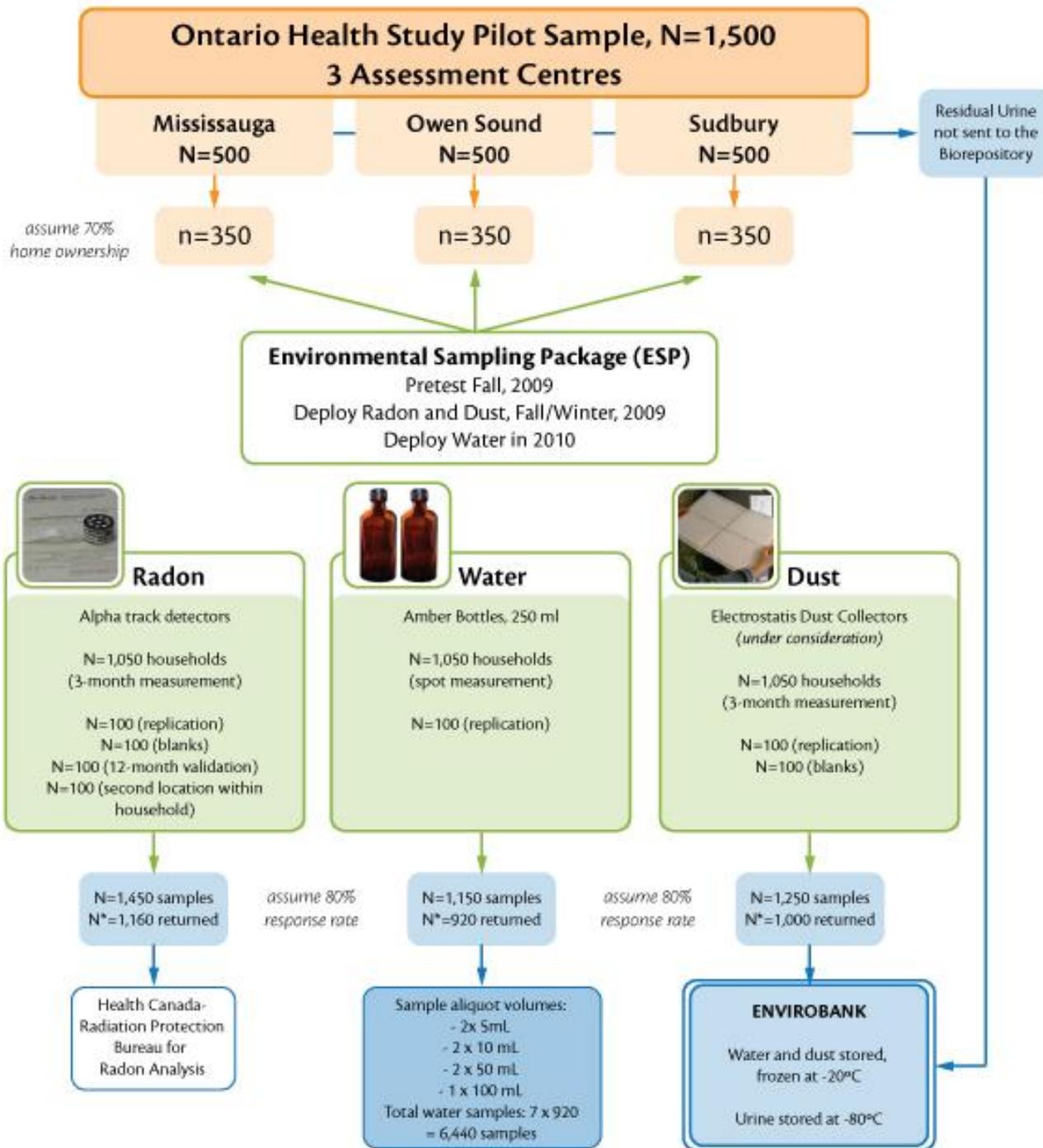
- Carpeting in the home
- Frequency of dusting/vacuuming



# Questionnaire: Cleaning & Personal Care Products, Hobbies and Time Activity

<p>Cleaning Products</p> 	<p><b>Phenols and Phthalates</b></p> <ul style="list-style-type: none"><li>• Request respondents list specific products used for general tasks ie, general cleaner, window cleaner, bathroom cleaner etc</li></ul>
<p>Personal Care Products</p> 	<p><b>Phenols and Phthalates</b></p> <ul style="list-style-type: none"><li>• Request respondents list specific products used for personal care tasks; shampoo, conditioner, soap, shower gel, hand soap etc.</li></ul>
<p>Hobbies</p> 	<p><b>Solvents</b></p> <ul style="list-style-type: none"><li>• Household and artistic painting, wood working, home renovations, maintenance and repair etc</li></ul>
<p>Time-Activity</p>	<p><b>Duration and time of exposure associated with routine activities</b></p> <ul style="list-style-type: none"><li>• Request respondents describe an average week in their lives during summer months and during winter months</li></ul>





# Occupational History

*The Canadian Partnership for Tomorrow Project*

## Occupational History Questionnaire (Pre-test)

Gender:  Male  
 Female

Age: \_\_\_\_\_

Province of residence: \_\_\_\_\_

Length of time  
to complete questionnaire: \_\_\_\_\_



# Occupational History Questionnaire

To the best of your ability, please tell us about **each job or occupation you held for at least 3 months** in Canada or elsewhere. Include full-time, seasonal work, part-time, volunteer work and military service if you worked the cumulative equivalent of 3 months per year or more. Also include your current job, even if you have had this for less than 3 months. Begin with your most recent job and continue back to your **first job**. Please estimate the time period if you cannot remember exact years. Please attach additional pages if you require more space. **Even if you are retired, we still require the information. Do not include time spent as a full-time house-wife or house-husband.**

Time Period (Mo/Yr to Mo/Yr)	Job Title	Main Job Tasks	Company Name	Company Address Please provide full street address or nearest intersection, county, city, to the best of your ability. Specify region if not a fixed work site.	What did your company do at that site?
01/02 to 08/09	Automotive Machinist	repairs automotive transmissions & brakes; operates a lathe & a grinding wheel; cleans & degreases parts; repairs cracks in engine parts with arc and gas welding equipment	ABC Automotive Repair Ltd.	900 block SW Marine Drive, Vancouver BC (between Shaughnessy Street & Oak Street Bridge off ramp)	Full service vehicle maintenance and car repairs.
04/95 to 12/01	Farm Labourer	fed & watered poultry; cleaned barn & pens; planted & harvested vegetables; cleaned plows & tractors	Mom & Pop's Farm Ltd.	25555-58 <sup>th</sup> Avenue, Aldergrove BC V4W 1T5	Free-range, non-medicated chickens and beef; grew tomatoes & swiss chard
<u>Job 1:</u>  to					
<u>Job 2:</u>  to					



# For each job....

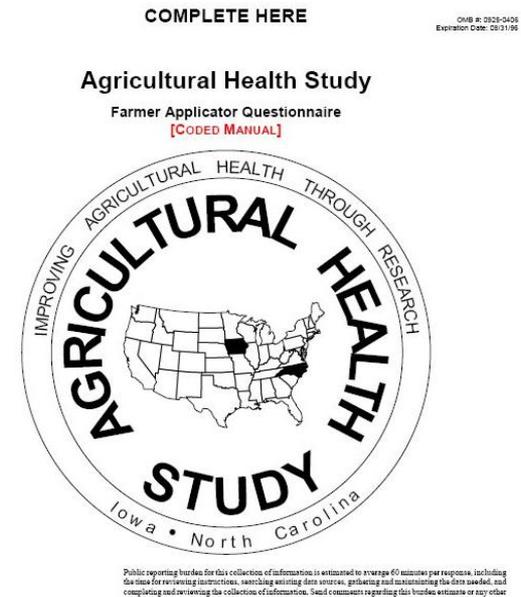
Please answer the following questions for each job you listed in the table above. Please attach additional pages if you required additional space to complete job history table.

Job #	How many hours per week, on average, did you work?	How many weeks per year?	What percentage of time did you spend working:  Indoors? _____  Outside? _____	Did your job require you to work outdoors in the warmer months of the year (Apr-Sept)? If yes, how much time each day, on average, were you in the sun between 11 am and 4 pm?  Less than 1 hour <input type="checkbox"/> 1-2 hours <input type="checkbox"/> 2-4 hours <input type="checkbox"/> More than 4 hours <input type="checkbox"/>	What best describes your work pattern?  Fixed Days <input type="checkbox"/> Fixed Nights <input type="checkbox"/> Fixed Evenings (shift ends before midnight) <input type="checkbox"/> Rotating <input type="checkbox"/> Other, please describe <input type="checkbox"/> _____	How many days per month did you work 3 or more hours between midnight and 5am?	For each job, how many minutes did you normally spend on any/each of the following means of transportation? Indicate all that apply.	
							June – August or the summer months	September – May or the cooler months
1							Car _____ Bus _____ Train _____ Subway _____ Walk _____ Bike _____ Other, please describe: _____	Car _____ Bus _____ Train _____ Subway _____ Walk _____ Bike _____ Other, please describe: _____
2							Car _____ Bus _____ Train _____ Subway _____ Walk _____ Bike _____ Other, please describe: _____	Car _____ Bus _____ Train _____ Subway _____ Walk _____ Bike _____ Other, please describe: _____
3							Car _____ Bus _____ Train _____ Subway _____ Walk _____ Bike _____ Other, please describe: _____	Car _____ Bus _____ Train _____ Subway _____ Walk _____ Bike _____ Other, please describe: _____

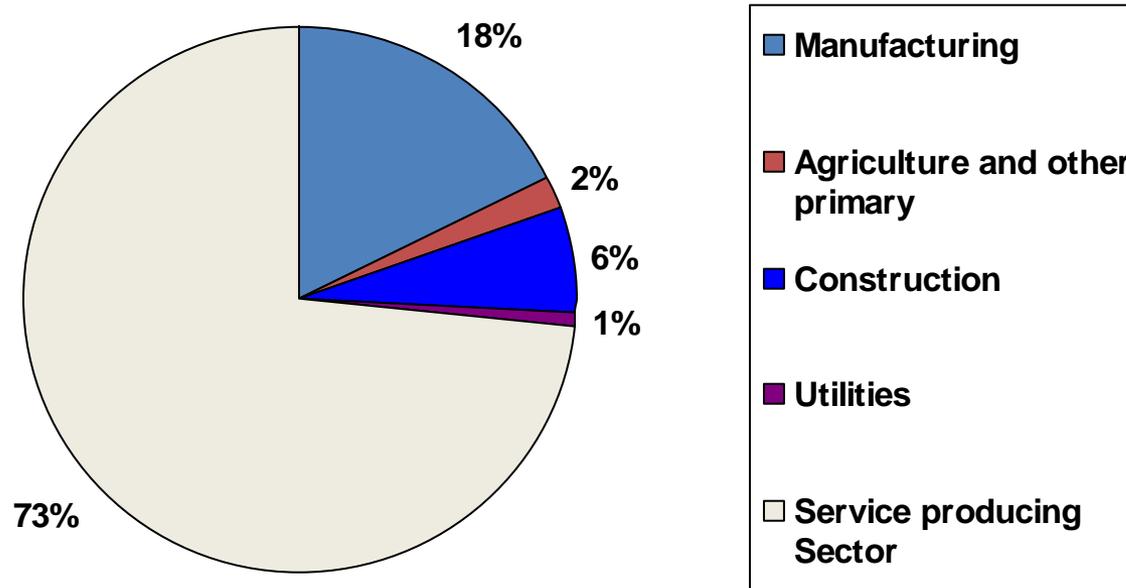


# Occupational Exposures - Opportunities

- Questionnaire modules
- New or adapted:
  - Farm/agricultural exposures
  - Commercial applicators
  - Construction workers etc.
  - Shiftwork



# Jobs by Industry Sector – ON, 2004



~ 2% employed in agriculture....n=3000 in OHS



# Opportunities

- Targeted recruitment
- Develop JEMs for Ontario/Canada
- Expert assessment of occupational exposures
- Biomarkers studies of exposure and/or effect
- Future collection of:
  - Biospecimens / high risk groups
  - occupational / environmental data
- Workplace measures?



# Our Funders & Supporters

- Ontario Institute for Cancer Research (OICR)
- Canadian Partnership Against Cancer (CPAC)
- Cancer Care Ontario (CCO)
  - In-kind including salaries, benefits, space
  - Access to specialized resources, long-term support
- Ontario Agency for Health Protection & Promotion
  - Pilot funding plus In-kind for biospecimen processing (including laboratory facilities and services)
- Occupational Cancer Research Centre (OCRC)
- Endorsed by Ontario Division of the Canadian Cancer Society



# Working Together

## **CCO Project Team for Science**

John McLaughlin, Nancy Kreiger, Vicki Kirsh, Scott Leatherdale, Shelley Harris, Beatrice Boucher, Patrick Brown, Peggy Sloan, Gord Fehringer

## **OHS Operations Team**

Sandra Sinclair, Pamela Spencer, Joan Antal, Laszlo Benedek, Leanne Blahut, Anna Caccamo-Davies, Connie Fernandes, Hedy Jiang, Raj Kapoor, Kelly McDonald, Caitlin Mills, Melissa Pirie, Umer Sami, Marcella Sholdice, James Stang, Bob Zurowski

## **Ontario Advisory Committee & Collaborators**

Roy Cameron, Jane Irvine, Julian Little, Matthew McQueen, Tony Miller, Greg Ross, Patricia Smith, Rob Roberts, Jack Tu, Brent Zanke, Len Ritter, working group chairs and members, and many others

## **Partner Agencies**

Tom Hudson, Vincent Ferretti (**OICR**), Anu Rebbapragada, Natasha Crowcroft (**OAHPP**), Heather Bryant, Stuart McLeod (**CPAC**), **CCS, Genome Quebec**, Teams in other provinces



# O/E National Advisory Committee



and Jeff Whyte, Jack Siemiatycki, Miriam Diamond

.....and many more





Your time could make a difference for the future health of all Canadians.

Votre participation pourrait contribuer à la santé future de tous les Canadiens.

您花時間做此調查可能會大大影響所有加拿大人日後的健康！

ਤੁਹਾਡਾ ਸਮਾਂ, ਸਾਰੇ ਕਨਾਡਾਵਾਸੀਆਂ ਦੀ ਭਵਿੱਖ ਦੀ ਸਿਹਤ ਵਿਚ ਫ਼ਰਕ ਲਿਆਏਗਾ।

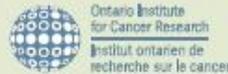
Have you ever wondered why some people get cancer or heart disease but other people don't?

The new *Ontario Health Study* is a large, long-term study that will help us learn more about the causes of these diseases. The causes could come from where we live and work or what we eat. They could also come from how much we exercise, whether we smoke or other causes we have yet to discover. We hope to find ways to help prevent and better treat these chronic diseases.

We are looking for 150,000 Ontario residents between the ages of 35 and 69 to join the Study.

To learn more, call us or visit our website.

[www.ontariohealthstudy.ca](http://www.ontariohealthstudy.ca)  
[www.etudesanteontario.ca](http://www.etudesanteontario.ca)  
1-866-606-0686



Ontario Institute for Cancer Research  
Institut ontarien de recherche sur le cancer



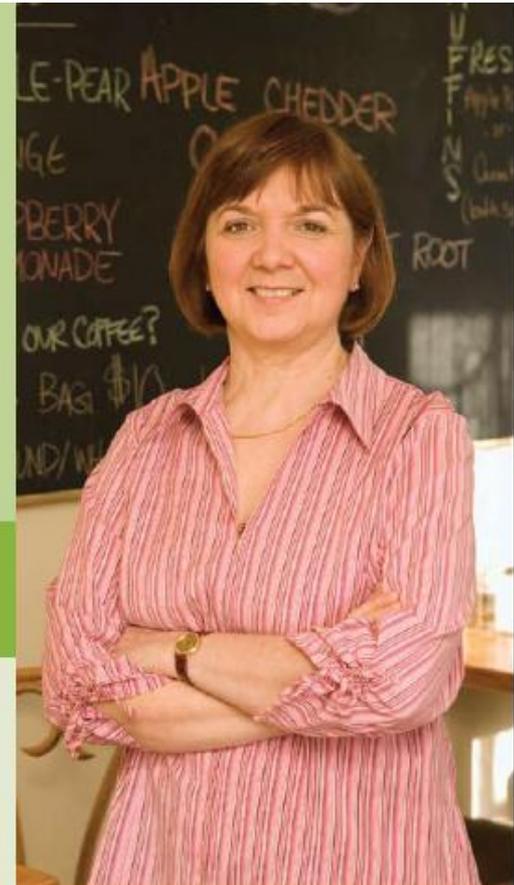
cancer care ontario | action cancer ontario



CANADIAN PARTNERSHIP AGAINST CANCER | PARTENARIAT CANADIEN CONTRE LE CANCER



Canadian Cancer Society | Société canadienne du cancer



Be part of **something big!**  
Participez à un **projet d'envergure!**



Ontario Health Study  
Étude sur la santé en Ontario

[www.ontariohealthstudy.ca](http://www.ontariohealthstudy.ca)

