

In search of an integrated policy approach to children's environmental health protection and chronic disease prevention

Presentation to: *Exploring the Evidence and Finding Solutions: A Forum on the Links Between Early Environmental Exposures and Chronic Disease*

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Re-cap: Chronic Diseases of Concern

- Asthma and respiratory diseases
- Cancer
- Cardiovascular diseases
- Diabetes
- Impacts on brain function: Lifelong learning/behavioural challenges; Alzheimer's and Parkinson's diseases
- (role of Endocrine Disruption and Epigenomics)

Terminology issue - “diseases” → arises from medical paradigm, focused on treatment vs. determinants

For env'l links to CD: concerned with both chronic “diseases” and chronic conditions.

Also need to consider role of Endocrine Disruptors and Epigenomics (as contributing to CDs of concern).

Re-cap: Epigenomics

- **Epigenome:** Sum of genome-wide epigenetic patterns. Distinguishes and defines one tissue from another, stem cells from somatic cells, and aged from young cells.
- Each cell has same genetic info – yet manifest in widely varied tissues → expression of epigenome. **Complex biochemistry.**
- Cellular differentiation processes (i.e., during development) rely strongly on epigenetic vs genetic inheritance. Expression of epigenome in brain development is also affected by behaviour and experience.
- **Impt'ce prenatally** – cell differentiation during development occurs via epigenetic sequences.
- **Heightens concern about chemical exposures, especially endocrine disrupting compounds.**

Re-cap: Pollutants/chemicals of concern for prenatal and childhood exposures

fine particulate matter, ozone, nitrogen oxides, carbon monoxide, sulphur dioxide, diesel exhaust, environmental tobacco smoke, polyaromatic hydrocarbons (benzene++), volatile organic compounds and additional solvents, chlorophenols, aromatic amines, perfluorinated compounds, phthalates, bisphenol A, metals, metalloids and organometallic compounds (lead, mercury, arsenic, cadmium, tributyl tin, etc.), persistent organic pollutants (DDT, PCBs, dioxins, PBDEs, organochlorine pesticides, hexachlorobenzene, etc.), pesticides (organophosphates, rotenone, paraquat, maneb, pyrethroids, etc.), radiation, etc. etc.

Where to focus attention on exposures?

Evidence-informed choices

- For CDs of concern: Many of the same exposures are implicated (i.e., **associations between certain exposures and multiple health endpoints**)
- Make sense of “alphabet soup” and provide clarity re:
 - **strength of evidence** for associations between specific exposures and specific CDs
 - origins/settings and degree of exposures (**outdoor air, indoor air and dust, food, products**) and informed by biomonitoring data
 - **timing** of exposure (repeatedly seeing greatest vulnerability *in utero*);
 - vulnerable **sub-populations** (poverty, First Nations, boys, etc.)

Context and Further Evidence: Multiple Determinants of Health (MDOH)

Environment as one of MDOH

- Major challenges and gaps with evidence and its eval'n
- Terminology problem – “physical environment” inadequately captures full meaning (e.g. OCDPA refers to it as “the built env't and access to healthy food”)
- Multiple interactions with other determinants (env't is similar to other cross-cutting determinants like socio-economic status or gender)

Social Determinants of Health

- Growing literature and empirical evidence about greater importance of SDOH to CD than “traditional” risk factors (diet, exercise, smoking). Quantified and significant.

Assuming a broad definition of policy

- **The Law**
 - enforceable laws and regulations (a.k.a. “standards”)
 - In general, laws set the framework, regulations spell out implementation details; can be further spelled out in policy
- Policy can be **voluntary, quasi-enforceable, or referenced within an enforceable framework**
 - e.g., Mandatory Core Program Guidelines
- **Guidelines, Criteria, Objectives, Codes of Practice...**
 - unenforceable approaches to broad suite of issues and concerns (e.g., research funding)
 - Subject to interpretation; flexibility for indiv/local circumstances.
- **Policy**, especially social policy, can also flow from an overarching political discourse such as neo-liberalism.
- Above largely about gov’t – org’ns also have policies to govern **internal operations** or to state **public positions**

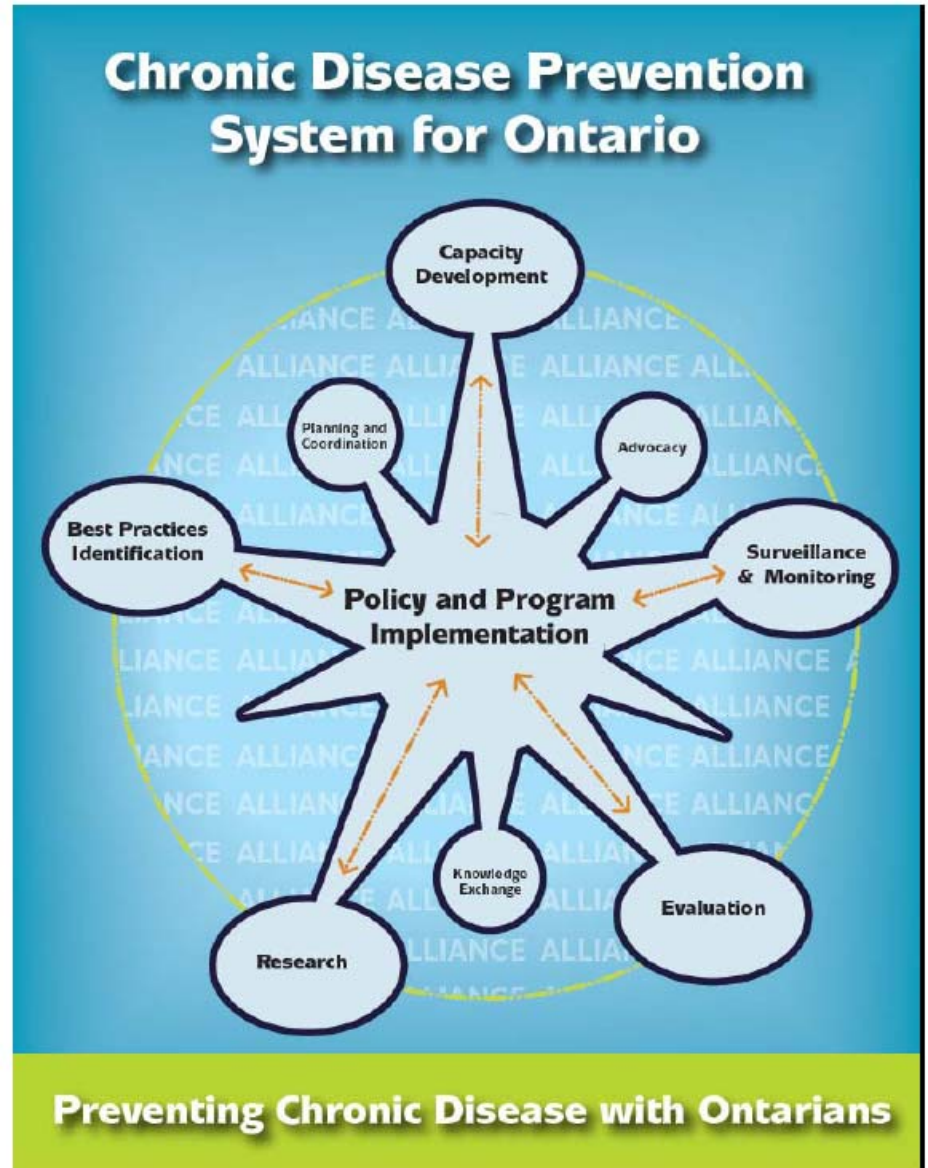
OCDPA: Chronic Disease Prevention System for Ontario

The Ontario Chronic Disease Prevention Alliance

Thinking like a system:

The way forward to prevent chronic disease in Ontario

March, 2006



OCDPA: Thinking Like a System

- Province-wide system to enable effective, coordinated planning, delivery and continuous improvement of health promotion and CD prevention
- Includes six elements: capacity development; best practices identification; research; surveillance and monitoring; evaluation; policy and program implementation.
- Actionable via three processes: planning and coordination; knowledge exchange; and advocacy.
- Via systems approach: can address **behavioural risk factors** (alcohol, diet, exercise, smoking, mental health) and **SDOH** (income, education, jobs, housing, nutrition and inclusion)

CPCHE: Vision and Strategy for Children's Environmental Health in Canada



First Steps in Lifelong Health

A Vision and Strategy for Children's Health and Environment In Canada



December 2008

An Integrated Strategy



Vision and Strategy for Children's Environmental Health in Canada

1. **Research.** Sustained and coordinated research on the fetal and child health effects of individual and multiple chemical exposures.
2. **Law and Policy.** Comprehensive and integrated legislation for chemicals, pesticides, consumer products, food and pollutants, within a framework that applies proactive child-protective measures, precaution, and seeks to reduce the multiplicity of daily hazardous exposures of prospective parents, pregnant women and children.
3. **On-the-ground Protection.** Prospective parents, caregivers, health care professionals, teachers and others knowledgeable about fetal and child environmental health risks and able to take steps to reduce or prevent adverse exposures, recognizing that individual action must be accompanied by strong policy, regulation and enforcement.

We are often speaking the same language

Common Elements and Approaches across CPCHE and OCDPA:

- Many of the same health outcomes of concern
- Recognition of importance of MDOH context
- Need for integrated, coordinated, systems approach.
- Therein, need for research, surveillance, monitoring, knowledge exchange, capacity development, best practices identification, planning and coordination, evaluation, policy and program implementation and advocacy.
- Both interested in prevention.

Do we always mean the same thing?

Common concerns, different focus:

- Both familiar with undue policy focus on behavioural risk factors (the “holy trinity of risk”) as primary DOH
 - OCDPA seeks greater attention to SDOH
 - CPCHE seeks greater recognition of environmental exposures (and of SDOH, but to lesser extent)
- Increasing recognition of epigenetics/epigenomics but from different standpoint.
 - experiences/behaviour as influence on epigenetic expression (Early Child Dev’t literature)
 - influence of chemicals on epigenetic expression (often as *in utero* exposures, esp. to endocrine disruptors)

Shared Language; Shared Approaches

Health Promotion \approx Precautionary Approach

Health Promotion:

- **Holistic** view of health; multiple determinants of health (sensitive to **equity** issues)
- **Participatory** approaches
- Focus on **prevention** of harm
- Building on existing strengths
- Multiple strategies and supports to enable education and **empower** behaviour change (incl. policy strategies)

Precautionary Approach:

- Similarly **holistic**; examine full range of alternatives, including no action
- **Participatory** decision-making (including ensuring public access to information)
- Focus on **prevention** of harm
- Focus on safe or lower-risk alternatives
- **Empowerment**, respectful, sensitive to **equity** issues

Mutually Reinforcing Concerns

Our concerns about environmental exposures and chronic disease are mutually reinforcing

- E.g., A child born into or living in poverty is disproportionately exposed to pollution and chemical hazards. A focus on the SDOH that contribute to CD is incomplete without including consideration of environmental exposures.
- An early environment free of harmful chemical exposures will not prevent CD if the broader SDOH remain unaddressed.

For both env'l exposures and chronic disease prevention:

- Diverse, multi-departmental and multi-jurisdictional policy areas

Environmental Policy Areas

- **Air** pollution – both federal and provincial jurisdiction on setting standards; multiple upstream strategies also needed to reduce car and fossil fuel dependence, make transition to renewables, implement toxics reduction, support green chemistry, etc.
- **Product** safety: Chemicals Management Plan; Modest progress with federal revisions to *Hazardous Products Act* but proactive measures lacking; key to addressing indoor sources of contamination in air, dust and food; legacy issues remain following regulation (e.g., lead in paint, PBDEs in products, etc.)
- Exposure via **food** – wide-ranging policy responses since exposures can originate in pesticide use, packaging or via historical or ongoing contamination (POPs, Hg, etc.)

Underlying All - Limitations of Chemical Risk Assessment

- Chemicals are managed one at a time but they occur in mixtures (in env't, in air, water, housedust and our bodies)
- “Risk-driven” assessments → find acceptable level based on scientific review of exposure and effects (in the midst of enormous ignorance about both for many chemicals)
- Narrow def'n: Risk = hazard + exposure
- But risk is also a function of age, gender, genetics, co-exposures, nutrition, stress, prior health status, etc. **Addition of MDOH challenges risk paradigm.**
- POPs and Endocrine disruptors – both challenge notion of being able to set acceptable limits
- Epigenetics further challenges traditional RA approaches

Policy Spectrum is Broader Still

- Some pressing environmental issues include chemical or pollutant exposures but go further. Broader concerns are raised that are relevant to both the CDs and SDOH at issue in this project. E.g.:
 - Built environment and sprawl: urban planning, car dependence, inactivity, obesity, loneliness, fossil fuel and resource consumption and env'l pollution
 - Responses to climate change: Energy choices will affect air pollution and other exposures, policy choices will affect energy poverty, energy efficiency retrofits need to recognize potential for toxic exposures (lead paint, indoor air quality), etc.
 - Occupational exposures – pre-conception and during pregnancy. Take-home exposures.

Chronic Disease Prevention Policy Areas

- Multiple policy areas at federal, provincial and municipal levels related to SDOH to address:
 - low income
 - social exclusion and inequality
 - social infrastructure (housing, child care, social assistance, etc)
- Ontario Poverty Reduction Strategy and *Poverty Reduction Act, 2009*.
 - Target of 25% reduction in poverty in 5 years.
- Ontario Health Standards – recently revised, including broadened public health mandate to address environment

Multiple Provincial Strategies, Action Plans

- Aboriginal Healing and Wellness Strategy
- Ontario Neurological Strategy
- Ontario Diabetes Strategy
- Ontario Aboriginal Diabetes Strategy
- Chronic Obstructive Pulmonary Disease (COPD) Strategy
- Ontario Heart Health Program
- Targeting Cancer: Cancer Care Ontario Action Plan
- Ontario Asthma Plan of Action
- Smoke-Free Ontario Strategy
- Healthy Eating and Active Living Action Plan
- Early Years Study
- Early Learning Initiative
- Federal level - multiple research initiatives

Observations on the literature

- Literature on SDOH – very little about environmental/chemical exposures, but for:
 - some housing issues (legacies of Pb and asbestos, impacts of dampness and poor ventilation)
 - Hazardous occupational exposures
 - Some location issues, e.g., zoning, sprawl, proximity to pollution
- Important to recognize the problems addressed within SDOH are vast and often intractable – poverty, inequality, inadequate food, housing, child care, workplace stress, racism, etc.
- Early Child Development literature – little to nothing about environmental exposures, especially *in utero*
 - Consistent and disappointing: seems a significant oversight
 - Environmental Toxicology and Epidemiology – with some exceptions, rarely addresses broader determinants

Relationship between Toxicology and Epidemiology Studies

- Epidemiology studies are better at hazard identification than at dose estimation
- Toxicological studies are essential for prevention of adverse effects prior to exposure

Rules from IARC/WHO:

- If epi. and toxicol. both negative → likely no risk
- If epi. +ve and toxicol. -ve → risk is likely
(e.g., arsenic as a carcinogen)
- If epi. -ve and toxicol. +ve → risk is probable
(e.g., Perfluorinated compounds)
- If epi. and toxicol. both +ve → hazard and risk demonstrated. (e.g., lead)

School of Sober Reflections...

“We should keep in mind that a positive finding in an epidemiology or clinical study is, in reality, a failure of preventive medicine policy.”

Dr. George Lucier, September 2007 to Domestic Policy Subcommittee
Oversight and Government Reform Committee “Will NIEHS’ new direction
protect public health?”

“We are conducting a vast toxicological experiment in which our children and our children’s children are the experimental subjects”

Dr. Herbert Needleman, Professor of Psychiatry and Pediatrics, University of Pittsburgh. Quoted by Dr. Philip Landrigan, Mount Sinai School of Medicine, keynote address to Children’s Environmental Health II: Global Forum for Action. September, 2001

Preliminary Framework for Coordinated Response

- Setting our own policies on mutually reinforcing issues. E.g., Env-focused groups with positions on SDOH and disease-focused groups with positions on controlling exposures associated with their disease.
- Likewise, joint statements by CPCHE-OCDPA; key educational role
- Overarching statements in key areas – shortcomings of risk assessment and challenges of emerging science
- Small number of strategic choices. Possible criteria:
 - Where evidence of associations is strongest
 - Focus on recurring gaps – e.g., consideration of *in utero* exposures
 - Implications of seeking/requiring +ve epi. findings
 - Where current strategies are narrowly focused/bridges needed
 - Where inherently safer alternatives exist

Acknowledgements

- CELA, CPCHE and OCDPA colleagues
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Comparing Risk Assessment and Precaution

Risk Assessment:

- Avoid Type 1 errors
- If scientific uncertainty about risk, don't act/await more info
- Evaluate individual risks with little consideration of broader context (other, similar risks or safer alternatives)
- Reactive and focused on pollution control and remediation

Precaution:

- Avoid Type II errors
- If concerns about risk, take action, in the face of scientific uncertainty
- Extend evaluation of risky option with broader consideration of risks (temporal, spatial, etc., and also evaluate safer alternatives)
- Proactive and focused on design of safer chemicals and products