How can systems’ approaches be optimally used to advance the primary prevention research agenda?

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Outline

• Why a system’s approach?

• What is a system’s approach?

• Types of interventions pertinent to a systems-orientation

• The funders’ role

• Conclusions
Why a System’s Approach?

• Wicked problems

  • Inherently multi-causal and complex (rather than simple or complicated)
  • Many actors – intersectoral and ecological
  • Social and structural determinants underlie the problem
  • Those responsible for addressing the problem may also be perpetuating the problem
  • Both simple and complex health-related interventions are inserted within complex systems

  • Led to calls for system approaches (e.g. “A systems approach is needed [to address obesity] with multiple sectors involved”. – The Lancet, 2011)
“Poorly described health systems and political systems factors and implementation considerations may make it difficult to develop contextualised recommendations on policy options”
What is a System’s Approach?

• “Systems thinking is an enterprise aimed at seeing how things are connected to each other within some notion of a whole entity.” (Peters, Health Res Policy and Systems, 2014).

• Makes implicit mental models explicit – better understand the whole, its parts and interactions within and between levels.

• Whole of government approaches
• Intersectoral approaches
• Prevention systems
Complex Adaptive System

Fundamental Properties of Complex Systems  
(Anderson, Crabtree, Steele et al., 2006; Rutter, 2011; Caffrey, Wolfe & McKevitt, 2016)

• **Emergence**  
  • properties of a complex system develop that cannot be directly predicted from the individual parts  
  • system is more than the sum of its parts

• **Feedback**  
  • both positive and negative feedback loops reinforce or rebalance further change  
  • systems exist within other systems – feedback loops may link one system to another

• **Adaptation and Self-Organization**  
  • non-linear adjustments in individual, community or organizational behaviour in response to interventions and/or to other contextual influences  
  • may not involve external direction
Fundamental Properties of Systems: Examples

• Emergence
  • Urban districts become specialized (e.g. gentrification)
  • Social movements

• Feedback
  • The case of a young hockey player- community response to H1N1 vaccination program

• Adaptation and Self-Organization
  • Industry response to a ban on advertising or to a tax on sugar
  • Informal networks
Adaptive and maladaptive change processes across system levels [Adapted from Gunderson & Holling (2002)].
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Places to Intervene in a System – Leveraging Points
(Meadows, 1999)

• (in increasing order of effectiveness and diminishing intervention control by researchers)
12. Constants, parameters, numbers.
11. The sizes of buffers and other stabilizing stocks, relative to their flows.
10. The structure of material stocks and flows (e.g. networks, population age structures).
 9. The lengths of delays, relative to the rate of system change.
 8. The strength of negative feedback loops, relative to the impacts they are trying to correct against.
 7. The gain around driving positive feedback loops.
 6. The structure of information flows (who does and does not have access to information).
 5. The rules of the system (e.g. incentives, punishments, constraints).
 4. The power to add, change, evolve, or self-organize system structure.
 3. The goals of the system.
 2. The mindset or paradigm out of which the system goals, structure, rules, delays, parameters arise.
 1. The power to transcend paradigms.
## Intervention Options from a Systems’ Perspective
(Carey & Crammond, 2015, BMC Public Health; (adapted from Meadows, 1999))

<table>
<thead>
<tr>
<th>Where to intervene in a system</th>
<th>Primary prevention examples</th>
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<tbody>
<tr>
<td><strong>Paradigm</strong></td>
<td>Surgeon General’s Report (1992) established tobacco as a collective issue. Targeting of LMICs and youth by tobacco companies viewed as unfair. Courts upholding litigation suits against Big Tobacco.</td>
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<tr>
<td><strong>Goals - system targets</strong></td>
<td>WHO Framework Convention on Tobacco Control established clear system targets.</td>
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<tr>
<td><strong>System structures</strong></td>
<td>Contraband, trade tariffs, agricultural subsidies and taxation systems.</td>
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<tr>
<td><strong>Feedback and delays</strong></td>
<td>Real time and interactive monitoring system for tobacco control with benchmark comparators across countries including differential impact on population subgroups.</td>
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<tr>
<td><strong>Structural elements</strong></td>
<td>Increase # and capacity of individuals enforcing ETS by-laws. Support international network of actors engaged in tobacco control.</td>
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Tobacco systems – Aging Chain of Smokers (Stocks and Flows)
Types of Interventions Pertinent to Systems-Oriented Prevention Research

• Researcher-designed interventions

• Natural experiments

• Simulation modelling
Types of Interventions - Examples

• **Researcher-designed interventions**
  • COMMIT Trial (U.S. and Canada)

• **Natural experiments**
  • Removal of fluoride from municipal water supply in Calgary
  • Introduction of Nurse Practitioners in Canada (Edwards, Rowan, Marck et al., 2011)

• **Simulation modelling – what if?**
  • Targeting obesity interventions in populations using an agent-based simulation (Beheshti, Jalalpour & Glass, 2017)
  • Universal versus targeted (high risk groups) versus targeted (networks)
  • “Using network information to inform targeting outperforms more standard targeting approaches” (p. 216)
Enlarging the focus on systems
(Edwards, 2013)

- Interventions without attending to systems
- Interventions constrained or supported by systems
- Interventions designed/adapted for system attributes
- Interventions targeting systems
- Intervention-multi-system integration
Why have intervention researchers been slow to embrace systems’ approaches?

• Orientation of predominant models of intervention research
  • Interventions we can control (researcher-designed)
  • A-contextual research designs
  • Predictable (hypothesized) and often short-term outcomes we can measure

• Theory we know (off the shelf theory) (Moore & Evans, 2017)
• Complexity we can understand
• Research and academic systems (funding timelines, academic reward systems) that reinforce certain kinds of research questions and designs
• Synthesis approaches with methodological inclusion criteria
• Sectors and networks we favour/know
• Disciplines we understand and can more easily communicate with
The Funders’ Role

• How can funders support and maximize the yield of system’s research in prevention?

• Specify system and sub-system foci and goals in funding calls.

• Encourage development of collective metrics and harness big data (e.g. administrative datasets and longitudinal cohorts) to compare short and longer-term outcomes and unintended consequences.

• Support networks of key stakeholders.
Interventions Within Systems


**Equity systems**
- system features that produce or perpetuate health equity or inequities

**Organizational (delivery) systems**
- system(s) within which the interventions of interest are primarily delivered including those likely to affect scale-up

**Regulatory, governance & political systems**
- contextual influences on uptake of interventions and their scale-up
## Systems’ Orientation of Selected Strategic CIHR Initiatives: Illustrative Examples

<table>
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<tr>
<th>Initiative and approximate CIHR investment over 5 years</th>
<th>Equity Systems</th>
<th>Organizational (delivery) systems</th>
<th>Regulatory, governance and political systems</th>
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<tr>
<td>Community-based Primary Health Care</td>
<td>Vulnerable populations</td>
<td>Models of care delivery &amp; access</td>
<td>Cross-jurisdictional comparisons</td>
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<td>Pathways - Aboriginal Peoples</td>
<td>Decolonization</td>
<td>Western vs indigenous health care systems</td>
<td>Indigenous governance</td>
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<tr>
<td>Environments and Health</td>
<td>Equity across nexus areas</td>
<td>Intersectoral systems</td>
<td>Regulatory systems</td>
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<td>Global Alliance for Chronic Diseases</td>
<td>Universal health care</td>
<td>Scale-up in resource constrained settings</td>
<td>International socio-political comparisons</td>
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Pathways to Health Equity for Aboriginal Peoples: CIHR Signature Initiative

Goal: To develop a better understanding of how to identify, assess and apply successful approaches to health issues that greatly affect Aboriginal peoples in Canada such as suicide prevention, tuberculosis, diabetes/obesity and oral health
Pathways Implementation Research Teams: Focus on adaptation and scale-up

• Successful scale-up of population health interventions: equitable reach and access to effective and culturally appropriate interventions

• New insights on how interventions can be adapted to target populations, their historical and contemporary contexts and to the systems that are used to deliver programs and policies

• Examines adaptive change processes: how interventions can be better adapted to different places, cultures, genders, or conditions, under what socio-ecological conditions interventions work and for whom, and how the impact of interventions can be scaled up
Community-Based Primary Healthcare (CBPHC)

http://www.cihr-irsc.gc.ca/e/193.html

• Develop and compare innovative models for CBPHC across jurisdictions within Canada and/or internationally that target:

  • prevention and management of chronic diseases
  • reduction of inequities in access to CBPHC and health outcomes in vulnerable populations
  • optimization of outcomes in CBPHC in specific subpopulations or with specific interventions

• Identify the conditions and strategies that would be necessary for scaling-up innovative models of CBPHC
Environments and Health Signature Initiative: 3 Priority Nexus Areas

- Agri-Food
- Resource Development
- Urban Form


Link to funded teams:
Global Alliance for Chronic Diseases: Examples of Guiding Questions in Funding Calls
www.gacd.org

• What contextual influences (leadership, governance, organizational culture) are critical for the successful implementation of effective strategies?

• What sets of inter-related (local to global) policies optimally support achievements towards prevention, management and control of chronic disease?

• What networks, coalitions, and inter-governmental agreements, within and between countries are needed to address implementation challenges for chronic disease prevention, assessment and control?
Towards a Common Set of Metrics to Examine Systems’ Change

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<th>Global Alliance for Chronic Diseases</th>
<th>Community-based PHC</th>
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<td><em>Researchers developed a set of consensus indicators to be used across all studies.</em> (Riddell, Edwards, et al., 2017, Global Health)</td>
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<td><em>Modular additions planned as new disease priorities addressed (hypertension, Type 2 diabetes, lung disease, mental health)</em></td>
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<td><em>Built on work of Grand Challenges Canada and their metrics, which include contextual considerations.</em></td>
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<tr>
<td><em>Researchers developed a set of indicators to be used across all studies (e.g. equitable, accessible, affordable PHC)</em></td>
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<td><em>Funders worked with Canadian Institute of Health Information to develop a dynamic cohort</em></td>
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Concluding Thoughts: Building a Proactive Agenda for Systems-oriented Prevention Research

• Select your systems of focus – (e.g. equity systems, intersectoral governance systems, delivery systems etc.).

• Support research that examines a range of leverage points in the system.

• Fund a complementary mix of natural “experiments”, researcher–designed interventions and simulation modelling studies.

• Develop and harness metrics to examine common system elements and system outcomes across health issues and populations.
Selected Readings (1)


Selected Readings (2)


Selected Readings (3)


