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)

Guidance for Evidence-Informed Policies about Health Systems: Assessing How Much Confidence to Place in the Research Evidence

Simon Lewin[1*], Xavier Bosch-Capblanch[2], Sandy Oliver[3], Elie A. Akl[4], Gunn E. Vist[5], John N. Lavis[6], Davina Ghersi[7], John-Arne Røttingen[8], Peter Steinmann[9], Metin Gulmezoglu[10], Peter Tugwell[11], Fadi El-Jardali[12], Andy Haines[13]

"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
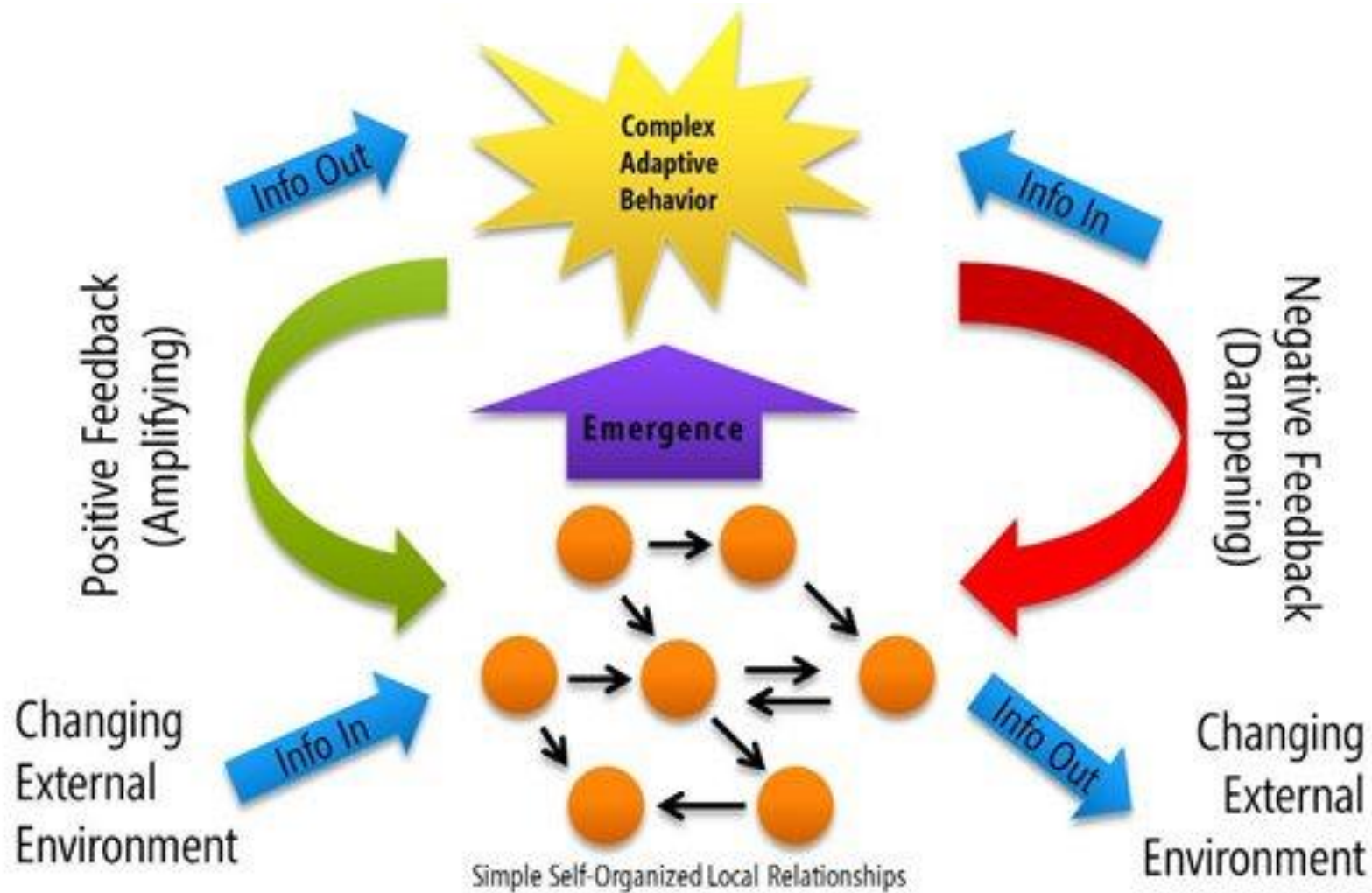
Haikimi, A. (2010, Aug. 10). The New World of Emergent Architecture and Complex Adaptive Systems. *Zen and the Art of Enterprise Architecture.* Retrieved December, 2014, from http://blogs.msdn.com/b/zen/archive/2010/08/10/the-new-world-of-emergent-architecture-and-complex-adaptive-systems.aspx

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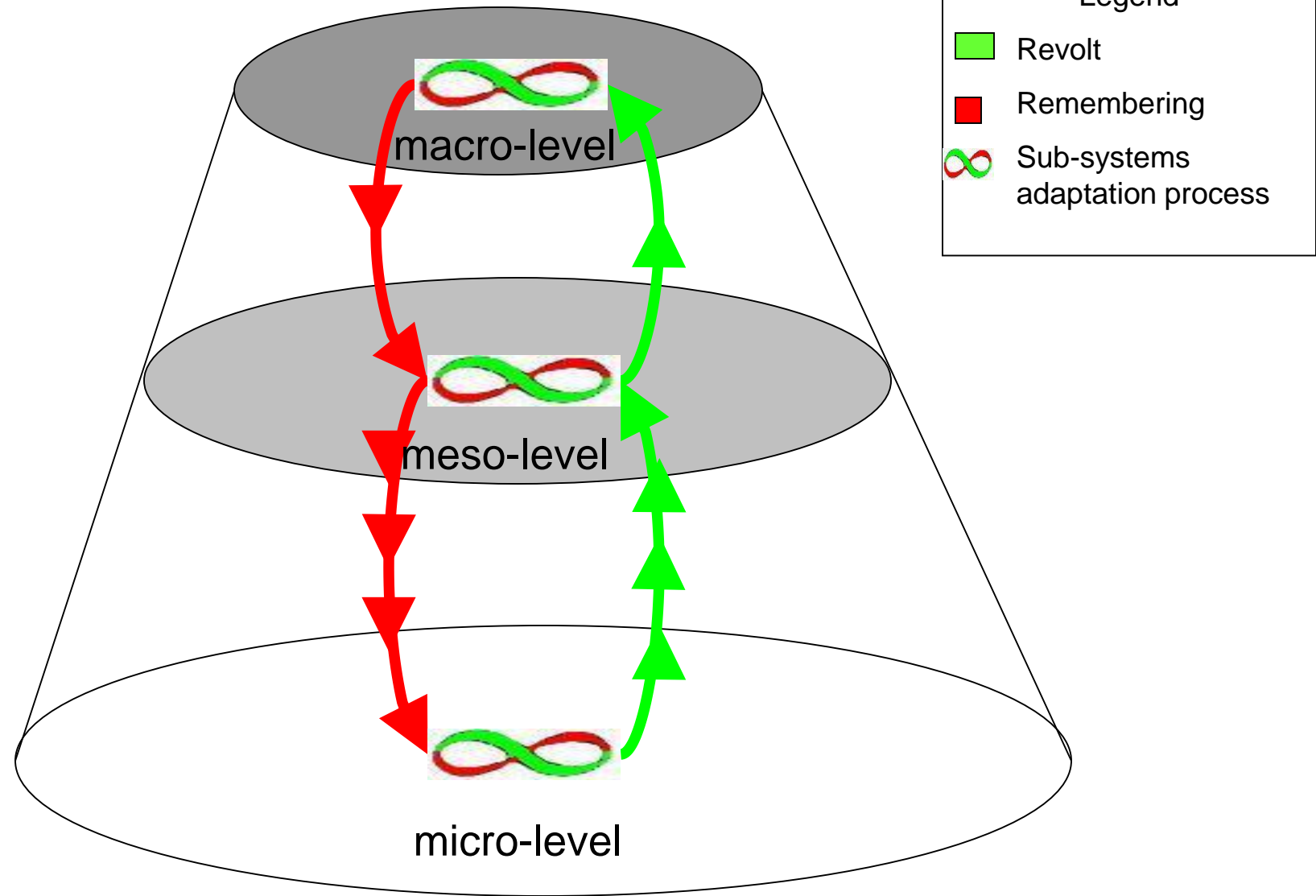- **Adaptation and Self-Organization**
  - non-linear adjustments in individual, community or organizational behaviour in response to interventions and/or to other contextual influences
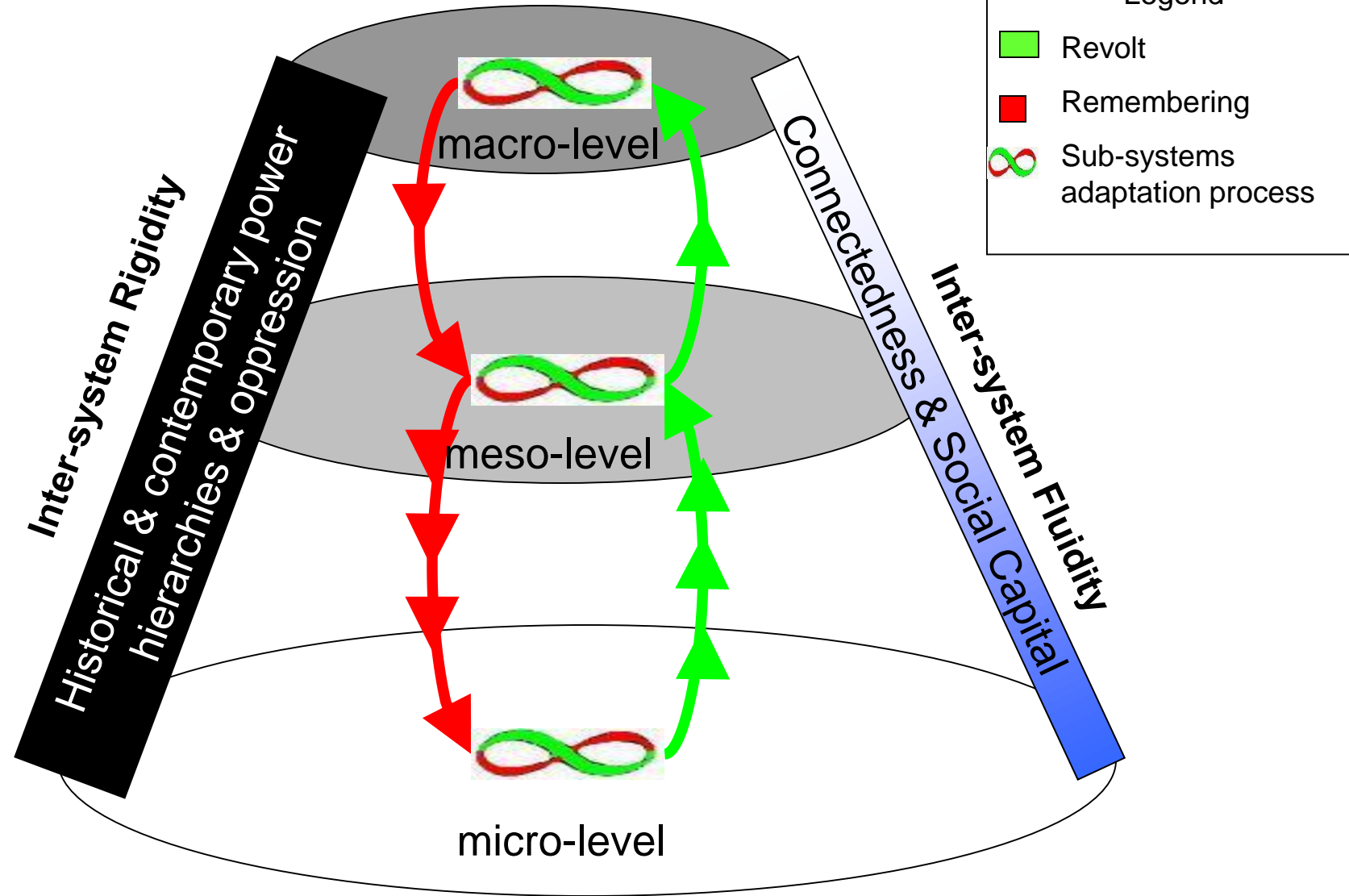 - may not involve external direction

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)]

Legend
- Revolt
- Remembering
- Sub-systems adaptation process

macro-level

meso-level

micro-level

Adaptive and maladaptive change processes across system levels [Adapted from Gunderson & Holling (2002)]

Legend
- Revolt
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- Sub-systems adaptation process

Inter-system Rigidity

Historical & contemporary power hierarchies & oppression

Connectedness & Social Capital

Inter-system Fluidity

macro-level

meso-level

micro-level

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))

Where to intervene in a system	Primary prevention examples
Paradigm	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.
Goals - system targets	WHO Framework Convention on Tobacco Control established clear system targets.
System structures	Contraband, trade tariffs, agricultural subsidies and taxation systems.
Feedback and delays	Real time and interactive monitoring system for tobacco control with benchmark comparators across countries including differential impact on population subgroups.
Structural elements	Increase # and capacity of individuals enforcing ETS by-laws. Support international network of actors engaged in tobacco control.

Tobacco systems – Aging Chain of Smokers (Stocks and Flows)
Leishow, Best et al., 2008. Am J Prev Med
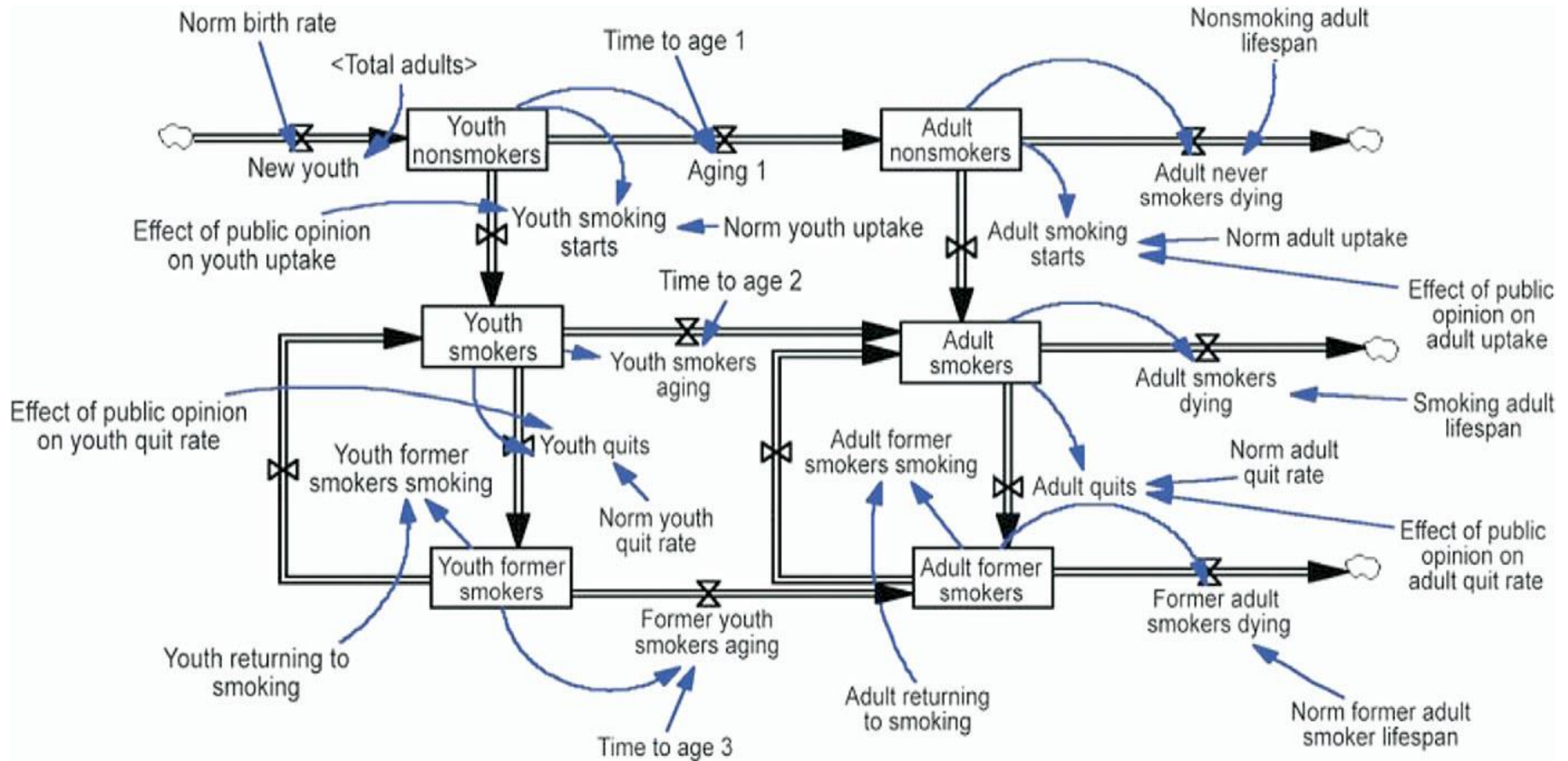
Types of Interventions Pertinent to Systems-Oriented Prevention Research

- 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

Canadian Institutes of Health Research, Institute of Population and Public Health (CIHR-IPPH). (Edwards. 2015)

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

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

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

CIHR IRSC

Pathways Implementation Research Teams: Focus on adaptation and scale-up

- Successful scale-up of <u>population health interventions</u>: **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)
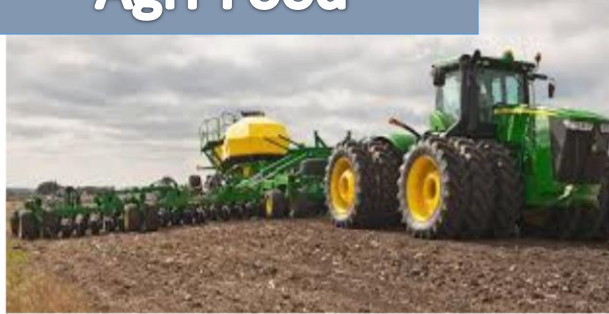*http://www.cihr-irsc.gc.ca/e/193.html*

- 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
https://www.canada.ca/en/institutes-health-research/news~~~~~~~~~~~~~preventionresearch.html

Agri-Food

Resource Development

Urban Form

- https://www.canada.ca/en/institutes-health-research/news/2017/05/government_of_canadainvestsinhealthiercitiesandcommunities.htmlLink 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

Global Alliance for Chronic Diseases

- Researchers developed a set of consensus indicators to be used across all studies. (Riddell, Edwards, et al., 2017, Global Health)
- Modular additions planned as new disease priorities addressed (hypertension, Type 2 diabetes, lung disease, mental health)
- Built on work of Grand Challenges Canada and their metrics, which include contextual considerations.

Community-based PHC

- Researchers developed a set of indicators to be used across all studies (e.g. equitable, accessible, affordable PHC)
- Funders worked with Canadian Institute of Health Information to develop a dynamic cohort

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.

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