Rethinking health systems strengthening: key systems thinking tools and strategies for transformational change
Systems thinking and Adaptive complex system

Box 1 A brief overview of complex adaptive systems and systems thinking

Health and other social systems have been described as complex adaptive systems (CAS) that adjust in dynamic and sometimes unpredictable ways to changes within the system itself or in the context in which it operates. CAS have a myriad of components (such as citizens, patients, communities, providers, policy makers, programme implementers, etc.) that are continuously interacting and adapting to other components changes and changes in the environment. The distinctive features of health and other complex systems include self-organization, constant changes, feedback loops, non-linearity, time lags between inputs and outcomes, history dependence and unintended consequences of policy interventions (de Savigny and Adam 2009).

Systems thinking is an approach that describes and considers the characteristics and effects of CAS and attempts to maximize their positive effects while minimizing unintended, negative effects. It is widely applied to diverse sectors, including engineering, economics, ecology and business, and it is an emerging approach in health systems research with tremendous potential to address challenges related to public health (Mabry et al. 2008; Mabry et al. 2010). Systems science methodologies consider dynamic relationships between elements ranging from cells to individuals and organizations, and the impact that those relationships have on the entire health system. Implications for research, policy and practice in public health are significant (Homer and Hirsch 2006; Sterman 2006; Leischow et al. 2008). Many systems thinking approaches and methodologies have been successfully applied to health and other sectors (Jackson 2003).
Systems thinking

- Systems thinking offers a lens of enquiry through which a system may be viewed as more than the sum of its parts.

- Systems thinking emphasizes the importance of relationships and the unpredictable behaviours that arise from interactions between system components.

- An iterative learning process in which systems viewed as a holistic, broad, long-term, dynamic, that reinventing our policies and institutions accordingly’
Systems thinking

- These **new modes of working** must seek to integrate across disciplines, hierarchies, departments and specialties.

- Policy makers **must identify** appropriate partners, grow relationships and build local capacity.

- They **must learn** from feedback, adjust, adapt, dissolve and regenerate to meet the changing needs of health systems.
a novel opportunity for synergy

- Health systems strengthening have been fragmented and unsystematic that underpinned disease-specific programmes.

- The disease-specific programmes have been variably successful:
  - Immunizations
  - anti-retroviral treatment for AIDS
  - directly observed short-course treatment (DOTS) for tuberculosis,
A novel opportunity for synergy

However, the long-term impact of these programmes on health systems is unclear, with unsystematic evidence for positive and negative effects.

This realization of limited documented positive effects on health systems of targeted health investments has led to a renewed interest in ‘health systems strengthening’ (HSS)

HSS emphasis on principles such as financing national health strategies, integration, local ownership and sustainability.
A novel opportunity for synergy

- However HSS approaches too often focus on a narrow aspect of the health system such as family planning, community health workers, financing schemes or particular interventions.

- Systems thinking can complement and enrich the prevailing reductionist approaches to health improvement and the current HSS movement, by improving health practice, education, research and policy.
A novel opportunity for synergy

- A paradigm shift towards systems thinking will strengthen health systems effectively around the globe thereby leading to improved health outcomes.

- Professionals will need to gradually transition away from exclusively applying reductionist health approaches, while simultaneously embracing systems thinking and widely accepted guiding principles.
Box 2 Three overarching themes in systems thinking tools and strategies

1. **Collaboration across disciplines, sectors and organizations:** Any approach to improve a health system will require that actors reach beyond their area of expertise or practice, and collaborate with colleagues with different experience, knowledge and goals.

2. **Ongoing, iterative learning:** Systems-level change requires a recognition that the context is continuously changing. As such, actors need to continuously adapt, learn and apply new knowledge to current challenges. Recognition of the importance of learning from experience opens additional approaches for research and practice, including qualitative and mixed methods research to understand subtleties of systems design and dynamic actions in implementation.

3. **Transformational leadership:** Visionary and courageous leaders are needed to challenge the prevailing paradigm; sacrifice personal and organizational interests for systemic benefit; enhance inter-organizational collaboration (Best and Holmes 2010); and advocate for change. People in leadership roles need not be the traditional heroic, charismatic individuals; leadership can and should be ‘distributed’ throughout organizations over time. Health workers at all levels of the system can be transformational leaders by challenging basic assumptions about how health is delivered; mobilizing around a shared vision of equity and efficiency; and elevating the values, vision, mission and morals of all stakeholders. Organizational culture that embraces such leadership is critical.
Systems thinking to transform health practice
Systems thinking to transform health education
Systems thinking to transform health research
Systems thinking to transform health policy
Practitioners on the ground are constrained: inter alia, regulatory policies, social norms, varying levels of evidence to support interventions, erroneous assumptions, commercial pressures, conflicts of interests, and inadequate education and training.

The degree of success of health producers depends on ability to collaborate with other key stakeholders around a shared vision. Organizations have to continuously working together to create a common future.
Health professionals will need to be able to set common goals and targets with patients, service users and relevant stakeholders, and ensure that each group or individual is properly informed and engaged.

Evidence and explicit knowledge need to be integrated with tacit knowledge of stakeholders within the working dynamic of the health team.
Box 3 Key systems thinking strategies and tools to transform health practice (National Cancer Institute 2007; Best and Holmes 2010; Paina and Peters 2011; Willis et al. 2011)

- Develop a shared vision and systems thinking skills among diverse stakeholders through iterative dialogue, and translate into firm commitments for collaborative action.
- Anchor the collaboration in core values, such as social responsibility and equity, a commitment to changing outcomes, and an evidence strategy that integrates needs for research and knowledge translation with policy and practice priorities (Herbert and Best 2011).
- Utilize systems thinking tools such as knowledge synthesis, concept mapping, social network analysis, programme budgeting and marginal analysis, and system dynamics modelling (Willis et al. 2011) to effectively manage complexity and changing dynamics (National Cancer Institute 2007).
- Consider the impact of current and new health programmes on existing health systems, and maximize positive effects (Swanson et al. 2009) by avoiding duplication and increasing local ownership and capacity.
- Ensure sufficient priority and investment in capacity development and transformational leadership.
- Pay attention to social, political and cultural contexts at the local level (both current and historical), as well as incentives and institutions.
- Plan for unintended consequences, and be willing and ready to adapt.
- Develop and implement programmes that engage key stakeholders through regular, strong monitoring and feedback loops, and transparent use of data.
- Strengthen existing institutions and organizations through genuine and equal partnerships.
- Embrace self-organizing ‘emergent’ phenomena: novel (and sometimes surprising) roles, relationships, practices and programmes that arise naturally when there is a shared vision around improved population health over time.
- Develop systems thinking among health facility managers and programme managers with the skills to develop organizational or team learning through actions using four sources of knowledge—theory, research, monitoring and evaluation, and tacit knowledge.
• Systems thinking to transform health practice
• Systems thinking to transform health education
• Systems thinking to transform health research
• Systems thinking to transform health policy
The use of a systems thinking approach in health education to address complex problems may bring about more creative and sustainable solutions to inadequate performance of health systems globally.

Systems thinking trained public health professionals address the complex challenges by designing effective interventions to maximize the positive health outcomes, while minimizing unintended negative consequences.
Systems thinking to transform health education

- It will require not only changes in curricular content, but also a need to base teaching and learning within the reality of a continuously changing health system on the ground.

- Ongoing learning must occur at all levels of the health system and academic centers should extend training into the health systems within their communities.
Box 4 Key systems thinking strategies and tools to transform health education (Frenk et al. 2010)

- Focus on transformational learning that leads to locally responsive and globally connected health systems leadership.
- Implement competency-based health curricula and team-based learning that is periodically reassessed to address the changing health needs of the community. Expand academic centres into academic systems that include communities by reaching out to community members and engaging in participatory research.
- Incorporate systems science approaches and methods, such as knowledge synthesis, concept mapping, social network analysis, programme budgeting and marginal analysis, and system dynamics modelling (Willis et al. 2011) as core, foundational components of health curricula.
- Promote trans-professional education in medicine, public health, nursing and health policy through case studies and practical experiences that encourage collaboration across disciplines such as economics, ecology, anthropology and organizational management, and that break down traditional professional and disciplinary silos.
- Systems thinking to transform health practice
- Systems thinking to transform health education
- Systems thinking to transform **health research**
- Systems thinking to transform health policy
Systems thinking to transform health research

- Health researchers have traditionally sought to answer a specific question at a particular point in time by controlling for all other variables as much as possible;

- Research in systems modelling and simulation has shown promise in capturing the complex, dynamic nature of health challenges.
Systems thinking to transform health research

- Systems thinking promotes the importance of multilevel and multi-actor methods (e.g. system dynamics modelling, social network analyses) to understand system behaviours.

- Qualitative health research can help understand health systems complexities: the behaviours of actors, and the perceptions and culture of the people related to health systems.
However, this traditional, reductionist approach, to research widens the gap between knowledge and practice.

A paradigm shift is needed in knowledge translation that takes a systems view by: embracing complexity in research; considering local context; widely applying community-based participatory and action research methods;

A shift from the current ‘research-to-practice’ model to an ‘applied research paradigm,'
Box 5 Key systems thinking strategies and tools to transform health research

- Adopt a culture that continuously identifies knowledge gaps in practice processes and ensures action research to fill gaps in needed knowledge.
- Embrace holism in research by widely incorporating mixed methods and interdisciplinary research into traditional health research, including:
  - Action (Meyer 2000), process and community-based participatory research.
  - Institutional and organizational (Royston 2011) management research.
  - Social sciences research (Gilson et al. 2011).
  - Systems science, operations and complexity theory methods and approaches, such as agent-based models, discrete event simulation, Monte Carlo methods, system dynamics modelling, knowledge synthesis, concept mapping and social network analysis.
- Recognize the complementarity of systems research and more conventional, reductionist research methods.
- Engage policy makers and potential research users in planning for research and through to the process of interpretation of findings and implications for actions to ensure relevance (of research outputs) as well as receptivity (of potential users) of research findings.
Systems thinking to transform health practice
Systems thinking to transform health education
Systems thinking to transform health research
Systems thinking to transform health policy
Health policies result from a complex interplay between social, political, physical, ecological, biological, cultural, technical and economic factors.

Negotiating the inputs from these various sources often is done under temporal and resource pressures, complicated by political and social upheaval.
Systems thinking to transform health policy

- Policy makers too often approach health systems from a mechanistic perspective, assuming that implementing a particular policy will lead to a predictable change in the behaviour of local actors thereby ignoring the interactions between them.

- This line of thinking leads increasingly to detailed incentives and regulations from the top down, a so-called ‘command and control’ approach to policy.
Health system problems usually, cannot be broken down, they are not just the parts but how they are put together, behaviours are unpredictable and non-linear ‘effects’ are felt.

Many well-intentioned policies fail to address the problems they are designed to solve, and in attempting to do so, actually generate new ones.
Systems thinking to transform health policy

- The tendency for these policies to be defeated by the response of the system to the policy itself is known as ‘policy resistance’.

- The command and control approach too often results in unintended consequences such as duplication of services, inefficiencies, policy resistance, erosion of capacity, dependence and other negative effects: ‘gaming the system’ to maximize individual gain at the expense of the larger system.
Systems thinking to transform health policy

- What is needed is a way of thinking that recognizes that parts are not disconnected from the whole and that dynamic relationships exist which shape, and are shaped, by their environment.

- Understanding evolutionary design of the health system by observing and identifying local intervention successes through feedback loops, the system can be optimized over time to promote long-term positive health effects.

- Embracing uncertainty in health decisions can facilitate the design of policy to structure complex adaptive systems.
Box 6 Key systems thinking strategies and tools to transform health policy (Plsek 2001; Sterman 2006; Rouse 2007)

- When health challenges and solutions are complex, avoid ‘command and control’ approaches that dictate detailed health delivery strategies and incentives.
- Implement policies that incorporate simple rules and incentives, allowing local practitioners and others to innovate around health efficiency and quality.
- Focus on high-leverage changes that are likely to have long-term positive effects, such as transformation of health curricula, health systems impact assessments (Swanson et al. 2009) and reimbursement for value (McMahon and Chopra 2012).
- Develop computer models to simulate dynamic complexity and conduct what-if analysis, thereby planning for unintended consequences.
- Challenge basic assumptions about health and its delivery.
Strengthening health systems through networks: the need for measurement and feedback
Role for networks

- Interorganizational networks have emerged at the global level, as well as at national and subnational levels, as important strategies for organizing human effort in a systems-thinking mode of operation.

- The rise in network popularity has come largely from the recognition that money alone cannot sufficiently improve the quality of health systems, and that the major health problems facing societies are unlikely to be successfully addressed by individual organizations acting in isolation.
Role for networks

- Network structures represent a broad set of collaborative approaches that are useful for bringing stakeholders together.

- Networks are ‘a set of nodes and the set of ties representing some relationship, or lack of relationship, between the nodes’

- Using network analyses provide studying organizational networks and the ways that they collaborate to impact health; and supporting leaders who strengthen the link between research and practice.
Role for networks

- The study of networks has provided important learning for how people and groups might work together either in spontaneously evolving networks, or through formal establishment of network partnerships.

- Appropriate governance structures are needed at global, national and subnational levels to foster commitment among network members and promote accountability through shared measures of network performance.
Measuring network indices

- Identifying the optimal approach to developing and supporting interorganizational collaborations in LMICs has been highlighted as a primary challenge for health systems strengthening activities.

- With only modest evidence that collaborative networks are effective, research is needed urgently to ensure current and future network efforts do not become ‘yet another ineffective talking shop that [do] more harm than good.'
Measuring network indices

To increase the role and value of networks in health systems, a clearer understanding of two issues is required:

- How should network performance be measured in ways that promote broad stakeholder learning?

- How can these measures be built into appropriate accountability structures in order to strengthen network and health system performance?
Measuring network performance

- As such, an evaluative approach built on systems thinking concepts is required for recognizing the complex factors influencing network performance and the dynamic, non-linear and interrelated nature of network activities.

- Measures of structure (such as gained through social network analyses) may be important for giving insights into network development, relationship strength and member involvement.
Community level outcomes may be measured through the contributions made by the network to communities, including costs incurred, public perceptions of network performance, and aggregate indicators of health status in the population.

Network level effectiveness is more concerned with the legitimacy of the network itself and may be measured by relationship strength and member involvement.
Improving feedback and accountability

Accountability structures may be best seen as useful sources of feedback for informing strategy and action.

Framed by systems thinking, the feedback mechanisms through which accountability may be generated require consideration of:

- How to use what data, by whom and when;
- What proportion of data to use;
- How to direct this use;
- How to ensure data are used appropriately and effectively;
Contextual factors will likely lead to differing feedback structures in networks managed by participant governance, shared governance, lead organization governance, or those with appointed administrative organizations.

Therefore feedback structures need to ensure data are not only reliable and valid, but that they are relevant and actionable for users in different network settings.