Understanding pathways for scaling up health services through the lens of complex adaptive systems

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Despite increased prominence and funding of global health initiatives, efforts to scale up health services in developing countries are falling short of the expectations of the Millennium Development Goals. Arguing that the dominant assumptions for scaling up are inadequate, we propose that interpreting change in health systems through the lens of complex adaptive systems (CAS) provides better models of pathways for scaling up.

Based on an understanding of CAS behaviours, we describe how phenomena such as path dependence, feedback loops, scale-free networks, emergent behaviour and phase transitions can uncover relevant lessons for the design and implementation of health policy and programmes in the context of scaling up health services. The implications include paying more attention to local context, incentives and institutions, as well as anticipating certain types of unintended consequences that can undermine scaling up efforts, and developing and implementing programmes that engage key actors through transparent use of data for ongoing problem-solving and adaptation.

We propose that future efforts to scale up should adapt and apply the models and methodologies which have been used in other fields that study CAS, yet are underused in public health. This can help policy makers, planners, implementers and researchers to explore different and innovative approaches for reaching populations in need with effective, equitable and efficient health services.

The old assumptions have led to disappointed expectations about how to scale up health services, and offer little insight on how to scale up effective interventions in the future. The alternative perspectives offered by CAS may better reflect the complex and changing nature of health systems, and create new opportunities for understanding and scaling up health services.

Keywords   Complex adaptive systems, health systems, scaling up, health planning

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KEY MESSAGES

- The blueprint approaches to scaling up health services commonly found in global health initiatives do not fit the dynamic and unpredictable ways in which health services can expand and be sustainable.

- The lens of complex adaptive systems (CAS) offers alternative approaches that better reflect the complex and changing nature of health systems, and creates new opportunities for understanding and scaling up health services.

- Understanding CAS phenomena of path dependence, emergent behaviour, scale-free networks, feedback loops and phase transitions is important to better planning, implementation, monitoring and evaluation approaches to scale up health services.

- Lessons from CAS suggest paying more attention to local context, incentives and institutions, anticipating unintended consequences, and developing and implementing programmes that engage key actors through transparent use of data for on-going problem-solving and adaptation.

Introduction

Scaling up health services has been a long-standing mission in global health. It was a central concern behind the slogan of 'Health for All' at the World Health Organization's landmark primary health care conference in Alma Ata over 40 years ago (World Health Organization 1978). For many years, UNICEF has widely promoted the nationwide delivery of child health interventions that have been shown to be effective on a small scale (Black 1986) as a strategy to capture 'low hanging fruit' (Taylor 2010). The importance of scaling up has taken on added urgency in recent years with the impetus of global health initiatives to promote the widespread roll-out of anti-retroviral therapy for HIV/AIDS. Scaling up of expanded packages of health services continues to be at the core of efforts to reach the Millennium Development Goals (MDGs) targets by 2015. Consequently, the interest of researchers, policy makers and programme implementers in this topic is growing rapidly (Mangham and Hanson 2010), both for increasing the coverage of small packages of cost-effective interventions and for strengthening health systems to achieve and sustain implementation of any health intervention (World Bank 2007; World Health Organization 2007). Despite increased funding for scaling up health services in low- and middle-income countries (Ravishankar et al. 2009), many developing countries are not on a track to achieve global MDG targets (United Nations 2008; United Nations 2010).

To date, plans to scale up health interventions to reach the MDGs have presumed a rather linear and predictable process which involves replicating implementation arrangements, costs and impacts that were produced on a small scale, often under relatively controlled conditions, and usually through a standardized public health services model across countries (Subramanian et al. 2010). This approach has produced standardized methods for predicting the human resources required for scaling up health services (Joint Learning Initiative 2004; World Health Organization 2006) and the global costs of scaling up various cost-effective health interventions (Johns and Baltussen 2004; World Bank 2004; Johns and Torres 2005; Stenberg et al. 2007; Taskforce on Innovative International Financing for Health Systems 2009).

However, the benchmarks and standards which are critical to guiding global policy discussions and fostering high-level commitment often lose their relevance on the ground, where programme implementation takes place in diverse social, political and cultural contexts.

Scholars worldwide have been working on increasing our understanding of why these perspectives fail to converge. It has been well established that the local context greatly affects programme implementation in health (Victora et al. 2005), and that influence over the behaviours of patients and communities is less 'controlled' in a non-research setting (Arnold et al. 2009), so that even simple biomedical interventions often involve complex social interventions (Bloom et al. 2008a). Recent literature has shown growing recognition that for successful implementation, the processes or pathways for introducing and scaling up interventions can be as important as the content of the intervention itself (Janowsky et al. 2006; Peters et al. 2009). There is also evidence of the value of scaling up through 'learning by doing' (Subramanian et al. 2010), although this approach has not yet been widely adopted nor has it entered mainstream MDG discussions.

Whereas the literature on scaling up health services continues to grow, few have challenged the underlying models for scaling up. In this paper, we examine the characteristics of scaling up processes through alternative models provided from an understanding of complex adaptive systems (CAS). We propose that such an analysis is timely and important given the limitations of current efforts for scaling up health services to achieve the MDGs through standardized and inappropriately simplistic models. We provide illustrative examples of how the application of CAS concepts and approaches can inform the process of scaling up health services and can uncover relevant lessons for the design, implementation and evaluation of health policy and programmes. Whereas we could not identify specific examples where scaling up has been explored through the lens of CAS, we hope that a deeper understanding of scaling up within CAS will inspire policy-makers, planners, implementers and researchers to explore new and innovative approaches for reaching populations in need with effective, equitable and efficient health services.

Health systems as complex adaptive systems

The study of complex systems has emerged in the last few decades as multi-disciplinary approaches to understanding the behaviour of diverse, interconnected agents and processes from a system-wide perspective. CAS are described as such because in addition to being comprised of many interacting components, they have the capability to self-organize, adapt or learn from experience. Most social, biological and economic systems can be considered CAS, as well as many complex physical systems, such as those related to weather, natural disasters or turbulent fluids. The interactions of system components are typically complex and non-linear, and are not easily controlled or predictable in detail. They also result in unintended effects or paradoxical behaviour. The 'slower is faster' effect, whereby delays can sometimes speed up the efficiency of traffic systems, is one example of such paradoxical behaviour (Helbing *et al.* 2000). People's understandings of systems that are actually CAS are often over-simplified or erroneous, which creates problems for decision-makers who cannot control such systems through conventional means, often while being vulnerable to sudden changes in public opinion (Dorner 1997). It is not unusual for systems to show little response to many attempts to control them, or to change suddenly when a tipping point is reached (Gladwell 2002). For example, many high-cost health investment projects have had little impact on people's behaviour or health status, in contrast to sudden changes that can occur in public opinion about smoking bans or in the demand for contraception.

To date, the growing body of public health literature using some aspects of CAS has been applied in epidemiology to the study of unpredictable diseases, such as cancer (Bell and Koithan 2006), HIV/AIDS (Perrin *et al.* 2010) or the flu and other infectious diseases (Longini *et al.* 2007; Epstein 2009; Hooten *et al.* 2010; Perlroth *et al.* 2010). Some studies also use CAS theories to describe and explain the effects of the physical, social and economic environment on health (Auchincloss and Diez Roux 2008; Auchincloss *et al.* 2011). Another body of literature describes how CAS can be applied to studying the behaviour of health care organizations, with a particular focus on determining what strategies work and why others do not, as well as identifying levers of influence for improving management (Miller *et al.* 1998; Anderson and McDaniel 2000; McDaniel *et al.* 2009; Jordon *et al.* 2010). Finally, CAS theory can help model the effects of different policy options on health (Anderson *et al.* 2007).

The theories and methodologies underlying CAS have been underutilized for understanding health systems processes such as scaling up. Health systems, especially in developing countries, are comprised of highly heterogeneous groups of actors (e.g. many types of health care providers, managers, policy-makers, patients, regulators, etc.) intervening at multiple levels through a variety of services and functions. The interconnectedness of actors and their dynamic interactions across the health system closely resemble the characteristics of CAS (Holland 1992; Tan *et al.* 2005; Rickles *et al.* 2007; World Bank 2007; De Savigny and Adam 2009; Keshavarz *et al.* 2010).

Scaling up in health is more than the expansion of coverage of health services. It can be defined as a set of processes that lead to expanded and sustainable coverage of services, and involves strengthening the capacity of delivery organizations, increasing diversity and robustness of funding and management arrangements, and growing the system's overall capabilities to add more services or to integrate services (Uvin 1995; Subramanian *et al.* 2010). The specific pathways through which scaling up occurs are as different as the contexts in which they emerge. Whereas some existing literature describes health systems as CAS in wealthy countries (Tan *et al.* 2005; Leischow and Milstein 2006; Van Wave *et al.* 2010), the application of CAS theories and methods to health systems in developing countries is even less advanced.
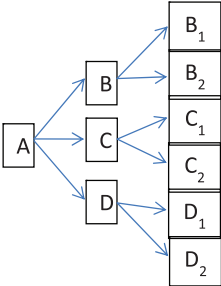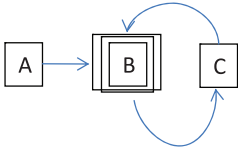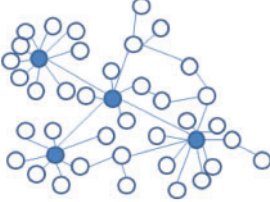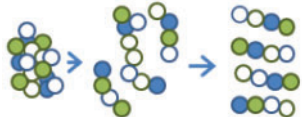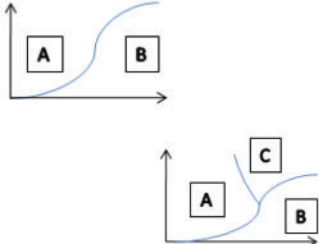
Complex pathways and health systems

The complexity of health interventions, which jointly considers technical complexity, delivery and usage characteristics, as well as implementation capacity, has been recognized as a constraint to implementation that needs to be managed to increase coverage (Gericke *et al.* 2005). However, there has been almost no analysis that examines the pathways involved in the process of scaling up health services. The few studies that touch upon this issue focus either on establishing the link between complexity and health services (Tan *et al.* 2005), or describing how change and innovation occurs in complex health care organizations (Longo 2007; McDaniel *et al.* 2009). Furthermore, there is no unifying theory that can account for how scaling up of health services actually occurs across countries or types of service, though at least six distinct conceptual models for scaling up health services have been described in the literature (Subramanian *et al.* 2010).

Through our reading of the literature, we identified the following CAS phenomena that are relevant to understanding health systems as complex adaptive systems, as well as the pathways for scaling up health services (Table 1).

Path dependence

Path dependence is an important phenomenon in the physical and social sciences, and describes that 'history matters' by demonstrating how non-reversible processes have similar starting points yet lead to different outcomes, even if they follow the same rules (Rickles *et al.* 2007). Outcomes are sensitive not only to initial conditions, but also to bifurcations and choices made along the way, so that single events can have system-wide effects that persist for a long time. Path dependence complicates predictions of the system's evolution over time and often occurs when there are rapid changes in technologies and heterogeneity in the types of actors involved. For example, early entry and success in a market often force rivals to co-operate on the question of standards and compatibility of technology, as was the case for national grid voltages, the QWERTY keyboard, railway gauges or vaccines. Any one of the present-day standards may not be selected today as the most efficient if not for its historical advantages or the transaction costs required to change standards. There is considerable diversity in the codification of health technologies, pharmaceuticals and services standards across countries due to historical preferences and local regulatory processes and actors.

Table 1 Examples of phenomena in complex adaptive systems (CAS)

CAS phenomena	Definition	Health sector examples
Path dependence	• Non-reversible processes have similar starting points yet lead to different outcomes, even if they follow the same rules, and outcomes are sensitive not only to initial conditions, but also to bifurcations and choices made along the way	• Health reforms such as introduction of social health insurance or quality assurance programmes may work well in one country but cannot be simply copied to a developing country and have similar results • Adoption of different standards for health technology in different countries

Feedback	• Happens when an output of a process within the system is fed back as an input into the same system:
	
	  ○ Positive feedback increases the rate of change of a factor towards an extreme in one direction
	  ○ Negative feedback modulates the direction of change
		• 'Vicious circles' between poverty and ill health; or malnutrition and infection
		• Swings in the prices or demand for certain health services
		• How standardized modes of health care delivery continue to serve the same populations, but fail to reach the poor

Scale-free networks	• Structures which are dominated by a few focal points or hubs with an unlimited number of links, following a power-law distribution	• Rapid pandemic disease transmission • The persistence of slow-spreading viruses to combat eradication • The disproportionate effect of influencing highly connected members of a sexual network on the transmission of sexually transmitted infections • The adoption of new health practices disproportionately influenced by 'hub' individuals
Emergent behaviour	• The spontaneous creation of order, which appears when smaller entities on their own jointly contribute to organized behaviours as a collective, resulting in the whole being greater and more complex than the sum of the parts	• Why health workers can suddenly organize to go on strike • How informal providers form organizations to protect practices in their trade
Phase transitions	• Events that occur when radical changes take place in the features of system parameters as they reach certain critical points	• 'Tipping points' in health services, leading to sudden changes in demand for health services or changes in referral patterns • How epidemic thresholds or herd immunity develops • Changes in collaboration–competition behaviours and referral patterns for patients within and across health facilities

Ball (2004) observed that such aggregation around standards is rarely created or enforced by legislation alone or agreed to by an industry, but more frequently involves the uniting of organizations and alliances related to market forces.

There are also relevant institutional examples from the health sector. It has been argued that the British National Health Service is a product of a particular cultural legacy that continues to determine the success of reform efforts (Greener 2006). Similarly, Bloom and Standing (2008) argue that you cannot simply copy health reforms from advanced market economies (like creating national health services in post-colonial states, or introducing internal markets in the public sector), and expect them to work in countries that have not had the political processes or institutions (e.g. for health

insurance or quality assurance regulation) in place to make them work. Much of the focus on scaling up health interventions in developing countries pays little attention to organizational arrangements needed to support the spread of access to health services.

Feedback loops

Feedback loops occur when an output of a process within the system is fed back as an input into the same system (Rickles *et al.* 2007). Positive feedback increases the rate of change of a factor towards an extreme in one direction (i.e. is self-reinforcing), whereas negative feedback modulates the direction of change (i.e. is balancing). Some feedback mechanisms can also lead to repetitive behaviours (or dead-end loops). In general, feedback loops reinforce common perceptions that the 'rich get richer', and the poor are left behind. In health, feedback loops have been used to describe 'vicious circles', for example between poverty and ill health or malnutrition and infection.

Feedback loops have been used to analyse variations in supply and demand for health care services. For example, studies have described feedback loops between individual and community health. Typically called 'neighbourhood effects' or 'place effects', these phenomena capture how an individual's community and environment can affect that individual's health in both the short term and the long term. Most such studies about 'neighbourhood effects' have been based in developed countries (Sampson *et al.* 2002; Fukuda *et al.* 2005; Wen and Christakis 2005), though with some applications in developing ones (Montgomery and Hewett 2004).

Studies on provider practice and variation capture the heterogeneity in provider behaviour and how clinical practices become reinforced within provider networks. On one hand, these analyses have uncovered practices inconsistent with state-of-the-art evidence-based medicine, which resulted in the provision of ineffective care (Fisher and Wennberg 2003; Busato and Kunzi 2008; Krumholz 2008; Ibáñez *et al.* 2009). On the other, they also helped to identify variation in provider practice connected to quality improvement and the diffusion of innovation (Fisher and Wennberg 2003).

Scale-free networks

Scale-free networks are characterized by a structure which is dominated by a few focal points or hubs with an unlimited number of links, following a power law distribution. They are not, in contrast to previous beliefs, comprised of randomly connected actors with a similar number of links to one another (Barabasi and Bonabeau 2003). One implication is that they have heavy-tailed distributions, so that extreme events happen much more frequently than is expected when one assumes a world of so-called 'normal' distribution. Stock markets, the World Wide Web, power grids, business alliances and the human brain are all examples of systems in which scale-free network structures have been identified. All such networks are known to maintain their cohesive structure in spite of breaks in random ties, such that the overall network remains undisturbed despite, for example, multiple daily minor disruptions across the internet or errors in cell mutations (Barabasi and Bonabeau 2003). Yet the same is not true when networks are faced with co-ordinated damage on the major hubs they rely on, such as when viruses enter a network through key sites or key cellular structures or organs are damaged. Feedback loops within a network can lead to chain reactions (also called 'failure cascades' or 'domino effects') that can lead to epidemic spreading of disease or the sudden collapse of markets (e.g. global financial markets or local health insurance markets) that depend on commonly held perceptions of trust.

Scale-free networks are particularly important in scaling up health services, because they can provide insights into the diffusion of health knowledge, technology and practices that are central to questions of increasing access to services. For example, networks with scale-free characteristics have been identified as key in the diffusion of knowledge about child health, as well as in overcoming barriers to access to child immunization services in Ghana (Andrzejewski *et al.* 2009) and in Ethiopia (Kiros and White 2004). In Kenya, understanding networks was shown to be important in how to change norms about unhealthy community practices (Hayford 2005). Networks are also useful for understanding how and why new health care practices and technologies, such as electronic medical records, are adopted or rejected (Zheng *et al.* 2010).

Emergent behaviour

Emergent behaviour, or the spontaneous creation of order, appears when smaller entities on their own jointly contribute to organized behaviours as a collective, resulting in the whole being greater and more complex than the sum of the parts (Rickles *et al.* 2007). Emergent behaviour can refer to any kind of learning or new pattern that emerges from the complex interactions of a system's components. The flocking behaviour of birds is a common example of how animals organize themselves. Humans self-organize in many ways, particularly in decentralized systems and as a way of establishing social norms, though not always with the most optimal results. The sudden transformation of a peaceful gathering into a violent one without planning is a more obviously harmful behaviour.

In the health sector, emergent behaviour can be seen when informal sector health providers form organizations to protect practices in their trade, or when health workers suddenly organize to go on strike. In environments where central regulation of health systems has been ineffective, self-organization and self-control of a health system is an important means of regulating health services (Bloom *et al.* 2008b). Because emergent behaviour may be particularly difficult to predict, plans for scaling up need to monitor and adapt to such events.

Phase transitions

Phase transitions are tipping points that occur when radical changes take place in the features of system parameters as they reach certain critical points (Rickles *et al.* 2007). The transformation from one phase to another has frequently been described in the physical sciences when substances change between gases, liquids and solids. In nature, they may occur abruptly (e.g. water at its boiling point), or gradually until a critical point is reached (e.g. the loss of magnetization as temperature changes).

In a health system, abrupt changes are unusual. However, transitions have often been described as threshold effects. Nonetheless, particularly in the process of scaling up, it is useful to identify the conditions under which both rapid and gradual transitions can occur, whether around the rapid adoption of a policy stalled for years, changes in social norms concerning health behaviours, or new demand for health services. At the global level, a phase transition was observed through the rapid scale-up of HIV/AIDS services as a result of a drop in treatment prices and the large-scale efforts of global initiatives. The rapid spread of results-based financing programmes in Sub-Saharan Africa in response to some evidence of health outcome improvements, coupled with a large injection of funding from development partners, provides another potential example. At the local level, phase transitions can be observed through the work of 'champions' who, in a relatively short time, can shape and set in motion stalled initiatives and programmes.

How CAS phenomena can inform the scaling up of health services

The lens of CAS opens up a deeper understanding of how to effect change in health systems, including the pathways for increasing and sustaining coverage of effective interventions. It proposes a shift in thinking from the current models around scaling up health services, which revolve around linear, predictable processes, to models that embrace uncertainty, non-linear processes, the uniqueness of local context and emergent characteristics. We were unable to identify specific examples where scaling up has been explored through these phenomena. However, a wide variety of theories and methodologies have been developed to understand complexity in a multi-disciplinary fashion and to guide the more conventional cycles of programme planning, implementation, monitoring and evaluation in future scaling up efforts. These include network analysis, scenario modelling, non-equilibrium statistics, systems theory and agent-based modelling, among others (Helbing 2009).

Planning, with an understanding of CAS and the need for ongoing research, can inform future programme implementation for scaling up health services. For example, Miller and colleagues compiled cross-sectional case studies of highly heterogeneous primary health care practices in order to understand their dynamic 'internal models' and to identify 'critical leverage points for change' (Miller *et al*. 1998). The planning phase also provides the opportunity for the identification and analysis of key stakeholders, and the identification of linkages with non-health sectors. Social network analyses can be used to explore the critical relationships between networks of organizations and individuals that can either drive or block the successful implementation of scaling-up activities. Explorations of the local context can deepen the understanding of path-dependent actions and consequences. Scenario-building or scenario-planning activities, such as the development of virtual worlds, can engage decision-makers in various simulated scenarios to test their abilities to anticipate and adapt to changing conditions (Neiner *et al*. 2004; Sterman 2006). Dynamic agent-based models, which show how interacting agents following a set of rules change over time to develop new systems (Auchincloss and Diez Roux 2008), can be used for identifying CAS phenomena, particularly feedback loops and emergent behaviour, that can be used to guide interventions in a CAS. For example, agent-based models have provided simulations of immunization demand in Uganda (Rwashana *et al*. 2009) and the spread of pandemics (Burke *et al*. 2006) to support programmatic decision-making. Agent-based models have also been utilized as a complement to traditional epidemiology methods when analysing neighbourhood or place effects on health (Auchincloss and Diez Roux 2008), and as a tool for modelling policy options (Anderson *et al*. 2007) and the adoption of new guidelines and technologies (Verella and Patek 2009).

Planning for unpredictability may be the most important, and perhaps also counterintuitive, action in the planning phases of scaling up in CAS (Rowe and Hogarth 2005). Rowe and colleagues explain that when approaching a system as CAS in their own experience, 'expected outcomes were not mapped out in advance, rather it was planned that a future, which met the expectations and needs of external stakeholders, practitioners and local people, would emerge through a continual process of learning, envisioning, clarifying and experimenting' (Rowe and Hogarth 2005). Instead of aiming to 'engineer' change, an intervention should be focused on creating the conditions within which change would emerge (Rowe and Hogarth 2005).

During the **implementation and monitoring** of scaling up, an understanding of CAS would emphasize the importance of adaptation, learning and flexibility to emerging issues rather than the rigid following of initial plans. The adaptation of tools, global standards and processes should be perceived as an iterative process, guided by local responses to the intervention and monitoring of both intended and unintended interactions between the dynamic health and non-health stakeholders involved. The use of data is central to maintaining effectiveness, transparency and accountability during implementation, which is important in processes that involve many different types of stakeholders. In addition to using traditional statistics, methods such as small-area variation analyses can help to identify and then explain variations in medical practice or community behaviour. Facilitating and monitoring dialogue among diverse stakeholders can be important to any programme, and especially to scaling up. For example, Norman and colleagues used CAS principles and modern communication technology to develop a model for creating networks of networks in order to enable relationship-building and transparent dialogue among diverse actors (Norman *et al*. 2010). The availability of robust time series data is more important to successful implementation and monitoring in CAS. The use of phase plots for time series data has been recognized by some authors as a method for identifying and visualizing recurring patterns in the activities of CAS organizations (Cheng and Ven 1996; Clancy 2007); however, no examples of their application have been identified.

The **evaluation** of health programmes, especially impact evaluations, is difficult even when not operating within a CAS framework (Victora *et al*. 2005). The analysis of CAS phenomena in scaling up would be a useful complement to traditional evaluation practices in that it would be likely to provide rich

insights into both intended and unintended consequences, as well as the process through which they manifest themselves in a health system. Unintended consequences that need to be considered when scaling up health services include populations that become marginalized as a result of projects that focus on a limited set of health services, or deliver services in a way that excludes certain populations (e.g. many health services are intended to reach the poor, but empiric analyses show they often fail to reach those most in need). Disorganized health-related markets are the norm in developing countries. Where institutions are not in place to assure the quality of drugs or health services, or where informal payments undermine formal financing mechanisms, the effects can be felt in many areas where the usual 'control' mechanisms are not working. Another consequence of projects that create islands of excellence is that they are not sustainable, but depend on short-term external resources that are not sustained when a project is completed, crowding out other actors during the project phase rather than integrating or complementing their work. While the experience of using CAS in evaluating scaling up is not well developed and concrete examples could not be identified, it is clear that a combination of methodologies will be needed to provide a complete picture of effects.

Conclusion

Health care providers, patients, officials and the many other stakeholders in a health system interact with each other through a web of complicated relationships, influenced by communities of practice, neighbourhoods and social networks. Scaling up health services involves intervening in these networks and engaging in dynamic health system relationships. The blueprint approaches commonly found in global health initiatives, with an emphasis on detailed initial planning and inflexible designs, are not a good match for addressing the adaptive properties of dynamic pathways for expanding health services. These approaches have often created rapid, short-term change at the expense of building sustainable health systems service-delivery processes and institutions in the long term.

Understanding the pathways for change in a CAS has much to offer. CAS phenomena can explain why a small stimulus in a health sector can create large or rapid change, or why large-scale inputs and programmes may lead to modest change or unintended consequences. It may also identify opportunities to create more effective health services or reach marginalized target groups, such as by identifying critical points for phase transitions, emergent behaviours, or using growing or untapped networks to spread effective practices, or anticipating unintended consequences. Frequent analysis of data on the implementation of health services and their effects is a common need for effectively understanding and intervening in a health system considered as a CAS. Failure to treat health system processes as CAS, and ignoring the phenomena which lie at the core of *how* services are scaled up at the country level, will compromise the opportunity to support locally relevant development of sustainable health systems and to make progress towards the MDGs.

The experience with incorporating CAS theories and phenomena into scaling up and other health systems processes is limited, and the relevant literature scattered across a large number of thematic areas. There is much more to learn about how CAS theory can be applied in practice to the process of scaling up, particularly in developing countries, and how CAS can help health system actors better understand and develop linkages with non-health sectors. Therefore, examining health systems processes from a CAS perspective is an important and underexplored research area, which promises to provide interesting and useful insights for health theory and practice.

Dynamic interactions, multiple perspectives and unique local conditions are on-the-ground realities in scaling up health services. As the MDGs approach their deadlines in 2015, it is critical to invest time and effort into applying other models and methodologies, including CAS perspectives for health system strengthening. This can be done by building flexibility in planning, using data in frequent cycles of adaptation, experimentation and assessment, and incorporating key actors in these processes (Peters *et al*. 2009). The old assumptions have led to disappointed expectations about how to scale up health services, and offer little insight on how to scale up effective interventions in the future. The alternative perspectives offered by CAS may better reflect the complex and changing nature of health systems, and create new opportunities for understanding and scaling up health services.

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