

The Health System Dynamics Framework:

The introduction of an analytical model for health system analysis and its application to two case-studies

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Abstract

Frameworks can clarify concepts and improve understanding of underlying mechanisms in the domain of health systems research and strengthening. Many existing frameworks have a limited capacity to analyze interactions and equilibriums within a health system overlooking values as an underlying steering mechanism. This paper introduces the health system dynamics framework and demonstrates its application as a tool for analysis and modelling.

The added value of this framework is: 1) consideration of different levels of a health system and tracing how interventions or events at one level influence other elements and other levels; 2) emphasizes the importance of values; 3) a central axis linking governance, human resources, service delivery and population, and 4) taking into account the key elements of complexity in analysis and strategy development. We urge the analysis of individual health systems and meta-analysis, for a better understanding of their functioning and strengthening.

Keywords: Health systems; health systems research; health systems strengthening; conceptual frameworks; complexity

The Health System Dynamics Framework:

The introduction of an analytical model for health system analysis and its application to two case-studies

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I. Introduction

Much more than clinical medicine, the domain of public health – and health policy and systems as a part of it - is shaped by dynamic alliances between actors from scientific, policy and operational backgrounds as well as the public in the form of patient groups, consumer associations and other interest groups and actors from the private sector. This strong influence of stakeholders from different backgrounds, each with their own logic and paradigms, contributes to the perceived lack of clarity.

The organization of health systems has long been considered more an operational problem and less a domain for research. This changed with the re-emerging attention for health systems strengthening and the demand of policy-makers for evidence to support their decisions. The scientific community has oriented itself towards health systems research, presently defining and developing the domain (Bennett et al. 2011; Gilson et al. 2011; Mills 2011; Sheikh et al. 2011). The scope of relevant research questions, approaches and methods in this domain is vast, but a recurrent element in the way of thinking is to start from a conceptual framework to both frame and interpret empirical research. Health system strengthening, universal coverage and primary health care – pivotal topics in the current health systems research domain – are abstract and multi-interpretable concepts. Frameworks can thus indeed help in clarifying the concept and can in turn point to linkages to other concepts, leading to a better understanding of underlying mechanisms, determinants of observed phenomena or a novel pathway to change.

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A number of health systems frameworks have been published over the last decade. These have served different purposes, from describing or analyzing existing situations to being predictive or prescriptive. Comprehensive frameworks at the national level include the widely used World Health Organization (WHO) models (World Health Organization 2000;World Health Organization 2007;World Health Organization 2009), some of which were adapted for evaluation (World Health Organization 2008b) or participatory planning (de Savigny and Adam, 2009). Other frameworks focus on specific “building blocks”, the interaction between actors, or on the interface between different components (Atun et al. 2009;World Health Organization 2005;World Health Organization 2008a;World Health Organization 2010).¹¹ (Shakarishvili et al. 2010) give a comprehensive and analytical overview of the differences in existing health system frameworks.

Many of the existing frameworks have a limited capacity to analyze the interactions and equilibriums between different elements of a health system., Most, moreover, do not focus on values as important steering mechanisms for the behavior of people and thus for choices and processes in a health system. In response to these shortfalls, we developed a framework for description and analysis of health systems dynamics, which consists of ten elements focusing on system interactions (van Olmen et al. 2010b). This paper introduces the health system dynamics framework and illustrates how it has been applied in two cases of health systems research. The aim of our research is to explain this modelization and demonstrate how it can serve as a tool for analysis and modelling, in health systems research and practice.

II. Methods

Developing the health system dynamics framework comprised of five stages, which partly ran in parallel: 1) an historical analysis of the evolution of ideas about health systems; 2) a literature review of health systems and frameworks for health system strengthening; 3) a series of three expert meetings at the Institute of Tropical Medicine Antwerp assessing the impact value of literature through specialized perspectives and to elucidate underlying operational values; 4) the drafting of a concept paper which was subject to internal and external peer review; and 5) the application of the framework in assignments with M.sc. students and in field studies, some of which were published or presented at scientific conferences (Boussery et al. 2011;Hôpitaux Universitaires de Genève 2010;Van Damme et al. 2011b).

III. The Health System Dynamics Framework

While the health system dynamics framework incorporates elements of existing frameworks, such as WHO building blocks (World Health Organization 2007), it goes further than most. First, it emphasizes that a health system should be geared towards outcomes and goals, but jointly adds that they are, and indeed should be, based on explicit choices of values and principles. Second, the framework considers some elements to be more important than others. We assert that the organization and delivery of health care services is the core of the central axis that includes leadership, governance as well as interaction with the population and other actors. This brings us to a framework consisting of ten elements and their dynamic interactions: 1) goals and outcomes; 2) values and principles; 3) service

¹¹ (Shakarishvili et al. 2010) give a comprehensive and analytical overview of the differences in existing health system frameworks.

delivery; 4) the population; 5) the context; 6) leadership & governance; and 7-10) the organization of resources (finances; human resources; infrastructure and supplies; knowledge and information).

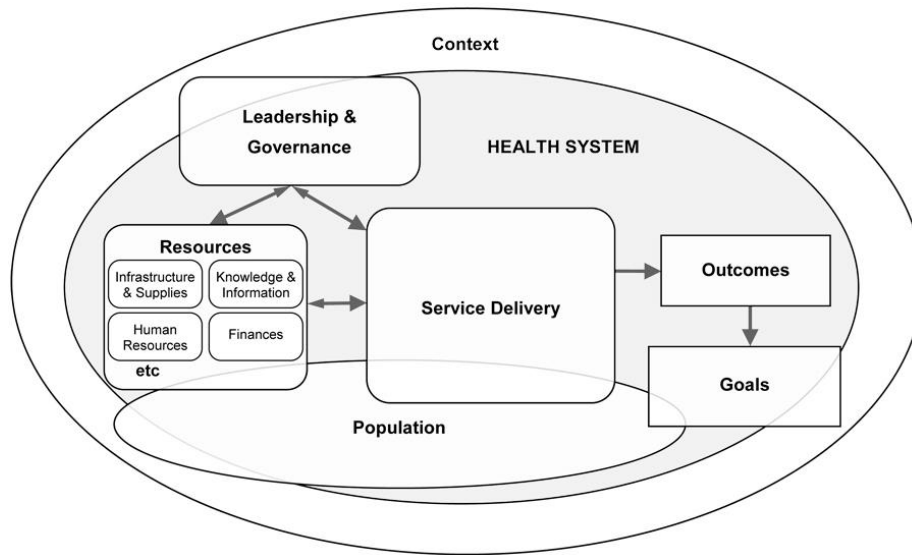


Figure 1: The health system dynamics framework

The dynamic dimension of this framework is essentially based upon the notion of complex adaptive systems (Paina et al. 2011). Health systems are in essence social systems, composed of many actors and organizations that interact with each other. Given the central role of actors and their interrelations, processes of communication, coordination and regulation often result as responses that are non-linear and, at best, hard to predict. Furthermore, interactions between elements take the shape of feedback loops and contribute to generative processes. These interactions lead to the emergence of temporary equilibriums. We would do well to note that health systems are also open systems, drawing and abstracting resources from their environment, but also responding to it. Finally, complex adaptive systems are path dependent: historical analysis can help elucidate how strategic choices are made when a health system needs to respond to opportunities and constraints. Using the Health System Dynamics framework to describe and analyze a health system calls for such elements to be taken into account as a logical necessity.

We will now discuss the elements of the framework in greater detail, highlighting the central axis and interactions between the respective blocks.

IV. Outcomes and Goals

Similarly to the WHO (World Health Organization 2000), we define outcomes as the direct results of the organization of health care delivery (e.g. universal coverage, quality of care and responsiveness), and goals as the expected impact in terms of improved health and social and financial protection. Attainment of such goals is not dependent on the health system alone, hence their place in the framework sooner orbit the health system. The integrated framework thus acknowledges that social, economic, political and other factors are major determinants of

health and the well-being of people.

Improved health and wellbeing is the first goal of any health system. The holistic definition of health as ‘physical, mental and social well-being’ (Alma Ata 1978;World Health Organization 1946) has been widely accepted although in reality the definition is often narrowed down to the mere ‘absence of disease’ as both measure and gauge. The increasing number of people with life-long conditions has led to advocacy for a broader definition, which again would take into account people’s resilience or capability to cope with, maintain or restore one’s integrity, equilibrium and sense of wellbeing (Huber et al. 2011).

Financial protection refers to the economic consequences of disease and in practice signals arrangements for access to care of decent quality and for ensuring income and financial support in case of illness. The ability of a country’s health system to offer financial protection to its population is an important factor in creating trust towards the health system. Social protection goes further and addresses the vulnerability of people who have fallen ill through services for relief from deprivation thus tackling more structural causes of inequity and power imbalances (Michielsen et al. 2010).

The definition of the goals and the choice for striking a particular balance between them reflect the interests and values of the actors at both central and local levels. This equilibrium is the result of power balances, reflecting domestic institutional arrangements as well as the influence of global, bilateral and other external actors. It is a key function of governance not only to make these different values and tensions explicit, but also to guarantee that accountability mechanisms are in place to ensure a fair decision-making process and to provide accounts of the choices made.

The outcomes of a health system include *access* and *coverage*, which are important determinants in the utilization and actualization of health services. Access relates to how many people have access to a health facility or particular service and takes the users’ perspective into account, entailing dimensions of affordability, acceptability and geographical access. Coverage is used to determine the ratio of the population that benefits from a specific service or intervention, such as vaccination or health insurance. In its 2008 World Health Report on universal coverage for example, the WHO defined it more broadly as “universal access to a specified package of health benefits and social protection”, which can be assessed in depth (scope of the package), width (reach of population having access) or height (relative part of cost that is covered by the package) (World Health Organization 2008a). The evaluation of access and utilization is, however, conceptually and methodologically difficult since there are no universally valid standards.

Quality of care is a multi-dimensional concept. It is defined differently by users, funders, providers and managers. Definitions of quality of care and other health related interventions usually emphasize a mix of the following components: effectiveness; efficiency; safety; patient-centeredness; integrated care (including curative care, prevention and health promotion); timeliness and continuity (within and beyond a single episode of disease and beyond the boundaries of a health care organization) (Institute of Medicine 2001;Unger et al. 2003b;World Health Organization 2008a). We add the dimension of enablement or empowerment, in line with the value of ‘ensuring (the) autonomy’ of people (Howie et al. 2000;van Olmen et al. 2010a).

Responsiveness entails reacting effectively to the needs and demands of the population and its different subpopulations and vulnerable groups. The content of the minimum package of activities should be informed both by the burden of disease and by the perceived needs of the population. It is a function of governance weighing the technical arguments; perceived needs; existing values and principles, and to decide which trade-offs to make, taking into account the infrastructure, level of development and capacity of implementation. This definition surpasses the definition of the WHO in its WHR 2000, which focuses on the individual expectations of people versus the health care provider (World Health Organization 2000).

V. Values and Principles

Health systems are not mechanically engineered structures to deliver health care, but social institutions, shaped by values, and likewise emanating values through their structure, institutions and respective inter-personal relationships (Freedman 2005; Gilson 2003). These values and principles vary between societies and among actors. Their effects on the health system are thus channelled through power structures and relations within society where certain values relate to processes such as effectiveness, efficiency and sustainability. Values such as solidarity, equity and autonomy reflect aspirations or ideological convictions. The latter include positioning on issues: a cosmopolitan versus a national paradigm of social justice for example, or a vision of health as an economic versus a social good (Evans et al. 1990; Roberts et al. 2004b). Since the pursuit of values may have opposing effects and since actors may indeed value outcomes and aims differently on the basis of their own set of values, tensions are likely to arise.

Many low- and middle-income countries (LMIC) face the tension of choosing between priorities for the short term and broader objectives on the longer term. Focused approaches can contribute to rapid results in particular fields, such as the decrease in the burden of malaria, but this often has the opportunity cost of neglecting mid- and long-term cross-cutting strategies in the health system (Richard et al. 2011). Priority-setting thus faces the challenge of choosing between options with different goals that emphasise different values. Whichever tensions and values at stake, their relative weight is unique to each context and paramount in the determination of priorities and processes within the health system. An essential function of health system governance is therefore to seek a balance, taking into account the values and principles of actors in the system through a process of negotiation on the basis of fair processes, whilst (1) being accountable to the ultimate beneficiary – the population – and, (2) minimizing harmful effects, especially for the most vulnerable groups. These choices ideally occur in-country, at the appropriate level – central or more decentralized – depending on the type of choice and the institutional arrangements therein articulated.

VI. Context

Because health systems are essentially open systems, they are shaped and influenced by wider societal change. This means that every country has a health system that reflects its political decision-making and historical evolution (Riley 2008). It also implies a constant need for response to new developments and transitions, such as an ever-evolving disease burden composition; new technologies; changing expectations of patients and providers; increased availability of information and the changing roles of the state in the health and social sectors.

An analysis of the national context encompasses a governance analysis covering recent evolutions in the domestic political regime (including regulatory system); institutional arrangements (relations state, private sector and civil society organizations); the organization of the public sector (public sector reform including decentralization) and public financial management. The policy context of a health system at each level cannot be analysed in isolation – local, national, regional and global – as each of these levels dovetails others through power configurations and dynamics. Global financial and economic regimes and policies have an important influence on national policies in LIC. Many global and national actors interact directly with local health service and program managers, politicians and other stakeholders.

Above, we referred to the crucial influence of wider social determinants on health system outcomes and goals. There has, for instance, been a longstanding recognition of the influence of water and sanitation on the burden of infectious diseases and of good education as a determinant for maternal and child health. Furthermore, the

framework of the Commission on Social Determinants and Health points to the broad impact of social and economic policies on health and social protection and its distribution in the population (World Health Organization 2008c). Analysis of health care organization for non-communicable diseases points to the large role of the private sector, especially the pharmaceutical, tobacco and food industry, in shaping the environment and the concordant behavior of people (Labonte et al. 2011).

VII. Service Delivery

Health service delivery is the process through which providers, health facilities, programmes and policies are coordinated and implemented so as to reach the goals of the health system. It relates to services and activities with the primary purpose to improve health and includes primary prevention; secondary prevention; curative care and rehabilitation (Marchal et al. 2011). This means that a wide set of activities needs to be organised, from focused activities to general services. There are several ways to classify the delivery of this wide range of activities and services. Criteria include: the focus on individuals/families or on the total population (Boussery et al. 2011); the need for permanent availability or the possibility for intermittent scheduling (Van Damme et al. 2011a) or the extent to which services are transaction-intensive, discretionary and subject to information asymmetry (World Bank 2004a).

Scarcity of resources and the respective need for rationing requires prioritization of interventions. In practice, health delivery interventions are often ‘bundled’. The choice of integrating interventions in one delivery platform is informed by intervention-related characteristics (such as the possibility to standardize and delegate activities or the added value of bundling); the capacity of the health service supposed to implement the interventions; the capacity of the health system steward to coordinate actors and give managerial support, contextual factors (e.g. disease burden, regulation capacity) and the historical evolutions (path-dependency) (Unger et al. 2003a).

Service providers can be categorized as private or public; for-profit or not-for-profit; formal or informal; professional or non-professional; allopathic or traditional; remunerated or voluntary. In practice, hybrid forms exist and boundaries are often blurred. In most health systems, providers indeed constitute a complex mix (often referred to as ‘mixed or ‘pluralistic’ health systems), partly as a result of planning and organization and partly due to personal initiative or spontaneous evolution or forces in the wider context (Meessen et al. 2011; Nishtar 2010). We believe that at the local level, health providers should operate within an integrated health system where there are no gaps in access, where composing tiers operate complementarily rather than competing and where there is an optimal flow of patients and information so that the patient is helped at the most appropriate level (Unger et al. 1995). The first-line health and social services are at the core of this system (World Health Organization 2008a), supported by an effective second level (including hospitals). Integrated systems require good coordination of all involved actors, which, given the pluralistic nature of most systems, is all the more essential (Bloom et al. 2001).

People seek to improve their health in many ways. Health seeking behaviour is diversified, based upon pragmatic and eclectic decisions, not only influenced by physical, financial and socio-cultural factors, but also by the accessibility, scope of services and the reputation of, and trust in, a provider or facility. This also involves self-referral and discontinuation of treatment. Mutual trust between health providers and the population and patients is a determinant as well as a consequence of the quality of care (Berlan et al. 2011). Trust of patients is influenced by the perceived fairness and behaviour and respect of individual providers, but likewise by the institutional set-up of care and by peoples experiences with public services in general (Gilson et al. 2005).

VIII. Population

The population is involved in the health system as patients or customers, but also as citizens having rights and obligations and as funders or even suppliers of care (Frenk 2010). There has been increasing attention for people as producers of health and health care, with attention for the (spontaneous) activities of individuals and the collective action of groups in the community such as self-help groups; patient organizations; peer-groups and informal caregivers.

The concept of participation includes a wide variety of approaches on a scale of increasing empowerment, from mobilizing people to contribute inputs, over common decision-making processes, to increased capacity and to autonomously recognizing and acting upon situations (Rifkin 2003). Empowerment at the individual and community level is widely recognized as an important goal, because it contributes to reducing inequities and bringing about desired social change (Gilson et al. 2007). At the community level, a strong community voice in relations with other actors in the health system, especially when priorities are set, is important. Empowerment implies the transformation of power relations that is likely to elicit resistance (van Olmen et al. 2010a). Empowerment of people, both at the individual and community level, calls for different approaches both at the supply and demand side that improve opportunities for voice (Perez et al. 2009), and also in the fair processes of decision-making to ensure that voices are heard and taken into account.

As much as providers' behaviour can be steered, so can that of people seeking health care. Examples of mechanisms influencing the demand for health service and health seeking behavior are the development of financial incentives (or barriers); voucher schemes and awareness campaigns about health risks or information about provider characteristics (Berlan et al. 2011; Peters et al. 2008). Some of these may provide leverage for improving the accountability of health providers towards service users.

IX. Governance

Governance entails policy guidance to the whole health system; coordination of actors and regulation of different functions; levels and actors in the system; optimal allocation of resources and ensuring accountability towards the population and all stakeholders.

Government actors have a central role in the steering of the health system, since they have a public mandate. Ensuring the protection of citizens against ill health and its social and financial consequences is an important element of their legitimacy as public servants. Government should play a mediating role between all stakeholders to promote equity, efficiency and sustainability and to ensure the public finality of the health system. In practice, however, the State's power is often undercut by forces at multiple levels (Reich 2002). Agreements with international organizations and donors, for instance, curb the State's autonomy to decide on macro-economic policies and this may subsequently impose limits on its role in the delivery of health services. Decentralization processes within States devolve responsibilities for the delivery of health services from central to local government structures. As a result, a variety of players, including market and civil society actors, politicians, professional organizations and cooperative structures, have an influence on governance.

The increased role of stakeholders at all levels and in different functions demands strong capacity in the ministry of health, its decentralized structures and local governments to take leadership and to steer pluralistic and fragmented systems into a satisfactory balance. It entails strategic vision, technical knowledge and information, consensus-building and negotiation skills, as well as the capacity to consider values and principles, but also the

ability to ensure effective participation and involvement of multiple stakeholders through transparent and fair processes. Furthermore, such involvement and linkage between different levels within the State and the health system is essential to facilitate the bottom-up influencing of policy-making and the implementation of policies.

Regulation is a major instrument to govern the health sector and includes rules, laws, guidelines and their enforcement, as well as professional and ethical rules and norms, and any kind of incentives acting upon actors (Mills et al. 2006). Lack of monitoring, insufficient knowledge and resources, diverging priorities and insufficient political commitment may cause gaps between the rules and their enforcement. The changing role of the State and the proliferation of actors have increased the importance of coordination as a governance tool. This implies the involvement of all stakeholders in discussion, decision-making and implementation. Again, it is up to State actors with a public mandate at central and peripheral levels to take the lead in creating and maintaining coordination mechanisms. At the decentralized level - the 'district' in many LIC - there is an important coordinating role for the teams heading that system. They are expected to organize the health services and health care on their territory in an efficient and effective manner, in line with national health policies but also to take into account the specific local needs and demands, coordinating with local authorities.

The 'essence' of accountability consists of having the obligation to answer questions regarding one's decisions or actions (Brinkerhoff 2003). In the health system, the obligation of accountability is situated at all levels, from provider-patient interaction, over the organizational meso-level to the relation of the ministry of health with government and the population. Accountability is a two-way relationship in which organizations are responsible but also held accountable by the users and the public at large (World Bank 2004b). This is greatly determined by general institutional arrangements of the State, such as the presence of the free press; transparency of decision-making and availability of information; the involvement of civil society and population representatives, and the level of corruption.

At operational facility level, various mechanisms for accountability have been used to varying degrees of success (Rifkin 2001). Recurrent problems in ensuring the accountability between health facilities and their users are caused by power differentials and information asymmetry, which hinder the capacity of populations to monitor providers, participate in decisions and, in general, claim their rights.

X. Organization of Resources

Financing

Financing involves the acquisition, pooling and allocation of financial resources in such a way that it effectively contributes to attaining the desired goals and outcomes. In essence, health financing needs to ensure access to services while protecting people against catastrophic health expenditure (World Health Organization 2008b). Health care financing modalities have a direct bearing on equity, efficiency and sustainability. The Commission on Macroeconomics and Health estimates the cost of a core package of activities at around US\$40 per person per year, although analysis of health system performance shows that a number of countries are able to perform well with less (Riley 2008). Since health financing always involves rationing, the decisions on priority-setting and allocation of resources have great implications, especially when resources run scarce (Palmer et al. 2004; Roberts et al. 2004a). The prime responsibility for revenue collection is located at the national level, because this is linked with government accountability to the population. There is, however, a strong plea for global social responsibility and for longstanding commitment of the international community to contribute to the health financing of the basic package for those countries too poor to raise sufficient funds internally (Ooms et al. 2009).

The way in which different health services are financed and how providers are paid, directly influences the type of services being delivered and how they are delivered. In the present reality with increased fragmentation in the health care

delivery and (donor and domestic) funder landscapes, there are many hybrid forms of input and output-based funding. Over the last 30 years, the role of market mechanisms, both formal and informal, has been increasing. This resulted in fee-for-service becoming a dominant payment modality. In such an environment, the government has an important role to correct market failures and to redistribute resources among the population so that health care is accessible to all according to need. For many poor people, this means that health services should be 'free at the point of delivery'. This implies a preference for prepayment by taxation, health insurance or a combination of both. Mechanisms to raise funds should contribute to equity and solidarity, and thus preferably involve progressive collection mechanisms. These principles make user fees the least desirable option, since they are regressive, limit access to care and provide no financial risk protection. If user fees exist, there should be effective arrangements for the protection of the poor.

Human resources

The transaction intensity of many health services makes professional staff one of the scarcest resources in many health systems. The *health workforce* can only meaningfully contribute to the performance of the HS if health workers are available, competent and performing up to standard. A comprehensive health workforce policy integrates planning and organization of training, recruitment, remuneration and deployment, adjusted to the evolving models of health care delivery, workloads and the evolution of the workforce (Marchal et al. 2003;Narasimhan et al. 2004). To create an enabling environment, human resource management ideally consists of a package of practices and strategies that balance financial and non-financial incentives with control measures and regulation, and maintain public-oriented values and ethics (Marchal et al. 2010). The wide array of health service organizations, each with different staff incentive structures, leads to big differences in staff availability, skill mix and capacities across sub-systems and between rural and urban areas. It is one of the functions of governance to regulate incentives, so as to reduce imbalances and tensions (Kalk 2011;Meessen et al. 2011c;Unger et al. 2008).

Infrastructure and supply of pharmaceuticals, technologies and goods

Developing the infrastructure of a health system means assuring that there are enough health facilities within proper reach of the population, which are equipped, maintained and adapted to the specific needs of those making use of it.

Essential medicines are a crucial commodity in any health system. Many LICs face problems in terms of poor availability and supply, poor quality, poor financial or geographical access, and the poor prescription and use of drugs. The oligopolies of big pharmaceutical companies, the lack of quality-assured sources and strong information asymmetries at different levels in the supply chain contribute to these problems. Globalization has moved the production of essential medicines from developed countries in less strongly regulated environments and the assessments of the manufacturing sites and the traceability of these products can be difficult.

Ensuring quality throughout the whole supply chain requires the identification of reliable producers, procurers and suppliers. In practice, this is often not the case. Currently, the WHO pre-qualification system only includes very few categories of drugs (Caudron et al. 2008). Drug regulating authorities in most LICs have too few resources to execute the necessary regulatory oversight to ensure quality, (Laing et al. 2001;World Health Organization.Regional Office for Africa 2009). In many countries, the central supply systems aggregating orders at different levels are vulnerable for hick-ups at different levels, affecting the functioning of the total chain.

Ensuring financial access to quality essential medicines entails adequate information on quality and prices, comprehension of international trade agreements and the capacity to negotiate prices and mark-ups in the national distribution system.

Essential medicines list and treatment guidelines are important steps in promoting the rational prescription

and use of medicines, which should be complemented by systems of control and support of provider behavior and increasing awareness on both the correct use and risk of irrational use.

Information & knowledge

Information and knowledge is needed for monitoring, evaluation and research, clinical decision-making, organizational management and planning, analysis of health trends and communication. The priority of routine information systems should be to develop and maintain their potential to contribute to sound decision-making, limiting the collection to data that are necessary for that purpose. Knowledge and information should flow optimally in all directions on a need-to-know basis, vertically and horizontally, so that the on-going processes of practice, education and research can feed into each other.

Other ways to generate and collect knowledge include surveillance, population census, civil registration, and research. Different types of knowledge are needed at policy, management or clinical level. This is reflected in a wide range of methods, from large-scale research focusing on effectiveness and impact to action research trying to improve existing practice (Peters et al. 2010). The processing of knowledge and information is greatly helped by developments in technology. New communication and information technology has a great potential to ease the processing, accessibility and use of information, both at system level and at individual patient record level.

Knowledge and understanding is supposed to inform decisions and actions. For this to be effective, knowledge and understanding must be shared in all directions, between people at different levels and at similar levels (Parkhurst et al. 2010). In reality however, knowledge management, planning and implementation (practice) are often located at different persons or structures, making the diffusion problematic. Networks and communities of practice with people from different levels, domains (research, policy, management and operations) and contexts can stimulate the exchange of knowledge, thereby reducing barriers to implementation. A comprehensive knowledge strategy covers all levels of the knowledge-value chain and fosters optimal collaboration between all knowledge holders (Meessen et al. 2011b).

XI. Putting the Framework into Practice

In the following two cases, we demonstrate how the health system dynamics model can be applied.

Case 1: the uncontrolled creation of medical schools in the DR Congo

Until 1990, there were only three medical schools in the whole Democratic Republic of Congo. Since then, there has been a boom of the supply side in the health and education sectors as a result of the economic liberalization policies instituted by the government. The ministries of health and education did not have substantial influence in regulation (e.g. of quality), coordination of involved organizations, or in the financing mechanisms. The first effect was an explosive increase in private medical schools that attracted huge numbers of students while often lacking adequate teaching facilities. In Katanga province (7.5 million people), there are three universities, one of which has six decentralized branches at other locations. The number of graduates has increased exponentially. Initially, new graduates were absorbed by health facilities. This soon stopped and those not hired by the government often entered the private sector, which boomed subsequently (Chenge et al. 2010a). Another consequence was that to cover staff cost, both public and private health facilities raised their prices. Utilization rates of many health facilities are low to very low. An evaluation of the medical care shows an increase in medical prescriptions, often without a rational basis (Chenge et al. 2010b).

This case illustrates how a policy of liberating the market for medical education can increase the number of health workers and health care facilities. However, if the aspect of quality control is neglected, then the competences

of these health workers, their distribution and the skill mix are easily distorted and thus the quality and efficiency of health care delivery jeopardized. In this particular case, the number of human resources has grown as a consequence of this policy, but the funding of the health system has not. The lack of accompanying measures, such as financing systems to employ newly graduate doctors in the public system, pushed them to the private sector in a non-regulated manner. Similarly, the unregulated increase of private facilities and the resulting increase of total supply do not improve access to qualitative and affordable care, and may even lead to crowding out of public facilities and to increasingly provider induced demand.

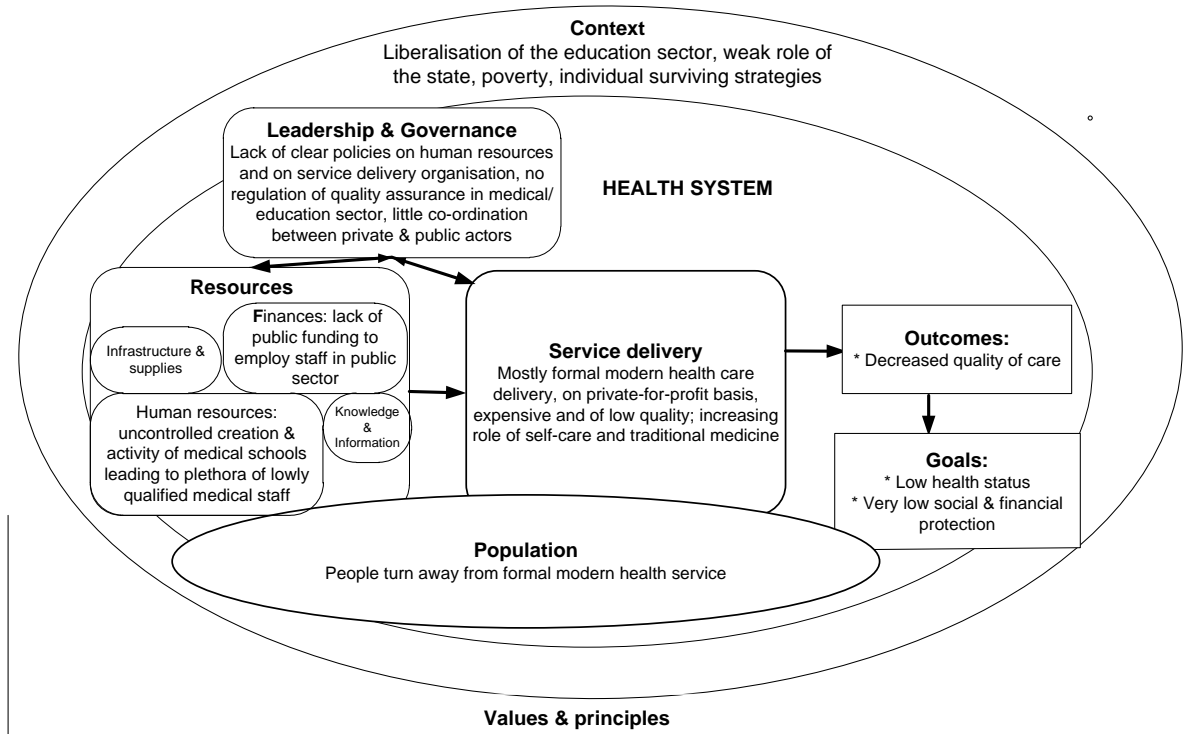


Figure 2: An illustration of the consequences of uncontrolled creation of medical schools in a province in the Democratic Republic of Congo (adapted from (Chenge et al. 2010b)

Case 2: Delivery of chronic disease care in a local health system in India

The second case is situated in India, which is undergoing an epidemiologic transition with chronic diseases becoming the leading cause of death and suffering (Reddy et al. 2005). The health systems dynamics framework was used to analyze the delivery of chronic disease care within the local health system of a poor urban district with almost 45 000 inhabitants in Bangalore, Kadugondanahalli (KG Halli). The district is changing due to urbanization and internal migration, resulting in big social, cultural and economic challenges, such as large numbers of people with few means and no residence, with poor access to welfare and healthcare services. Big infrastructural projects lead to displacement of health facilities to other areas. Urbanization in itself contributes to a rise in chronic conditions (Beaglehole et al. 2003). In this turbulent environment, it is difficult for the government to provide services for a rapidly growing population and to have an adequate overview of transitions and the spontaneous evolution of the markets such as health care.

The healthcare delivery system in this district is pluralistic, including government and private providers, practicing different healing traditions. The government and private subsector function more or less autonomously. The government has neither administrative oversight nor a strong regulating authority over the private subsector. Also at the operational level, there is very little collaboration between providers of both subsectors, with a lack of systems to organize referrals and the sharing of information. Most people with chronic diseases (80%) use private health care services, either first line providers or hospitals. The private subsector has more resources in terms of trained personnel, laboratory diagnostics and pharmaceutical supplies, but it charges clients on a fee-for-service basis. Out-of-pocket health care expenditure is high, whereby up to a quarter of households faces catastrophic expenditure levels. There is very little attention for continuity of care and risk monitoring, except for people living with tuberculosis and AIDS. If there is a coverage plan considering access to health care facilities, it is not balanced (facilities being hard to reach) and not comprehensive (private providers not taken into account).

The health systems dynamics framework allows to organize the observations that came from field research and facilitates identification of problems at different levels in the chain (Bhojani et al. 2011).

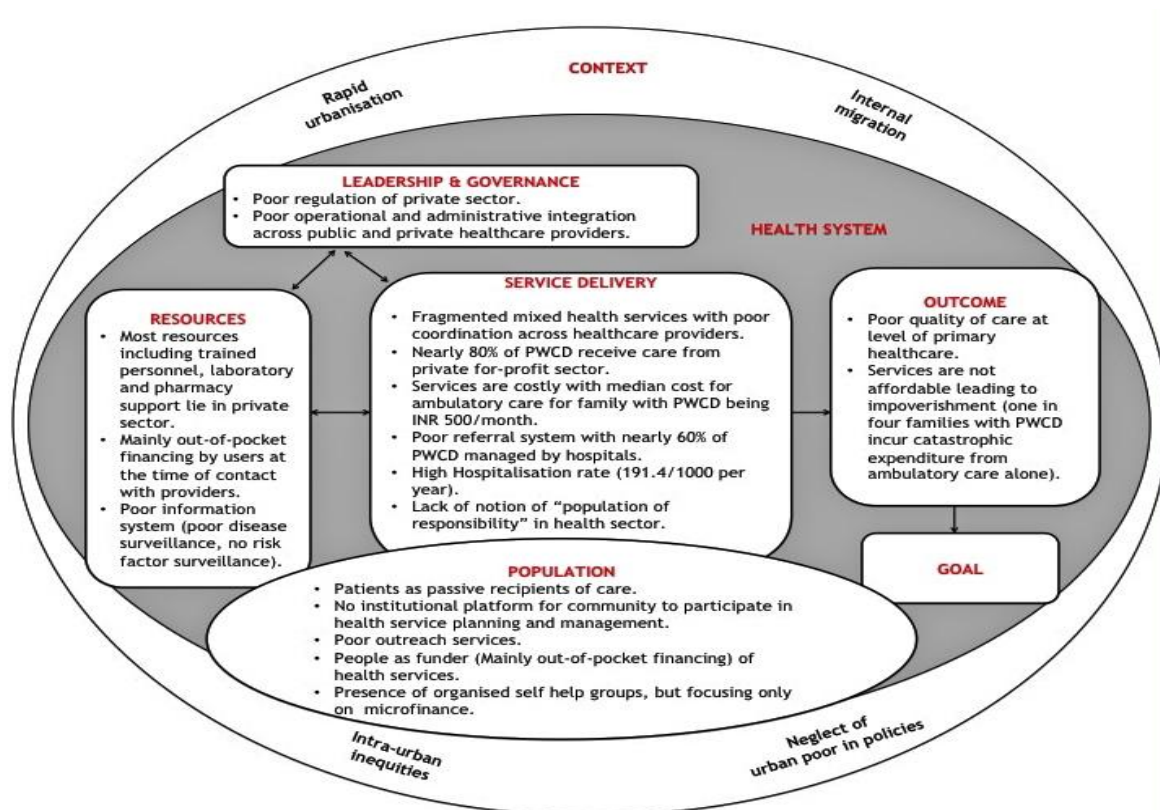


Figure 3: An illustration of health system obstacles in delivering chronic disease care within the local health system of KG Halli, India (Bhojani et al. 2011)

XII. Discussion

Our review of existing frameworks revealed limitations in terms of analysis of the interactions and mutual relationships between the different elements of a health system and the absence of discussion of values as an important steering mechanism for the behavior of people and thus for choices and processes in a health system. With the framework presented in this paper, we attempt to address those limitations, thereby bridging gaps in knowledge and practice. Our framework, consisting of ten elements and their interactions, facilitates a comprehensive analytical view on a health system, its composing parts and its functioning at national, meso- or micro-level.

We believe that the added value of our framework lies, firstly, in the way it stimulates the researcher to take into account the different levels of a health system: the patient-provider interactions; the organization of individual health facilities; the local networks of health facilities and the interaction between these operational services and the central level. It also allows mapping the relevant global actors and their influence on the health system. In other words, the framework allows us to scale how interventions or events at one level influence other elements and levels. Secondly, the model emphasizes the role and importance of values. It can easily be used to describe the actual status of any given health system, but can also be loaded with normative values (as presented in this paper) and thus be utilized to assess whether a health system is in effect attaining the goals and aims it proclaims. Thirdly, a major difference with other frameworks is the role we assign to the central axis of our framework that links governance, human resources, service delivery and population. Health systems fail if this backbone is neither strong nor cohesively structured and health system strengthening fails if it does not ensure that this backbone is well developed. Fourthly, our framework builds upon the notion of the HS as a complex adaptive system and encourages the user to take into account the key elements of complexity in the analysis of the performance of health systems and the development of strategies for improvement.

This framework does not produce a classification of health systems. The existing attempts of typologies are based on characteristics such as the level of income of a country; its institutional financial arrangements; the availability of human resources; the service delivery patterns and the health status of the population. Most classifications are without clear relation to performance and thus rendering the construction of predictive and/or prescriptive frameworks difficult (McPake et al. 2009; Paris et al. 2010; Riley 2008). Nevertheless, the links between the different elements in our framework help to understand the relationships between certain health system characteristics and to compare the outcomes or ways of organizing elements in different health systems. In order to facilitate decision-making and induce change, the development of strategic and operational frameworks that help to decide what to do, how to do, and what results to expect has been advocated (Reich *et al.* 2009). A universal framework for such purpose risks to be too generic (Shakarishvili et al. 2010). We therefore plead for the analysis of health systems with frameworks like ours, followed by the meta-analysis of these applications.

Our framework does not aim to provide a uniform or definite model. Instead, it is flexible and can be adapted to the purpose of any particular analysis or planning exercise. Health systems research is a domain in which actors may struggle to find a balance between understanding and acting, or to combine knowing with doing. Although the core part of this paper deals with the understanding, we feel that it would be incomplete without spending a few words on what is meant by health systems strengthening and the processes to follow. The roots of our framework in notions of complexity point to the fact that strengthening a health system entails a change in equilibriums, and that reactions will occur as actors recalibrate their actions. It points to the need to understand the history of the system and its actors, and the linkages between these actors. Since intervening in health systems may change power interests, effective and lasting health system strengthening efforts are best done in a manner acceptable to most stakeholders. Inclusive decision-making is difficult but may increase the chances of aligning all

actors, including the donor agencies and external actors, towards the overall goals and values. Interventions that mainly consist of increasing the inflow of resources are likely to work only if the health system has the capacity to transform these resources into (structural) positive changes (Potter et al. 2004). Health systems strengthening thus requires sound processes that are well maintained over a continuum in time and the creation of structures that ensure the institutionalization of these processes, while there are mechanisms to learn and adapt to transitions in the context (Keugoung et al. 2011; Marchal et al. 2011).

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