Chapter 2 – General application of the theory[1]

This chapter presents our attempts to describe the health system using the conceptual apparatus offered by Social System Theory. The discussion unfolds in three sections:

1. The first question to be addressed is whether health systems can be considered a *function system* according to Luhmann's conceptual architecture. In one of his few articles on health, Luhmann (2016)[2] agrees that health is indeed a *function system*; he speaks of "medical system" or a "system for treatment of the sick". This section discusses the basis for the categorization: the existence of binary code (healthy/sick), the autopoiesis, the operational closure, the social differentiation, the specific programmes, the coupling with other systems, etc.

2. Having established that health can indeed be considered a function system, the second section of the chapter discusses the peculiar internal structure of health systems, which shows a number of distinct partial systems: (2.1) It is explained that besides the core functional role of diagnosing and treating patients, there are a number of diverse entities performing other specific roles inside the system; (2.2) Among these entities, there is public health, which functions by communications concerned with the health and health risks of populations instead of individual patients; (2.3) The system also encompasses the presence of entities like professional councils and associations, licensing bodies, etc. with oversight, self-referential, normative, quality assurance, accredi-

1 The discussions in this chapter draw from diverse sources: Luhmann (1990a, 2016 and 2017a); texts on Sociology of Health and History of Medicine (Knudsen 2012 and 2015; Meyer 2015; Canguilhem 1978; Foucault 2003; Mol 2002; Vogd 2015; Bynum 2008) and several published articles on health systems.

2 A Spanish translation of the article, entitled "El código de la medicina", can be found as the fourth chapter in the book "Distinciones Directrices" published in Spain (Luhmann 2016).

tation and licensing roles; (2.4) We also find entities representing the interests and views of patients and other stakeholders receiving healthcare services. The section discusses the relations between these partial systems and their integration into a recognizable unit, the health system.

3. A discussion is then held on the complexity-reduction strategies employed in health systems. The section discusses how complexity reduction is performed in relation to the environment while the complexity of the system increases in the process.

1. Is health a function system?

In the first chapter we listed the attributes that characterize a social function system. We need to test whether those features can be found in health systems. We can start with the concept of communication. Obviously communication is central to the health system; it goes on all the time between professionals and between professionals and patients. Everything happening in a health system is communicated orally and/or in writing. Communication is so visible and constant that it is a sort of "natural" state of the system. We may even say that nothing happens, no actions are performed if some sort of communication is not announcing, or accompanying, or confirming and registering any step taken or to be taken. In a fictional scenario where communication stops, nothing could continue in the system.

In correspondence to that, the incorporation of an individual as a professional in the system is preceded by lengthy learning processes whereby the individual acquires sufficient competence in communication to be recognized as a professional of the system, in whatever role he/she might be assigned. Patients are also required, or at least expected, to communicate their complaints and confirm their understanding of the instructions given to them.

Such huge volumes of exchanges are made possible by the basic single healthy/sick binary code (a basic distinction for observations across all operations in the system). The communications are justified by assigning all that is communicated to one or the other side of the distinction. In the abovementioned article, Luhmann notes that the sick side of the distinction is the one that leads to further communications. Healthy bodies are not of concern for the health system; the doctor shakes hands with the individual and says goodbye, sending them back into the outside environment. Health systems

display the crucial feature of function systems: the deployment of a binary code in their communications.

Having established that, we can now examine whether we can see in the health sector autopoiesis as defined by Luhmann's theory. This concept holds that the system generates the means of its own reproduction, and this is done by the system alone. The reproduction of a communication-based social system is the reproduction of the communications that are system-specific, an exclusive prerogative of the system. There is no question about the fact that the health system only recognizes as its communications those generated by recognizable legitimate sources in the system. Furthermore, communications assign the potential for production of new valid communications. This way, the system communicatively controls its own, we may say, communicative reproduction.

The operational closure of function systems means that the system only works with information internally generated by itself. The system is closed for information generated outside it. This feature implies that health systems can rely exclusively on their own self-generated information. This may prompt some controversy: it could be argued, for example, that a decision by a judge in relation to provision of healthcare to privately insured patients needs to be dealt with in the health system as relevant information. In this regard, two points need to be considered. First, a function system only operates with the binary code that corresponds to it; no utterance using other binary codes is meaningful for it. The function system comprehends the universe of possible communications within that semantic sphere. However, organizations as social systems have interests in a number of different function systems; organizations have legal departments, have economic operations, have communications within the education system as well as within the science system, they interact with the media system and the political system, and so on. Organizations can do that because their unit is preserved by the exclusive principles of membership and decision-making.[3] In any organization there are specific members dealing with specific function systems, communicating through the specific code of the system in question. An organization can also communicate with other organizations because they have members who deal with matters of the same function systems; they can therefore share and use the same semantics. Operational closure is a feature of function systems; a function system cannot communicate with another function system, as their

3 In contrast, the binary code is what preserves the unit of a function system.

semantic universes do not overlap. This may sound counter-intuitive but is of central relevance in the architecture of the theory. For the moment we can accept that health systems display operational closure, with their unique and exclusive communications often "unintelligible" to others.

Operational closure leads us to the related concept of social differentiation. As a function system only operates with the binary code that corresponds to it, no utterance using other binary codes is meaningful for it, and this is the basis of social differentiation. The differentiation separates different function systems within the society. Empirical evidence of social differentiation means it requires no further discussion. It can be easily observed. Modern societies show internal differentiations with function systems living within their own communicative spaces. The health system is one among the differentiated systems.

Two additional features that are worth mentioning at this stage are the specific programmes and the coupling with other systems. Specific programmes are linked with the binary codes; the programmes set chains of connected meanings that ultimately refer back to the founding binary code. Programmes imply logical conditional steps of selections based on true or false assertions. Health systems have plenty of exclusive programmes.

Structural coupling is the operation by which, within its operational closure, a system can observe another one and by doing that adapt its own operations, making coordination between systems possible. As an example we can think of the close mutual observation that the systems of science and of education (two distinct functional systems) engage in with the systems of health. The health system largely relies on these two systems for carrying out and improving its communications.

A simple conclusion we can take out of these sometimes controversial points is that the health function system should be understood as the unique meaning universe whereby all communications related to health and sickness are fully intelligible and understandable. We talk of the health system as a semantic dimension.

2. What is the structure of a health system?

Once we have accepted that health is a function system, we can discuss the peculiar internal structure of health systems, which shows a number of distinct sub-systems. Under the overarching frame of the health system there are sev-

eral distinguishable services and functions that could not be described as generators of communications based on the healthy/sick binary code in the context of diagnosis and treatment of patients.[4]

Although healthcare delivery is at the centre of the health system and is the reason for its existence and reproduction (absorbing almost all the resources of the system), there are a number of complementary functions that play an important role in any health system, although not directly linked to the treatment of the sick.

Among those sub-systems is public health, comprehending a number of functions and communications concerned with the health of populations instead of individual patients. There are also entities with oversight, self-referential, normative and licensing roles, such as professional councils, professional associations, quality monitoring and accreditation bodies. Furthermore, we also identify entities representing the interests and views of patients and stakeholders receiving or entitled to healthcare services. We discuss each of these sub-systems next. The final task therefore is to understand how this multiplicity of sub-systems is integrated into the recognizable unit, the health system.

Under the public health banner there are numerous programmes and activities. We can for instance list: health promotion activities (including community and society-wide dissemination of health information); health surveillance; health information systems as well as related functions such as planning, monitoring and evaluation; management and implementation of health programmes such as immunization, vector controls, health surveys and risk assessments.

By looking at collective rather than individual sick patients, public health acquires a macro-perspective for self-observation of the system. Public health tries to see health as a system, distinguishing the interconnectedness and interactions the system's components develop in the process of detecting and treating patients. Using epidemiological tools, public health can observe trends, assess how the system is performing as a whole, and project scenarios.

4 Several texts discussing and applying the Social Systems Theory constructs (some in the health field) can be found in Knudsen and Vogd (2015), Seidl and Helge (2006), and Bakken and Hernes (2003).

The Six Pillars framework and subsequent conceptualizations such as health systems thinking, promoted by the WHO,[5] reveal the "mind set", so to speak, of the advanced public health representation of health systems. In having the capacity to represent the health system to itself, public health can also establish couplings with other systems, in attempts to "irritate" them in pursuance of advantages for the autopoiesis of the health system.

In that regard public health plays a key role in coupling with the political system to project forward health agendas. However, the representations of the health system constructed by the public health sub-system have to live with diverse representations independently constructed by each health sub-system about itself, which do not necessarily coincide or agree with the views elaborated by the public health sub-system. Still, the public health sub-system may have little influence or impact on what goes on at the core of the health system, i.e. the service provision where diagnostics and treatments are uninterruptedly delivered.

Moving on with the discussion on the sub-systems, we can now address those sub-systems with oversight, self-referential, normative and licensing roles, specifically focused on professionals.[6]

Medical as well as other professional councils, legally in charge of licensing and controlling professional authorization to practise, perform a crucial self-observation role for the health systems. The control of professional licensing is a self-regulatory competence by which the system assures the maintenance of the binary code and the integrity of the communications deploying the code in all its expanded levels of complexities (including all specialities and professional practices).

In doing this, the professional councils play a fundamental role. They are empowered by the political system, through legal instruments approved by high legislative bodies, to perform corrective and punitive actions. The councils carry out vital tasks for health systems. They also constitute models to be replicated at smaller scale at the level of health facilities and regions, which for instance acquire ethical oversight responsibilities, resorting to the higher level for more serious cases, requiring for instance suspension of licences.

---

5 *Systems Thinking for Health Systems Strengthening*, edited by Don de Savigny and Taghreed Adam (WHO 2009).

6 Surely public health also has oversight, self-referential, normative and licensing roles, however these roles focus on the health system, not the individual professions.

Furthermore, at this sub-system we can also identify professional associations interested in representing the interests of the professionals – for example, concerned with dissemination of information on new techniques among professionals, as well as training and orienting the adoption of the techniques and standards; guiding, coordinating and promoting professionals in specific fields and specialities.

To be sure, professional qualifications are undertaken in the education system, however much professional training happens in the course of the daily activities of treating patients. These are health system activities rather than of other function systems.

Still, at the level of this sub-system, we can observe organizations developing standards and sometimes carrying out assessments of conditions for quality of care and accreditation, which although located a step away from the provision of actual services, are relevant internal observers of the health system. These are not necessarily found or effective in every health system.

Finally, we can identify a fourth specific sub-system represented by the entities that are not engaged in the communicative conveyance of the healthy/sick binary code. However, they are relevant and generate valid communication in the system. Examples are patients' associations and healthcare users stakeholder groups. They communicate the experience of being classified as sick, and treated (or not) as such inside the system; these are recognized by the system as legitimate communications.

These four sub-systems are inside the health system, participating in the internal communications. They perform essential roles for health systems' autopoiesis. This roughly drafted architecture of health systems is summarized in Table 2.1.

This picture is certainly not free of controversy. Some readers may have noticed that we did not include any of the typical managerial functions as subsystems of the health system, such as the financing, administration, human resources management, legal and political governance functions. The reason is that these areas belong to other function systems, such as the economic, political or legal. In short, their communications are not based on the healthy/sick binary code; they specifically communicate with other binary codes, even when they refer to patients and their treatment; their concerns are thus distinct. Within health systems' organizations, departments and divisions take care of such matters and communicate accordingly. Organizations are social systems with a "multi-contexturality" composition; we deal with this topic in Chapter 7.

Table 2.1 : Health social system structure

Sub-systems	**Example of components**
Healthcare service delivery	Hospitals, polyclinics, primary health care centres, pharmacies, clinical laboratories, etc.
Public health	Epidemiological, environmental and sanitary surveillance; preventive programmes; health information; surveys; risk assessments, etc.
Normalization and standards for professionals and practices	Councils, associations, accreditation, etc.
Patients and healthcare services users	Patients' associations, healthcare users' interest groups, etc.

Some readers might mention other institutions, such as universities, health insurance or ministries of health. A brief answer at this point is that they also belong to other function systems. Qualification of professionals is mainly conducted in the education system, even when the teaching and health system practices seem to overlap in university hospitals, where, nevertheless, it is always possible to separate what belongs strictly to the health system and what pertains to education. Health insurance organizations obviously belong and communicate within the economic system, with their operations consisting in buying and selling health services and policies. Ministries of health, as entities belonging to governments and therefore mostly concerned with and communicating on political matters, where the binary codes government/opposition or governing/governed are the key features, belong in the first instance to the political system.

We can add that educational activities are essential for the autopoiesis of the education system. Health insurance is not essential for a health system and providers pursue their autopoiesis as organization systems. And finally, health systems continue to deliver healthcare, even in countries at war and in other extreme situations when governments, ministries of health, educational institutions, insurance organizations, etc. have totally collapsed. In such contexts, essential communications characterizing a health system persist regardless of the status of those organizations where the services are provided.

3. What are the complexity issues of a health system?

As mentioned in Chapter 1, complexity is a feature of observation, not an object in itself. Complexity refers to observation capacity and the volume of elements and relations between elements that can be observed. Observers, watching either of the two sides of the system/environment distinction, can admit complexity.

Luhmann says: "we will call an interconnected collection of elements 'complex' when … it is no longer possible to connect every element with every other element" (Luhmann 1995, p. 24). In his words "complexity is a measure for indeterminacy or lack of information. Viewed in this way, it is the information that the system lacks fully to grasp and to describe its environment (environmental complexity) or itself (system complexity)" (Luhmann 1995, pp. 27–28).

In several of his texts, Luhmann addresses the question of complexities inside the system and in the environment. The system needs to keep its internal complexity at a level that does not compromise its autopoiesis. If the system becomes internally too complex for the tools and communications it can generate, it needs to engage in complexity reduction strategies. A system that goes beyond the limits of its capacity to articulate its increasing number of sub-systems, for instance, may risk collapsing.

One may therefore ask: Why does a system increase its complexities? The more complex a system becomes, the more complex observations it can make of the environment where it lives. As the environment has limitless or, more precisely, unknown limits of the complexities of elements and relations between elements, a system is under permanent pull to increase its competences to address the known unknowns as well as finding out the potential unknown unknowns.

Such a drive to address environmental complexity may lead the system to increase internal complexities to a point where it can no longer meaningfully maintain and reproduce itself. So, systems must permanently strike balances between their internal complexities and the complexities they address in the environment

Based on Luhmann's work, Ahlemeyer (2001) proposes a definition of complexity relevant for our discussion. In correspondence to what has already been said above, he states that "Complexity is not a system operation – nothing what the system does or what happens to it. It is rather a notion of observation and description, including self-observation and self-description" (p. 27). Furthermore, he says: "A system is complex for an observer when it is neither in a state

of complete order nor of complete disorder, that is to say: when it represents a mixture of redundancy and variety", where *redundancy* means repetition of patterns or patterns of variability, and *variety* means changing of patterns.

In more concrete terms, we can say that a health system facing the challenge of an outbreak of an unknown disease (such as Ebola or Covid when they initially appeared) needs to set in motion a number of sub-systems in its response. In the process, new communications will have to develop, representing the new settings, techniques and operations to be implemented. They will add complex relations that were not in place before, and the complexity of the system will consequently increase. But from then on the system should be better equipped to identify and react to such increased complexity in its environment. The system is, from its perspective, "decreasing" the complexity of the environment, while at the same time "increasing" its own complexity.

Summary of the chapter

As a concluding summary of this chapter we can say that health systems have the characteristics of function systems as described in the Social Systems Theory. Particularly, being autopoietic systems, health systems control their reproduction by means of their internal operations, i.e. their communications.

The structure of health systems incorporates a number of sub-systems around the core healthcare service delivery function. The sub-systems, with diverse contributions, play crucial roles in the self-reference and self-observation of the health system.

Finally, the theory suggests that health systems become progressively better able to address the complexities of their environment by becoming themselves more complex. In Ahlemeyer notes, "If one wants to construct a system able to deal with a high level of environmental variety, one has to provide a sufficiently high level of system variety" (Ahlemeyer 2001, loc. 886). Key for any health system strengthening initiative is the observation of how the balance between the complexity of the system and its environment is to be preserved, guaranteeing the autopoiesis of the system.