Chapter 7: The Construction of the Self-Reference of Social Health Systems

Having presented the theory, a short history of medicine and a discussion on public health as a sub-system of the health system, we can now go back to the three questions formulated at the introduction and try to answer them:

1) How does the history of medicine show the development of self-reference?
2) How did medicine self-reference become the foundation of the self-reference of health systems?
3) How did the coupling of the self-references of medicine and public health create health systems?

However, before addressing these three questions we revisit some of the themes discussed in previous chapters, particularly the topics of self-reference and complexity. The separation of the four periods of the history of medicine was intended to make recognizable when major transformations of medical knowledge and practice happened, and how the periods could be understood from the perspective of the development of social differentiation for the construction of health as a social system, as proposed by the Social Systems Theory.

While the marked differences of medicine development can be traced and described in those four periods, the evolution of society according to the differentiation thesis went through two historical forms: differentiation based on *stratification* and *functional* differentiation (see

Chapter 2 or Glossary for explanations of these concepts). We can only talk about fully developed functional differentiation in relation to the fourth period. The first three periods in the story of medicine unfolded while the societies had internal differentiation based on stratification.

To refresh the point, in the fourth period medicine became embedded in societies structured according to functional differentiation. With functional differentiation societies are organized in several function systems, each with their specific functions, codes, semantics and communications. Health became one social system among the others.

Self-reference and complexity

These two themes have appeared in a number of previous sections in this book. The reader may already be familiar with them, if not perhaps a bit weary of reading about them. However, as we approach our concluding chapter we still need to note a few aspects of these concepts, which are of crucial relevance for the thesis we advocate.

According to the Social Systems Theory, self-reference happens in the web of communications maintained in the system. We try to illustrate this process here. Doctors will sometimes talk with each other about what medicine is or isn't. Regularly in fact, they talk about what would be the correct medical procedure for treating a case, including what should be done or should be avoided. In that, we can say that medicine is what the doctors agree about it. That is, what they say reflects and is reflected in what they do and observe others doing.

It is not only the formal university training and post-graduate courses that reproduce medicine, but also, more importantly, daily professional communications recognized as carrying valid medical meanings. Obviously we are not talking about a single doctor or a small group of doctors redefining the conceptions of medicine; there are many organizations and institutions involved, all using medical terminology on a daily basis.

There is widespread social recognition of medicine and related social expectations about medical services and their effects. However, it

takes doctors to validate, endorse or otherwise disqualify any statement as medical or not. A medical statement cannot be validated outside the medical world; so, in this sense, medicine is what doctors say it is.

These communications reproduce and therefore maintain what medicine is. They communicate selected meanings and leave aside what is excluded. The history of medicine is the history of its self-reference because, at any time, only the selected meanings incorporated into the universe of communicable topics are registered as part of medicine and therefore part of its history. What was rejected was forgotten; what was adopted was preserved and reproduced.

A brief paragraph here on the conceptualization of self-reference in complement to what was presented in Chapter 2 should help us to move forward with the discussion about self-reference of health social systems. Luhmann (1990, p. 114) says that a system's self-reference is not only identity (the narratives the system constructs about itself), or only self-organization (structural and operational dispositions the system develops reflecting those narratives). He adds that self-reference refers basically to the constitution of system's elements by the system itself; elements that are produced and reproduced as self-referential units – that is, units that refer back to themselves as elements of the system that created them.

To step back a bit from the formal abstractions into an illustrative example, we can think of a medical speciality – let's say orthopaedics – created as an element of the medical assemblage of self-referred constituent specialities, referring to itself as a component of that assemblage. This apparently convoluted reasoning nevertheless has relevant implications for the analysis of self-reference. Luhmann calls attention to the fact that the admission of self-reference has relevant epistemological consequences for scientific studies of systems, and self-referential systems are indeed empirical objects without any transcendental status.

Continuing our journey, we acknowledge that self-reference is historically self-reproduced. We can say that, through communication, medicine selects valid statements that could be made about itself. The reproduction of these selections is repeated and communicated continuously, confirming and maintaining medicine's recognition of itself.

This denotes the very mechanism of identity creation, made possible by the self-referential functionality of a communication-based system. Still, history shows us that over the centuries medicine has developed diverse and increasingly more complex meaningful constructions to be included or excluded in its matters of concerns. Medicine as scientific endeavour or as daily undertaking to improve patients' lives is how it has been defining itself. We are repeating ourselves here, aren't we?

Moving on to the topic of complexity, if we accept the thesis that the development of societies and their structures goes in the direction of increasing levels of internal complexity,[1] the history of medicine can therefore be described as an evolutionary process of increasing complexity in a number of areas, namely:

- More complex models of the human body's structures, functions and diseases affecting it;
- More complex processes of observation, elaboration of prognosis and diagnosis;
- More complex procedures, tools and technical apparatus for treatments, with complex matters related to use, accuracy and reliability;
- More complex regulations and self-regulations of professional fields of practice;
- More complex training and professional development pathways;

1 It is important to say here that the unavoidable historical trend of increasing complexity is also continuously adapted, with strategies and tactics for reducing complexities where needed and possible, avoiding overwhelming the components of the system with complexities beyond their capacities. For instance, the creation and recognition of a medical speciality strategically reduce complexity, as the matters of concern for the speciality become its exclusive domain and the other specialities can resort to consulting the respective specialist when necessary. The overall system becomes more complex with additional specialized knowledge, but the additions are dealt with – i.e. reduced – by creating adequate communication channels. The theory calls attention to the continuous adjustments of these two trends of increasing and reducing complexities.

- More complex public health observations and actions for surveillance, prevention, monitoring and management of health services;
- More complex sets of organizational and institutional arrangements for healthcare provision and management;
- More complex coupling with other systems (legal, political, educational, scientific, religious, media, and so on).

These fields of complexities correspond to semantic realms sustaining communications in increasing levels of sophistication and differentiation of expertise. The self-reference of the health system has to "account for" all these complex domains – it isn't a simple task.

In a snapshot, medicine evolved from individual craftsmanship at patients' bedsides to the diversified practices in institutional and organizational settings, with specialist doctors in the currently complex integrated field of interrelated expertise, working in coordinated teams inside organizations' structures of health systems. The evolution has thus been from individual provider to systems provision; this reflects the parallel evolution of the medical knowledge uncovering the complexities of the human body and the diseases afflicting it, and, more recently, public health comprehensively addressing the health of populations.

We need to add here a few words in relation to the differentiation of the systems of science and health. The disciplines in the system of science have their own self-reference – as being a scientific field. In the domain of physics, for instance, communications are about the subject of physics and the validity of methods of observation. The same can be said about chemistry, biology, sociology, psychology and so on, each with its own self-reference and criteria to judge what is meaningful for them.

To be clear, as we have said in previous chapters, disciplines are not social function systems; science is the function system. Therefore, medicine is also a discipline in the system of science, as medicine is not strictly confined within the biology domain. Although human bodies are biological organisms, medicine approaches them with the specific objective to identify the health and more importantly the pathological structures and functionalities, intending to find ways of recovering health, if possible. Medicine also emphasizes perceptions, experiences

and descriptions the patients make of their conditions; biology does not have such a universe of possibilities and nuances. Therefore, it goes without saying that, despite being in the same scientific realm, medicine and biology are distinct disciplines, however controversial this statement may still be.

On the other hand, as also said, medicine is applied knowledge, dealing with concrete patients in the processes of diagnosing and treating them. Its interest in any particular case is distinct from the scientific intention of finding generalized or generalizable patterns common to human diseases. Medicine in this case is not just applied science; it operates in the empirical world, even when the science has not yet found the answers to the problem at hand. In this sense, medicine is an undertaking inside the domains of health as a social function system. We can distinguish between the science system with its interest in finding general truths (regardless of the use made of the formulated generalized knowledge), and the health system with its interest in dealing with the problem of any patient captured in the net of attention of the system, whether or not the scientific knowledge and means at hand are effective.

Medicine self-reference as a scientific endeavour is projected in its assessment and revision of concepts and paradigms it considers as constituting its field of concern. Medicine self-reference as part of operations of a health system is concerned with the problems it solves or fails to solve, and how it carries on communicating about that inside the system. It does not matter if all the scientific knowledge required for delivering a baby in an ectopic pregnancy is perfectly described in a book on the shelf, if a doctor in a particular circumstance cannot implement the solutions as needed.

As operation of health systems, medicine has to do something about the patient in front of the doctor. The patient is under some sort of legally established protection, granted rights to the service or covered by the ethical principles of medicine. Medicine as a scientific field does not need to worry about any patient in particular because the scientific investigation can choose its topics according to its quest to find the truth. The norms regulating the scientific field are attentive to the validity of the investigations and their results, while the norms of the

health system regulate entitlements, protected rights and obligations. The science system can live with its promises (theoretical science is still science). But a health system must live out of the responses it provides to concrete health problems. By the same token, as a legal system cannot leave a plaintiff without a final legal decision, a health system cannot ignore any patient; these are matters of justification of the very existence and self-reference of these systems.[2]

We can say that the same argument is also valid for public health, as a sub-discipline in the scientific system (with several interfaces with diverse scientific disciplines such as sociology, economics, political science, anthropology, and so on), and public health as set of concrete practices implemented by public health organizations in a variety of settings; the latter dealing with concrete problems, and the former dealing with the design of models and scientific methods to test them.

Now we move on to our three questions.

(1) How does the history of medicine show the development of self-reference?

Medicine showed specific self-reference peculiarities in each of the four historical periods, as we briefly discussed in the sub-sections for each period in Chapter 4. Based on that, we try to bring those elements together in the following summary narrative.

At a point in time, when a semantic set is constituted with selected meanings distinct from those in other semantic sets in the same society, we can say that self-reference is distinctive in their making.

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2 Quoting from Bynum (2008, p. 115), "Claude Bernard (1813–1878) […] summarized his own research career, as well as developing a philosophy of medical research, in his classic *Introduction to the Study of Experimental Medicine* (1865). It remains a book well worth reading. In it, Bernard argued that the laboratory was the true sanctuary of medical science. In the hospital, where sick patients need care, and the number of variables means that observations are only piecemeal, no real experimental science can flourish. Only in the laboratory can the experimenter keep variables constant, so that changes can be unambiguous".

The orientation for the selections of meanings needs to be preserved together with the selected meanings. The orientation designates where the meanings are to be picked from and their connectivity with the already selected meanings. The consistency and cohesion of the meanings have to be kept while new selections are made and the meanings are deployed in communications.

Let's try to be less abstract. At some point in time, the body was constituted as an object of observation with the intention to see how and maybe why diseases appeared in it. The body was then understood as a medium (even if not acknowledged this way) where disease forms could take shape. This object, the body, was the concrete base to which meanings could symbolically connect – could refer to. The body thus became the base of references – references denoting and supporting distinct narratives about the observed diseases.

Taking a brief detour, there was nothing ontological in attaching specific semantic meanings to the body as a symbolic medium. The same body (as medium) became the basis for the development of very different semantic structures leading eventually to ancient medical knowledge systems as diverse as Chinese medicine, Ayurveda medicine in India, Western medicine and many others, with the semantic schemes unfolding in different directions, developing multiple articulations proper for each differentiated knowledge system. In Luhmann's terms we can say, "there is no compelling pull from the object" itself to adopt any specific semantics, privileging a specific direction.

All this is to say that at those times, a community of observers of the body developed,[3] sharing similar interests in talking about the body and its dysfunctions. The semantics they used became characteristic of their particular way of paying attention to the body and their concerns with it. Maintaining the semantics thus became a way of recognizing common interest and belonging to the group, which implied also sharing an epistemological orientation towards the elected object of observation (the

3 Similarly, those seeking artistic representations of the body also gathered together around the same time in Greece.

body) and, furthermore, preserving the memory of what had been observed and talked about.

If this has happened in such way, this does not mean that there was a decision-making process deliberately deciding and establishing such a community and semantic universe. Surely the whole process unfolded over generations and centuries, and many such communities may have started and ended without leaving any trace. Finding historical evidence of such initial stages may be an impossible task, as only the eventually consolidated successful and agreed upon practices, as seen in the Hippocratic writings, became evidence from the past. The description therefore only briefly describes processes of long maturation; an evolution with fortuitous and unforeseen events, and, as Luhmann says, of "highly improbable" developments.

When we see in Hippocratic narratives the Greek doctors visiting patients in their homes, listening to their complaints, and taking detailed notes of what they observed in the bodies of the patients, long evolution surely had already happened, without leaving vestiges behind. The Greek doctor went to the patient with an idea about the object he was going to look at, and the points of observation he would be most interested in checking. He took his notes following the already expected standards of such recording, and later on shared them with small group of doctors who were also interested in discussing their own observations and notes.

Those who could read and write and may have had access to the notes of the doctors could use the same words without sharing the same observational intent and rigour. In this sense, the use of the vocabulary was not yet fixed as the prerogative of doctors; no one could claim exclusive rights to use it. Whoever knew the words could use them as they wished. It would not have been possible to name anyone as a charlatan then; even if the distinct groups shared such a judgement about outsiders, such agreements would not have had repercussion beyond the group itself.

This was the scenario when the closure of the semantic space had not yet taken place. Without the closure, no group could claim ownership or exclusivity over the use of the terminologies, and there was no possibility of developing any self-reference to be endorsed by the society at large.

The self-reference would be for the members of the group, recognizing themselves only. A semantic universe distinctly used and preserved by a segment of a population, but not acknowledged by the society at large, could only work as a thin base for internal self-reference in those groups, with circumstantial external acknowledgement when a doctor may have been remarkably successful in treating some cases.

The point is, the meanings and words they used still "belonged" to the society at large without exclusive use being assigned to anyone. Therefore, the only sustainable self-reference then was that of belonging to the group of those who used the same meanings and also shared the same principles and intentions for the formulation and deployment of those meanings.

The members of the group had a good idea of what they were doing – looking at diseases and trying to describe them. Hippocrates and his followers intended to separate the meanings they used from the then current superstitions and common beliefs driving people to the temples to please the mythical God doctor Asclepius, giving prayers and offerings for the desired healing.

We cannot see any system operating at that time. All we can see is a vocabulary being developed, without the regulated circumscription of its use to recognized singular groups of users, and also not linked to a dedicated set of practices that only those specific groups could perform. In other words, a system could not exist without the semantic space and the designation of rules of inclusion and exclusion from the system – that is, rules for designating who was recognized as a valid user of the semantics. This recognition is a crucial step in the establishment of self-reference, as being where the validated meanings were used in communications.

Delimitation of semantic space arises together with self-reference, as cause and consequence of each other, in a tautological self-reinforcing relation. This also establishes the hetero-reference – that is, the other side of the distinction, denoting what is external, the outside of the semantic space, and therefore belonging to the environment. These conditions for the genesis of systems were not yet fulfilled.

Tracking the appearance of self-reference requires assessing the conditions that could bring it about. These conditions, as we have repeatedly noted, should include the distinct semantics, the operatives communicating using those distinctions, and their social recognition. The communications thus would by themselves select those admitted as valid, which would then reoccur, along with other communications likely to be considered valid. Self-reference is thus the acknowledgement that those conditions have been met. They are prerequisites of self-reference that have also embedded self-observation functionality, which made it possible to perform the selection of valid communications. Self-reference operated with self-observation. We talk about individuals and groups observing themselves, observing their own communications, and communicating about the way they communicated.

To sum up, we recall that self-reference is closely related to how a developed social function system makes sense of itself with the meanings it selects and produces. Luhmann uses the term autopoiesis to denote such process. A fully developed system would therefore show the following observable attributes of self-reference:

- Self-reference – seen in narratives of the system explaining the system (the system speaks about itself);
- Self-reference – seen in a system's ability to construct and change such narratives about itself (the system speaks about itself in its own terms);
- Self-reference – seen in exclusive prerogatives for construction of the self-reference narratives (the system is the only one able to speak about itself in its own terms);
- Self-narratives – communications by the system saying what it is;
- Self-reference as opposed to hetero-reference – the system acknowledges being hetero-referenced from other systems' perspectives.

Fast-forwarding to centuries later, an embryonic system, developing its self-reference, acquires new functionalities. Once doctors could recognize each other by their practices and communications, and therefore communicatively reproduce the semantics they used and the self-ref-

erence they constructed, they could allow themselves internal disputes about their findings, approaches and understandings.

For instance, doctors could become interested in knowing how accurate the identification of symptoms was, and how stable the predictions and prognosis based on that. From that point, around the end of the Middle Ages, medical thinking realized the crucial relevance of complementing observation at the bedside with post-mortem examination of patients' bodies. This raised questions regarding the correctness of the clinical conclusions, now possible due to the confidence medicine developed of its own capacity to investigate and find answers, and allowed the mobilization of efforts to get permission and authority to open the bodies and examine and make observations about them. The self-referred embryonic system needed to find ways to confirm for itself whether its hypothesis was correct, strengthening the criteria for assessing the validity of its communications.

Internally, among themselves, doctors created spaces of communication of their points of view, with doctors participating and taking sides in the debates. That led to advancing self-observations and self-references concerning criteria for judging opinions. The following quotation illustrates the process:

> „French innovations permanently left teaching hospitals with two regular events: the daily ward round, in which a senior clinician, followed by junior doctors, medical students, and a nurse, would see and discuss each patient at his or her bedside; and grand rounds, in which interesting "cases"' would be presented by a member of the junior staff and analyzed by someone from the senior hierarchy, in front of a large gathering of students and doctors at all levels of experience. Often, after the presentation of the patient's history and clinical course, and the discussion of the differential diagnosis, the autopsy findings would be revealed by a pathologist, and the whole life and death of the patient put together in a seamless whole." (Bynum, 2008, p. 62)

The acclaimed settings for communications among peers with legitimacy to validate them, was one of the ways the embryonic system

set about reproducing itself. The system's internal dynamics would be alien to outsiders. Outsiders' main interest was with the outcomes of patients' treatments, with no concerns regarding the merits of polemics they could not understand.

The system needed to establish stable processes to confirm for itself its presuppositions and understandings. Medicine was fully in charge of the assessment of its judgements. By that time, for instance, the theory of humours was no longer sufficient to explain what was being uncovered by the autopsies. It was therefore necessary to expand the explanatory models. Medicine was observing itself, assessing its methods of observation; in other words, it was observing how it was observing.

The Social Systems Theory calls this *second-order observation* – observation of observers, or observation of itself observing. Newer and better explanatory models would replace the old ones and medicine was ready for that step without being threatened by the risk of losing self-reference. New self-references were being made.

From the fifth century BC to the fifteenth century AD, to be socially recognized as a doctor, someone would have to be able to talk about humours and how they were responsible for what was happening to a patient. That communication would be acceptable to others also claiming to be doctors. By the fifteenth century, such communications would not be enough. Other references had arrived in the semantic universe and were acknowledged in every field where medical observations and treatments were performed. The claimant would have to add a number of other elements and considerations. Doctors could criticize their own communications and claim the validity of broader horizons.

With the enhanced capacity to communicate about itself, medicine acquired autonomy and differentiation in a way that made it impossible for other knowledge disciplines to talk about what was considered medical business. These developments also counted a number of key points for strengthening self-references such as university medical courses, practices at the hospitals, corporative organizations to protect those with university diplomas, and so on. With its assured internal self-reference, medicine could claim its own domain vis-à-vis other domains in society, and gain recognition.

In the sequence, once firmly established in universities, hospitals, guilds, associations, and so on, the forum for debating and communicating about medicine allowed new types of questions to be formulated. After anatomical-clinical and physiological-pathological fields were consolidated as descriptive narrative of diseases, etiological questions of actual causes of diseases were formulated and nosologies organized classification schemes.

Through acknowledging the limitations of the explanatory models available at the time, medicine "learned" how to do it again and again, how to develop and bring new paradigms under scrutiny as soon as new understandings of particular pathologies of particular body parts were described. By being able to perform the revision of its self-references, medicine opened the door to new discoveries and new revisions in increasingly differentiated fields, with newly distinguished factors and hypothesized causal relations between pathogenic factors and complex body structures now described in minute detail.

At this point we need to make reference to an additional relevant topic of self-reference of medicine, the Hippocratic Oath. That was a remarkable step with profound influence on medicine's self-reference in many senses. It established self-reference on ethical grounds, setting the acceptable limits of behaviour for those aspiring to be recognized and present themselves as doctors.

The acceptance of the oath orientated the self-identity of the individuals, as well as the mutual recognition among those seeing themselves as members of the particular category of doctors. Members of the category acquired a fixed reference to assess anyone willing to claim to be guided by and behave according to the oath.

On the other hand, the oath also set references for outsiders to judge and scrutinize those claiming to be doctors. The oath to some extent drew a line according to which anyone could assign, even if tentatively and imprecisely, real doctors and charlatans to either side of the distinction.

The oath had long-lasting effects on the setting of self-references and self-identity, covering thousands of years. In systems terminology, the oath became a component of the programme for self-reproduction of

medicine. It became a programme to create an identity to be continually reproduced throughout generations of doctors. It was a stable representation of what doctors were supposed to be. Anyone claiming to be a doctor could be asked: "are you a doctor? So, you must know the oath, right? Please tell us what it says". Although no longer used in graduation ceremonies, it has inspired similar oaths currently replacing it.

To conclude our discussion on the development of medicine self-reference, we need to talk about a few additional aspects. Self-reference also points to what may come next, in the sense that it establishes criteria to select what is to be accepted as self-reference and what is to be rejected as hetero-reference. Self-reference thus sets the boundaries of the system, at the same time indicating what would need to be further explored and, on the other side, rejecting what would no longer be considered.

Although creating and striving for stability, self-reference is also in continuous need of reconfirmation, re-evaluating what was selected and rejected, and reproducing those steps. Self-reference does not become "ontological", so to speak, or definitive as an inherent fundamental essence. The elements of self-reference are contingent, so they can be revised, replaced and can also be different from their actual content.

As a system becomes more complex, it needs to develop ways of incorporating complexities into its self-reference. A complex system generates opportunities for challenges in specific matters of its elements. But localized challenges do not put the broader self-reference of the system at risk, even if the self-reference attached to the challenged elements needs to be resolved. Therefore, small changes do not necessarily affect the overall stability of the self-reference definitions.

Speaking in less abstract terms, medicine developed ways of dealing with its complexities; the creation of specialities is one of those strategies. Specialities are recognized as part of medicine. However, radical changes in the main themes of a speciality would not constitute a challenge for the self-reference of medicine. When autoimmune diseases were identified, for instance, they constituted a paradigm change in the realm of infectious diseases and immunology. But this did not have a similar impact on general medical self-reference. Self-reference there-

fore includes the possibilities to create internal divisions (specialities for instance), hence keeping complexity "tamed".

In conclusion, we can say that by the third period the self-reference of medicine was well established. That constituted a model for other disciplines, developing in line with an orientation of providing specific healthcare, identified nevertheless as different from strict medical practices (such as dentistry, nursing and physiotherapy).

(2) How did medicine self-reference become the foundation of the self reference of health systems?

Although strictly linked to the development of medicine, the historical emergence of health as a social system does have its peculiarities. Health systems could only be established after medicine achieved the degree of self-reference and semantic development described in the previous section. However other conditions combined with medical evolution led to the appearance of a socially differentiated health system.

The emergence of a social function system (to recall, health social systems are social function systems in the terms of the Social Systems Theory), occurs once a number of preconditions are achieved:

1) The society has reached the function differentiation stage, where different social functions (political, economic, legal, religion, art, and so on) are established as systems (see Chapter 2).
2) The new function system has acquired the exclusive domain of a specific binary code (health/illness) orientating all communications inside the system.
3) Based on the binary code, a network of meanings constitutes a semantic universe of exclusive use by the new system (meanings established in a nosology for example).
4) With its prerogative use of the meanings it creates and preserves, the new system constructs its own self-reference with which the system internally self-reproduces its communications (operational closure).
5) The other function systems in the society, with their respective codes and semantic universes, are recognized as belonging to the environ-

ment as opposed to the system, and as such they can be observed by the system.

6) By observing the other systems and being observed by them, the system can enter into structural couplings with any other system that it considers relevant to itself.
7) With the coupling processes, the system becomes socially relevant for other systems, and at the same time the system's self-references incorporate internal communications in connection with those couplings.[4]

By the early nineteenth century, almost all these conditions for the establishment of the health social system were fulfilled. To briefly explain, developed societies were already structured according to the functional differentiation. Conditions 2, 3 and 4 were also achieved, as medicine had already developed its well-defined exclusive semantic domain, which only medicine could reproduce. Conditions 5 and 6 also met the requirements based on the previous achievements. However, condition 7 had to develop further.

Our thesis is that while fixing its attention on the bodies of individual patients and, despite the remarkable development of knowledge of the body's anatomy, physiology, pathology and so on, the therapeutic arsenals were still insufficient, and medicine did not have much to offer to society at that time. Besides, etiological knowledge had not progressed much; diseases were identified and described in detail, but their causes were not clear.

Furthermore, even more important for establishing the health function system, there was very little understanding and few solutions for the illnesses affecting many in society, particularly epidemics with their devastating effects. Medicine in this sense offered too little as far as the social needs of the time were concerned. Without firm and valuable solutions for society, the incipient system would linger on with little recognition.

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4 Chapter 2 has a summary of the theory and explanations of these concepts. See also the Glossary at the end of the book.

The crucial development arrived with a better understanding of the causes of diseases and the constitution of public health, with tools and knowledge to address the health problems of the collective, tackling populations rather than individual patients, and, of high importance, achieving the recognition of the political systems, realizing the powerful potential of the societal-wide implications of public health policies.

We develop the arguments in favour of this hypothesis throughout this section. To start our narrative, we return to some historical points in the evolution of medicine. A comparison with the legal system can be useful here. The legal system, together with the political system, was possibly the first social function system to become differentiated in human societies.

Consider the lawyers as professionals dealing with and defending cases on behalf of their clients in courts of the Roman Empire or earlier. A lawyer could not exert his profession alone, he would need first of all laws to refer his cases to. Laws, in whatever form they may have existed, had to be enacted as politically binding decisions – that is, decisions made by a political system – whatever regime and power structures in which they were decreed.

Besides that, a lawyer would have to present his case in front of a jury or judge, who would also listen to the other side of the dispute (probably another lawyer), and then make a deliberation, which would have legal weight and meaning, would be imposed and compliance demanded. Compliance would be enforced by the mechanisms made available to the legal system by the political system. The picture could be a bit more complicated with the inclusion of the appeals courts. Without these legal structures, lawyers could not exist.

A doctor, contemporaneous to such lawyers, would not have any of that; in fact, he would not need similar structures. Doctors were not required to submit their cases to a court, or argue with opponents, or justify their procedures in line with enacted policies; none of that. In ancient Greek society an individual interested in performing healing practices, with some communication skills and capacity to interact with sick people, listening to their complaints about bodily dysfunctions, with some knowledge of herbs, massages, baths, diets, and so on, pos-

sibly including prayers and invocation of godly powers, could claim the role of doctor/healer and conduct his business, as long as he could find clients interested in his services and willing to pay for them.

Such a set-up persisted until the final century of the Middle Ages about 2,000 years later, when formal medical education became recognized and offered as university courses. Then, becoming a doctor was hard, requiring a high level of literacy and money to finance the expense of the training. Those doctors were conscious of the specificities of their category and the necessity to be distinguished from the charlatans or surgeons who were then considered craftsmen with the same low status as barbers. In that context, the development of interactions between medical professionals and the political power was convenient for both, as exemplified by the eagerness after the French Revolution to bring doctors into the fold, with official public initiatives and spaces for medical practice and the training of medical professionals (see Chapter 4).

We can say that the medical profession, politically endorsed and promoted, became the backbone of the health system in the making, lending to the soon-to-be health systems the essential distinctive semantics, practices and self-references, endowing them with a differentiated social identity with specific meanings.

In accordance with the acknowledgement of belonging to a politically supported category, medicine was granted space for practising and for its self-reference reflecting its legal and political recognition. The medicine of universities' research and training combined with the medicine of public hospitals and political recognition, gained a status granting it the legitimacy and freedom to examine bodies, alive or dead, as medically justifiable, and was authorized to carry out experimentation of techniques of examination, diagnosis and treatment.

At that time, the growth of the embryonic health system was dependent on the reproduction of medicine, which medicine could perform with its self-reference and self-observation functionalities. By already being able to perform its operational closure (reproducing meanings created by itself), medicine would make possible the operational development of a health system where it would occupy the core reference. With its specific meanings, medicine could perform the selection of opera-

tions, keeping inside the system meanings adequately communicated with validated semantics and excluding the rest. Only medicine could judge medical practices and communications and that was key to establishing the health function system.[5]

Medical semantic development was thus complete and the health system could be built on that. Also, medicine was no longer only practiced by individual doctors on their own with individual patients. Medicine was becoming institutionally located and its practices were acquiring social recognition and visibility. Hospitals became the privileged, but not the only, site for that. The French Revolution envisioned a system covering large parts of the population with services according to communities' needs. This reveals the attention the political system had started to pay to health as a collective problem and medicine as a possible socially acceptable solution (see Chapter 4). We can say that the terrain was fertile and prepared for the sowing. But something was still missing.

At the beginning of the nineteenth century, a number of developments met the remaining requirements. We can list the most relevant ones: (1) better understanding of epidemic surveillance and control measures (John Snow and cholera as water-borne disease); (2) better understanding of links between poverty, living conditions, sanitation and diseases (Chadwick); (3) civil registration, epidemiological data and statistical analysis (Chadwick); (4) whole-life events and hygiene (maternal, infant and child care, housing, lighting, fresh air, disposal of dead bodies, and so on – Johann Peter Frank); (5) inoculation and vaccination (Edward Jenner). The notion of prevention was embedded in all these fields.

Also common in all those was the orientation of what was understood as the "Public Health Movement", which eventually found recognition and a place in academic disciplines as well as political spaces as

5 The same applies to any other function system. Only the legal system can make valid communications with the legal/illegal binary distinction; only the art system can make credible statements according to the distinction art/non-art; only the science system can communicate with acceptable claims of whether something is scientifically true/false; and so on.

public health authorities. The recognition of social factors (brought into the medical consideration), for which the discovery of the transmission of germs and diseases gave strong evidence of the need for programmes and actions of wide social coverage, made incontestable the understanding that health was definitely the business of the state.

We may say that nothing would have happened if medicine had not developed its self-reference, which could be at the core of the health systems. An image that may come to mind is of a nucleus around which larger structures could genetically develop.

Medicine was already differentiated as a discipline with a clear shape among other scientific disciplines. But the practice of medicine as a service to society, as curing or alleviating diseases in individuals, could only be configured as a social function system by adopting broader perspectives of social relevance (not only individual but population-wide) for addressing, preventing or alleviating disease in societies.

When public health concerns acquired political relevance and became prominent, medical professionals were already in hospitals and communities, studying diseases and providing healthcare services. Medicine made available the knowledge about how prevention could be tried and implemented. Medicine provided the fundamental knowledge of diseases to structure and guide the public health orientation. Public health needed that foundation from where it could expand the social focus and reach of medical practices – by social we mean the complex network of interrelated and intertwined sets of factors such as political, demographic, economic, cultural, educational, religious as well as environmental.

It is clear that medicine became and has remained the core of the health system, while the health system itself, with its public health self-reference, developed and incorporated additional concerns and specific semantics. Within the development of the health system there are innumerable communication operations related to a diverse range of disciplines. The development of the system around its medical core and its binary code (healthy/sick) made it possible to connect, incorporate and reproduce expertise such as nursing, physiotherapy, dentistry, pharmacology, biomedical engineering, as they and their specificities

became constitutive parts of the health systems, contributing to daily care of patients. This is addressed in the next section. But crucially, the health system emerged with the ethos that society as a whole had to benefit from healthcare knowledge and practices, and public health occupied that space of meanings.

In short, we can say that without medicine's consolidation of its communications (based on the distinct healthy/sick binary code) and related semantics, there would not be a health social function system.

(3) How did the coupling of the self-references of medicine and public health create health systems?

In *Law as a Social System*, Luhmann (2008a, p. 423) says: "An external, scientific description of the legal system does justice to its subject only if describes the system as a system that describes itself and constructs theory about itself".

With this quotation about the legal system's self-descriptions in mind, we can reflect on whether the same applies to the health system and its components: medicine and public health sub-systems. We may say that a description of a health system as a system should be made by the health system itself in the first place.

From the beginning of legal institutions in ancient times, lawyers operated (communicated) with others in the ambit of legal practices – legislators, judges, attorneys, jurors and so on – according to the roles they played at the time. In contrast, only by the end of the third period (eighteenth century) did doctors start to receive support, with a number of roles and schemes involving non-medical health professionals.

Today, the practice of medicine is surrounded by expertise of professionals such as pharmacists, nurses, laboratory and radiology technicians, physiotherapists, psychotherapists, nutritionists. The complexities thus established need to be orientated in a systemic way; a system has to be in place, reflecting a comprehensive unit and its role vis-à-vis the society, all under the same fundamental binary code healthy/sick.

The practice of medicine changed, and it is no longer just an encounter between a doctor and a patient; a lot has to be arranged around

those encounters, beforehand, during and afterwards. Many inputs, tools, resources need to be assembled (and essentially communicated about) to what is no longer simply an interaction that starts and ends during the meeting between patient and doctor. Health-themed communications now are used in many instances involving different professionals. This clearly indicates the necessity of having a system in place, requiring meaningful communications, in predictable fashion, corresponding to expectations and preserving stable meanings.

Being at the core of the health system, medicine now requires all the services that surround together with medical actions; the system makes all actions meaningful. A health system, as a self-referential system, constructs its own image and organization, creating a complex unit of which medical treatment is a component – the core one, but still a component among many others. The self-reference of the system has to be constructed and continuously maintained, incorporating medicine but not limited to medicine's exclusive concerns.

On the other hand, society is everywhere in the health social system. Public health is in charge of dealing with observing society from the point of view of the health system. The sub-system of public health evolved and differentiated itself from medicine in the internal environment of the health system, actualizing the overall orientation of the system towards society – that is, constructing the references by which the system can recognize and justify itself to itself and to other social systems, vis-à-vis the society the system has to assist. The health system recognizes itself for both the delivery of medical care and the delivery of public health operations for the health of the collectivities.

Very early in the history of medicine, as noted in previous chapters, the political powers of the time understood health as government matter, as societies needed healthy soldiers, cities to be kept reasonably inhabitable, and epidemics contained. Progressively, around the third period (also explained in the respective section), medicine also became a matter for educational, economic and legal concerns, each considering health and medicine from their own perspective. The "interfaces" and coupling with these other systems, had to be elaborated with the observation of their concerns, with public health taking shape by setting ten-

tative questions and tentative answers, and evolving as a distinct set of knowledge and references.

Telling this history in other words and with a few more details, we can say that while medicine carried on finding diseases and treating individual patients, public health (in a broader sense) had to find ways of dealing with:

1) the political system on matters of what would be justifiable as collectively binding decisions concerning the health of the population from which the political system were continuously pursuing legitimacy;
2) the legal system on matters concerning the legal mandates of health systems related to the rights of patients, the limits of professional practice, and so on;
3) the education system on the exclusive control of the health system, and the limitation and validation of the reproduction of healthcare skills and competences;
4) the scientific system on the advance of knowledge in fields of health and treatments of interest, as far as those advances are intertwined with on-going healthcare practices and the outcome of the incorporation of new knowledge into the health system's communications and actions;
5) the economic system as economic transactions might impact access, supply and provision of health services, and therefore has effects on distribution of risks of disease, outcome of treatments and deaths.

To this list we could also add interactions of public health with the functional social systems of religion, media, art, and so on. But we do not go into those details here.

In a broader sense, public health, keeping its central focus on populations and risks (as we have previously discussed), and therefore using the secondary binary code of at risk/not at risk (the primary code being healthy/sick), observes the other systems and communicates with them at the level of the respective organizations. The examples are:

1) the political parties, communicating about political support for policies of interest for both the political and the health systems;
2) the legal system, on what concerns applications of law to populations at risk, where rights to access to care have legal implications and entitlements;
3) the education system, on decisions about the number of professionals to be trained, new schools and courses to be opened, and so on, in correspondence to the population's needs and health service coverage according to society's risk profile;
4) the scientific system, on updating communications and new knowledge, on field trials, and assessing scientific evidence for optimizing reduction of risks;
5) the economic system, on sale and purchase transactions performed by the health system's organizations with potential effects on the population's health risks.

Of course, such broadening of public health horizons may sound unusual for the common characterization of public health as only the sets of functions a Ministry of Health takes care of, with the essential purpose of preventing disease (vaccination, surveillance, epidemiological controls, water and sanitation monitoring, drugs controls, and so on).

But here we support the notion that planning and dealing with all issues that may have an impact on the health of the population are matters of public health concern, be it carried out in the ministry or among private enterprises (pharmaceutical industry, insurance companies), academic institutions or others. The health system encompasses all communications where the medical (healthy/sick) codes are used, and also all communications on topics of increased or decreased risks of getting sick and dying, and their population distribution.

Everything that might be relevant for the collective in terms of producing or avoiding diseases and disease risk factors, assuring (or not) access and provision of effective (or not) healthcare, falls within the domain of public health, which public health can and should have a say about. All those possible areas of concern are currently, in one way or another, found in institutions reflecting, fulfilling and reproducing this broader

public health role. Some may say that we are bringing the whole field of health management into the realm of public health, and we would agree with that.

Furthermore, of key relevance among public health functions is the self-reflection of the health social system – that is, how the health system defines itself, ascertains what it is and what it is not, and its duties. To demonstrate why the health system should be concerned with legal, political, economic, educational or scientific deliberations (as well as other social system decisions), the health system needs a vision of itself and of the environment it tackles, including the diverse causal relations of disease occurrences, treatments and preventions.

We need to recall Luhmann's theory, where he establishes that a function system cannot communicate with another, because they do not use the same codes (see Chapter 2). However, organizations, a type of social system, can communicate with other organizations when they have within themselves sections specifically related to the same function system. For instance, the legal department of company A can communicate with the legal department of company C because they use the same legal codes and can therefore understand each other's communications. This therefore allows for the organizations of the health system to communicate with organizations of the legal, political and other systems. Being part of the environment of the health system, the other systems (political, economic, educational, legal, scientific, and so on) are observed by the health system, which is likewise observed by them. The organizations in each other's environments can communicate with each other on matters they have in common, arising from their mutual observations.

In addition to that, different departments within the same company can talk to each other because, belonging to the same company and having the overarching membership identity common to them, they share the company's orientation concern. For example, in a company, the legal department can talk to the engineering department, each recognizing the use of their respective distinct semantics; however, they have common understanding when matters of the autopoiesis (self-reproduction) of the company is at stake. The legal department may, for instance, warn about the legal implications of decisions the engineering department

wants to make. The interests of the company offer the guiding rules and channels for communication between the departments.

Following from these points, we can understand that the health system, particularly its public health sub-system, can engage in communications with organizations of other function systems when health matters are at stake. For that, the public health sub-system observes and represents the other systems inside itself; the public health sub-system sustains internal communications about the matters observed in other systems.

The public health sub-system can select the themes of communication with the political, scientific, legal systems, in relation to which it internally communicates and makes decisions about. Public health departments select and prepare the topics to communicate with organizations/departments outside the health system. The health system is thus preserved. While communicating with organizations outside the health system, the public health system will always communicate from its own perspective, always a perspective constructed within the public health sub-system in terms that are meaningful to it.

The selections and constructions the public health sub-system performs in these processes are constitutive part of its self-reference. Without self-reference, public health would not have a position from where it could observe its environment, observe other systems and organizations in it, never mind communicate with them, because it would not be able to differentiate itself from its environment.

The crucial historical moment for the constitution of public health (as discussed previously) was the French Revolution. What that revolution brought about was a new way of meaningfully structuring the provision of healthcare, creating entitled citizens, and bringing the reproduction of medical knowledge in line with social concerns of the revolutionary ideals, in the process of dismantling the old privileges of the aristocracy and creating a new order.

In fact, medicine's treatments were almost as poor as they had been for more than thousand years, but knowledge of the human body had expanded considerably, and the consolidation of new institutions like universities with medical schools, and guilds representing doctors' in-

terests, created new forms of social recognition of medicine (new forms of medicine communicating to itself and about itself).

At that time, the political system took matters of health as part of its concerns. The political system produced decisions on issues of social relevance that the system considered necessary for its legitimacy. That included regulation of doctors' training, hospitals, coverage and distribution of services. Medicine could not advance itself in those domains without political endorsement and authorization of medicine's purposes. That corresponded to the institutionalization of public health, first within the political body itself, and then in the soon-to-be-established social health system with distinct public health administrations.

The public health sub-system thus created was in charge of constructing and presenting visions of where, how and why state intervention was required and would make a difference. Even if institutions were still being established, the construction in practice of public health self-references was activated.

With advances in the observations of epidemics, establishment of surveillance schemes, inspections, vaccination, hygiene, prevention, and measurements of distribution of diseases, risk factors and medical services, a universe of rationale and argumentation for interventions became available. In that process, public health constructed its own self-reference in terms of its unique capacity to identify social health problems and solutions.

Public health thus portrayed itself as having the keys to the door to better health systems and better population health, proposing planned distribution of services, structures, resources, and suchlike, aimed at maximizing benefits. Public health now has consolidated command of the tools to elaborate and justify the solutions. It can advise the political system on the decisions that need to be taken. However, the Social Systems Theory reminds us that political systems, as autonomous social systems operating in the context of societies' function differentiation, still retain their own ways and the exclusive prerogative of deciding on political matters.

As final words on the topic, while elaborating its scenarios, plans and justifications, public health has to keep intense awareness, considera-

tion and communication with the medical sub-system, understanding the requirement to preserve what has been achieved and its aspirations. Any plans and proposals have to be as meaningful for the public health sub-system as for the medical sub-system.

The health system cannot afford to have its two sub-systems in conflict. The self-reference of the two sub-systems together create the self-reference of the health system. The health system has no self-reference constructed independently from those two self-references.

We can summarize this section as follows. With medicine as its "nucleus", treating individual patients, the health system needed the "membranes" to separate the system from its environment, and to work the "interface", regulating the interactions with the environment. From a Social Systems Theory perspective, although imperfect, this "cell-like" metaphor may give a tentative picture of health systems with the two sub-systems. It is instructive, however, to explain that the "cell" metaphor is misleading because it gives an appearance of "solidity" or "concreteness" to the health system, while we are in fact dealing with systems made of meanings – communicated meanings. Social systems are constituted in the realm of meanings, and the distinctions of "nucleus" and "membranes" is made by meanings. All of that is to say that the health system emerges as a unit with these two sets of meanings (medicine and public health) combined with their own self-references.