The GEM Model:
A Model of Health Based on Generalized Empirical Method
Parts 1-4

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The GEM Model: A model of health based on generalized empirical method – Part 1 – Introduction

Abstract

This is the first of a four-part essay in which I present a comprehensive model of health based on the philosophy of Bernard Lonergan. In this introductory article, I situate the model within my overall project to develop a philosophy of health based on Lonergan's philosophy and within contemporary efforts to understand the relation between the health science and healthcare. In the following set of three articles [1-3], I discuss the philosophical background of the model before fleshing the model out and then comparing it to other accounts of health and disease.

Keywords

health, model, generalized empirical method, emergent probability, human good, health science, healthcare, humanities

The role of a model in a comprehensive philosophy of health

The model that I present in this set of papers is part of an ongoing project to develop a comprehensive philosophy of health based on the work of Bernard Lonergan, a Canadian philosopher-theologian whose life spanned the first eight decades of the 20th century [4]. In contrast to the dialectical orientation of my earlier papers, in which I analyze several mainstream accounts in bioethics [5-6] and philosophy of medicine [7-8], my orientation in this paper is foundational. According to Lonergan [9, pp. 266-267], models stand as foundational to the human sciences in much the same way that mathematics stands to the natural sciences. On his account, models provide an interlocking set of terms and relations – as opposed to descriptions or hypotheses – that specify basic categories of investigation; they orient investigation as a sketch to be filled out or as a clue to what might be overlooked as currently formulated; and they facilitate description and communication regarding complex realities. My aim here is to lay out a basic set of terms and relations that can serve as a methodically dynamic framework for understanding health science and healthcare practice that is relevant to clinicians, researchers, educators, policy makers, those engaged in cultural critique – including philosophers and theologians – and in the final analysis to any thoughtful person. With respect to cultural critique, it is meant to provide a framework for systematically relating the manifold problems currently addressed by philosophy of medicine, philosophy of psychiatry, philosophy of nursing, bioethics, medical humanities, and related subdisciplines. This methodical, comprehensive, and systematic orientation of my project is why I call what I am doing *philosophy of health* and the model I am proposing a *model of health* rather than a medical model [10-11], a nursing model [12], a psychiatric model [13], or an epidemiological model [14], although in an important sense that will become apparent as I proceed it is definitely an *ecological model* [15-16].

The model operates from the standpoint of Lonergan's generalized empirical method [17, pp. 135-139], so I refer to it as the GEM model. As I hope to demonstrate, generalized empirical method provides a way to integrate health-related theory and practice and, within the realm of theory, to coordinate the role of natural and human science in a unified health science. The model relies on Lonergan's theory of emergent probability [18, pp. 144-150] to account for the

stratification and probabilistic interrelation of generically distinct levels of function within organisms as well as the world within which organisms live and die. Furthermore, the model relies on Lonergan's account of the structure of the human good [9, pp. 47-54] as a key to relating the historical and natural dimensions of human living. Generalized empirical method, emergent probability, and the structure of the human good constitute the three legs on which the GEM model of health stands. I discuss each of these in more detail in the accompanying set of papers.

The role of a model in understanding the basis of health science and healthcare

Ian McWhinney, an early proponent of patient-centered clinical method, advocates explicit attention to the philosophical foundations of medicine in his classic *Textbook of Family Medicine* [19]. He sets up an interesting dynamic there between two ways of thinking about these foundations, one based on systems theory [20-21] and the other on the traditional notion of a great chain of being [22-23]. On the one hand, he relies on systems theory to explain the biological basis of family medicine and acknowledges the key role of George Engel's biopsychosocial (BPS) model in calling attention to the mutual interaction of a hierarchy of systems within and between individuals with respect to health and disease. On the other hand, the physical exchange of information that occurs between different systems levels, both individual and social, is not the same as what a patient actually feels in being well or ill or what occurs in the intersubjective communication of meaning between caregiver and patient. According to McWhinney, knowing the subjective (or mental) dimension of illness involves hermeneutical understanding concerning meaning, but knowing the objective (or physical) dimension of illness involves empirical science concerning sense data. He says that these represent distinct levels of being, each with "its own level of knowing" [19, p. 80; citing 20].[1] Note that this differentiation of levels of being is qualitative in contradistinction to the quantitative stratification of the BPS hierarchy, which depends primarily on differences in size and number [see Table 1]. As to how the mental and the physical are related epistemically, McWhinney says, "The distinction between subjective and objective data is artificial because perception and interpretation always go together. Learning to be a skilled observer is a training in interpretation" [p.82]. But he leaves open the question how the mental and physical are related ontologically.

This last point relates to a problematic that George Khushf identifies in attempting to "rethink the core model that informs medicine," which takes for granted a sharp divide between facts and values [24, p.445]. Biomedical models of health and disease presume that "explanation traces a path downward" to the level of cell biology or genetics or neuroscience and that causation "proceeds upwards" from these levels to determine the functional state of the whole organism (or network) [p. 434]. Although Engel took explicit account of the role of top-down determination of lower-level functioning in his BPS model, he excluded value from playing a truly "scientific" role in such determinations. More recent and less hierarchical medical models based on genomic versions of systems biology, such as P4 or P5 medicine [25-

[1] McWhinney [19, p. 81] also mentions a third level of being, the transcendental, concerning which knowing is "contemplative" and "difficult to express in words." Schumacher [22] specifies four ontologically distinct levels of being: matter, life, consciousness, and self-awareness.

Table 1: Engel's natural systems hierarchy [21]

SYSTEMS LEVEL	SUBLEVEL	METHOD
SOCIAL	biosphere ↔ society/nation ↔ culture/subculture ↕ PERSON ↔ two person ↔ family ↔ community	*natural history*
ORGANISMIC	↕ nervous system ↔ organs/organ systems ↔ tissues ↕ subatomic ↔ atoms ↔ molecules ↔ organelles ↔ cells	*factor analytic*

26],[2] link biological and psychosocial functioning in terms of the flow of information across networks and treat value in terms of measurable utility. They seek to represent medicine in engineering terms as a complete set of network relations, a view that Vogt, Hofmann, and Getz characterize as "technoscientific holism" [27]. Khushf accepts the move to understand health as intra-systemic integrity, but argues that health science and clinical practice are both "irreducibly interpretive" and "value-laden" [24, p.444] and that the "rate-limiting steps in the long-awaited molecular revolution [in healthcare…may depend more] on new social and cultural forms…[than] on a new technology or on filling in the missing term in a network diagram" [p. 447].

Several Cartesian presuppositions underlie these various models. One concerns the ontological dualism of mind and matter, which reduces to materialism if one denies any real difference between them. Another concerns the notion of organisms as machines, an analogy that Descartes considered in his *Discourse on Method* [28] and that still animates much contemporary biological thinking, including the engineering ideal of P4 medicine. This viewpoint discounts the difference in kind between non-living and living things, independent of a further differentiation of being at the levels of consciousness and reflective intelligence, along the lines noted by Schumacher. A third point concerns the problem of the bridge in dualistic or more differentiated accounts: how are different levels of being related or integrated? This question has both epistemic and ontological implications. McWhinney takes up the epistemic side of the question, as noted above. In [29], Thomas Fröhlich and co-authors take up the ontological side. In developing the GEM model, I take up both sides of the question: ontologically in terms of Lonergan's account of emergent probability and epistemically in reference to his generalized empirical method. Regarding the bias against data of consciousness and questions of meaning as less than scientific, I should add that generalized empirical method attends to data of sense and data of consciousness in an equally critical way.

Conclusion

[2] P4 medicine stands for medicine that is *predictive, preventive, personalized,* and *participatory*; P5 medicine, for medicine that is also *psycho-cognitive.*

Models specify basic categories of investigation; orient investigation as a sketch to be filled out or as a clue to what might be overlooked in their current formulation; and facilitate description and communication regarding complex realities. The GEM model of health that I sketch in the following three papers (Parts 2-4) aims to function in these ways with respect to the investigation of health science and the practice of healthcare. The model addresses some fundamental philosophical issues, but always with a view to elucidate a comprehensive notion of health. I deal with background questions of worldview and how we investigate the world in which we live in Part 2, where I discuss Lonergan's accounts of emergent probability and generalized empirical method. In Part 3, I relate the notion of health to Lonergan's account of the structure of the human good and, building on this, I elaborate the GEM model as a table of terms and relations that encompass the multiples dimensions of intrapersonal and interpersonal health. In Part 4, I compare and contrast (1) the GEM definition of health with that of the World Health Organization (WHO); (2) the methodical integration of judgments of fact and value in the GEM model with their incommensurability in most naturalist and normativist theories of health; (3) the significance of differentiating risk factors and disease relative to states of health in the GEM model with the tendency to blur any such difference in current multifactorial accounts of disability and dysfunction; (4) the GEM model's emphasis on the common core of operations underlying health science and healthcare with the gap separating hermeneutic understanding and scientific explanation that is often the rule in humanistic accounts of health; and (5) the role of the ordered and eco-socially conditioned set of relationships in the GEM model of health with the multilevel perspective on health in the developing field of global bioethics. In conclusion, I note that the GEM model offers a unique framework – a higher viewpoint – for integrating in dynamic fashion the manifold viewpoints of clinical practice, the humanities, health science, and health policy.

Conflicts of Interest

None.

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The GEM model of health: a model based on generalized empirical method – Part 2 – Background

Abstract

In this paper I discuss background issues of worldview and method that underlie the GEM model of health. First, I present Bernard Lonergan's account of emergent probability, a differentiated and developmental worldview that stands in sharp contrast to the inadequately differentiated viewpoints of materialism and dualism discussed in Part 1. This opens up a new way for the GEM model to approach questions of health that stands in sharp contrast to the way that the standard biomedical model and alternative hybrid models approach these questions. Second, I present Lonergan's account of generalized empirical method, a unified method for investigating the natural and historical dimensions of the world in which we live and seek to thrive.

Keywords

health, emergent probability, generalized empirical method, systems theory

Emergent probability

In medical models based on systems theory, like Engel's biopsychosocial (BPS) model [1] or Hood and Flores' P4 model [2], all levels or nodes of an organism's functioning are thought to be systematically and quantitatively related to one another via the bidirectional flow of information. According to these models, the emergent properties of whole systems differ from that of their parts, but the relations between whole and part, like the relations between parts, are to be understood in engineering or algorithmic terms. In contrast to these models, the GEM model of health distinguishes systematic and non-systematic relations both in world order (the way the universe is ordered) and in the way that living things like human beings are organized. New kinds of systematic relations and new types of things have emerged over time as part of an evolving world order that is both materially and formally dynamic. For instance, living things differ from non-living things not only in the complexity of their material organization, but also formally in being self-organizing so long as they are alive. Higher level schemes and things are not systematically (algorithmically) related to lower level schemes and things; rather higher level schemes and things depend non-systematically (probabilistically) on lower level schemes and things for their emergence and survival.[1] The spatial image of levels is meant to convey the dependency relationship of higher on lower levels; however, the levels differ from one another not in terms of spatial relations or extension, but in kind.

Lonergan identifies five generic levels of world order: physical, chemical, organic, psychic, and intellectual. This corresponds closely to the levels of being (matter, life, consciousness, self-awareness) noted in the introduction [5], to which McWhinney refers as part

[1] Lonergan [3, p.71] says that systematic relations are those that can be understood in terms of a unified set of insights. Such insights might be expressed as an algorithm (not his term) or a scientific law, like $E=mc^2$. Non-systematic relations can only be understood in terms of a diverging set of insights, as in Aristotle's example of a man running into someone at the market who happens to owe him money [4, 196a 1-5].

of the perennial philosophy [6, citing 7], with the added division of matter into physical and chemical levels. Lonergan does not start with ontological categories in working out his account, however. He starts first from an analysis of inquiry and works from there to his positions on epistemology and metaphysics. So, his initial justification for his division of systematically distinct levels is the autonomy of the relevant sciences: physics, chemistry, biology, psychology, and human sciences (such as sociology and economics). A key notion for Lonergan in his account of world order is development, which entails a sequence of higher integrations of "successively transformed lower manifolds" [3, p. 479]. One of his prime examples of development is the sequence of asking and answering questions: understanding, when it occurs (at the intellectual level), integrates an underlying manifold of data and images (at the psychic level) that begin to be transformed in the very act of questioning. Otherwise insignificant events have the potential when questioned to be understood as meaningful – for instance, the fact that the dog didn't bark to become a clue in solving a mystery. Putting the underlying manifold of data in question potentially conditions, but does not guarantee, the emergence of insight – that is, the act of understanding. Witness the difference between Holmes and Watson.

The relation between insight and data is not systematic. There is no algorithm for getting the right answer in particular situations, although finding and asking the right question(s) can be approached methodically, both in scientific and in practical terms. Galileo, Newton, and others introduced a new way of understanding science that was remarkably open to development in virtue of generating an ongoing cycle of new data and new questions. They searched for and discovered generalizable and invariant correlations – between distances and durations, between force and mass and distance – that order the universe. But these systematic (or classical) generalizations only determine the possible ordering of events. They do not determine their probable ordering, which statistical investigation seeks to understand – when, where, how often, and under what circumstances they do occur. Nor do these classical and statistical correlations necessarily determine the actual ordering of events. These latter determinations concern the *ceteris paribus* conditions of general laws and the empirically residual conditions that limit probabilities to runs of events rather than individual events. Classical investigation, according to Lonergan, seeks to understand the systematic relations specific to a given level of function; statistical method seeks to understand the non-systematic relations between different levels of function; classical and statistical investigation complement one another in learning what is possible and what is probable. Common sense supplements these modes of investigation in understanding what actually happens in particular circumstances.

An analogy may help to convey Lonergan's point. The values of the various hands that are possible in poker represent a systematic set of relations that define the game. The probability of getting any particular hand or a winning hand can be calculated, but these calculations only hold over the long run. The actual frequency with which specific poker hands happen to occur in a run of games varies non-systematically relative to the calculated (or ideal) frequencies since the actual hands dealt in any game also depend upon a diverging set of conditions regarding the way that the cards are shuffled, dealt, and played. The best players take the possible, the probable, and the actual elements of the game into account. In just the same way, applying classical and statistical correlations – for instance, pathophysiological and epidemiological correlations – in concrete situations requires additional practical insights concerning particular patients in particular circumstances [8]. In practical terms, the more familiar one is with local conditions, the more likely one is to attend to the relevant local data. At the same time, what is systematically possible and statistically probable remain pertinent. Just as systematic and

statistical understanding complement one another from a theoretical standpoint, correct theoretical understanding fills out common sense understanding of what actually occurs from a practical standpoint.

The cycle of learning that modern science exhibits and the series of hands played in a poker game are both examples of what Lonergan calls *schemes of recurrence*, a series of events that mutually condition their respective and regular occurrence [3, pp. 141-143]. These schemes may admit any number of terms, the possibility of alternative routes including defensive schemes, and in general any degree of complexity. Other examples of schemes are cycles of star formation and extinction; the origination of chemical elements at the center of stars under appropriate conditions of temperature and pressure; the hydrological cycle linking the earth and its atmosphere; biological cycles of photosynthesis, metabolism, and reproduction; and economic cycles of production and exchange.

Schemes of recurrence represent a deceptively simple idea. Even the rationally defined game of poker discloses that the sequence of hands played in any particular game involves a fascinating array of the possible, the probable, and the actual seriation of events. Similarly, the weather pattern on the face of the earth varies on any given calendar day from year to year, but generally conforms to a seasonal pattern over a period of months, which relates in turn to the systematically ordered orientation of the earth in cycling the sun every year, other things being equal (that is, barring a cosmically catastrophic event). Unlike these relatively stable cycles, the cycle of learning augmented by empirical method over the past 500 years more readily discloses the dynamic potentiality in the unfolding of world order for the development of new types of things and schemes; in this case, new forms of understanding and new sciences, such as analytic geometry and calculus or classical and quantum mechanics or evolutionary and molecular biology.

Lonergan calls the dynamism of world order *emergent probability*. On this account, lower order schemes and things condition the emergence and survival of higher order schemes and things. The laws or correlations that define a given generic level are systematic; the relations between lower and higher levels are statistical. As in the example of poker, besides these generically intelligible relations, what actually occurs entails non-systematic and contingent relations, which can be known as a matter of fact only upon their occurrence. For instance, what happens randomly from the standpoint of physics – the binding and release of oxygen from a hemoglobin molecule – is ordered biochemically and physiologically within an organism; what happens in a particular organism at a particular time and place in this regard is also conditioned by the availability of ambient oxygen, which itself is subject to a diverging set of conditions. Regarding emergence, the law of large numbers comes into play. What occurs once a million years – say, a mutually conditioned sequence of events forming a scheme – may occur a million times in a million years. The spatiotemporal distribution of schemes and things in the universe narrows as their level of order increases, since the probability of their mutual occurrence diminishes in direct proportion to the number of conditioning factors – that is, the appropriate array of underlying schemes and events.

Lonergan provides an account of explanatory genera and species in chapters 8 and 15 of *Insight* [3, pp. 280-292 & 463-467], which is outside the scope of this paper. He summarizes the relation between generic levels in chapter 15 as follows:

> Otherwise coincidental manifolds of lower conjugate acts invite the higher integration effected by higher conjugate forms. Thus, in our account of explanatory genera chemical elements and compounds are higher integrations of otherwise coincidental

> manifolds of subatomic events; organisms are higher integrations of otherwise coincidental manifolds of chemical processes; sensitive consciousness is a higher integration of otherwise coincidental manifolds of changes in neural tissues; and accumulating insights are higher integrations of otherwise coincidental manifolds of images or of data [p. 477].[2]

The role that "higher integration" plays in this account resembles that played by the "principle of marginal control" in Michael Polanyi's account of emergence [11, p. 40], by which higher level things govern the "boundary conditions" of their lower level schemes. Consider in this regard the limits of blood pressure or blood glucose that are compatible with life or health.

In summary, Lonergan distinguishes systematic and non-systematic processes in his account of world order, which he calls *emergent probability*. Their combined unfolding allows for the emergence of generically distinct levels of schemes and things in world process, characterized by distinct systematic relations at each level, the statistical dependence of higher-level schemes and things on lower-level schemes and things, and the setting of internal boundary conditions on lower-level schemes within higher-level things. The same process also accounts for the emergence of different species of things at each generic level. In the next of this set of papers I define health and disease in terms of the well-ordered/disordered functioning of schemes of recurrence within organisms. In the last of this set of papers I compare the advantages of this approach to other accounts of health and disease. But first I turn from Lonergan's generalized account of the world being investigated – emergent probability – to his generalized account of human inquiry.

Generalized empirical method

After some preliminary remarks, in this section I discuss what Lonergan means by each of the terms: method, empirical, and generalized. Then I discuss the way that he distinguishes (1) common sense and theoretical inquiry and (2) the four basic orientations of theoretical inquiry.

Lonergan draws on several strains in his philosophical education in working out generalized empirical method: the Aristotelian-Thomist attention to the intelligent act of understanding; the British empiricist tradition which advocates progressive science and clear-headed logic; and the phenomenological problematic of historical consciousness, rooted in and animating much of continental European philosophy [12]. In his major work, *Insight: A Study of Human Understanding*, Lonergan joins these three strains "from a moving viewpoint" [3, p. 18]. His overriding concern is with readers' developing an understanding of their own acts of understanding, which can then serve as a dynamic and invariant base for future personal and interpersonal development. Employing a form of phenomenological investigation that in later years he called "intentionality analysis" [13, p. 188], in *Insight* he carries out his project, first,

[2] Lonergan distinguishes different kinds of schemes and events in terms of *conjugate* relations or forms, a technical term that he may have gleaned from John Dewey [9, pp. 231-232, 505]. For instance, in *Logic: the theory of inquiry* [10, p. 280], Dewey says: "The functional correspondence, or conjugate relationship, of involvement and implication, kinds and categories, characteristics and characters, generic and universal propositions, signifies, to sum up, that they represent cooperative divisions of function in the inquiry which transform a problematic situation into a resolved and unified one."

relative to examples of inquiry and insight in mathematics and science in chapters 1-5, and then, relative to an account of practical inquiry and insight in human history in chapters 6-7.

From a higher viewpoint, it becomes apparent that Lonergan is modeling generalized empirical method as he proceeds. Like the empirical method of modern science, by method he means a "normative pattern of related and recurrent operations that yield ongoing and cumulative results," not an algorithm for replicating a determinate set of answers [14, p. 135]. That he intends to proceed empirically is implied in the very title of his book, which brings to mind classic texts in the British empiricist tradition - John Locke's *An Essay Concerning Human Understanding* and David Hume's *An Enquiry Concerning Human Understanding.* It is specifically empirical in that it relies on readers' own experience of understanding what they are doing when they understand the examples of scientific and practical insights that he provides and then carry out a similar process with examples of their own. As he moves to higher viewpoints in subsequent chapters regarding cognitional structure, epistemology, and metaphysics, Lonergan methodically maintains an empirical perspective, seeking to verify all judgments, including those of metaphysics, in reference to experiential data.

Lonergan's method is generalized in two ways relative to empirical and phenomenological method. First, it attends to both data of sense (colors, sounds, odors, tastes, the wet and the dry and so forth) and to data of consciousness (acts of seeing, hearing, smelling, tasting, perceiving, imagining, inquiring and so forth). So-called subjective data are not assigned a secondary status, as per Galileo and Locke, and acts of intelligence are not cut off from acts of sensibility, as per Kant. Generalized empirical method, Lonergan says, "does not treat of objects without taking into account the corresponding operations of the subject; it does not treat of the subject's operations without taking into account the corresponding objects" [14, p. 136].

Second, generalized empirical method generalizes the notion of method. "It wants to go behind the diversity that separates the experimental method of the natural sciences and the quite diverse procedures of hermeneutics and of history. It would discover their common core and thereby prepare the way for their harmonious combination in human studies" [p. 136]. Lonergan identifies four levels of operation that are common to scientific investigation and everyday living: experiencing, understanding, judging, and deciding. These operations are conscious and dynamically interrelated by the wonder of experience and the ensuing responsiveness of inquiry: What is going on? Is that really so? Is this the best way to proceed? Answers to these questions are expressed in words and deeds that call forth new rounds of experiencing, questioning, understanding, and acting to form what Lonergan calls the self-correcting cycle of learning.

Operations at the level of *experiencing* – among which are hearing, seeing, feeling, attending, remembering, and imagining – are responsive to the wonder out of which discrete questions arise; operations at the level of *understanding* – among which are inquiring, understanding, conceiving, and formulating – respond to questions for understanding that ask what? why? and how? concerning data given in experience; and operations at the level of *judging* – among which are reflecting, marshaling and weighing evidence, and affirming or denying – respond to questions for reflection about what is purportedly understood: Is it really and truly so? Is this the best way to proceed? The dynamically ordered sequence of experiencing, understanding, and judging forms a basic unit of human knowing and doing that differentiates as one develops from child to adult into a nested pair of schemes – cognition and

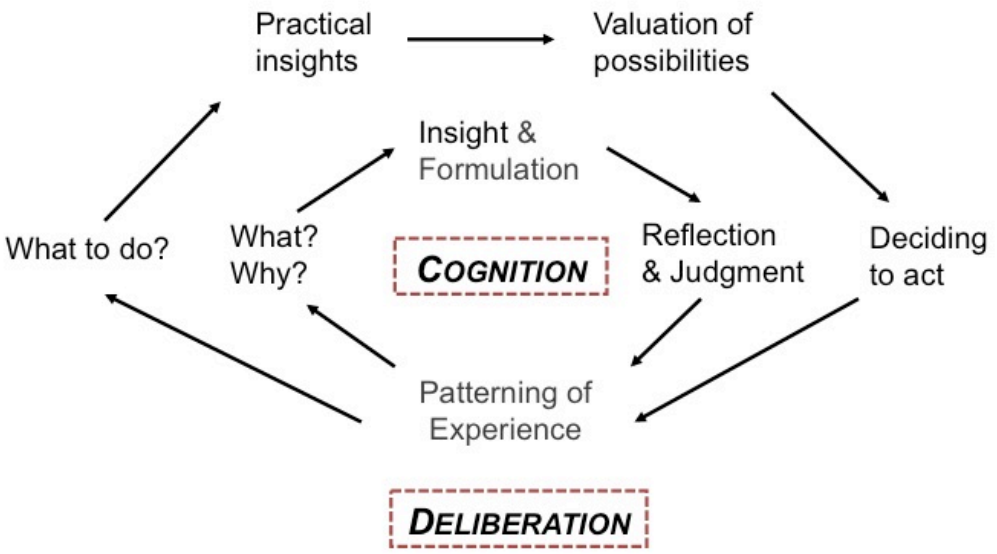

Fig. 1: Nested operations of cognition and deliberation

deliberation – that are united at the level of experience (see Fig. 1). The cycle of cognition is oriented toward judgments of fact with regard to what is going on or has gone on: is this so or not? The cycle of deliberation is oriented toward judgments of value with regard to possible courses of action that are yet to occur: is this choiceworthy? The cycle of deliberation culminates in a fourth, existential level of operation, deciding what to do. Operations at the level of *deciding*—among which are deliberating, deciding, and choosing—respond to judgments of value: considering what is possible given what is known, what is most worth doing? Having decided what is most choiceworthy to do, one must then choose whether or not to act accordingly.[3] The cumulative results of understanding correctly and acting in accord with judgments of fact and value set a standard for the right way to proceed. Taken as a whole, then, the operations of knowing and doing manifest an intrinsic normativity that orients their proper performance: be attentive, be intelligent, be reasonable, be responsible.

Since the same set of operations is involved in all human learning and praxis, Lonergan maintains, these norms serve a transcendental function in relation to all human endeavor. This does not mean that all inquiry and decision-making are the same. In fact, Lonergan makes several important distinctions regarding types and methods of inquiry. Regarding types of inquiry, he distinguishes common sense and theoretical inquiry. Common sense is a "specialization of intelligence in the particular and the concrete" [3, p. 198]. It develops and unfolds as the expression of a collaborative effort in human affairs to understand, judge, and communicate what needs doing and how to do it. In doing so, it "engenders and maintains the enormous structure of technology, economics, politics, and culture that not only separate man from nature but also adds a series of new levels or dimensions in the network of human relationships" [p. 232]. Its analogies and generalizations do not aspire to be universal, but only to apply in specific situations, which it is the function of discrete and specific commonsense

[3] As Aristotle observes, a person can know what is right without doing it [15, 1145 b12].

insights to discern. Compare, for instance, knowing when to apply the proverbial advice: *look before you leap* or *he who hesitates is lost*.

Common sense is oriented toward understanding how things relate to us and, in this sense, is confined to descriptive knowledge. Theory, or science, on the other hand is oriented toward understanding how things relate to one another and, in this sense, ultimately toward explanatory knowledge. It grows out of and relies for its application on commonsense knowing, but it seeks to know determinate relations – both systematic and statistical – that apply to all situations, if only through a series of approximations. It requires unambiguous definition of terms, careful statement of postulates, and exploration of presuppositions and their implications. By way of contrasting common sense and theory, there is a problem that arises in deciding which of Eddington's two tables is real [23, p. ix-xi]. One of them is brown, flat, and hard; the other is a sparsely scattered pack of subatomic particles with a low probability of letting one's elbow pass through. These are the same object considered first in the everyday descriptive terms of common sense and then in the explanatory terms of physical science. However, since *brown* and *hard* do not occur without organs or appropriate chemical structures, a fully explanatory account would also have to draw upon other sciences, such as chemistry, physiology, and psychology [17, p. 317].

Lonergan identifies four possible methods of theoretical inquiry based on the anticipated intelligibility of any field of data: classical, statistical, genetic, and dialectical. As Lonergan says, "data must either conform or not conform to system, and successive systems must be either related or not related in a directly intelligible manner" [3, pp. 509-510]. Classical method seeks to understand data in terms of their constant systematic interrelations; for instance, classical mechanics. Genetic method seeks to understand data in terms of an intelligibly related sequence of systematic interrelations; for instance, developmental biology. Statistical method seeks to understand the extent to which data do not conform to constant system; for instance, quantum mechanics and epidemiology. Dialectical method seeks to understand data regarding the relations between successive stages of a changing system that are not directly intelligible; for instance, political science. Despite the anticipated generality of the systems and structures toward which they head, these methods rely on data that are all individual – for discovery, verification, and application. Insights regarding concrete unities are needed in addition to insights regarding structural interrelations in order to link individual data with general structures. In addition to being unified by concrete reference to individual data, these methods are also unified structurally in complementing one another with respect to investigating world order – emergent probability – and in virtue of relating what we learn from distinct, autonomous sciences in terms of successive higher viewpoints. "[T]he notion of successive higher viewpoints is alone capable of intelligibly relating the generically distinct properties of the same thing without violating the autonomy of the sciences" [p. 510]. This last point is key to understanding the GEM model of health.

In summary, generalized empirical method is a method, a "normative pattern of related and recurrent operations that yield ongoing and cumulative results" [21, p. 135]. It is empirical in that all judgments, even those of metaphysics, are to be verified with reference to experiential data. It is generalized with respect to data and to method. First, as intentional acts and the objects intended are correlative, it takes into account all data, including data of sense and data of consciousness. Second, it identifies a structured and intrinsically normative core of operations in all human inquiry and endeavor: experiencing, understanding, judging, and deciding. These operations unfold in a recurring scheme of knowing and doing that Lonergan calls the self-

correcting cycle of inquiry. There are two primary modes of inquiry: common sense and theory. Common sense relates things and events to us; theory relates things and events to one another. There are four methods of theoretical investigation regarding data that either conform or not conform to system and regarding successive systems that are either related or not related in a directly intelligible manner: classical, statistical, genetic, and dialectical. These methods are unified by concrete reference to individual data and, in structural terms, by the notions of emergent probability and successively higher viewpoints.

Conclusion

Lonergan identifies (1) five generically distinct levels of function in world order: physical, chemical, organic, psychological (sensitively intelligent), and intellectual (formally intelligent) and (2) a common core of operations in all human inquiry underlying common sense and the humanities, human science and natural science. The intrinsic normativity of these operations provides a basis for relating scientific inquiry and knowledge to practical inquiry and decision-making. His account of emergent probability provides an ontological basis for both the differentiation and integration of these distinct generic levels and his account of higher viewpoints provides an epistemic basis for understanding them in relation to one another. A musical analogy may help to summarize the overall scheme underlying the GEM model of health. The structured operations of knowing and doing constitute the harmony of human inquiry and living; the unfolding of schemes of recurrence at all levels mark the rhythm.

In the next of this set of papers, I relate health to the structure of the human good and then I flesh out the GEM model of health by extending this framework to all levels of human living.

Conflicts of Interest

None.

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The GEM model of health: a model based on generalized empirical method – Part 3 – Fleshing out the model

Abstract

In this section, I discuss Lonergan's account of the structure of the human good and then demonstrate how it works in reference to a doctor's description of her experience at a New Orleans' hospital in the aftermath of Hurricane Katrina. Next, I proceed to define health and disease on the basis of Lonergan's accounts of the human good, emergent probability, and generalized empirical method. Then, I lay out the generic levels of human living in a table of terms whose interrelations embody the multiple dimensions of health and their dynamic potential for integration (and breakdown) in the GEM model of health.

Keywords

human good, notion of health, disease, schemes of recurrence, finality, emergent probability, generalized empirical method

The structure of the human good

Like Aristotle and Aquinas, Lonergan holds that the good is always concrete. Thus, he speaks of the good as a notion rather than a concept. Concepts are abstract; they express answers to questions. Notions orient inquiry.

> We ask the question, Why? What? What for? How? not because we know what or why, but because we want to know. We are intending an intelligibility that we want to know but do not know, and that is a notion. These notions are not abstract; they are comprehensive. These questions keep recurring as long as there is something I have not yet understood. And because, of themselves, they are comprehensive, they are not abstracting from any intelligibility, they are intending intelligibility and they keep on intending it [1, p. 337].

He observes that in seeking an unknown it is helpful to name the unknown, the ''x,'' in order to guide the inquiry. He speaks of the ''notion of being'' [2, pp. 372-398] as the object intended in any question—those with answers, those without, those that are yet to be asked. He calls this definition of being a heuristic definition. Similarly, he defines the good heuristically as what is intended in asking what is worthwhile, what is worth doing.

Lonergan calls the good from the viewpoint of human apprehending and choosing the *human good* [3, pp. 47-51; see also 4, pp. 26-106]. Just as world order manifests dynamic and generically distinct levels investigated by such disciplines as physics, chemistry, biology, psychology, and human science, so too the human good unfolds historically on three distinct schematic levels: particular goods, goods of order, and value. Lonergan represents the structure of the human good as a tri-level table of terms (see Table 1). Human praxis oriented toward particular goods involves the capacity to operate as individuals and to cooperate in groups to satisfy the need or want of an individual at a particular time and place; for instance, restoring a patient's health. The good of order concerns actually functioning setups that meet the needs and wants of a group of persons in a recurring and coordinated fashion. This entails the ability to develop skills, carry out tasks, and participate in institutions; for instance, a healthcare institution

Table 1: The structure of the human good [3, p. 47]

INDIVIDUAL		SOCIAL	ENDS
POTENTIALITY	ACTUATION		
liberty	orientation, conversion	personal relations	terminal value
plasticity, perfectibility	development, skill	institution, skill, role	good of order
capacity, needs	operation	cooperation	particular good

that not only possesses adequate material, personal, and social resources, but actually functions responsibly and cohesively in meeting the needs of the community it serves. Ethical value pertains to human action as freely chosen. At this level, the objective and subjective poles of the human good meet: cultural values constitute the historical horizon of choosing operative at particular times and places; persons are originating values, the agents who do the choosing in virtue of their concrete value-feeling, value-insights, and value-judgments.

Ruth Berggren's description of her experience at Charity Hospital in New Orleans in the wake of Hurricane Katrina provides a good example of what Lonergan is getting at. Berggren reports "survival, functioning, and sanity…depended critically on a number of unexpected necessities" [5]. She lists ten of these, ranging in her words from "simple commodities" (valued in terms of their utility) to "principles and rules of behavior." The categories she mentions in passing – *commodities* and *principles* – correspond to the dominant consequentialist and principlist motifs in the standard model of contemporary bioethics [6]. But Lonergan's structured account of the human good provides a better way than the standard model, I believe, to understand the many concrete ("unexpected") judgments of value that Dr. Berggren's list represents (see Table 2). The first four items on the list are "particular goods" that took on special importance when the power went out, elevators stopped working, caffeine withdrawal set in, the temperature rose, white coats were shed, and hallways and stairwells went dark. The next three items fall under the good of order. There was a problem handling patients with diarrhea due to Clostridium difficile on one of the wards, so a night nurse stayed up during a dayshift to create two restrooms – one for urine only and another with a sanitary way to dispose of fecal waste. The nurses also organized as teams to work in 12-hour shifts, which allowed everyone to get adequate sleep. This is remarkably different from the frantic scene of sleep deprivation across town at Memorial Hospital that Sheri Fink describes in *Five Days at Memorial* [7]. Staff also decided to meet each evening at 5:30 pm to sing and pray and support one another. Morale boosting activities like these directly link the good of order to the level of value. In addition to the values of initiative and courage, Berggren says, "The most critical necessity is a team of professionals who care about their patients and one another…Our group received an offer of special rescue, which we did not accept until each and every one of our patients had been evacuated" [5, p. 1553]. In actually caring for their patients and one another, Berggren and her team link the objective and subjective dimensions of value, which Lonergan calls terminal and originating value, respectively.

Table 2: Unexpected necessities at Charity Hospital [5]

STANDARD ETHICAL THEORY	UNEXPECTED NECESSITIES	TRI-LEVEL HUMAN GOOD
Simple commodities	Shoes	*Particular goods*
	NSAIDs	
	Underwear and fanny packs	
	Flashlights and D batteries	
	Toilets	
Principles and rules of behavior	Morale boosting activities	*Good of order*
	Shift work and adequate sleep	
	Strength of initiative	*Terminal and originating value*
	Self-possession	
	A team	

Lonergan observes that the three levels of the human good are isomorphic with the three levels of cognitional structure. Becoming acquainted with particular goods primarily involves *experience*; working out the good of order entails *understanding* the relevant schemes by which particular goods are realized on a recurring basis; and reflecting on the value of different social setups occurs on the level of *judgment* [26, p. 41]. Similarly, Lonergan notes that the three levels of cognition are isomorphic with the metaphysical elements of potency, form, and act. Potency is the component of being to be known by experience; form is the component of being to be known by understanding; and act is the component of being to be affirmed by judgment. "It follows that potency, form, and act constitute a unity. For what is experienced is what is understood; and what is understood is what is affirmed" [2, p. 457]. In virtue of these two sets of isomorphic relations, there is also an isomorphism between the three levels of human good and the metaphysical elements of potency, form, and act. In addition to these vertical isomorphic relationships, there is also the horizontally oriented ontological structure that unfolds at each level of the human good schemes by moving from *potency* ("capacity") to *act* ("actuation") in accord with the *form* (the specific "particular good," "good of order," or "value") being enacted. Intrapersonal schemes operative at organic, psychic, and intellectual levels also unfold according to this pattern, although the specific forms enacted differ according to the generic level of function in question. This set of fundamental metaphysical, epistemic, and ethical relations (see Table 3) that link emergent probability, generalized empirical method, and the structure of the human good might be compared to a three legged stool on which the GEM model rests.

In the next section, I define health and disease in terms of the human good. Then I expand the structure of the human good to include intrapersonal (organic, psychic, and

Table 3: Relating elements of cognition, human good, metaphysics, & schemes

COGNITION	HUMAN GOOD	SCHEMES OF RECURRENCE	METAPHYSICAL ELEMENTS
judgment	value	actuation	act
understanding	good of order	end (function)	form
experience	particular good	potentiality	potency

intellectual) schemes in order to represent the interrelationships of all generic levels of human living of which the GEM model of health takes account.

Defining health and disease

Health is a subset of the good. As such, health is always concrete and never abstract. I define health in the same way that Lonergan defines the good, heuristically as a notion rather than formally as a concept. From the standpoint of emergent probability, health is what we intend in asking about well-ordered schemes of recurrence. From the standpoint of generalized empirical method, health is what we intend in asking whether things are going well and, when things are not going well, it is what we intend in asking what will make things better. The heuristic notion of health is not a concept of biological normalcy derived from ''life itself,'' as Canguilhem [8] says.[1] The notion of health extends beyond biological schemes to encompass schemes of human inquiry and praxis – cognitive, deliberative, and historical. Healthy schemes are open with respect to new experience, new questions, new insights, and new actions. In this sense, being healthy or whole is open-ended. In terms of human praxis, health unfolds on three levels corresponding to the levels of the human good (see Table 1): *clinical health* pertains to well-ordered schemes at the level of the particular good; *social health*, to well ordered schemes at the level of the good of order; and *cultural health*, to well ordered schemes at the level of value. On this account, disease is a disordered scheme or set of schemes of recurrence.[2] For instance, drug addiction is a public health disorder that involves multiple, interacting schemes of recurrence; among these are the disordered schemes of satisfying the need for drugs at the level of the particular good; of drug trafficking at the level of the good of order; and of personal and official corruption at the level of value.

Lonergan defines *finality* as the direction in which schemes develop and unfold [1, pp. 470-476]. Horizontal finality refers to how things unfold at a given level of organization. Vertical finality refers to the development and integration of new and higher levels of organization, either in the life cycle of an organism or with the emergence of new things and

[1] ''It is life itself, and not medical judgment, which makes the biological normal a concept of value and not a concept of statistical reality'' [8, p. 131].

[2] In practice, disease and disorder are often used in a more limited sense with regard to ill health and contrasted with other terms, such as disability or injury. In the context of the GEM model, *disease* is a generic term for the contrary of health. *Disorder* is an even more general term that may apply to non-recurring events as well as schemes of recurrence.

schemes in world order. The notion of finality provides the GEM model with a way to think about health not only in terms of the horizontal unfolding of schemes, but also in terms of their vertical integration, both synchronically (functionally) and diachronically (developmentally). Human praxis manifests both types of finality. At the level of human praxis, actions are oriented horizontally toward the three levels of the human good. Vertical integration of these same three levels unfolds dialectically relative to a tension between embodiment and spirit. For instance, the caregivers at Charity Hospital in the days following Hurricane Katrina coordinated the need for regular sleep with their overall goal of caring for one another and their patients, while the caregivers across town at Memorial Hospital were less coordinated, more sleep deprived, and quicker to give up on rescuing marginal patients. The vertical integration of biological function in humans typically reaches its mature form around the age of eighteen. Psychological, moral, and spiritual integration are more flexible processes that can continue to develop throughout adult life. The flexibility of these higher-level intentional schemes – involving as they do a "world mediated by meaning" [2, p. 335] – makes it much more difficult to distinguish between their normal and abnormal functioning and development as compared to making similar distinctions with regard to pre-intentional schemes of organic function and development, which itself is far from easy.

In summary, emergent probability, generalized empirical method, and the structure of the human good form a basis for understanding health in terms of the well-ordered functioning of schemes of recurrence, including intentional schemes oriented toward a dynamically open-ended notion of health. Defining disease as disordered schemes of recurrence specifies a theoretical unit in terms of which the findings of various methods for investigating any given state of health – classical, statistical, genetic, or dialectical – can be intelligibly related and evaluated.

The GEM model: levels of human living

The notion of schemes of recurrence provides a framework for differentiating and relating generic levels of functioning (physical, chemical, biological, psychological, intellectual), both internal and external to the organism, in accord with the ecological perspective that lower level schemes set conditions for the operation of higher level schemes. The commonsense perspective of most hierarchies of biological functioning limits their explanatory potential. For instance, Christopher Boorse [9, p. 7] sorts the "hierarchy of functional processes" that constitutes "species design" (organelle-cell-tissue-organ-gross behavior) in terms of relative size; and a conventional hierarchy of ecological systems (cell-organism-population-community-ecosystem-landscape-biome-biosphere) makes no explicit reference to abiotic systems [10]. More is to be gained theoretically by attending to levels of organization in terms of what E. P. Odum [11] calls biogeochemical cycles, in which bio-, geo-, and chemical refer to generically distinct levels of functioning. Lonergan's theory of emergent probability provides an even broader explanatory framework than Odum's for investigating the interrelations between physical, chemical, organic, psychic, and intellectual schemes in the ecology of human health and in human endeavors to heal such processes when they are disordered

Table 4 represents the generic levels of human living as a series of four tripartite groups – organic, cognitive, deliberative, and historically expressive – modeled after and inclusive of the three levels of the human good. The organic group includes the three lowest explanatory genera – physical, chemical, and organic – whose integration as an individual organism is the foundation of well-ordered functioning pertinent to health. Abiotic/inorganic schemes may be

Table 3: Generic levels in human living

Group level	Individual (person)		Social context	Ends
	Potentiality	Actuation		
Historically Expressive	liberty	orientation, conversion	personal relations	terminal value
	plasticity, perfectibility	development, skill	institution, skill, role	good of order
	capacity, needs	operation	cooperation	particular good
	Individual (subject)		Interpersonal context	Operation
	Potentiality	Actuation		
Deliberative	formulated possibilities	reflective insight rē their relative value	historical horizons of valuing	judgment of value
	inquiry rē experiential/existential possibilities	artistic/practical insights	historical horizons of inquiry	artistic/practical understanding
	capacity to respond to y/n of judgment	feeling out experiential/existential situation	intersubjectivity	apprehension of value
Cognitive	formulation	reflective insight	common sense & theory	judgment of fact
	inquiry rē data of sense & consciousness	insight	common sense & theory	understanding
	capacity for consciousness	experiencing	intersubjectivity	experience
	Individual (organism)		Biogeochemical context	Function
	Potentiality	Actuation		
Organic	x, y, z…	x', y', z'…	x", y", z"…	survival & reproduction
	m, n, o…	m', n', o'…	m", n", o"…	chemical energy transfer
	a, b, c…	a', b', c'…	a", b", c"…	physical energy transfer

well-ordered or disordered, for instance in the birth and death of stars, but the notion of health relates only to organic and higher level schemes. The cognitive and deliberative groups have already been introduced in the discussion of the structure of cognition and deliberation in Part 2 of this set of papers [12].[3] These two groups link the next two explanatory genera – psychic and intellectual – in a self-correcting cycle of fact-based and value-based learning. Their integration constitutes the individual as a subject. Beyond these pre-intentional and intentional groupings of vertical integration, there is also the performative integration of the individual as a person at the level of the human good or praxis.[4]

I introduced my definition of health and disease in terms of the structure of the human good. An explanatory account of health and disease extends beyond this performative (clinical) level to include the subjective and organic (subclinical) levels of functioning and integration. For instance, an explanatory account of iron deficiency anemia should be able to explain both the schemes that lead to anemia (biological dysfunction) and those that lead to fatigue (clinical dysfunction). Unlike Lennart Nordenfelt [13], who defines health in relation to human action and disease in relation to bodily or mental processes, the GEM model relates both health and disease to clinical schemes of daily living as well as subclinical levels of function. This approach is in accord with the Hippocratic dictum that nature heals. For instance, the defensive schemes of the immune system developed long before the relatively recent discovery of antibiotics to counter infection.

Referring again to Table 3, each level manifests a potency to act in a generically distinct way (indicated by the relevant function, operation, or end), depending upon the appropriate eco-social context. The historical schemes of human praxis unfold in a social context. The intentional schemes of cognition and deliberation unfold in an interpersonal context. By this I mean that by the time that infants are able to walk and talk, they live in a world mediated by meaning not of their own making; prior to this they live in a world of immediacy in which differentiating themselves from their mothers (or mother-figures) is a task to be learned with variable and lifelong effect [3, 14]. The pre-intentional schemes of organic life unfold in a biogeochemical context. For instance, the circulation of nutrients and waste is conditioned by subsidiary biophysical schemes, systematically ordered for instance by Ohm's law, and by subsidiary biochemical schemes, systematically ordered for instance by laws governing oxy-hemoglobin dissociation. At the organic level, circulatory schemes are simultaneously linked and integrated with respiratory, digestive, and excretory schemes, in terms of which the concepts of nutrient and waste become meaningful. Organic schemes are pre-intentional; their functioning is ultimately oriented toward and integrated in terms of survival and reproduction. The intentional schemes of cognition and deliberation and the performative schemes of human praxis are ultimately oriented to living well or thriving.

The psychic level of experience is the threshold of intentional operation. Psychic schemes are conditional on organic schemes supporting waking life and presenting "neural demand functions" [2, pp.212-215], to which the subject selectively attends in patterning

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[3] Concerning terms related to cognition and deliberation not mentioned previously: *intersubjectivity* pertains to a spontaneous sense of belonging together that precedes and undergirds one's sense of individuality; *horizon* refers to the border of one's interests and knowledge; *experiential* valuing is aesthetic; *existential* valuing is moral.

[4] In brief, a *person* is an embodied subject; a *subject* is a conscious person; and an *organism* is a living thing.

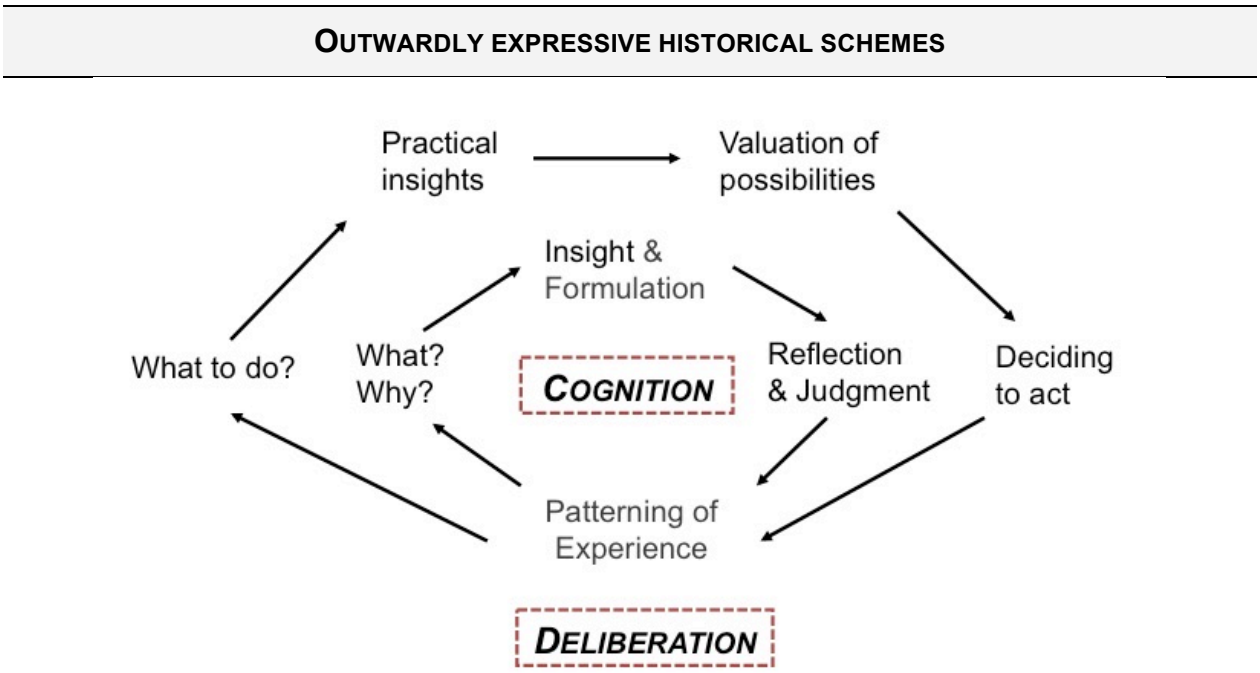

Fig. 1: Intrapersonal intentional schemes linking organic and historical schemes

experience and embodied performance. Psychic schemes, in turn, underlie both cognitive and deliberative schemes. Cognitive functioning integrates interdependent but hierarchically ordered psychic and intellectual schemes oriented toward understanding correctly what is happening or has already happened. Deliberative functioning integrates psychic and intellectual schemes oriented toward deciding what is best to do; that is, what is yet to happen. However, the way that I represent the cognitive and deliberative schemes of operation in Table 4 is potentially misleading. It works for thinking about the structure of each intrapersonal schematic group – organic, cognitive, deliberative – as analogous to that of the human good. But it misrepresents the role of psyche and experience in both cognition and deliberation. In Figure 1, I represent the nested cycles of cognition and deliberation as an intrapersonal hub of intentional operations linking pre-intentional organic schemes below and outwardly expressive interpersonal schemes above. Note that the psychic level of experience contributes to and links cognitive and deliberative schemes of recurrence. At the same time, psychic schemes – potentially transformed by the higher viewpoints of cognition and deliberation – also shuttle between sensitive organic schemes below and expressive historical schemes above, interacting with these schemes in terms of feelings, feeling-laden images and symbols, and embodied action. Note that the integration of psychic schemes of functioning within the more differentiated levels of cognition and deliberation bears directly on questions of psychological and mental health. From the standpoint of the GEM model, delusion represents a paradigmatic disorder at the level of cognitive (fact oriented) functioning; psychopathy, a paradigmatic disorder at the level of deliberative (value oriented) functioning.

Conclusion

From the standpoint of the GEM model, human health is what is intended in asking about the well-ordered functioning of the whole person. This entails the coordinated and unified interaction of all schemes of human functioning, such that lower level schemes set conditions for the well ordered functioning of higher levels schemes while higher level schemes integrate the systematically distinct operations of lower level schemes (relative to maintaining appropriate boundary conditions at those levels). The bidirectional relationship between lower level and higher level schemes is statistical, not systematic. For instance, the state of one's cardiovascular functioning is conditional on the diurnal state of one's blood pressure (from below) and subject to regulation for better or worse (from above) by choosing to exercise and eat well or not. Intrapersonal schemes at all levels are conditioned in turn by eco-social schemes, such as those affecting dietary salt intake and basal physical activity. Disease may originate with disordered schemes at any group level – organic, cognitive, deliberative, or historically expressive.

Conflict of interests

None

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The GEM model of health: a model based on generalized empirical method – Part 4 – Comparisons and contrasts

Abstract

In this paper, I compare and contrast in summary fashion (1) the GEM definition of health with that of the World Health Organization (WHO); (2) the methodical integration of judgments of fact and value in the GEM model with their incommensurability in most naturalist and normativist theories of health; (3) the significance of differentiating risk factors and disease relative to states of health in the GEM model with the tendency to blur any such difference in current multifactorial accounts of disability and dysfunction; (4) the GEM model's emphasis on the common core of operations underlying health science and healthcare with the gap separating hermeneutic understanding and scientific explanation that is often the rule in humanistic accounts of health; and (5) the role of the ordered and eco-socially conditioned set of relationships in the GEM model of health with the multilevel perspective on health in the developing field of global bioethics. In conclusion, I note that the GEM model offers a unique framework – a higher viewpoint – for integrating in dynamic fashion the manifold viewpoints of clinical practice, the humanities, health science, and health policy.

Keywords

WHO definition of health, normativism, naturalism, line-drawing problem, humanism, phenomenology, global bioethics

The WHO definition of health

The World Health Organization [1] famously defined health as a "state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." Jerome Bickenbach [2] recounts how this definition set the stage for a prolonged debate about the overreach of normative accounts of health, which tend to medicalize social problems and lack scientific validity, and the scientistic bias of naturalistic accounts, which discount the role of value judgments in health science. Neither account is entirely satisfactory, so various hybrid accounts have been advanced [3-5]. In fact, while still subscribing to its original definition, the WHO [6] subsequently endorsed a naturalistic perspective in developing a classification scheme for measuring health outcomes in terms of bodily and person-level functioning. But, as Bickenbach remarks, these hybrid accounts leave open basic questions of whether or how normative and naturalistic perspectives can be integrated.

The notion of health in the GEM model is even more comprehensive than the WHO definition of health, but I do not consider this a problem for several reasons. First, the notion of health is not the same as the state of someone's health or the concept of health. The notion of health is what is intended in asking what is well-ordered functioning or what to do to restore well-ordered functioning. States of health pertain to particular situations and particular internal and eco-social conditions; they are a matter of degree. Similarly, health interventions seek to improve a person's state of health not completely in most if not all cases, but as a matter of degree. Concepts of health are abstract and subject to historical development; the notion of

health is a thread that potentially unifies this line of conceptual development. Second, the dimensions of health in the GEM model are not based on a dualistic opposition of body and person, fact and value, or mind and matter. Rather, they correspond to generically distinct levels of schematic functioning that are intelligibly related to one another in terms of emergent probability (on the side of the object) and higher viewpoints (on the side of the subject). Biological, intentional, and historical schemes are successively higher levels of operation and integration in human functioning that can be understood in terms of successively higher viewpoints.

Third, the GEM model seeks to emphasize the possibility of healing that pertains to each and all of these levels, not to medicalize them. The model does in fact support a team approach, incorporating professionals with non-medical training and skills, in clinical settings such as primary care and palliative care as well as non-clinical settings regarding public health and health policy. On the other hand, the account of the human good on which the model is based entails far more than health. For example, marriage is a scheme of recurrence related to the good of order that may or may not function well in particular circumstances. True instances of a loving relationship between a couple and their children are inherently valuable not because they are healthy, but because they themselves are good. When a marriage relationship suffers, the questions for health are: what is wrong and what will make things better? And the answer may be, working on disordered schemes of communication for the sake of the greater good of the marriage itself. Fundamentally, Lonergan identifies both a creative and a healing arc in human history [7, pp. 94-103]. Besides seeking to restore and maintain the healthy functioning of well-established schemes, humans also seek creative answers to new questions about what it is possible to know and do. This occurs individually, where people are engaged in creating the one and only edition of their lives [8, p. 72]; and culturally, for instance, with respect to the adventure of ideas in education [9], the dynamism of economic development [10], the new frontier of space exploration [11], or the challenge of interreligious dialogue [12].

Values and norms

Normativist theories maintain that health and disease are value-laden concepts [13]; naturalistic theories favor a value-free account of health and disease [14]. The GEM model differentiates norms (or laws) with respect to different schematic levels of operation. As Lonergan says,

> [A] single human action can involve a series of components: physical, chemical, organic, neural, psychic, and intellectual; and the several components occur in accord with the laws and realized schemes of their appropriate levels. However, while physical and chemical laws are static, higher correlations pertain to systems on the move [15, p. 494].

Health pertains to higher "systems on the move," that is, to things that develop, beginning with things that develop organically. The integration of schemes within organisms is not static, but flexible, subject to breakdown, and ultimately to cessation of biological integration (death). Aristotle called the principle of biological integration the form (or soul) of an organism. Robert Wachbroit [16] refers to this principle as a biological norm, as opposed to a statistical or moral norm. The norms or laws of successful organic functioning are pre-intentional and do not of themselves raise questions of value. Like physicochemical laws, biological laws are determined in accord with judgments of fact. Similarly, in theory, the nature of disordered biological

functioning is also determined in accord with judgments of fact.[1] This is not the case with respect to determinations of health regarding the full range of human development, which involves the ordered functioning and integration of psychic and intellectual schemes over and above pre-intentional organic schemes. The operation of these higher level schemes is not merely intelligible, but intelligent – that is, subject to critical reflection and thus to questions of value alongside questions of fact [15, p. 494]. The normativity of psychic and intellectual schemes (see Part 2 [18]) is ultimately ordered to the open-ended drive to know and value all that truly is – in the same way that organic schemes are ordered to survival and reproduction.[2] Human science investigates the determinate functional relations of these intelligent schemes and things not only with respect to questions of fact, but also with respect to questions of their inherent value. Health science combines natural science (regarding organic functioning) and human science (regarding psychic and intellectual functioning), with human science providing the higher viewpoint for their overall integration. From the standpoint of the GEM model, a full account of human health is both fact-based and inherently value-laden, in theory as well as practice.

Multifactorial accounts and the line-drawing problem

According to the GEM model, health entails the well-ordered functioning and integration of organic, psychic, and intellectual schemes; disease entails their disordered functioning and integration. On this account, normal cell growth differs in kind from cancerous cell growth. But the question of the boundary between well-ordered and disordered cell growth involves empirical and statistical relations that are continuous and non-systematic in nature and thus blur the line (that is, the formal difference) between normal and abnormal in particular cases. Many investigators now hold that states of health and disease run along a continuum and that drawing a line to separate them for clinical purposes entails value judgments [19-20]. For instance, Élodie Giroux writes:

> 'Risk-based diseases', such as the paradigmatic cases of hypertension and hypercholesterolemia (as used as an indicator of the atherosclerosis process), form a continuum with normal states and thus have an equivocal and unclear status, located somewhere between the normal and the pathological [20, p. 181].

She argues that analytical (or risk-factor) epidemiology should play a role equal to or greater than that of pathophysiology in understanding the multifactorial etiology of chronic diseases like atherosclerosis or diabetes, whose prevalence has risen relative to infectious disease over the past century. She argues, further, that "the correlation of the level of a variable with its consequence in terms of probability of survival" could provide an objective measure for comparing states of health without committing to a dichotomous definition of health and disease [20, p. 192].

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[1] While natural science aims at judgments of fact, natural scientists themselves rely on others' judgments for much of what they know. For Lonergan, belief entails a decision to trust another's testimony in making judgments of fact. Belief in this sense is part of normal science, and so are the judgments of value involved in trusting another's testimony. In order to correct mistaken beliefs, besides reevaluating the framework in which they operate, one resorts in some measure to independent judgments of fact [17, pp. 42-47].

[2] Intentional norms or values may be aesthetic, moral, or religious relative to what is in question: experience, choice of action, or ultimate meaning.

From the standpoint of the GEM, it is important to distinguish between the nature of health and states of health. In formal terms, health and disease differ in kind. If not, how could one tell one end of the continuum (health) from the other (disease)? In concrete terms, schemes and things have a probability of emergence and survival, which varies over time depending on circumstances. A person's state of health is determined by what is actually occurring across a series of distinct levels of systematic functioning, which stand in non-systematic relation to one another and to the eco-social context in which they unfold. Thus, the state of an individual's health can be diminished as a matter of degree (not kind) and this can be measured and expressed in terms of statistics and probability of eventual morbidity (overt dysfunction) or mortality. For instance, physical factors like blood pressure can statistically alter the state of an individual's health prior to the development of overt organic dysfunction, such as heart attack or stroke. The GEM model views classical (formal, systematic) investigation and statistical investigation as complementary. One seeks to understand the kinds of events and things that occur – what is a heart attack? The other seeks to understand when and where and how often such things occur relative to underlying conditions – like blood pressure. Thus, Lonergan says that the state of someone's health, theoretically speaking, is a set of probabilities corresponding to a set of classes of events [15, p. 86]. These theoretical determinations entail judgments of fact. Practical decisions about taking clinical action on the other hand involve comparative judgments of value regarding states of health (particular goods) and their impact on public health (good of order) and, from a higher viewpoint, overriding judgments of value regarding the persons whose health is at stake.

Humanizing healthcare

As I have noted, Engel's BPS and Hood's P4 models overlook the systematic difference between nature and history – that is, between pre-intentional levels of biological functioning and intentional levels of psychosocial functioning [21-22]. This oversight explains the lack of any significant attempt to integrate the humanities into these models alongside natural and human science. Pravettoni and Gorini recommend adding a *psychocognitive* "ingredient" to the mix "in order to tailor treatment for the patient...not only at organic and technical level, but also at psychological, cognitive, emotional and social levels" [23]. However, the question of what mixing or integrating these levels actually means in theory or practice remains unanswered [24]. This is one of the most important problems that the GEM model addresses, not conceptually but methodically, by showing a way to integrate the humanities and health science in the practice and theory of health on the basis of appropriating for oneself the common core of operations underlying common sense and theoretical inquiry.

Commenting on the relation between observation and interpretation, McWhinney says, "Learning to be a skilled observer is a training in interpretation" [25]. I would add that learning to be a skilled practitioner is also a training in self-understanding. McWhinney [p. 84] is well aware of this and frames the task in terms of understanding the "nature of this weaving back and forth" in a clinical encounter as a shift in attention between an objective focus on disease and a subjective focus on meaning. He is aware that he and other caregivers can affirm this shift in attention in their own experience and that this experiential shift in consciousness is real, even if it is discounted in most medical education. But there appears to be a tacit acceptance of a gap in this account between the value or reality of what we know phenomenologically and what we know scientifically. Lonergan's intentionality analysis, which underlies his approach to self-

understanding, draws explicitly on phenomenology, but his accounts of cognitional structure, verification, and science differ significantly from most phenomenological accounts [26]. A full discussion of these points is beyond the scope of this paper, but for present purposes it may suffice to compare Fredrik Svenaeus [27] and the GEM model on the multiple perspectives that enter into a clinical encounter.

Svenaeus distinguishes the first person perspective of patients who experience the "unhomelike" state of illness, the second-person perspective of healthcare professionals who attend to patients, and the "scientific" third-person perspective of those healthcare professionals who also diagnose disease [p. 208-209]. Disease, he says, "is a disturbance of the biological functions of the body…which can only be detected and understood from the third-person perspective" [p. 212]. The GEM model goes about this somewhat differently. First, it differentiates four modes of conscious experience: subject-to-object (my awareness that my toe hurts); subject-as-object (my awareness of being in pain); subject-as-subject (actually feeling pain); and subject-to-subject (my awareness that my doctor or nurse is actually listening to me as I describe my pain) [28]. Second, it differentiates data of sense and data of consciousness. Third, it differentiates the orientation of common sense and theory in asking and answering questions about what is given in experience. Like Svenaeus, the GEM model understands illness in terms of an individual's concrete experience and disease in more abstract terms as biological or higher level dysfunction. But it is not only experience and praxis that are concrete; so too are commonsense understanding and judging. Thus, not all third person statements are abstract. When someone says, "I feel ill," she expresses a judgment about what she is experiencing. When a caregiver acknowledges to this person that "you feel ill", or makes their own judgment that "she looks ill," these are also concrete, commonsense judgments of fact. Furthermore, first person speech is not free of objectification; in fact, it represents an objectification of the person who is speaking. Another way to say this is that someone speaking in the first person performs or narrates in the role of subject-as-object ("I") an interior dialogue (or script) dictated by the unobjectified subject-as-subject.[3] With this in mind, according to the GEM model, the caregiver knows another's *illness* in the mode of subject-as-object; the affected individual knows illness introspectively in the same mode, subject-as-object, but in addition consciously experiences illness in the mode, subject-as-subject. The caregiver (as opposed to a neutral or robotic observer [29]) may also respond empathically and compassionately to another's distress and vulnerability in the mode of subject-to-subject, to which the patient may respond in the same mode with hope and trust.

Theoretical knowledge of *disease* builds upon commonsense knowledge, first by classifying the experiential conjugates (signs and symptoms) of illness and then investigating their significance to develop an increasingly systematic set of explanatory conjugates. To the extent that commonsense insights determine that they are applicable, certain of these explanatory conjugates enrich the knowledge of a given illness by caregiver and patient alike. So, knowledge of disease (in the limited sense of biological dysfunction) is based on data of sense, given in the mode of subject-to-object, and understood either in terms of the experiential conjugates of common sense (signs and symptoms) or the explanatory conjugates of health science (theory). Knowledge of psychic or higher level dysfunction is based on data of consciousness, given in the mode of subject-as-object and understood either in commonsense or theoretical terms.

[3] This relates to the dialogical (discursive) nature of thinking and to the dramatic pattern of experience, which predominates most human living [15, pp. 210-213].

From standpoint of scientific theory, the GEM model discloses a way to integrate the contributions of natural science and human science – biomedical, clinical, social, and cultural – in a unified and comprehensive health science. From the standpoint of human praxis, the GEM model discloses a way to differentiate and integrate the contributions of common sense and theory in healthcare practice. This integral perspective of the GEM model fully accords with the perspective of the scientifically informed, *person-centered care* model, which aims to address illness and disability in all its dimensions and, at the same time, to avoid the dichotomization of healthcare and healthcare education [47].

Global bioethics

In coining the term *bioethics*, Van Rensselaer Potter hoped to identify a new discipline that was "broader than the usual medical ethics," one that combined "knowledge of the sciences, particularly the life sciences, with the expertise of philosophy and ethics" [30, p.23]. He subsequently renamed the discipline *global bioethics* to distinguish it from the individualistic perspective of what became mainstream bioethics. He was concerned to address health-related problems – including peace, pollution, and poverty – in the broadest biological, environmental, and ethical/political terms because of threat that they pose to the survival of humankind. Henk ten Have has done much to advance Potter's program in his recent *Global Bioethics: An Introduction* and *Encyclopedia of Global Bioethics* [30-31]. He argues that a bioethics modeled on a neoliberal framework that abstracts individual well being from the eco-social dimensions of human living is incapable of recognizing, let alone solving, global bioethical problems. Solving these problems, he says, will require cooperation across a broad array of societies and a broad array of disciplines, both within and outside academia, which can only occur justly on the basis of mutual respect and shared values. "But then areas of commonality will have to be determined. How can this be accomplished?" [30, p. 73].

The GEM model of health does not offer a ready-made answer to this question, but it does identify a normative core of operations – experiencing, understanding, judging, and deciding – in all human knowing and doing that provides a basis for transcultural dialogue and critique – be attentive, be intelligent, be reasonable, be responsible. Furthermore, it provides an explanatory framework (1) for interrelating human and natural science in understanding the organic, the subjective, and the historical dimensions of human living; (2) for taking into account the conditional nature – ecological, social, spiritual – of the different schematic levels of a world order characterized by emergent probability; and (3) for the structured relations of the human good, in which technology expands the range of particular goods, new economic orders emerge to accommodate technological progress, new political arrangements – in this case, geopolitical arrangements – emerge to mediate between economic arrangements and various cultures to maintain and support the flourishing of all peoples. The GEM model also takes into account that the historical unfolding of the human good is subject to decline as well as progress. It is the function of dialectical method to work out the difference between progress and decline in what is going forward at particular times and places. Moreover, in being open to a transcendent dimension in human living – a "going beyond" such as occurs in asking and then answering questions [15, p. 658] – the GEM model is open to hope and believe that love heals all in the end.

Conclusion

This is the last of four papers in which I present a comprehensive model of health – the GEM model – based on Lonergan's accounts of emergent probability, generalized empirical method, and the structure of the human good. The model differentiates five hierarchically ordered levels of functioning – physical, chemical, biological, psychic, and intellectual – that are systematically distinct, but non-systematically dependent upon one another, such that lower levels statistically condition the emergence and survival of each successive higher level of functioning. The model defines the notion of health as what is intended in asking what is well-ordered functioning or asking what to do to restore well-ordered functioning with respect to biological and higher level schemes of recurrence. It defines disease in generic terms as a disordered scheme of biological or higher level functioning.

Lonergan's generalized empirical method integrates the empirical method of natural science and the phenomenological method of historical and related human sciences in a way that is unique among contemporary thinkers to my knowledge. The GEM model, in turn, offers a unique framework – a higher viewpoint – for integrating the manifold viewpoints of clinical practice, the humanities (the drama and narrative of human living), health science, and health policy in a methodically dynamic and critically progressive fashion in order to address the many pressing problems of contemporary healthcare. A viewpoint, I should add, that prioritizes the ecologically informed development of new social and cultural forms and that explicitly rejects a mechanistic understanding of the organism and an instrumental understanding of science as mind over matter.

Conflicts of Interest

None.

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