



## COMMENTARY

# “Multimorbidity” as the manifestation of network disturbances. From nosology to the Meikirch model<sup>†</sup>

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## 1 | INTRODUCTION

The explanations of “multimorbidity” as manifestation of network disturbances by Joachim Sturmberg and his coworkers give a very interesting and comprehensive description of “multimorbidity” from the perspective of the whole chain of mechanisms that may be involved, ie, from the genome up to the biological level and from the human scale to the level of individuals, environment, and society.<sup>1</sup> It becomes evident that in “multimorbidity” very large ramifications of interacting phenomena occur in different fields and relate with each other in a complex manner. This leads to a highly individualized picture characterizing in detail each person's own health or disease even beyond its physical aspects. In view of the complexity of the clinical picture in patients with “multimorbidity” it is certainly justified to approach each case with a systems-based method. The question remains, however, whether or not it is needed and possible to develop the whole diagnostic picture from molecular genetics to the person and its surroundings in each case. This commentary has the purpose to explore the possibility to analyze patients in a more focused manner by raising the following question: Is it possible to do the best for the patients, when applying a recently described model of health and disease, the Meikirch model?<sup>2,3</sup> Can it identify the factors that are predominant in rendering a patient diseased, and can it help the patient to evolve further and to emerge into a better state of health? This method also gives a single picture instead of a nosological analysis of many diagnoses. For this purpose, the Meikirch model must be theoretically convincing and applicable in the practice of the care for patients with multiple diseases. This text has the purpose to describe the model, to explain its application to “multimorbidity,” and to compare it with the network model described by Sturmberg *et al.*<sup>1</sup>

## 2 | THE MEIKIRCH MODEL, A DEFINITION OF HEALTH AND DISEASE AS COMPLEX ADAPTIVE SYSTEMS

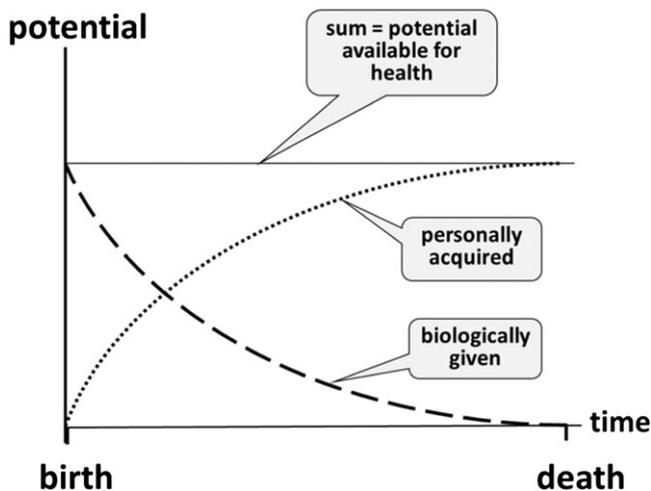
Every biological organism must fulfill certain demands of life in order to survive, eg, it must at the least get water, food, and energy and

eliminate waste.<sup>4</sup> For man the situation obviously is more complex. There are 3 categories of demands of life. They are physiological, psychosocial, and environmental. Some of them must be fulfilled on a short-term basis such as oxygen supply and food and water intake, and others become important on longer terms. Examples are housing for all weathers and all seasons, education for children, and savings for old age. Because of the importance of long-term concerns the idea arose to consider the sum of human resources as potentials.<sup>5</sup> To meet the demands of life humans have 2 kinds of potentials. The biologically given potential is the gift of life everybody receives at birth (Figure 1). The personally acquired potential must be developed by each individual during the whole life. Everybody is responsible for it and is obliged to carry the consequences of neglect. In order to meet the demands of life every day the sum of both potentials is always used. Humans are not functioning in isolation. Each individual is closely related to and supported or challenged by his social setting. Yet social determinants of health may also influence the demands of life, eg, by creating work conditions and a culture to live in. Finally, the environmental determinants of health interact with the social determinants, the 2 potentials and the demands of life (Figure 2). Obviously, all these interactions are nonlinear, complex, and certainly give health the nature of a complex adaptive system that must evolve continuously throughout life.<sup>6,7</sup>

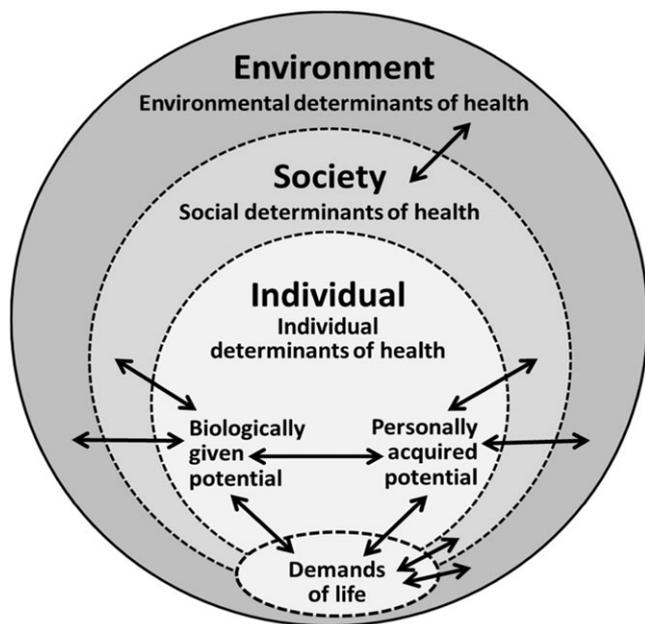
In order to understand health we must consider that from birth to death the 2 potentials of each individual are constantly exposed to the 10 complex interactions depicted in Figure 1. The exchanges may function well during much of the time, but during some phases of life disturbed interactions may lead to critical situations. Puberty, menopause, and retirement are prominent examples. In daily life there are many more. Whenever one or several of the interactions do not function properly, a crisis occurs. This may be minor and disturb well-being to some degree, or there may be major defects that lead to a severe chaos or decompensation of the system, ie, to disease or even death. In conclusion, an individual is healthy as long as he or she is in a position to satisfactorily respond to the demands of life (Figure 3). Unsatisfactory responses always lead to disease.

When looking at health as a complex adaptive system, we should remember that a system evolves from an earlier state to the present

<sup>†</sup>For the purpose of readability only the male gender is used. By implication it applies equally to the female gender.

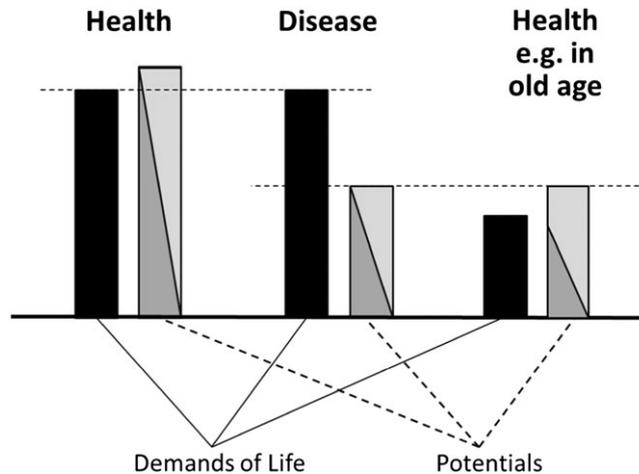


**FIGURE 1** Idealized time courses of the 2 potentials throughout the life span.<sup>5</sup> The importance of the biologically given potential (BGP) is reduced continuously and reaches zero at the time of death. The personally acquired potential (PAP) may increase throughout life, provided the individual cares for it. If it is neglected, eg, in alcohol abuse, it will move toward zero. In reality the curves are moving downwards and upwards depending on how a patient manages his biography and responds to intervening challenges. To meet the demands of life both potentials are always used together and represent the total potential available for health. The PAP may to an important degree compensate for losses of the BGP



**FIGURE 2** Representation of health by the Meikirch model.<sup>2</sup> There are 5 components and 10 complex interactions expressed as double arrows. This setting fulfills the conditions necessary for a complex adaptive system. Throughout life the contributions of the different components and the quality of the various complex interactions evolve in a more or less continuous process. If one of these interactions is unable to contribute its part, the system may go into a crisis

and then to a future condition. Therefore, we can learn much by taking a history about constructive and destructive events in the past and up to the present state. Were there crisis-eliciting factors that could now be eliminated? Systems cannot be repaired in the same way as



**FIGURE 3** Examples of different relationships between the demands of life and the potentials. On the left-hand side there is health with the 2 potentials together being larger than the demands of life. The example in the middle shows the same demands of life with smaller potentials leading to disease. In old age both potentials are often reduced. Yet the demands of life may be diminished even more thereby restoring a new state of health (right-hand side)

defective machines. Favorable conditions must also be created so that the system may then progress autonomously to a new and hopefully better state. Treatment therefore consists in the preparation of conditions that support a favorable evolution. Sustained success cannot be assured by the physician or health professional or by pharmacotechnical interventions alone. The individual's potential to respond to demands of life is constitutively involved.

### 3 | REPRESENTATION OF “MULTIMORBIDITY” IN THE MEIKIRCH MODEL

“Multimorbidity” means that an individual is affected by multiple disorders, illnesses, diseases, or syndromes as expressed, eg, by the International Classification of Diseases, the ICD 10 of 2007. All of them are classified and enumerated, and this is called nosology. There have been many approaches to “multimorbidity,” but so far physicians are expected to set priorities and in general find this difficult.<sup>8,9</sup> “Multimorbidity” increases with age and leads to more severe health conditions and to a poorer prognosis when compared with patients with single diseases. Patients with multiple abnormalities may also have more than one physician—eg, one from each relevant specialty—and are prescribed more drugs, sometimes even leading to dangerous drug interactions. It therefore is a virtue to look at “multimorbidity” with an approach using a single system as proposed by Sturmberg *et al.*<sup>1</sup> This gives a more coherent picture and helps to find the most appropriate priorities.

The condition of patients with “multimorbidity” evolves through several stages. Initially, patients may be treated as usual. As new diseases appear the situation becomes more and more complicated. The patient then fares best to go to a general practitioner who overlooks his condition as a whole and integrates needed consultations by specialists. Eventually, palliative care may become the best option. At each phase priorities change.

This presentation proposes to assess patients with “multimorbidity” by the Meikirch model. Table 1 summarizes its 5 components and its 10 interactions. In patients all components and interactions may have to be assessed. This yields a single albeit complex overall picture of the condition of the patient. Thereafter, the questions may be asked: To which state may the patient's condition improve and how could this occur? What can be done to support a favorable evolution of his condition? Which components can be enhanced and which interactions could be favorably modified? These questions may be discussed with the patient and together with him the treatment may be worked out. He will then indicate which measures should have priority and which may be postponed. Such discussions are opportunities to recognize potentially useful options and to set priorities in a shared decision process. Within this context it may be critical to talk about how to make sense of the patient's future.<sup>10</sup> An individual who fulfills his view of what he wants to achieve in his life has a better prognosis.<sup>11</sup> Such an approach to “multimorbidity” renders nosology, ie, the correct formulation of diagnoses, much less discerning.

## 4 | DISCUSSION

Modern medicine has kept patients alive much longer than in the past and thereby the number of cases with many diagnoses, ie, with “multimorbidity,” has increased. When analyzing such patients by the Meikirch model, their components and interactions may easily be followed through the different phases of their disease. The model yields a unifying picture of the condition of the patient and of his potential for improvement, and it reflects the course of the condition as it progresses through the different phases.

In such cases treatment may progressively become more difficult, as the patient's condition advances. Yet application of the Meikirch model—instead of many diagnoses—yields a picture of the whole

**TABLE 1** Disability and therapeutic potential analyzed by the Meikirch model

The 15 possibilities (Figure 1) to improve the situation of the patient can be analyzed and used for a decision process shared with the patient.
Five components of the model:
a. Demands of life
b. Biologically given potential (BGP)
c. Personally acquired potential (PAP)
d. Social determinants of health
e. Environmental determinants of health
Ten complex interactions:
1. BGP–demands of life
2. PAP–demands of life
3. BGP–PAP
4. PAP–social determinants
5. PAP–environmental determinants
6. BGP–social determinants
7. BGP–environmental determinants
8. Demands of life–social determinants
9. Demands of life–environmental determinants
10. Social determinant–environmental determinants

process and uncovers a number of factors that may or may not be changed in a way that is favorable for the patient. When positive possibilities are found and can be implemented, it still remains beyond the control of the physician alone whether or not the condition of the patient improves. Systems theory implies that the purpose of the proposed analysis is to create a new situation for the patient that offers him optimal conditions for a self-directed, autonomous further evolution. Within this context a good and personal physician-patient relationship may give strong support and encouragement.<sup>12</sup>

At the present time the Meikirch model is still hypothesis. It is well founded in a large number of reasonable assumptions and established medical theories. Nevertheless, its value in clinical practice needs to be documented by solid clinical research. In view of the frequency of “multimorbidity” this will be a feasible and highly valuable undertaking, complementing the future management of “multimorbidity” as outlined by Sturmberg *et al.*<sup>1</sup>

## CONFLICT OF INTEREST

The authors did not receive any money. There are no conflicts of interest.

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