

Health and Disease – Emergent States Resulting from Adaptive Social and Biological Network Interactions

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Health is an adaptive state unique to each person. This subjective state must be distinguished from the objective state of disease. The experience of health and illness (or poor health) can occur both in the absence and presence of objective disease. Given that the subjective experience of health, as well as the finding of objective disease in the community, follow a Pareto distribution, the following questions arise: What are the processes that allow the emergence of four observable states

- subjective health in the absence of objective disease,
- subjective health in the presence of objective disease,
- illness in the absence of objective disease, and
- illness in the presence of objective disease?

If we consider each individual as a unique biological system, these four health states must emerge from physiological network structures and personal behaviors. The underlying physiological mechanisms primarily arise from the dynamics of external environmental and internal patho/physiological stimuli, which activate regulatory systems including the hypothalamic-pituitary-adrenal axis and the autonomic nervous system. Together with other systems, they enable feedback interactions between all of the person's system domains and impact on his system's entropy. These interactions affect individual behaviors, emotional, and cognitive responses, as well as molecular, cellular, and organ system level functions.

This paper explores the hypothesis that health is an emergent state that arises from hierarchical network interactions between a person's external environment and internal physiology. As a result, the concept of health synthesizes available qualitative and quantitative evidence of interdependencies and constraints that indicate its top-down and bottom-up causative mechanisms.

Effective care arises from strategies that combine person-centeredness with the scientific approaches that address the molecular network physiology, which together underpin health and disease. Good health can also be promoted by strengthening resilience and self-efficacy at the personal and social level, and via cohesion at the population level. Understanding health as a state that is both individualized and that emerges from multi-scale interdependencies between microlevel physiological mechanisms of health and disease and macrolevel societal domains may provide the basis for a new public discourse for health service and health system redesign.

Reference

[1] Sturmborg JP, Picard M, Aron DC, et al. (2019). Health and Disease—Emergent States Resulting From Adaptive Social and Biological Network Interactions. *Front. Med.* 6:59. doi: 10.3389/fmed.2019.00059.