SOCIETAL IMPACT OF ARTIFICIAL LIFE

EDITORIAL

Moving from Overwhelming to Actionable Complexity in Population Health Policy: Can ALife help?

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1 Understanding Population Health as a Complex Adaptive System

In this issue, we highlight a call to arms to the Artificial Life community to join the effort to address complex, whole-systems problems in health care. Many problems that society wishes to address in population health are clearly problems of managing complex adaptive systems. They involve making interventions in systems with multiple interacting causal connections, which span domains from physiological to economic. Additionally, of course, the individuals whose health we ultimately wish to improve adapt and change their behavior in response to medical or policy interventions.

But how do we do it? In complex adaptive systems, as the following article reminds us, individual-level interventions are often not the most effective. Rather we might wish to change the conditions or structures of interaction in which individual behaviors play out. Taking a whole-systems view of the problem can allow us to identify higher-level levers that may allow us to reach broader swathes of the population simultaneously. We might be able to change what emerges or is stable in the system, without relying on the limited agency of individuals in a constrained and tangled context. Systems-based and complexity methods can help decision makers to understand their system at a level that makes such interventions possible to envisage and design.

2 From Overwhelming to Actionable Complexity: Avoiding the "Horrendogram"

However, as Silverman rightly points out, producing effective and actionable policies [1] should be the goal that we aim to assist. Complexity approaches, however, run the risk of exposing policy makers to *overwhelming* complexity—situations in which revealing the reality of the situation paralyzes action. A case in point is the obesity systems map commissioned by the Foresight program of the UK Government Office for Science in 2007 [2]. This qualitative causal map attempted to

systemically represent the full range of factors that affect individual obesity and their causal interconnections. The systems map produced had 108 factors organized in ten domains. Of these factors, only a very few concern individual physiology or calorie intake and energy expenditure. The rest span a large range of domains and phenomena such as social psychology, economics, the food production industry, transport infrastructure, urban design, and more, including long-term social changes such as more women in the workplace, the move away from manual labour, longer working hours, and a decrease in the social acceptability of smoking. It neatly shows the systemic nature of the health problem and the need for diverse and innovative policy interventions above the individual level.

The map should be a powerful tool for enhancing understanding and communicating complexity and offers a means to identify levers, feedback loops, and causal cascades that could help to design complexity-appropriate policy interventions that exploit system structure. Interestingly, however, it is commonly referred to by policy professionals as "the horrendogram" and seems to have made people feel powerless in the face of the realities of the issue's complexity.

This perhaps highlights, more than anything else, that without guidance, models that demonstrate complexity may simply be intimidating. Without a domain expert to facilitate model exploration and translation, one has no idea how to start to unpick the complexity that has suddenly been revealed, let alone how to go about acting on it. Working in policy or public domains therefore requires much more than building models. It requires us to be on hand throughout a process of transforming overwhelming complexity into *actionable* complexity.

This ultimately requires capacity building on complexity-appropriate methods and approaches within policy-making contexts themselves. For now, it entails a commitment to stay with the modeling and interpretation process as long as it is supported, a willingness to work in a way that can meet policy makers' needs, and the provision of clear methods for stakeholders to investigate and interact with models. We must be clear, and illustrate with action and insights, that complex adaptive systems approaches are not silver bullets, but will pay dividends if committed to over time.

3 What Can Artificial Life Offer?

Simulations in population health fall outside of what might be considered the traditional concerns of the artificial life community; however, the skills that ALife researchers might bring to the domain are clearly urgently required and, as Silverman reports, are being actively sought. It is heartening to find that genuine recognition of societal challenges as complex adaptive systems problems is spreading, despite the many entrenched interests and institutional constraints that lead to reductive thinking. For many decision makers, however, that nagging feeling that things need to be done differently continues to grow and grow. We must continue to build the groundwork, communicate, and actively seek out opportunities to make a difference. The appetite for change in policy design and evaluation is real, and the more support we can offer, the greater will be the chance that a groundswell of complex adaptive systems thinking can bring real change.

References

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