Symposium: "Applications of Complex Systems Science in Obesity and Non-Communicable Chronic Disease Research" EB 2014

Presentation: Complex Systems Science and Obesity

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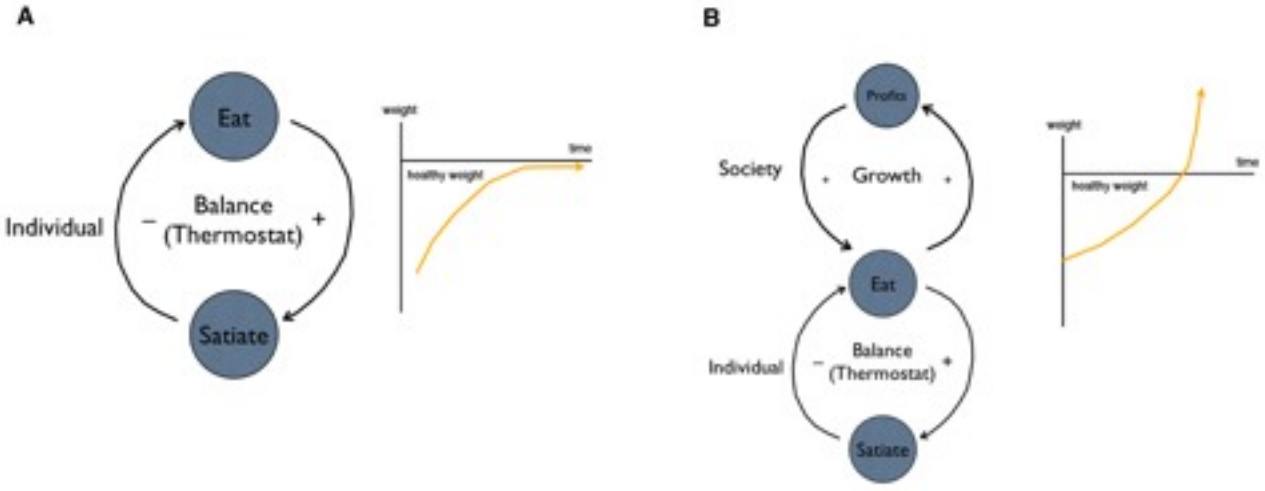
Dr. Bar-Yam discussed complex systems science, focusing on multi-scale complex systems analysis and its applications to obesity and non-communicable chronic disease research. He started with an introduction to complex systems: the idea that correlations are not sufficient, and we need to study patterns and collective behaviors of components [1,2]. Cells, neural networks, and social communities are all examples of complex systems. Complex systems science has been used in many areas including: the food system, the health system, and the social-environmental system. For example, multi-scale complex analysis has been employed in healthcare to reduce costs, improve prevention, enhance patient care and reduce medical errors [3-5]. It was used in the social context to advance our understanding of food riots, revolutions, ethnic violence, urban dynamics, and more [6].

Dr. Bar-Yam noted that the complex nature of many of our problems, including the obesity epidemic, requires systems-oriented solutions. He pointed out that an individual has a regulatory system that should be preventing obesity. This regulatory system should cause people to stop eating when they are satiated (Panel A in the figure). The reason this regulatory system isn't it working is that the society is overriding the individual regulation (Panel B in the figure). In particular, the food system is making money from promoting more food



(A) Individual's eating and satiating balancing feedback loop causing a regulating "thermostat" that leads to convergence to a normal weight. (B) Combining the individual feedback with the societal corporate profit feedback loop that has a financial motivation for eating more leads to override of regulation and unbounded growth of weight.

consumption, and low cost, variety, palatability, and advertisement of high energy density food are all overriding the individual regulatory process. A key question is whether it is possible for

government or public pressure to modify the profit model of the industry. Regarding individual regulation, Dr. Bar-Yam pointed out that research need to be conducted to understand dynamic instability, for example, how different foods make people eat more or less, what controls the desire for more food, and the role of taste and –hunger in the dynamics of eating. He presented a simple dynamic model to demonstrate that the eat-satiate balance is broken by the profit-pursuing behaviors of the food industry, which promotes overeating and suggested a systematic future research direction: to understand the combined individual-societal regulatory systems.

References

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