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http://dx.doi.org/10.1590/0102-311XCO03S115

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Professor Diez Roux brings together two relatively recent traditions in population health science scholarship – an explicit focus on the health of urban populations as an area of discrete inquiry, and the adoption of complex systems approaches to articulate, and hopefully answer, questions of import for population health. Professor Diez Roux makes a case for the potential utility of systems methods to the study of urban health and articulates four implications that might emerge through a marriage of systems science and urban health scholarship. I generally agree with the argument presented by Professor Diez Roux, and highlight here two additional thoughts that may extend the argument, perhaps provoking further discussion in the field.

In many respects all of science is concerned with the articulation of appropriate metaphors that help our understanding of the world. These metaphors are typically reductionist, replacing complex webs of causation with simpler ideas that allow the articulation of hypotheses that are testable using available tools. Some disciplines have the luxury of articulating questions that can be shorn of context, and that, as such, can be shown to produce the same knowledge when repeated time and time again, under the same conditions. Physics comes to mind as the classic example in this case. The same perfectly spherical ball in the same vacuum will be expected to always react in the same way to an equivalent force applied to it. Clearly in real life we do not have many dealings with perfectly spherical balls in vacuums, but experiments under controlled conditions provide us with insights that we can then learn from and extend to the far messier situations under which we typically deal with moving objects. In this case, a simplifying metaphor allows the formulation of universal properties that inform our understanding of the natural world. Other disciplines, however, deal with an intractably complex set of causes that may make overly reductionist metaphors inefficient and unhelpful. If we are interested in how spatial residential segregation generates racial disparities in health, we are likely to learn little about this phenomenon from studying any two individuals and how they interact with one another.

This is the central challenge faced by population health in general, and by urban health in particular. We are interested in answering questions that are, of necessity, dependent on their context and that benefit only in a limited way from simplification. This challenge bedevils inference that rests on assumptions about the plausibility, and utility, of causal isolation, controlling for the influence of context. To this end, the adoption of systems thinking in urban health stands to make a contribution, centrally through forcing the articulation of tractable metaphors at a level of complexity that can be useful to advancing our understanding. Systems approaches require the explicit conceptualization of models that can serve as the starting point of our analytic efforts. Drawing of these models, physically or conceptually, is, in many ways, much harder than are the technical aspects of model building, or even the arduous task of model specification. The model explication process requires us to ask which factors might matter, how they interact, and what the underlying causal architecture that produces health might be. Requiring scientists to articulate a model forces us to be clear about the guiding metaphor we are using to ask our questions, and, as such, how we should be going about looking for answers. This stands to be the central contribution of systems approaches to urban health inquiry. Urban health is motivated by a desire to understand how dense, diverse, and increasingly ubiquitous human-made environments influence health. It is intuitive that these environments influence the air their residents breathe, water they drink, food they eat, and how urban residents feel, think, and behave. However, from the perspective of framing urban health questions of consequence, we need to understand what in these urban environments influences health within this complex context. This requires the scientist to articulate useful metaphors, and complex systems approaches stand to be a tool to get us there, perhaps rising in utility

above the other benefits systems approaches can bring to urban health inquiry.

Professor Diez Roux's comments, focusing on the adoption of systems methods in urban health inquiry, aim to introduce the relevance of these ideas to a broader audience. There is little question that the field of urban health specifically, and public health more broadly, remains quite far from the widespread adoption of systems thinking. Our mainstream training, scholarship, and practice of urban health remains centered explicitly on causal paradigms that suggest we can effectively isolate causes that are instrumental in the production of health. This leads a quest for singular causes that can serve as levers we may manipulate to improve the health of these populations. But is this approach even realistic? Should systems thinking be (as it is now) a "new" approach on the margins of the field, which needs special commentaries to gain acceptance and a foothold in the mainstream of the science? Or should we accept that we are dealing with irreducibly complex systems, and that we need to be in the business of articulating metaphors that grapple with this complexity, grounded in the approaches of systems thinking? Systems thinking is late to the game in population health, emerging only recently in empirical discussions in the field. This reflects the dominant deterministic paradigms that have long dominated thinking in the health sciences, and the dominant pedagogical paradigms that continue to guide our training programs. Professor Diez Roux suggests that systems approaches will never replace more traditional empirical approaches in urban health research. But, one wonders, should they? Traditional empirical approaches are predicated on the assumption that we can articulate simplifying metaphors to the end of generating knowledge that is durable and applicable across contexts. Hence, we can understand the physics of motion of a spherical object in a vacuum, and those observations always hold. But that is worlds away from the questions of interest in urban health. Urban health is ultimately interested in questions that are irrevocably contextual. The very field, concerned with the nature of the urban environment, rests on the understanding of particular contexts that are far too complex to distill into overly simplifying metaphors. One can imagine a body of scholarship that is predicated on an embrace of complexity, where the adoption of approaches in systems science underlies the questions we ask and the answers we seek, and frames how we teach our students. This does not have to mean that the methods of systems science – be they differential equations models or autonomous agent-based models – need to be applied to all urban health questions. It does mean however that the concepts of systems thinking would take precedence in framing our thoughts, in shaping our metaphors, and in guiding the questions we ask. That would be a very different urban health scholarship than the one we have today. Professor Diez Roux's comments provide an early nudge in this direction.