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The March, 2006 issue of the *American Journal of Public Health*, the official journal of the American Public Health Association, focuses specifically on new mental models and research approaches for addressing important public health issues. The collection of provocative and informative articles examines the potential applications of systems thinking to public health. Although the articles do not talk specifically about mental health, they have great applicability to mental health, and therefore this special *Data Trends* reports not on one article but on a general theme as reflected in several articles.

In his opening comments about the special issue, Editor Kenneth McLeroy indicates that, "New ways of framing public health may increase our understanding, expand our options for interventions, and increase our effectiveness" (p. 402). In one of the articles, John Sterman goes further in challenging the public health and related fields. He maintains that, "Thoughtful leaders throughout society increasingly suspect that the policies we implement to address difficult challenges have not only failed to solve the persistent problems we face, but are in fact causing them. All too often, well-intentioned programs create unanticipated 'side effects'" (p. 505).

The dilemma pointed out by several authors is that in complex systems the relationship between causes and effects is frequently non-linear, and greatly delayed in time. As a consequence, learning in complex systems is often inadequate to prevent negative long-term consequences. Horner and Hirsch report that, "Dynamically complex problems are often characterized by long delays between causes and effects, and by multiple goals and interests that may in some ways conflict with one another. In such situations, it is difficult to know how, where, and when to intervene, because most interventions will have unintended consequences..." (p. 452).

Sterman indicates that our "mental models," or common frameworks for thinking about issues, are often narrow, static, and reductionistic, contributing to the problem. He says that, "Common mental models lead to erroneous but self-confirming inferences," (p. 513), and that if progress is to be made in public health and related fields, "the reductionist program of ever-finer specialization is no longer sufficient" (p. 513). Similarly, Green maintains that, "we must open our own public health sciences to the transdisciplinary blending of methods and theories, and we must open them to the findings from the application of methods foreign to our prior traditions" (p. 407).

Methodologically, several of the authors (e.g., Green, Horner & Hirsch, Sterman) call for an expansion of our traditional research reliance on experimentation and direct observation as the main approaches. They suggest simulation and system dynamic modeling approaches as an alternative method that they believe is more suitable for studying complex systems. The approach involves the development of causal diagrams and policy-oriented computer simulation models that capture non-linear relationships and the dynamic complexity of change.

In a presentation at the Research and Training Center conference in 2005 on the new science of complex adaptive systems, Agar illustrated the integration of equation-based modeling and agent-based modeling. Such an approach combines a computer-generated visualization of actual and/or simulated system functioning, with ethnographic interviewing of key participants in the system to derive the often implicit rules that govern system operation, and affect system performance.

In a 2003 report for the U.S. Department of Education, the point is made that the 21st century will require new ways of thinking about and understanding the complex world in which we live. "In the last twenty years, rapid advances in high-speed computing and computer graphics have created a revolution in the

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scientific understanding of complex systems. We now have the ability to move beyond the old reductionist paradigm; to look at whole systems; to study the interactions of many interdependent variables and to explore the underlying principles, structure and dynamics of complex physical, biological and social systems...it is laying the foundation for a fundamental shift in how we view the world, and with it the need for a shift in how we think about, organize, plan for, and lead 21st century organizations” (Sanders & McCabe, p. 5).

This special issue of *Data Trends* is designed to stimulate policy-makers, advocates, and researchers to explore the implications and applicability of systems thinking, in general, and the new science of complex adaptive systems for the children’s mental health field. Given the strong system-focus in children’s mental health, and the challenge both of changing and studying systems, these new mental models and research methods merit careful study.

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