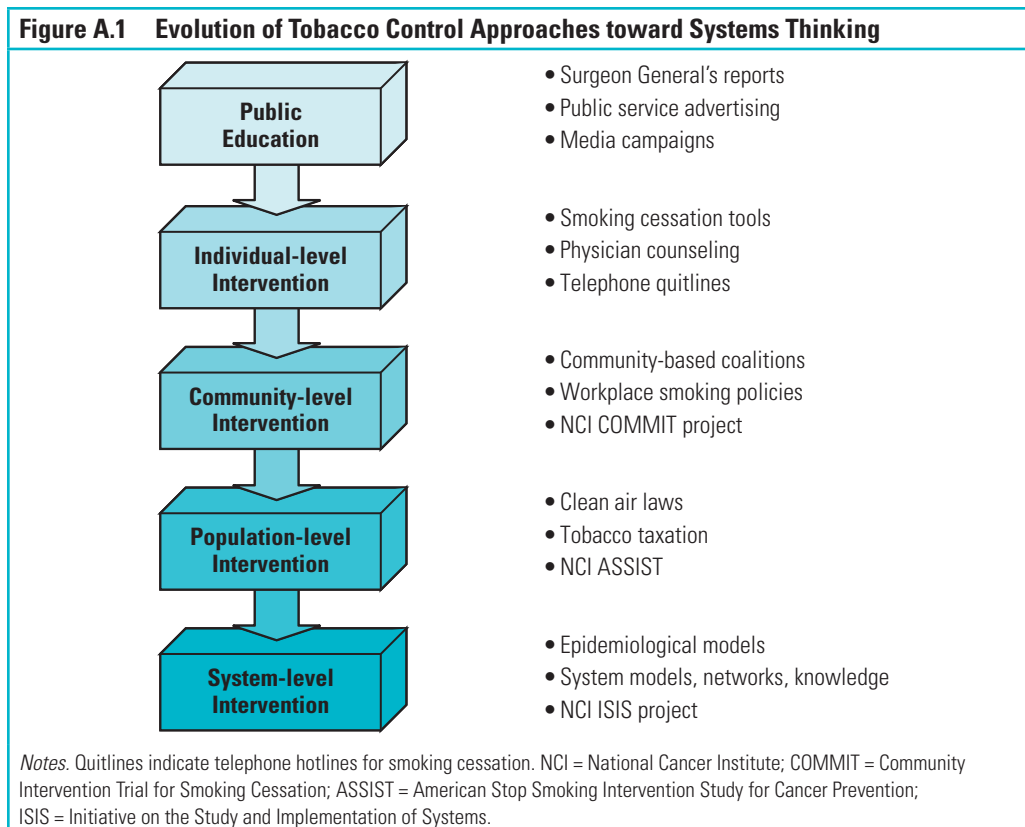# Initiative on the Study and Implementation of Systems: A Project History

ISIS is interested in creating a generic approach to public health [by] using tobacco control as an example. Our goals include alignment of the relevant network toward policies and practices that work; alignment of each organization toward policies and practices that work; [and] uncovering and agreeing on high-leverage public health policies and practices that work.

This statement from the original 2003 summit meeting that kicked off the Initiative on the Study and Implementation of Systems (ISIS) project summarizes the broad goals of the project: to use systems thinking approaches and theory to address previously intractable issues, to improve the health outcomes associated with tobacco control and, by corollary, to improve all of public health. These goals were not conceived in isolation but were rather a direct response to both the growth of systems methods in recent years and the complexity of today's tobacco control environment. The ideas presented had their roots in trends affecting not only tobacco control but also many areas of human endeavor in the early 21st century.[1–3]

Figure A.1   Evolution of Tobacco Control Approaches toward Systems Thinking

Public Education
- Surgeon General's reports
- Public service advertising
- Media campaigns

Individual-level Intervention
- Smoking cessation tools
- Physician counseling
- Telephone quitlines

Community-level Intervention
- Community-based coalitions
- Workplace smoking policies
- NCI COMMIT project

Population-level Intervention
- Clean air laws
- Tobacco taxation
- NCI ASSIST

System-level Intervention
- Epidemiological models
- System models, networks, knowledge
- NCI ISIS project

Notes. Quitlines indicate telephone hotlines for smoking cessation. NCI = National Cancer Institute; COMMIT = Community Intervention Trial for Smoking Cessation; ASSIST = American Stop Smoking Intervention Study for Cancer Prevention; ISIS = Initiative on the Study and Implementation of Systems.

The numerous approaches that fall under the rubric of "systems thinking" jointly represent a formal effort to deal with the natural complexities of life, as well as a natural evolution of problem-solving abilities. The underlying premise of this project was that the state of tobacco control was ripe for the integration of systems thinking, for four key reasons:

1. Tobacco control efforts encompass numerous disparate communities of interest with frequent duplication of effort.

2. Tobacco control efforts lack organized methods for dissemination and collaboration.

3. Tobacco control activities engender competitive responses from a well-financed and highly organized tobacco industry that has well-integrated dissemination and networking strategies.

4. Specific tobacco control efforts often lack effectiveness on key outcomes such as cessation of tobacco use and morbidity and mortality.

Systems thinking encompasses a set of approaches and methodologies that facilitate understanding of the behavior of a system in terms of both the totality of the components and their dynamic interaction around the knowledge/content. It also reflects a natural evolution in the approach to control of tobacco use (figure A.1).

Since the 1964 Surgeon General's report on smoking and health[4] and resulting public awareness of the risks of tobacco use, early tobacco control efforts were aimed at the individual, through measures such as education, patient counseling, and smoking cessation services.[5] Subsequent initiatives, such as the Community Intervention Trial for Smoking Cessation (COMMIT),[6] underscored the importance of community-level coalitions and smoking policies and demonstrated their effectiveness by using a randomized community trial model. By 1991, the American Stop Smoking Intervention Study for Cancer Prevention (ASSIST)[7] and other efforts, such as the privately funded SmokeLess States program,[8] examined the impact of upstream population-level interventions, such as legislation, taxation, media advocacy, and state-level tobacco control infrastructures. Later, in 1993, the Initiatives to Mobilize for the Prevention and Control of Tobacco Use (IMPACT) led by the Centers for Disease Control and Prevention (CDC) also funded the 33 states not funded by ASSIST, to implement similar interventions.[9] The ASSIST, SmokeLess States, and IMPACT programs were particularly significant in that they marked a period in which fundamental social attitudes toward the acceptability of tobacco use were beginning to undergo a permanent change.[10]

In the wake of such initiatives, it was clear to key researchers at the National Cancer Institute (NCI) and elsewhere that further gains in the reduction of tobacco use hinged on addressing the issues of tobacco use from a systems perspective by using science to address the complex web of forces and counterforces underlying the root causes of the prevalence of tobacco use and tobacco product consumption. This realization mirrored gains from adoption of systems approaches in other areas, such as business,[2] defense,[3] and social policy.[11] As one of few public health areas that had a major industry actively opposing its efforts, together with a complex landscape of social, political, and economic factors, tobacco control seemed to be an ideal context for systems thinking.

To meet this challenge, experts in systems thinking disciplines and stakeholders from the tobacco control and public health communities were recruited to participate in the ISIS project as a transdisciplinary team with funding from NCI. After a series of summit meetings to define the scope and goals of the initiative and funding for specific research efforts, this project ultimately took shape as both a study and a proof-of-concept model for future systems efforts in tobacco control.

The origins of ISIS date back to the summer of 2001, with a series of informal discussions between two key figures in tobacco control who were attending a conference on the National Blueprint for Adult Tobacco-Use Cessation—Scott Leischow, then chief of NCI's Tobacco Control Research Branch, and Allan Best, a senior scientist at Vancouver Coastal Health Research Institute and professor at the University of British Columbia. They were concerned that the systems models in fields such as business and defense were not being more widely applied in public health.

At this conference, Best's presentation, "Building Collaboration: Cautions from the Trenches," set forth his view of core needs for dissemination of evidence-based practice. These included a system for interagency coordination, identification of needs, development of networks and sites, and acquisition of major funding. In examining the issues of dissemination, he sketched

the beginnings of a systems view of the world, a topic of interest to Leischow as well. This interest, combined with a shared concern about the state of dissemination, led to discussions that gave birth to the ISIS project. Perhaps more important, this shared interest had deep roots, going back decades, and coinciding with a similarly evolving view among researchers who had worked with community health systems.

Best's interest in a systems view of the world dates back to his doctoral work in psychology, which involved the roles of context and social ecology in effective psychotherapy versus a world that "simply compared therapy A with therapy B." His service as the principal investigator for the first Canadian site of COMMIT preceded eight years in the private sector as a consultant and director of organizational health. In these positions, he learned firsthand the challenges of integrating practices found in the research literature with the real-world needs of practitioners. Similarly, as an academic at the University of Arizona, Tucson, prior to coming to NCI, Leischow noted the strong parallel between the emerging systems theories of researchers such as Peter Checkland of Lancaster University in the United Kingdom and his own work in developing tobacco cessation programs involving multiple stakeholders in Arizona. He was especially struck by the lack of coordinated systems thinking in tobacco control initiatives at that time. For both Best and Leischow, the meeting on the National Blueprint for Adult Tobacco-Use Cessation provided the opportunity to pursue important changes in outcomes for the field of tobacco control.

These discussions were trendsetting on two fronts. First, they engendered a realization that the study of tobacco control at a systems level might lead to improved outcomes. Second, they were an important evolutionary step in the trajectory of integrating research and practice. Subsequent to his arrival at NCI, Leischow and colleagues noted three fundamental disconnects in the discovery, development, and delivery "system": (1) too little discussion between government organizations about disseminating results from funded research to the appropriate programs, (2) the existence of organizational and informational "silos," and (3) insufficient communication between organizations. The ISIS project became a logical extension in efforts to build bridges among tobacco control stakeholder organizations and reflects a broader move toward evidence-based tobacco control practices compared with previous efforts.

The concept of evidence-based practice had steadily grown among the public health community, particularly since the advent of meta-analyses of research data, such as the Cochrane Collaboration in medicine, related initiatives in public health, and their extension to dissemination efforts such as CDC's *Guide to Community Preventive Services*.[12] However, it was clear that evidence-based practices still often sat unused on shelves. These early discussions among Best and Leischow and their colleagues initially examined how systems approaches might help dissemination of evidence-based practice in tobacco control. Over time, they evolved to consider the broader question of why gaps remain between the research of scientists and the needs of practitioners.

Ultimately, NCI determined that systems thinking in tobacco control was sufficiently important to warrant development of an NCI-funded initiative for more in-depth study. Consequently, NCI funded a formal effort that became the ISIS project and issued a contract

to the Battelle Centers for Public Health Research and Evaluation, under the direction of Pamela Clark, a noted expert in tobacco control research who had been a major contractor for the evaluation of ASSIST and the Global Tobacco Research Network (GTRN). With a strong voice in the profession and expertise ranging from technical areas such as the biochemistry of smoking to social research in tobacco control, Clark was a key coordinator of what quickly became a broad multidisciplinary project. From there, the effort progressed to a literature review and identification of the members of the ISIS innovation team by Best's colleagues in Vancouver, British Columbia. Project coordinator Gregg Moor, who contacted experts ranging from industry leaders to academic specialists, spearheaded that effort. These activities culminated in an initial planning meeting in late 2002, in San Francisco, California, as a joint meeting with the evolving GTRN to explore a research effort with five modest goals:

1. Pinpoint key perspectives and literature that might contribute to transdisciplinary integration

2. Identify, evaluate, and synthesize seminal documents from key literature

3. Facilitate development of ongoing structures and processes for effective transdisciplinary collaboration

4. Develop a conceptual framework that maps key concepts for future development

5. Produce a mid- to long-term plan for further development of strategic thinking and strategy

Best characterized a subsequent meeting in May 2003, in Denver, Colorado, as a "first date" during which systems and tobacco control experts began to discuss a collaborative research initiative. In June 2003, a summit meeting was held in Washington, DC, featuring an open discussion among key tobacco control stakeholders and a facilitated workshop session with systems expert and consultant Rick Karash, which led to the evolution of an action plan and agenda. These summits served as necessary points of dialogue for establishing the scope of the ISIS project and the range of expertise required.

At the meeting in Washington, DC, it became clear that the problem at hand—using systems thinking to improve tobacco control and public health—required a focus that went far beyond simple system dynamics models. George Richardson, University at Albany, State University of New York, a key expert on system dynamics, had discussed the interaction between systems simulation and network analysis in his Denver presentation. He joined many others in arguing for broadening the focus of ISIS from its base of system dynamics. These early summits were designed with a focus on systems, but by the end of the first Washington, DC, summit, the consensus was that systems and network methods had an important synergy and that network methods should be included in the ISIS project.

After this meeting in Washington, DC, Noshir Contractor of the University of Illinois at Urbana-Champaign, a noted expert in network theory, and Keith Provan, University of Arizona, who had successfully applied network methods to other public health issues, became part of the core ISIS team. After the next ISIS summit meeting in Scottsdale, Arizona, in late

2003, the scope of the ISIS project grew once again to encompass both issues of knowledge management and the broader aspects of large-scale organizational change, aligned with Best's original vision of "managing a federation of systems." Once again, the core team expanded to include knowledge-management expert Francis Lau, University of Victoria, British Columbia, and Ramkrishnan Tenkasi, Benedictine University, Lisle, Illinois.

At the next ISIS summit, in the Washington, DC, area in January 2004, key stakeholders from NCI, CDC, and major tobacco control organizations and advocacy groups met to hear formal presentations on the core technology areas of ISIS. Richardson showed the evolution of a system dynamics simulation of tobacco control efforts, including the simulation of prevalence of tobacco use and cigarette consumption across a 40-year "chain" of aging smokers. Contractor and Provan discussed methods for network analysis and their applicability to public health, and Lau shared findings from his recent work on the use of knowledge-management approaches in the health care profession.

This meeting in Washington, DC, referred to as the Bolger Summit, named after the conference center in which it took place, was an open forum ultimately leading to a fundamental shift in focus for ISIS. After the meeting, a "think piece" developed by William Trochim, Department of Policy Analysis and Management, Cornell University, Ithaca, New York, solidified the ISIS goals around systems thinking for integrating science and practice. This direction evolved to an examination of organization or management of the "systems of systems" inherent to tobacco control and public health. A consensus quickly formed around the think piece. A report presented at a public health conference in Banff, Alberta, Canada, in April 2004,[1] constituted a public statement of its concepts.

This summit and its resulting document also helped to move the focus of ISIS away from a study of the application of four specific methodologies and technologies (system dynamics, network analysis, knowledge management, and systems management) toward a much more synergistic effort to use systems thinking to improve public health outcomes. Gabriele Bammer, Australian National University, Canberra, and Harvard University's Hauser Center for Nonprofit Organizations, Cambridge, Massachusetts, shared a comprehensive view of "integration and implementation sciences." This presentation and the frank discussions from stakeholders in attending the summit helped the group to envision ISIS as the study of a synergistic framework for integrating public health science and practice.

A series of transdisciplinary teams to examine functional areas, such as how researchers and practitioners communicate and work together, anticipate change, and organize themselves with the federation of systems took shape and began working. A follow-up summit in April 2004 in Vancouver solidified the ISIS core group's direction. The original research funded as part of this study moved forward, ultimately leading to publication of this NCI monograph, which is based on the first two years of the four-year project.

Development of this monograph was a systems effort. As the project evolved, the ISIS innovation team chose to depart from the traditional model of chapters contributed by specialists in narrow areas and instead formed a dedicated writing team with the task of

integrating "shards" of original research, literature reviews, and content from several broad, transdisciplinary teams of key experts in their fields. This writing team, led by Trochim, included professional science writer Rich Gallagher and research assistants Jennifer Brown and Derek Cabrera. Best's team of project coordinator Moor and assistant Snjezana Huerta-Kralj, at the Vancouver Coastal Health Research Institute, provided logistical support. Timothy Huerta, then a postdoctoral fellow at the Centre for Clinical Epidemiology, Vancouver General Hospital, provided key literature review and synthesis support. Together, this bicoastal, international effort linked the contributions of a diverse group of participants across a high-bandwidth network of teleconferences, meetings, listserv postings, shared drafts, and face-to-face meetings over a two-year period, leading to the completion of a draft monograph.

In February 2005, members of the ISIS core group, meeting in Chicago, Illinois, reflected on their efforts to date and forged a set of conclusions for future needs and directions in applying systems thinking to tobacco control. These conclusions, which form the centerpiece of the closing chapter of this monograph, were put forth as next steps to further explore systems approaches in tobacco control. The conclusions outline the research, policy, and capacity-building efforts that could bring such an environment into reality.

The ideas behind these conclusions evolved considerably throughout the project and will undoubtedly continue to evolve as these recommendations are considered and put into practice by tobacco control stakeholders. The project itself represented a proof-of-concept of a real-life complex adaptive system, in which participants continually learned from one another in working toward a broad consensus that will continue to evolve in future efforts. Within this mosaic, each person had a unique perspective on the meaning of this initiative.

- To some, this project was fundamentally about strategy and how to develop strategic structures and functions to improve health and save lives; how to understand the nature of systems and networks; how to create the networks needed to facilitate this process; and what information is needed to make the system work more effectively.

- To others, the project revolves around the concept of communities of practice, in which stakeholders at multiple levels share collective responsibility for tobacco control strategies and improved outcomes. In this view, people drive the process and the product, so the network comes first—gathering together key stakeholders to reach out and achieve buy-in and bringing people and structures to build a sustainable platform.

- Some felt the key issue within this project was the effect of traditional command-and-control strategies in a tobacco control environment that clearly is a complex adaptive system, requiring a more adaptive and organic strategy.

- Others saw a clear fit between systems modeling approaches and the most frustrating issues in today's tobacco control environment, such as the inability to rationalize gaps and redundancies in surveillance, lessons learned from unintended consequences not being fed back into the system, and lack of true multilevel analyses.

- Most shared the view that the role of efforts like this was to speed up evolution, that systems thinking is going to happen, and that efforts should be directed toward making it happen more effectively and efficiently by promoting public health practice that is more flexible, adaptive, and successful. Evolution is characterized by diversity and selective retention. There is consensus that systems thinking is about making these changes more quickly and more effectively.

At the same time, this very diverse team of experts quickly came to share many goals: a need for connectivity and sharing of information, a commitment to engage stakeholders at all levels, and above all, a desire to address the complexity inherent in public health issues through adaptive and ecological means. The concepts must now be tested in the real world, a broader range of stakeholders must be brought into the discussion, and mechanisms for feedback must be in place to guide this evolution. There are no "cookie cutter" solutions for local communities to begin implementing systems thinking. However, there now is a clear potential direction for the future of tobacco control.

The initial two-years of the ISIS project were necessarily limited by time and resources. Consequently, the project's efforts and this monograph's focus are on tobacco control for the home countries of the project participants, most notably the United States, Canada, and Australia. Given the worldwide challenge of tobacco control, it is clear that the dynamics of tobacco use elsewhere follow their own distinctive evolution. It is fully expected that the results of this study will be generalizable to, and will need to be adapted for, the unique tobacco control contexts of other regions and countries.

This monograph represents the research outcomes and future directions of the first two years of the ISIS project as part of a process that should continue beyond the document. The monograph acts as a current index or snapshot of a dialogue about systems thinking for tobacco control that must evolve beyond what is on the printed page. Social scientist Donald Campbell described this phenomenon somewhat tongue in cheek as "historicist dialectical indexicality." As such, this project has moved from a topical research initiative to a living document that serves as a framework for using systems thinking to improve health outcomes and has evolved much as dynamic systems evolve over time.

In particular, the project has evolved from a study of system dynamics to a broader examination of approaches to integrated systems thinking. It ranges from network analysis and knowledge management to systems organizing and potentially encompassing a number of cutting-edge developments such as syndemics, complex adaptive systems, chaos theory, and complexity theory. It also has evolved from a traditional model that treats many of the methods of systems thinking as separate silos to a model that examines broader questions such as "who we are" and "what we know," which are addressed through joint efforts of transdisciplinary teams. Perhaps most important, the fundamental question has evolved from "how to disseminate evidence-based practices in tobacco control" to the much deeper issue of "how to apply systems thinking to improve health outcomes"—a critical question for the future of all public health efforts.

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