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Communities with Multiple Afflictions: A System Dynamics Approach to the Study and Prevention of Syndemics

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Authors:

Jack Homer, Homer Consulting, Voorhees, New Jersey, USA

Bobby Milstein, Centers for Disease Control and Prevention, Atlanta, Georgia, USA

People living in poverty in America are often afflicted by multiple health-related problems. The term "syndemic" was coined by the medical anthropologist Merrill Singer (1994, 1996) to describe what he saw as mutually reinforcing epidemics of substance abuse, violence, and AIDS that disproportionately impact the inner city poor. Other researchers have noted that the intertwined health problems of the urban poor are all strongly affected by an array of economic and social factors characterizing their neighborhoods, "including high rates of unemployment, poverty, homelessness and residential overcrowding, substandard nutrition, infrastructural deterioration and loss of quality housing stock, forced geographic mobility, family breakup and disruption of social support networks, youth gang formation, and health care inequality" (Singer and Romero-Daza 1997, citing Wallace R 1988, 1990, and Wallace D 1990).

There is growing acknowledgement in the field of public health that effective responses to the health problems of the urban poor require comprehensive, system-wide interventions. Community leaders have long argued that it does not make sense to concentrate on preventing some afflictions while allowing others to go unchecked, especially when the afflictions are mutually reinforcing. New approaches have been described for organizing resources and framing problems in ways that will address connections among all those issues that threaten community health and well-being (Institute of Medicine 1996). However, the desire to engage in comprehensive health planning stands in contrast to what most public health agencies are

prepared to do. Engrained in their financial structures, scientific frameworks, and statistical models is the idea that each affliction can be prevented individually by understanding its unique causes and developing targeted interventions.

To strengthen the scientific foundation for comprehensive health initiatives, the U.S. Centers for Disease Control and Prevention (CDC) is supporting research on syndemics (see: http://www.cdc.gov/syndemics). A central aim of this effort is to develop methods and models for understanding how and why syndemics develop, and for evaluating alternative approaches to intervention. System dynamics modeling has been adopted as one of the principal techniques toward this end, both for its analytic capability and for its usefulness as a learning tool for those seeking a more practical and far-sighted approach to public health policy development.

This presentation describes our progress in modeling syndemics, and outlines plans for carrying the work forward. At present (January 2002), we have developed a general model, not yet applied to any particular case study, but based on the literature and the observations of public health officials, researchers, and community health advocates. This preliminary model has been made available as a web-based game at: http://broadcast.forio.com/sims/syndemic.

The dynamic hypothesis underlying the model is shown in Figure 1. One of the key concepts in this diagram is affliction prevalence, which refers to the fraction of the population afflicted by one or more of the interrelated health problems under study. The term is used in Figure 1 as shorthand for the population's more detailed breakdown by affliction status. Figure 2 presents such a breakdown in stock-and-flow form, with eight population stocks defined by the presence or absence of three types of afflictions; *Popn AB0*, for example represents those individuals who have afflictions "A" and "B", but not affliction "C".

Affliction prevalence is affected by a number of factors as shown in Figure 1. The main reinforcing loop involves *contagion*, through which interpersonal contact causes spread of the affliction (be it biological or behavioral in origin), and *cross-impact*, in which having one affliction makes it more likely that one will acquire or have difficulty recovering from another type of affliction. Other reinforcing side effects of affliction prevalence include out-migration of non-afflicted community members, and reduced investment in the community's general conditions.

These general conditions are the second key concept in Figure 1, a concept formulated in the model as a single stock increased by investments and decreased by natural erosion. The

general conditions include all of those components of the community—its economy, infrastructure, and social organization—that, when positive, support health and help prevent affliction. Investments that boost these conditions may take many forms, from the creation of jobs, to enhanced opportunities for home ownership, to the funding of a free drop-in clinic, to the construction of a public walking path. Here, too, there is a difficult reinforcing loop to contend with: When general conditions are not good, there is a natural reluctance to invest further, thus allowing continued community stagnation and deterioration.

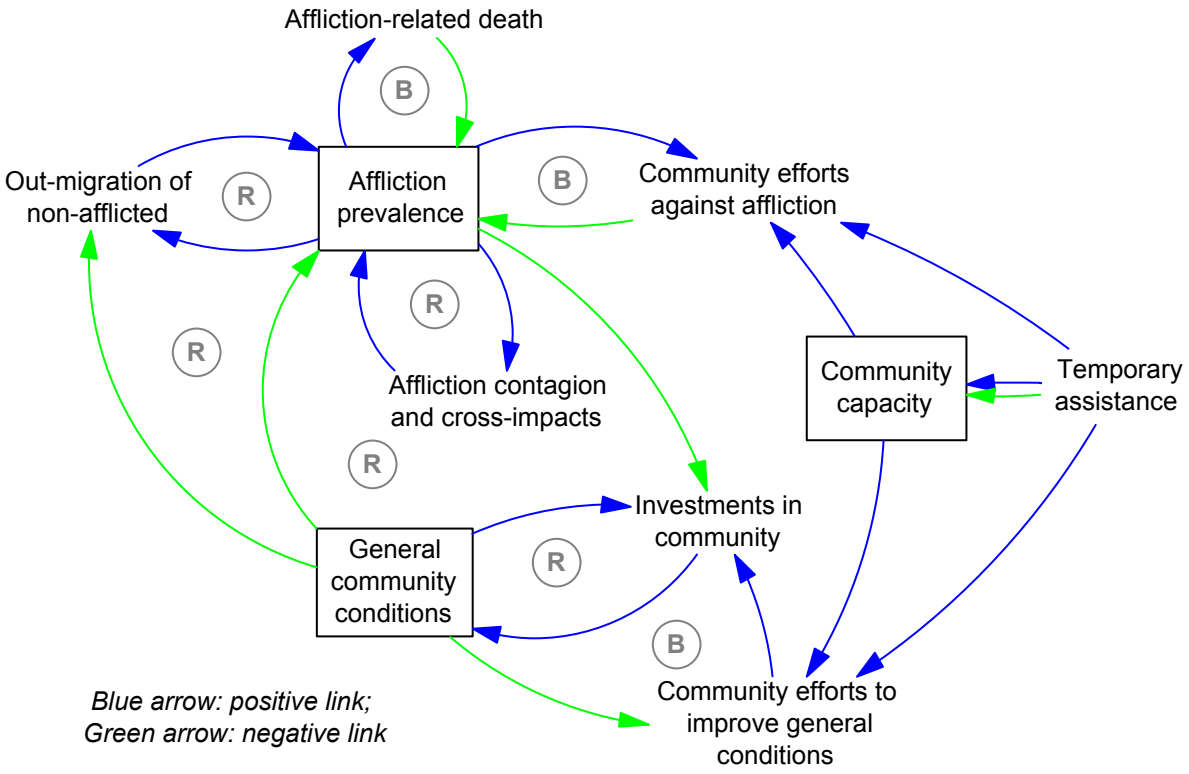

Figure 1. Dynamic hypothesis

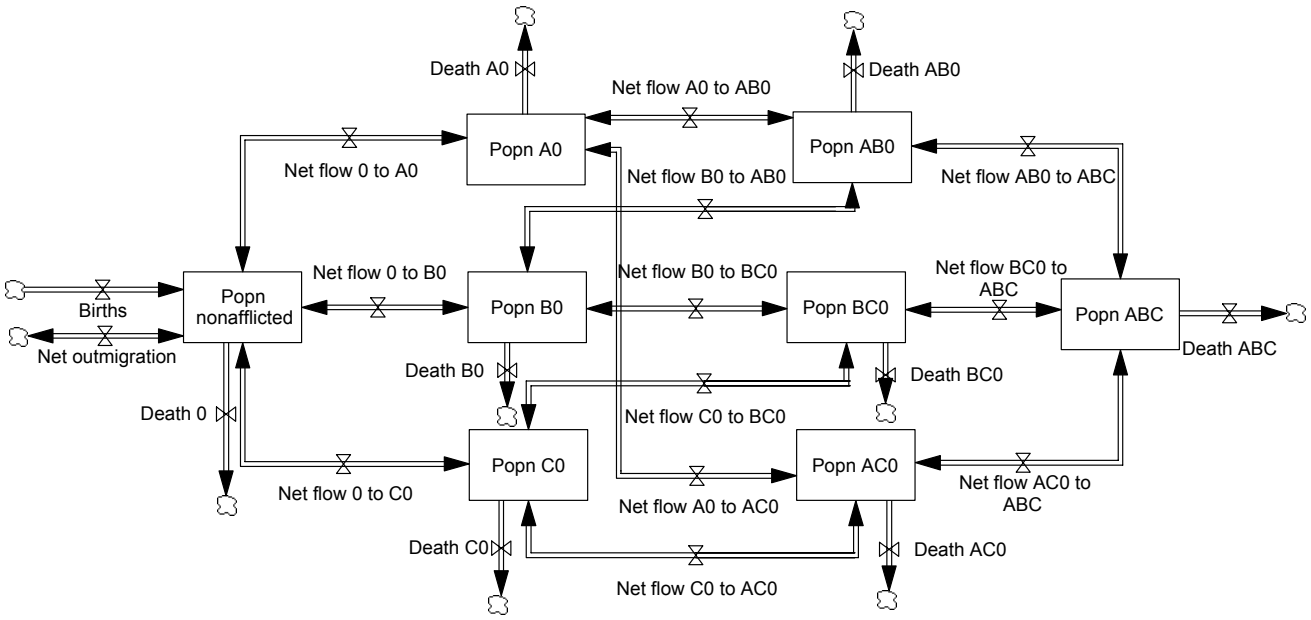

Figure 2. Stock and flow structure for a population with three types of afflictions

Countering the reinforcing loops in Figure 1 are balancing loops, most importantly those involving the community's efforts to fight the burden of affliction, or to improve general conditions. Assistance from agencies outside the community has the effect of boosting local efforts during the time such assistance is active, and may also have longer-term impacts on the community's internal capacity for action (Goodman et al. 1998). Public health interventions translate in the model into specific assumptions about the magnitude and timing of outside assistance, be it assistance to fight affliction, or to improve general community conditions, or to build community capacity. Interventions may also alter the relative priorities among the different types of afflictions in the community's allocation of available effort.

With the model one may look at the short- and long-term consequences of alternative syndemic scenarios, and learn what the most effective intervention strategy is likely to be for a particular community context. Our presentation describes the results of such policy testing and shows how these results may be affected by specific assumptions about the afflictions and the community.

References

Goodman RM, Speers MA, McLeroy K, et al. 1998. Identifying and defining the dimensions of community capacity to provide a basis for measurement. *Health Education and Behavior* 25(3): 258-278.

Institute of Medicine. 1996. *Healthy Communities: New Partnerships for the Future of Public Health*. National Academy Press: Washington, DC.

Singer M. 1994. AIDS and the health crisis of the US urban poor: The perspective of critical medical anthropology. *Social Science and Medicine* 39(7): 931-948.

Singer M. 1996. A dose of drugs, a touch of violence, a case of AIDS: Conceptualizing the SAVA syndemic. *Free Inquiry in Creative Sociology* 24(2): 99-110.

Singer M, Romero-Daza N. 1997. *A notable connection between substance abuse, violence, and AIDS: Initial findings from research in the Puerto Rican community of Hartford*. Hispanic Health Council: Hartford, Connecticut.

Wallace D. 1990. Roots of increased health care inequity in New York. *Social Science and Medicine* 31(11): 1219-1227.

Wallace R. 1988. A synergism of plagues: Planned shrinkage, contagious housing destruction, and AIDS in the Bronx. *Environmental Research* 47: 1-33.

Wallace R. 1990. Urban desertification, public health and public order: Planned shrinkage, violent death, substance abuse and AIDS in the Bronx. *Social Science and Medicine* 31: 801-813.