A Framework for Improving Health in Cities: A Discussion Paper

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ABSTRACT *This paper considers health in cities from the perspective of complex adaptive systems. This approach has a number of important implications for intervention that do not emerge in traditional accounts of cities and health. The paper reviews various accounts of the nature of cities and of health as well as the traditional urban health and Healthy Cities movements. It then provides a framework for intervention and tests it against an actual case study. It concludes that a complex adaptive systems framework opens up fresh possibilities for improving health in urban contexts.*

KEYWORDS *Complexity, Concept of health, Healthy cities, Health policy, Urban health.*

UNDERSTANDING HEALTH IN CITIES

The health of city dwellers is a domain that has proven to be particularly difficult for the development of effective interventions. Cities' very size means that they often contain identifiable clusters of people with mental illness, physical disabilities, or those with such medical conditions as HIV/AIDS, asthma, and tuberculosis. Because of the great concentration of jobs, wealth, and other resources, large urban environments tend to attract large populations with health concerns, such as drug users, unemployed youth, homeless people, and refugees. These and other groups like them produce unique problems. In addition, cities present challenges and opportunities related to greater ethnic diversity, the influence of the built environment, concerns about transportation and mobility, and urban violence. However, in the past, the unique nature of cities and their impact on the health of their residents have been addressed in fragmented, often narrow ways. What is needed to improve health in cities is an approach that recognized the complexity of health and cities.[*] This paper discusses two existing dominant approaches—the

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urban health approach and the Healthy Cities approach—and introduces a third, the health in cities approach. We will elaborate on the health in cities approach, which is motivated by providing urban health advocates and practitioners with a suggested framework for improving health in cities by going beyond the first two approaches.

DOMINANT APPROACHES TO URBAN HEALTH

The Urban Health Approach

This approach to health in the urban context is largely oriented to diseases and at-risk populations. There are three major areas of focus.[3] The first identifies and studies urban health problems and their distribution among various populations, the second considers the sanitary environment and its impacts, and the third considers the delivery of services in urban settings.

In the area focused on urban health problems, attention is given to particular diseases or syndromes that are of concern primarily in cities (such as AIDS, tuberculosis, or asthma)[4–7] and to vulnerable communities (e.g., ethnic minorities, the socially disadvantaged, drug users, or those living below the poverty line).[8,9] Although this approach does recognize that many factors are involved in the health of urban residents, in general, it focuses on specific problems. Thus, interventions (such as the Robert Wood Johnson Foundation's Urban Health Initiative)[7] tend to be narrow in scope and directed mainly at specific problem areas or problem populations.[3,7] Because communities and groups with health concerns compete for limited money and services, interventions directed at certain groups may inadvertently lead to reduced attention to other communities.

The second area of focus addresses the environmental problems unique to the urban context. Most of the work in this area has come in studies on the sanitary environment (including water quality,[10] waste,[11] population density,[12] housing conditions,[13] and air pollution[14]) and its effects on children's health, both at the household and neighborhood levels.[15]

The third and final focus of this approach considers how health care is delivered in cities. The urban context poses unique challenges. A prime example of this is the problematic issue of vaccine-preventable diseases and immunization among the urban poor.[16] The urban setting uniquely favors the spread of such diseases, given that the urban poor often live in unsanitary and cramped conditions. Despite their preventability, because of the low immunization coverage among the urban poor, such diseases often go unchecked and can become a major burden on the health care system.

To deal with the unique challenges of the urban cityscape, many urban health services interventions have been designed and implemented. Examples are special urban policies for expanded immunization coverage and the proliferation of polyclinics or reference centers, designed as a level between primary health centers and tertiary urban hospitals, which help ease pressure on the system.

There are numerous health service delivery agencies in urban settings, much more than in rural areas. Research performed using the urban health approach has traditionally examined the efficacy of different agencies when compared against each other and questioned the value of the individual organizations, rather than addressing the potential resource and benefit of each additional agency.

The Healthy Cities Approach

The Healthy Cities approach emphasizes the way that the city environment (conceived very broadly) influences the health of residents.[17–19] This approach explicitly acknowledges the diversity and interconnectedness of the many elements of urban living.[20,21] It is a holistic approach that assumes that everything within a community is connected, and cities therefore need to get many sectors involved in developing public health policies. In 1988, Hancock and Duhl[22] published *Promoting Health in the Urban Context*, in which they reviewed the variety of existing opinions on what constitutes a healthy city before offering their own definition of a healthy city:

> A healthy city is one that is continually creating and improving those physical and social environments and expanding those community resources which enable people to mutually support each other in performing all the functions of life and developing their maximum potential.[22, p. 24]

They note that the range of topics to be addressed in a healthy city project is large because, in their view, a healthy city encompasses much more than just the conventionally defined notion of health. In their approach to healthy cities, "health" includes not only physical health, but also mental, social, economic, political, and spiritual health. They list the following 11 features of a healthy city:

1. A clean, safe, high-quality physical environment (including housing quality).
2. An ecosystem that is stable now and sustainable in the long term.
3. A strong, mutually supportive, and nonexploitative community.
4. A high degree of public participation in and control over the decisions affecting one's life, health, and well being.
5. The meeting of basic needs (food, water, shelter, income, safety, and work) for all the city's residents.
6. Access to a wide variety of experiences and resources with the possibility of multiple contacts, interaction, and communication.
7. A diverse, vital, and innovative city economy.
8. Encouragement of connectedness with the past, with the cultural and biological heritage, and with other groups and individuals.
9. A city form that is compatible with and enhances the above parameters and behaviors.
10. An optimum level of appropriate public health and sick care services accessible to all.
11. High health status (both high positive health status and low disease status).[22, p. 33]

This list serves as a guideline for cities participating in the Healthy Cities movement, sponsored by the World Health Organization. Hancock and Duhl also emphasized the importance of the involvement of local governments in health promotion.

In her literature review, Kenzer[23] notes that the central ideas behind the movement are that "cities provide a good setting in which to develop action strategies to promote health" and that "the city has an unmatched potential for producing healthy human beings when attention is paid to the values of the city dwellers."

One of the key features of the Healthy Cities approach is its recognition of the importance of interactions between individuals and the natural, built, and social environment.[24] Individuals are not just passive, narrowly defined entities, but also interact with the city in many ways. By optimizing these interactions, both individual and community health can be improved. This emphasis on the interactive nature of health, and its determination through multiple factors, is an important feature of this approach. Involving communities in planning, with methods such as Forester's,[25] has resulted in limited success.

Although cities that participate in Healthy Cities initiatives work to improve general environmental factors that potentially affect all city residents, they tend to downplay the importance of particular problems and vulnerable groups and to ignore the importance of the medical and other health care assets of cities. What is needed is a model that captures both the urban health and Healthy Cities approaches and that, in addition, provides a strong theoretical basis for intervention.

A THIRD WAY: HEALTH IN CITIES

Health in cities involves multiple groups, with multiple health needs, and potentially competing interests, connected in a nonlinear fashion to multiple urban environments, each of which interacts with the groups and individuals within those groups. To develop effective health interventions within this complex web, what is needed is an approach that recognizes both the particular vulnerabilities and problems faced by certain specific populations within the urban environment and also addresses the effects that the urban environment has on all city residents.

A Complex Question

We have approached health in cities from the perspective of complex adaptive systems.[26,27] This approach has a number of important implications for intervention that do not emerge in traditional accounts of cities and health. We believe that our approach can serve as a basis for innovative and effective promotion of the health of urban residents at a variety of levels and in many different forms.

Complex adaptive systems are systems made up of many individual, self-organizing elements capable of responding to others and to their environment. The entire system can be seen as a network of relationships and interactions, in which the whole is very much more than the sum of the parts. A change in any part of the system, even in a single element, can result in reactions and changes in associated elements and the environment. Therefore, the effects of any one intervention in the system cannot be predicted with complete accuracy because the system is always responding and adapting to changes and to the actions of individuals. Nevertheless, by making many small-scale changes and selecting those that produce the desired effects, individuals and groups may succeed in bringing about improvements in the system as a whole. At the same time, the tendency of elements within the system to organize themselves offers opportunities to bring about sustainable changes that benefit the system.

Distinguishing Complex from Complicated Systems

In understanding complex adaptive systems,[28–30] it is important for our purposes to distinguish them from large systems that are not formally complex.[31] Complex adaptive systems are not merely "complicated," as in having a lot of parts. Crucial

to the notion of complexity is the fact that the parts of the system interact and change in the face of changing circumstances, often in ways that cannot be deduced from the characteristics of the individual elements in isolation. Thus, for example, an individual automobile is complicated, but it is not complex in this formal sense. A car possesses thousands of individual parts, but in general, these parts have identifiable and limited interactions with each other. The various stages of the ignition procedure are connected sequentially in a linear way. Other parts are entirely independent of each other. One can, for example, change the oil without worrying about altering the behavior of the headlights, or defrost the windows without affecting tire pressure.

By contrast, the rise of the automobile as a popular mode of transportation produced massive and unforeseen changes in society and human settlements. Not only did mobility increase, but other somewhat unexpected changes occurred as well: Huge resources had to be devoted to road construction; suburban living was made practical, with all its positive and negative effects; pollution from cars affected health; a new source of traumatic injury—auto accidents—appeared; teenagers were given a new freedom, with a huge impact on youth culture; and so on. The physical function of an individual automobile may require a relatively complicated account to predict how an automobile will function, but the way in which millions of automobiles interacted with society produced effects that were often unpredictable.

Complicated systems are amenable to simplification by reduction to smaller parts. Complex systems are heavily interconnected and cannot be analyzed in the same fashion. This does not mean that it is impossible to intervene in complex systems. However, the approach to intervention is very different from that used in systems that are merely complicated.

In the following sections, we will consider how cities and health can be understood as complex adaptive systems.

Cities Are Complex

Most traditional approaches to understanding the urban environment have been useful within narrow limits but almost invariably have failed to capture the full range of city dynamics. However, recent developments in the science of complex adaptive systems offer a better explanation of how cities work and how to intervene in them.

In trying to explain what cities are and how they work, many people have resorted to metaphors. The city has been likened to a marketplace,[32] a fortress,[33] a garden,[34] a theater,[35] and a machine.[36] Each metaphor says something about the city, but none adequately captures the many different ways in which the city functions and how it is perceived, nor is it possible to create a better representation of what the city is simply by "adding up" or combining various metaphors. The different perspectives offer views that are competing, not complementary. Although these various metaphors may all be "true," they are not completely compatible.

Metaphors for city life affect the way we believe that cities can be changed. The use of narrow perspectives on what cities are and how they work has been responsible for the failures of so-called "rational" city planning. Exponents of the rational approach tend to assume that planning outcomes are *predictable*, and that if the system is manipulated in the appropriate way, predetermined results will ensue. This view of cities as static, predictable entities that respond in calculable

ways to interventions or as the passive recipients of interventions, rather than dynamic systems that actively respond to change, has time and again been shown wanting. As Scott[37] has argued, many planning disasters can be traced to the failure of centralized interventions to take into account the differing desires and understandings of the subjects of the intervention.

Jacobs,[38] one of the most influential thinkers on cities and their development, proposed a view of cities as organic entities, which differs markedly from the vision of cities as static entities of narrow purpose. For Jacobs, cities are *self-organizing* entities—structures and functions arise without the need for external controls. This organization occurs at both the macro and micro levels. At the macro level, cities develop as economic drivers, playing a fundamental role in the national economy. At the micro level, streetscapes and communities are defined by local forces, and well-functioning neighborhoods will spontaneously arise if the conditions are right.[38]

Furthermore, Jacobs believes that interventions in urban development must respond to local circumstances. Successful strategies for change in cities will not succeed unless the context of the local area is understood. "One-size-fits-all" interventions, delivered in a top-down fashion, are doomed to failure.

When we view cities as complex adaptive systems, we can appreciate more of their particular characteristics. The following are some of the examples.

Self-Organization   City structures often develop without the need for official intervention. Faced with difficulties or failures in the urban environment, individuals may not wait to have the problem addressed by formal authorities but will instead gather like-minded citizens to develop solutions outside the formal political system. Such organization is true in health as well as in other areas. Despite the existence of a central planning capacity, nonpredictable gaps in services will always occur. When allowed to do so, individuals and groups will come forward to fill these gaps. Self-help groups around particular problems, such as alcoholism, or particular conditions, such as asthma, emerge to provide support and step in where the formal system does not.

Dynamic Interactions   Cities are not static and passive, but are constantly changing and responding to change. Individuals within cities are in constant contact with the natural, built, and social environments. These environments influence the individual, but in addition, individuals influence their environments. The relationship is not one of determinants acting on people, but rather of people and their environments *interacting*.

Multiple Viewpoints   A single view of cities has limited use. Cities can legitimately be described in a variety of ways, many of which may conflict with each other. In addition, people within a city take on a wide variety of roles: citizens, members of various communities, users of services, consumers of products, and so on. Each city inhabitant leads both an individual and a communal life. Individuals can belong to many different communities and lead relatively complex lives.

Emergent Characteristics   A city is not just a very large village or even a large collection of villages. The scale of a city produces phenomena and institutions that are not present in smaller population groupings (few villages, for example, have symphony orchestras, mass transit, or homeless people). Influences on a city may

therefore produce different effects, depending on their scale. The effects of interventions do not just "scale up," and small-scale interventions may not work in larger contexts (as can be seen, for example, in urban transit). In addition, the elements of a city come together to produce something more than the component parts. The characteristics of a neighborhood are different from and not just the sum of the individual elements of houses, streets, parks, and shops. What makes a neighborhood work, or not, is not the result of its particular parts but rather of the complex interactions of the individual elements.

Critical Nature of Local Conditions   The local context can make a huge difference in the effect of any intervention. As has been frequently demonstrated, importing programs or policy initiatives from other places without adapting them to the local context is a recipe for failure.[39,40]

Nonpredictability of Interventions   Because cities are dynamic, interactive, and self-organizing, they change in ways that seem at times to be unpredictable. This unpredictability also applies to the effects of policy initiatives and interventions, which often do not seem to generate the results that "rational" planning would anticipate.

These characteristics of cities fit well with the theory of complex adaptive systems. By understanding how such systems work in general, one can begin to formulate effective interventions. Health, too, shares some of these abstract features.

Health is Complex

Just as it takes sophisticated conceptual tools to fully understand cities, it takes careful analysis to fully appreciate the domain of health.[41] Most concepts of health fall into one of three categories: (1) biomedical concepts that focus on the body as an organism[42–44]; (2) epidemiological concepts that stress the environment[45,46]; or (3) sociological concepts that recognize the importance of complex interactions between the two.[47,48]

The third category has been underemphasized so far but in fact leads to a more dynamic picture of health in which the quality of the interaction between an individual and his or her social context is a major contributor to health.[49] Positive interactions, such as those in good husband–wife relationships, improve health,[50] whereas negative interactions, such as those between certain workers and excessively controlling workplaces, harm health.[51] We have argued elsewhere that health is a function of the complex nonlinear interaction of many forces.[26]

Our changing understanding of health affects the entire health field. Much of medical science is struggling to transform itself from a deterministic, mechanistic, organic focus on the state of the individual body to a more interactive, less deterministic practice that recognizes the importance of a broad range of influences on health.[52] Hospitals and other health care organizations are trying to define their role beyond repairing the organism.

It is possible to trace the evolution of ideas about health by looking at how more and more determinants of health have been identified and how health care researchers have come to appreciate their complex interactions with each other and with health status.[41] The Lalonde Report[53] urged Canadians to recognize that influences on health went beyond biological constitution and medical interventions.

It added two other determinants: lifestyle and environment. Since then, various studies have suggested many other determinants.[54,55] A review by Anderson and Armstead[56] found 28 different factors that had been identified as determinants of health status (see Table 1). As more and more determinants of health have been identified, health care researchers have come to appreciate their complex interactions with each other and with health status.

These factors are not mutually exclusive. A person's lifestyle, for example, is not independent of his or her socioeconomic environment, which is why the impact of health education about tobacco varies in different social settings. An individual who is surrounded by family members, friends, and coworkers who smoke may continue to smoke, although he or she knows that it is unhealthy. Such interactions between the determinants suggest that the outcome of interventions cannot always be predicted accurately. Moreover, unforeseeable events can affect the health not only of individuals but also of entire populations. A good example is the widespread impact of September 11 on the (physical, mental, and emotional) health of many millions of people. These observations suggest the value of approaching health through the lens of complexity.

The complexity of the concept of health, and indeed of the entire health field, is now being mirrored in theories of policy development and intervention.[41,57] Until recently, most efforts have been to create staged rational policy planning models for understanding and changing the health field.[58] Models of policy development, as a whole, have evolved from a hierarchical, bureaucratic model,[59] through various policy planning models,[58,60] to views about policy development in complex systems.[57,61]

The urban health and Healthy Cities approaches focus almost exclusively on the problems typical of urban settings. This narrow focus on *problems* misses the opportunity for what Cooperrider and Srivastva[62] call "appreciative inquiry": an understanding of the *strengths* and *assets* of an area, population, or situation. Its key principle is that "research into the social (innovation) potential of organizational life should begin with appreciation." One begins by focusing on the assets of a given context rather than its problems because every social system works to some degree, however imperfectly. Rather than focus on the ways in which a given system is imperfect and failing, the goal of research is the discovery, description, and explanation of the positive aspects, which give life to the system. Appreciative inquiry aims to generate knowledge by focusing on community strengths, expanding the realm of the possible, and helping community members visualize and implement a collectively desired future.

Both the urban health and Healthy Cities approaches tend to ignore the great assets that cities have with regard to health. The healthiest and best-off populations in a country often live in cities alongside those who are particularly vulnerable or ill. Cities also are the sites of major hospitals, medical schools, and a great deal of medical intelligence. Cities have enormous potential to improve urban dwellers' health using easy communication among residents, the existence of large groups with similar interests, the ability to organize and mobilize concentrated populations, and their strong regulatory capacity. These advantages are not found in rural settings and, when used correctly, can maximize the success of interventions.

Looking at cities, at human health, and at health in cities as examples of complex adaptive systems offers the opportunity to bring together the useful insights of the urban health and Healthy Cities perspectives, while avoiding some of the drawbacks of these approaches.

TABLE 1 Determinants of health status

Physiological factors	Psychological and behavioral factors	Sociodemographic factors	Socioeconomic status (SES)	Social, environmental, and medical factors	Outcomes
Cardiovascular	Psychological distress	Age	Education	Residential characteristics	Health and illness
Immune	Personality factors	Ethnicity	Income	Occupational environment	
Muscular	Health-promoting behaviors	Gender	Occupation	Social support	
Endocrine	Health-damaging behaviors	Location	Family wealth	Social/professional hierarchy	
Height			Perceived SES	Access to health care	
Weight			Economic mobility		
			Childhood SES		
			Material possessions		
			National income distribution		

Adapted from Anderson and Armstead.[56]

THE HEALTH IN CITIES FRAMEWORK

Viewing cities and health as complex adaptive systems has important practical implications for intervening in the health of urban residents. A possible framework for such intervention is developed here.

1. *Gather local information.* Because understanding local conditions is vital to intervening in complex systems, accurate and complete information about the context of a problem is a critical step in developing ideas for intervention. Acting without this understanding in complex systems can often make a situation much worse. At the same time, understanding a local situation often goes well beyond formal information gathering. For example, it is just as important to identify positive as well as negative features to gain full comprehension of a given issue. Understanding the local strengths and assets that can be brought to bear on a problem can be of enormous assistance in developing truly local solutions to the problem. An example of the failure to appreciate existing assets occurred in Africville, a neighborhood of Halifax, Nova Scotia. An urban renewal project failed to recognize the high level of community organization and destroyed the strong community support structure by physically demolishing the existing neighborhood and then dispersing the new housing throughout Halifax.[63]

2. *Respect history.* Unlike traditional mechanistic systems, adaptive systems are shaped by their past, and knowledge of this history may suggest constraints on, or opportunities for, what can be performed in the future. Understanding the history of the people or communities who are involved in any intervention will provide a clearer picture of what interventions are possible or have some likelihood of success.

3. *Consider interaction.* Health is not just a function of the individual's biological characteristics, but is profoundly affected by interactions with the natural, built, and social environments. These factors must be considered when developing approaches to health in cities.[64] However, these elements do not just have an "impact" on individual health, but *interact* with the individual and with each other in complex and often unpredictable ways and change over time as the entire system adapts. Thus, the language of "determinants" of health, with its suggestion of mechanistic, linear, one-way relationships, constant over time, may be misleading.

4. *Promote variation.* Introducing many different, small-scale interventions for the same problem offers a greater hope of finding an appropriate and effective solution (or solutions) than does a very large single, top-down, "rationally planned" approach. Promoting a variety of possible interventions may sound inefficient, but this approach is highly effective when a system is unpredictable, as health in cities often is. However, it is also important to understand and accept that many interventions will "fail." Such failures should not be viewed as failures of the overall way of understanding the system—this is simply a feature of how one develops successful interventions in complex adaptive systems.

5. *Conduct selection.* Although most complex systems produce a variety of solutions to particular problems, these possible solutions undergo selection by the system (e.g., natural selection in species or consumer preference in the market). Over time, as the experience is repeated, more and more effective

solutions are identified. Likewise, for interventions in health in cities, a beneficial strategy would include evaluating performance of potential solutions and selecting the best candidates for further support and development.

6. *Fine-tune processes.* In complex systems, which change over time and respond dynamically to outside forces, it is necessary to constantly refine interventions through a continual process of variation and selection. As various solutions are tried and evaluated, issues are gradually clarified and solutions are refined. Thus, the process of intervening in complex adaptive systems in any meaningful way will always be an iterative one. There is no one final best approach that can be permanently adopted and no one more efficient or effective way of intervening that will always work. Because the system is constantly changing, it is necessary to continue adjusting and adapting the interventions to keep them current and useful.

7. *Encourage self-organization.* Complex adaptive systems often spontaneously generate solutions to problems without external input or formally organized interventions. This feature is evident in health in cities, where grassroots, self-funded groups often arise to address what they see as pressing health issues through service delivery or advocacy. This self-organizing quality is a "free good" that can be very valuable in producing innovative and novel approaches to problems. Often merely eliminating obstacles to self-organization can result in solutions.

CONCLUSION

Cities are enormously complex, and changes in one part of a city may produce unforeseen consequences in another. Human health, too, is a product of many factors, each of which interacts with the others and each of which is subject to change that may affect the overall health of an individual. The web of interactions whereby individuals within cities respond to each other and to the urban environment can be viewed as a complex adaptive system. Therefore, improving health in cities is a matter of making numerous small-scale interventions, selecting those that prove to be effective, encouraging self-organization among city dwellers, and constantly modifying approaches as the system continually changes and adapts.

ACKNOWLEDGMENTS

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