

Creating Healthy Communities, Healthy Homes, Healthy People: Initiating a Research Agenda on the Built Environment and Public Health

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Mounting evidence suggests physical and mental health problems relate to the built environment, including human-modified places such as homes, schools, workplaces, parks, industrial areas, farms, roads and highways. The public health relevance of the built environment requires examination.

Preliminary research demonstrates the health benefits of sustainable communities. However, the impact of mediating and moderating factors within the built environment on health must be explored further. Given the complexity of the built environment, understanding its influence on human health requires a community-based, multilevel, interdisciplinary research approach.

The authors offer recommendations, based upon a recent conference sponsored by the National Institute of Environmental Health Sciences (NIEHS), for research and policy approaches, and suggest interagency research alliances for greater public health impact. (*Am J Public Health*. 2003;93:1446–1450)

THE BUILT ENVIRONMENT—

human-modified places such as homes, schools, workplaces, parks, industrial areas, farms, roads and highways—is our most important habitat, since 80% of North Americans live in towns and cities and spend 90% of their time indoors.¹ To date, much discussion of the built environment has focused on the challenges of providing adequate transportation (roads, highways, infrastructure, public transportation), urban sprawl, air pollution due to increased traffic, the lack of sidewalks, and the diminishing natural environment. New evidence, however, increasingly recognizes that even the places we live and work clearly affect our health.² Nevertheless, causal relationships between the built environment and specific human illnesses are often difficult to ascertain.³

Recent research explores the effect of improved built environments on physical activity,⁴ asthma,⁵ obesity,⁶ cardiovascular disease, lung cancer mortality,⁷ and mental health.^{8,9} However, a pressing need remains for more concerted research to identify mechanisms by which the built environment adversely and positively impacts health and to develop appropriate interventions to reduce or eliminate harmful health effects. The growing health burden and attendant economic costs associated with higher chronic disease incidence (e.g., obesity, asthma, cardiovas-

cular disease, cancer) require such research efforts. These complex diseases are attributable to an interaction of genetic and environmental influences, and many of the latter can be directly connected to the built environment. While research has focused on the negative public health consequences of the built environment, there has been very limited focus on the benefits of living in sustainable communities. A research agenda on the public health and quality-of-life benefits of sustainable communities is necessary.

DEFINITIONS

Built Environment

Scientists’ understanding of the “built environment” has undergone several changes. Health Canada’s¹⁰ definition of the built environment has been modified as follows and provides a framework for this discussion:

The built environment includes our homes, schools, workplaces, parks/recreation areas, business areas and roads. It extends overhead in the form of electric transmission lines, underground in the form of waste disposal sites and subway trains, and across the country in the form of highways. The built environment encompasses all buildings, spaces and products that are created or modified by people. It impacts indoor and outdoor physical environments (e.g., climatic conditions and indoor/outdoor air quality), as well as social environments (e.g., civic participation, community capacity and investment) and subsequently our health and quality of life.

Environmental Health

The scientific community’s definition of “environmental health” also has changed in recent years. Two decades ago, the study of environmental health focused almost exclusively on chemical toxicants and their relationship to cancer and other illnesses. Now the definition of environmental health is much broader, and researchers are studying the effects on human health of the physical and social environment, which includes issues related to urban and rural development, appropriate uses of land, pesticide use, public transportation systems, and industrial development.¹¹ This change is reflected in the U.S. Department of Health and Human Services (DHHS) *Healthy People 2010*¹² current definition of environmental health:

In its broadest sense, environmental health comprises those aspects of human health, disease, and injury that are determined or influenced by factors in the environment. This includes not only the study of the direct pathological effects of various chemical, physical, and biological agents, but also the effects on health of the broad physical and social environment, which includes housing, urban development, land-use and transportation, industry, and agriculture.

Thus, the broader definition of “environmental health” encompasses the “built environment” within its scope and provides the context for future research.

THE BUILT ENVIRONMENT AND HEALTH

Research on the connections between the built environment and health has largely focused on housing, transportation, and neighborhood characteristics. These research endeavors have also pointed out that the burden of illness in the built environment has been greater on lower socioeconomic strata and minority populations. This section reviews some of the literature in these areas.

Housing

The association between substandard housing and health has long been recognized.^{13,14} However, only recently has a growing body of evidence emerged suggesting that physical and mental health problems—*anxiety, depression, attention deficit disorder, substance abuse, aggressive behavior, asthma, heart disease, and obesity*—relate to the built environment, particularly to poor urban planning and inadequate housing.^{15,16} Inadequate housing, for example, may indicate that inhabitants are under significant physical and mental stress.^{13, 17} Dilapidated housing—*leaking pipes, peeling paint, or cracks and holes in ceilings*—may be a stressor that affects the human immune system.^{5,18}

Housing disrepair among the poor exposes them disproportionately to lead, pests, air pollutants, contaminants, and greater social risks.^{5,13} Pest sightings increase when buildings are dilapidated, and no amount of cleaning can remove the pest problem when such structural disrepair remains uncorrected. Further, pesticide use in dilapidated structures may jeopardize the health of inhabitants.^{19,20}

Transportation

In recent decades, US residents have had a greater reliance on cars and trucks, which burn fossil fuels, for transportation needs. Increased vehicle use and the methods employed in energy generation contribute to air pollution that negatively impacts health.²¹ In sprawling communities, cars and trucks pollute the atmosphere with ground-level ozone and particulate matter, contributing to human health problems such as lung disease.^{22,27} People most affected by air pollution include older adults with pre-existing respiratory disease,²³ children, especially those with asthma,²⁴ persons with inadequate health care, and even healthy individuals who work and exercise outdoors.^{24,25}

Higher dependence on motor vehicles also has resulted in higher levels of congestion²⁶ and increased motor and pedestrian injuries and deaths.²⁷ Lack of safe sidewalks in growing urban areas has resulted in a reduction in the number of children walking or biking to schools.¹² Today, only 10% of children walk or bicycle to school—a 40% reduction over the last 20 years.²⁸ Research indicates that inadequate urban planning, including a dearth of bike paths and sidewalks, has contributed to an increasingly sedentary lifestyle for children, possibly factoring into the growing rates of childhood obesity.²⁹

Isolated Communities and Sedentary Lifestyles

Mounting evidence suggests that there are social, health, and economic consequences to isolated and sedentary lifestyles.³⁰ Unfortunately, the physical and social construct of the urban environment promotes isolation.¹⁷ Higher rates of television viewing,

increased computer usage, concern about crime, little contact with neighbors and geographic isolation have created communities that are not interconnected.²⁹ This isolation may result in a lack of social networks and diminished social capital,³¹ which can contribute to obesity, cardiovascular disease, mental health problems, and increased rates of mortality.^{17,32–34} People who live in such isolated communities are often unable to effect changes or deal with crises or public health challenges. Studies suggest that a reduction in childhood and adolescent obesity, for example, through various intervention and prevention programs, would yield long-term economic benefits.^{29,30}

Health Disparities

In exploring the impact of the built environment on public health, research indicates that the burden of illness is greater among minorities and low-income communities.^{17,29,32–33} Lower—socioeconomic status communities usually have limited access to quality housing stock and live in neighborhoods that do not facilitate outdoor activities or provide many healthy food options.³⁵ Inequities in construction and maintenance of low-income housing, especially for Blacks, older persons, persons with disabilities, and immigrants, have resulted in insufficient housing, poor quality housing, overcrowding, and higher levels of population density and health problems.^{16,36} Consequently, these communities may experience greater rates of respiratory disease, developmental disorders, obesity, chronic illnesses, and mental illness.

Also, studies have consistently shown an association between a deteriorated physical environment

and higher rates of crime, making neighborhoods less safe for walking and in some cases resulting in greater social isolation.^{37,38} Understanding linkages between socioeconomic inequity and health is essential to reducing exposures to environmental hazards as well as disparities in health.

SUSTAINABLE COMMUNITIES

While some research indicates the negative health impact of the built environment, there is very limited research on the health benefits of promoting sustainable communities. The President's Council in 1993 offered a working definition for sustainable communities as “healthy communities where natural and historic resources are preserved, jobs are available, sprawl is contained, neighborhoods are secure, education is lifelong, transportation and health care are accessible, and all citizens have opportunities to improve the quality of their lives.”³⁹ The sparse research on sustainable communities suggests that diligent planning is needed to create an environment that is conducive to the mental and physical well-being of humans as well as the natural environment.^{40,41} These studies contend that health benefits exist when people come into contact with the natural environment. The studies recommend both the creation of green spaces and the use of environmentally conscious construction.⁴²

Some argue that urban sprawl has created more highways, thus causing greater air pollution. With the expansion of urban areas and the resultant sprawl, agriculture has become more dependent on the use of pesticides and mechanisms that can produce larger quantities of food in

smaller areas. All this has had a debilitating impact on human health, resulting in greater rates of asthma and other respiratory problems.

Accordingly, there have been recommendations to develop green infrastructures to address the ecological and social impacts of sprawl and their impact on health.⁴³ Examples of the principles behind incorporating green spaces and environmentally conscious construction in the built environment include using natural daylight, solar collectors, passive cooling, and nontoxic materials; harvesting rainwater; installing operable (openable) windows; creating pedestrian and bike greenways; and filling building structures with plants, water, art, light, and natural air. Studies indicate health and occupational benefits from using some or all of these design principles through lowering workplace stress and employee absenteeism, enhancing and preserving land, reducing energy waste, and reducing expenditures by having lower energy and maintenance costs.⁴⁴ These studies have argued that these kinds of sustainable communities may in the long run translate into a healthier economy.

ADDRESSING THE CHALLENGES

Current research on the relationship between urban design and human illness is inconclusive and requires further exploration. There is limited research on measures and methods to quantify the health benefits of improved urban planning, including an examination of land-use policies that could support sustainable and nonpolluting agricultural and industrial sys-

tems.⁴⁵ To address some of these gaps, the National Institute of Environmental Health Sciences (NIEHS) convened a conference called the “Built Environment—Healthy Communities, Healthy Homes, Healthy People: Multilevel, Interdisciplinary Research Approaches,” in July 2002 in Research Triangle Park, North Carolina. The National Institutes of Health’s Office of Rare Diseases and Office of Behavioral and Social Science Research cosponsored the conference.

As its objective, the conference sought to delineate areas of research to better understand the connection between specific illnesses and health challenges in the built environment. A broad spectrum of participants representing community organizations, state and local departments of health, academic researchers, and federal agencies participated. They discussed the state of the science and explored future directions in conducting research on the built environment and health. Speakers described current research and examined connections between the built environment and human health and discussed challenges in developing sustainable communities that seek to balance the social, economic, cultural, and ecological infrastructure with human health and development.

The conference participants derived their major recommendations from current literature; they found gaps in the literature and research on sustainable communities, and they found that it focuses predominantly on the adverse health effects of the built environment, with very little focus on the positive health impacts of sustainable communi-

ties. To encourage research in this area, major recommendations from the meeting included the following:

- Develop effective measures and indicators for sustainable communities.
- Conduct multidisciplinary research on the positive health impacts of sustainable and planned communities.
- Assess the environmental health benefits of efficient or alternate energy (for transportation, agriculture, architecture, community design, and so on).
- Develop models to incorporate cost-effectiveness when adopting environmentally sustainable technologies.
- Create coordinated programs among federal and nonfederal agencies that address research on the built environment.
- Encourage multidisciplinary programs for training and research within governmental and nongovernmental agencies.
- Improve communication and partnership strategies among various entities; especially encourage community participation in research endeavors.
- Develop multilevel techniques of measurement and longitudinal models of analysis for assessing the impact of the built environment on sustainable communities. These measures and models should account for individual, community, and systemic variables including biological factors, socioeconomic factors, and neighborhood and physical environment variables.
- Identify factors and variables that mediate and moderate built environment health effects.
- Study methods and channels to translate research findings into policy and to the community-at-large that improve public health.

STRATEGIES FOR IMPLEMENTATION

The built environment poses many complex challenges that involve physical and social environments. In spite of research indicating that chronic diseases of the 20th century, such as heart disease, obesity, asthma, and others, are affected by how we design, build, and sustain our environment, many communities and planners still do not fully understand the health consequences of environmental factors. This stems partly from the sparse research concerning the health benefits of sustainable communities. Creating communities that are conscious of environmental health concerns may require partnerships and collaborations among policymakers, governments, researchers, communities, and health specialists with interdisciplinary perspectives.

Awareness of environmental health consequences requires not only collaborative partnerships but also the adoption of multidisciplinary research approaches to environmental health, such as studies that include public health researchers, health professionals, architects, builders, planners, and transportation officials. Such multidisciplinary coalitions would be better equipped to develop indicators and measures of sustainable communities and to elucidate their association with environmental health.^{39,46} These coalitions may be better equipped to: (1) determine what constitutes safe neighborhoods, (2) determine what constitutes safe and affordable housing, (3) provide green space for people to enjoy where they live and work, and (4) re-

think the modes of transportation and travel from one place to another.

Since 1993, the NIEHS has supported a series of translational research programs designed to establish sustainable mechanisms for educating the public about environmental health issues and for supporting individual and community involvement in the identification and investigation of environmental health concerns. The NIEHS developed the translational research programs to foster partnerships and alliances among various relevant parties keen on understanding the effects and risks to human health from exposure to physical and social environmental agents.

The NIEHS has defined translational research as the conversion of findings from basic, clinical, or epidemiological environmental health science research into information, resources, or tools that can be applied by health care providers and community residents to improve public health outcomes in at-risk neighborhoods. In addition, the NIEHS has given special attention to ensuring that the information is culturally relevant and understandable.⁴⁷

In various programs under the auspices of translational research, such as the “Community-Based Participatory Research, Health Disparities, and Environmental Justice program,” some research endeavors address aspects of the built environment. These research projects involve various combinations of partnerships among environmental health researchers, social scientists, health care providers, public health departments, and communities. They are multidisciplinary in their scope.

An example is the “Southern California Environmental Health Project,”⁴⁸ a collaborative effort between Communities for a Better Environment and the University of Southern California Environmental Health Center.⁴⁹ Their partnership successfully provided evidence to Los Angeles city planners concerning adverse health effects of air pollution on children in low-income, largely minority areas where oil refineries were located. In so doing, the partnership helped keep the oil refineries from reopening.

The Northern Manhattan Environmental Justice Partnership⁴⁹ in New York is another such project; it involves partnerships between the West Harlem Environmental Action and Columbia University. The partnerships have succeeded not only in conducting research in the community to assess the effects of diesel pollution but also in effecting policy change for rerouting buses and placing a time limit for idling of buses and trucks in neighborhoods.⁴⁹ These partnerships have allowed these projects to develop a more comprehensive and multidisciplinary research agenda and also initiate intervention and prevention programs to impact public health. Such multi-disciplinary endeavors could lead to a greater understanding of the costs of unhealthy indoor environments (not only schools and workplaces but also hospitals and in-vehicle environments), the health consequences of urban sprawl and associated housing, transportation and societal energy use.^{50,51} ■

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