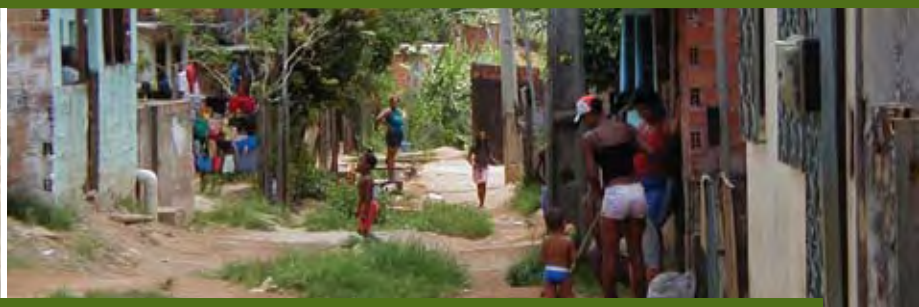
Slums & Sprawl | *Perspectives on the Built Environment*

The built environment—created by people rather than nature—has a profound impact on the health of those who live, work, and play therein. UC Berkeley Public Health asked two experts from the School's faculty to discuss the health issues of two different built environments: slums and sprawl. Lee Riley has conducted extensive research on health among the urban poor in slums of Brazil, India, and other countries. Richard Jackson has published widely on the health effects of sprawl in the United States and is coauthor of the book, Urban Sprawl and Public Health.



Slums: Contaminated Water and Unsafe Play Areas Cause Disease

Lee W. Riley
Professor of Epidemiology and Infectious Diseases

What do you believe are the primary problems affecting health in urban slums in developing countries?

Health in urban slums is affected by multiple factors. Of course, the root cause is socioeconomic. However, there are many environmental structural factors unique to each slum that engender very specific types of health problems. Slum houses built on hills—common in Brazilian cities—have limited access to piped water, since pumps are needed to deliver water to higher grounds. Limited access to clean, potable water is associated with a variety of infectious disease problems, especially diarrhea in children. Houses built along open sewage runoffs, riverbeds, and estuaries (spaces not likely to be taken over by developers) undergo flooding during rainy seasons. Flood water gets contaminated with rat urine, which is associated with epidemics of an often fatal, kidney-damaging disease called leptospirosis. This happens seasonally in Brazil, India, and China. Vertical, multi-story brick or cinderblock houses built due to lack of open recreational spaces are associated with falling injuries. Roofs of these buildings are used by children to play (flying kites, etc.), and by adults who get drunk. Slums built next to city dumps upon which the slum residents depend financially (recycling) create conditions that favor occurrence of severe acute and chronic respiratory diseases, diarrhea, and even congenital defects, such as hydrocephalus. Slums are often built adjacent to factories that spew out toxic chemicals and wastes, which are associated with a variety of illnesses as well as death. For example, the 1984 Bhopal pesticide disaster that killed more than 20,000 slum dwellers.

What steps should we take to mitigate the poor health effects?

The long-term solution, of course, is poverty alleviation and reducing socioeconomic disparity. This is not likely to happen in our lifetime, despite many well-meaning interventions. But the structural problems—open sewers, lack of barriers on roofs, lack of open recreational spaces, preventing toxic chemical and waste spillage, and preventing exposure to particulate matter released from city dumps—are all amenable to simple structural corrections.

What strategies can we use (policy, interventions, etc.) to prevent these kinds of poor outcomes in future communities?

The most important policy-based intervention is to reduce wealth (and greed): wealth of developers, politicians, investors associated with multinationals, and even urban planners. Then, study and identify the immediately correctable defects in the built environment that directly or indirectly contribute to the health problems of slum residents. Identify groups, organizations, and individuals who can correct these defects, and correct them. This will not solve all the health problems, but it will help to prevent many.

Are there any additional issues public health leaders and policy makers should consider with regards to the built environment?

Probably the most important consideration is the recognition by the public health leaders and policy makers that the formal health sector is already expending a large proportion of its resources in taking care of the severe complications of the easily preventable health problems the slum dwellers encounter. These leaders and policy makers need to recognize the existence of this often neglected or invisible population and institute direct interventions in their communities that will prevent the severe complications of preventable health problems.

Sprawl: Inactivity Leads to Obesity and Related Illnesses

Richard J. Jackson
Adjunct Professor, Environmental Health Sciences and Health Policy and Management

What do you believe are the primary problems affecting health in U.S. cities and suburbs?

Today, California, the United States, and the rest of the world confront epidemics of chronic disease: long-lasting difficult diseases like diabetes, obesity, depression, osteoporosis, and cancer. They are costly. "Years of Life Lost" due to obesity is now predicted to cause as much as a 22 percent reduction in life expectancy. The direct cost of obesity and physical inactivity has been estimated at 9.4 percent of U.S. health care expenditures. Obesity increases the risk of becoming diabetic in adulthood nearly 40 times, and today's children may be the first generation in American history to live less long than their parents.

We and our children increasingly cannot walk to where we need to do our life work: schools, sports fields, friends' homes, libraries, shops or churches. The difference between highly walkable and non-walkable communities is an average of about seven pounds of body weight. We have "designed" a lot of incidental exercise, such as walking, out of our lives. In 1969, 48 percent of American students (90 percent of those who lived within a mile) walked or bicycled to school. In 1999, only 19 percent of children walked to or from school and 6 percent rode bicycles to school. Overall, Americans walk or bike a trivial amount—only about 6 percent of our trips—as compared to close to 50 percent for the people of Scandinavia. Yet the best way to banish depression and reduce obesity and diabetes is to walk. For persons with diabetes, walking for exercise just two hours per week reduced their death rate by nearly 40 percent. If you ask people why they don't walk or bike, you get answers like: "There are no sidewalks or bike routes or nearby destinations or transit stops." Or "I don't feel safe. We don't have people watching out for each other the way we did when I was young."

What steps should we take to mitigate the poor health effects?

The built environment must be designed to support people making healthier choices. A doctor telling a patient to exercise is useless if there is nowhere to walk or run. A neighborhood's design dictates how people get around, for example walking or bicycling versus automobile use. Transit-oriented neighborhoods generate 120 percent more pedestrian and bicycle trips than those that are car-oriented.

We need to create cities and towns that meet the planet's demands and our pocketbook needs for efficiency; places that allow a child or someone elderly, disabled or poor to meet their life needs for safety, autonomy, transport, access to healthy food and medical care, and to culture and community. We must stop pretending that if we build endless tract houses on fine agricultural land that these human benefits will magically spring up. Better habitation helped beat infectious diseases; it can help to beat the chronic disease epidemic as well.

What strategies can we use (policy, interventions, etc.) to prevent these kinds of poor outcomes in future communities?

We need to preserve green space around our cities for "urban edge agriculture"—it brings meaningful work, fresh and local food, air and temperature benefits, and aesthetics. This won't happen under

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Genomics Technology Opens Doors to New Possibilities

The completion of the Human Genome Project in 2003 has made incredible new technologies available to environmental health scientists. Professor of toxicology Martyn Smith, research toxicologist Christine Skibola, and associate adjunct professor Luoping Zhang are applying these technologies at the Molecular Epidemiology and Toxicology Laboratory, where Smith is director and Skibola and Zhang are associate directors. Working with colleagues in the School and across campus, they are employing new methods that open up possibilities for a new era of scientific discovery.

For example, the Genome Project has made it possible to scan the whole DNA sequence for variations that confer susceptibility to environmental diseases and chemical toxicity. The National Cancer Institute recently granted funding to Skibola to scan the human genome for genetic traits that confer susceptibility to lymphoma, a cancer whose incidence has risen dramatically in recent years. Assistant professor of epidemiology Lisa Barcellos is performing a similar scan on multiple sclerosis patients. This research, called "whole genome association" studies, will provide new clues to the adverse gene-environment interactions that cause chronic diseases.

Zhang is looking for susceptibility genes using another new technology called RNA interference (RNAi). With Christopher Vulpe of the College of Natural Resources, she uses whole genome analysis initially to look for candidate genes that confer sensitivity to toxic chemicals in yeast. RNAi is used to confirm these candidates in human cells and variation in confirmed genes is examined in human populations exposed to these chemicals. Vulpe and Zhang, with epidemiology professor Allan Smith, are looking for genes that confer susceptibility to arsenic toxicity, while Zhang and Martyn Smith are studying susceptibility to other important environmental pollutants such as benzene, trichloroethylene and formaldehyde. Their work should explain why some people are sensitive to the toxic effects of chemicals and others are not. This will improve risk assessments for these chemicals and help identify and protect susceptible members of the population.

Zhang and Martyn Smith are also using these new technologies to better understand the causes of childhood leukemia, working with Patricia Buffler, who holds the Kenneth Howard Kaiser & Marjorie Witherspoon Kaiser Chair in Cancer Epidemiology. As part of the Superfund Basic Research Program, they are using new "omics" methods that detect the expression of genes and proteins to better separate out different forms of leukemia. The project will determine whether these different forms, or "subtypes," of leukemia have different causes. If different forms have different causes, applying "omics" methods may make it easier to see associations between exposure and effects because these can be assessed separately.

With Richard Mathies's group in the Chemistry Department, Martyn Smith and Zhang are working to develop new high throughput methods for the detection of cancer-related mutations in humans. Such methods could help better predict who will get cancer and detect it early enough for treatment. This research aims to rapidly sequence the DNA of single cells. It forms part of a new Center in Exposure Biology, led by adjunct professor Stephen Rappaport, which has been funded at $1 million per year by the National Institute of Environmental Health Sciences. The center's main goal will be to apply new technologies, including genomics, lab-on-a-chip, and biosensing, for use in epidemiology studies of blood cancers.

"In all my years of research," says Martyn Smith, "this is the most exciting time, with major breakthroughs possible in the coming year or two as the new center's collaborative work kicks into high gear."

Slums & Sprawl, continued

current tax policies, which make big box stores and auto malls (which generate large sales tax revenue) the desired new developments. Some will say this is expensive, but I think there is a need to compare continued sprawl with the costs of continued bad health and sprawl-requiring car use.

Are there any additional issues public health leaders and policy makers should consider with regards to the built environment?

We must rebuild our existing cities; it is absurd to have our downtowns devitalized by acres of baking asphalt. This can be done. Twenty-five years ago when I lived in Berkeley I did not enjoy my many visits to Sacramento. The capital city had no rail service and the city seemed a sea of parking spaces. The downtown (except for the immediate Capitol Park area) was tumbledown and culturally moribund. In 2004 when I returned from CDC in Atlanta to be the California state public health officer, I was pleased with how Sacramento had improved; it has made great strides in reclaiming its downtown, its parks and community. It is now a lively, diverse place filled with lots of young people, good restaurants, and a resurgent cultural life. Capital Area Development efforts have been a major contributor to the change, as have city leaders pushing for vacant and underutilized land to be redeveloped, not just for high rises, but for quality live-work-play multi-story developments with first floor retail, second floor commercial, and third floor and up residential units. This habitation style, so successful in U.S. and European cities, creates an energy- and land-efficient habitation that supports a 24-hour lifestyle with restaurants, transit, culture, and sport. With adequate density and tax base, public safety, sanitation, and other services improve as well.