

# The People's Epidemiologists

Sibling specialists attack the political and economic causes of health disparities.

by MADELINE DREXLER

**I**N THE CITY OF BOSTON—and everywhere else—wealth equals health. If you live in Beacon Hill's Louisburg Square, which sits in the federal census tract with the third highest median family income in Suffolk County—\$196,210—you're sitting pretty. Your risk of dying before the age of 65 is about 30 percent less than if you live on Pleasanton Street in Roxbury, about four miles away, where the median family income is \$30,751, and where one-third of residents live (or more accurately, survive) below the poverty line. Put another way, Louisburg Square's red brick and brownstone, lovingly maintained locusts and beeches, wrought iron gates and sparkling windows with wavy glass exert a measurably salutary effect on the human body. Pleasanton Street and its environs—home to dilapidated Victorians and untended maple trees, abandoned lots and overflowing dumpsters, shards of automobile

glass and billboards that say "Looking to Re-Establish Credit? We Finance Anyone"—in effect act like a potent risk factor for a spectrum of ills.

Two years ago the *New England Journal of Medicine* published a commentary titled "Class—The Ignored Determinant of the Nation's Health." Its authors, a policy analyst and an academic physician, wrote: "[P]eople in lower classes die younger and are less healthy than people in higher classes. They behave in ways that ultimately damage their health and that take their lives prematurely (by smoking more, having poorer eating habits, and exercising

less). They also have less health insurance coverage, live in worse neighborhoods, and are exposed to more environmental hazards. Beyond that, however, there is something about lower socioeconomic status itself that increases the risk of premature death."

For 20 years, that "something" about being poor and getting sick has preoccupied Nancy Krieger '80, Ph.D., professor of society, human development, and health at the Harvard School of Public Health. It has also preoccupied her older brother, James Krieger '78, M.D., chief of the epidemiology, planning, and evaluation unit at Public Health-Seattle and King County, his local

public-health authority. Independent of each other, the Krieger siblings have transformed that fixation into the leading edge of public-health theory and practice. Nancy's hypotheses and methods are called, by many colleagues, the most brilliant contributions to social epidemiology in a generation. Jim's on-the-ground innovations are the envy of local health departments across the country. Sister and brother have set a standard for what public health can and should be in the United States; both are trying to steer the profession back to its roots in social justice. That few beyond their respective fields have heard of the Kriegers says as much about their modesty as about the battered profile of public health in America.

Public health is dedicated to the humble proposition that social action to promote health and prevent disease saves more lives more cheaply than does high-tech medicine. Recently, U.S. health authorities have paid some lip service to this perspective. In scientific meetings, official reports, and federal financing, the terms "health disparities" and "social determinants of health" have cropped up. In 2006, the National Institutes of Health will allot \$200 million (out of a total budget of \$28 billion) for its Center on Minority Health and Health Disparities. Here's the main idea behind the terms: the immediate causes of individual human affliction,

premature death rate among blacks, compared to whites, wasn't due to the victims' genes or lifestyle choices, as the conservative line of the time insisted, but rather to the overwhelming circumstances of their lives since birth. To comprehend how jarring this assertion was, consider the statement in a leading epidemiology textbook, published the same year, that "social class is presumably related causally to few if any diseases."

In the 20 years since, Krieger has shown that social class and racism are related causally to the leading sources of illness and death in the United States. Those overarching social forces remain the focus of her curiosity.

Last November she brought her ideas to the REACH Boston Elders 2010 coalition, a group of community advocates, retirees, and citizens concerned about health issues. Traveling from their homes and apartments in the mostly black neighborhoods of Dorchester, Roxbury, and Mattapan, they meet each month in a function hall at the golf course in Franklin Park. It is the kind of event Krieger relishes, because it plucks her out of academia and drops her in a world where her work could make a difference. Her attire reflected her self-identity as someone outside the academic mainstream: a man's oxford-cloth shirt that billowed out, with sleeves rolled up (because she is five feet two); cargo pants;

**"This means that people born before the 1960s, including you, carry within their bodies the history of the Jim Crow era."**

tion, parsed *ad nauseam* by newspaper and magazine health-advice columns—fatty diets, tobacco smoke, sedentary ways—are themselves caused by underlying forces: poverty, discrimination, stressful jobs, marketing by profit-driven global food companies, substandard housing, dangerous neighborhoods, and so on. Put another way, if every human being enjoyed all life's opportunities, disease patterns would look very different.

What makes the Kriegers' work unique is that they have toiled in vastly different domains but toward the same goal of understanding the social determinants of health, starting long before the phrase acquired professional cachet. They have proven that these institutional precursors are as amenable to study as any single-celled bacterium—and not only to study, but to change.

**T**HOUGH ONLY 47, Nancy Krieger has published empirical papers, theoretical treatises, and historical essays that have shaken her field. Her work is technically complex, but the main premises are simple: Racism and social class indelibly stamp disease across populations. These forces stemming from the body politic can be dissected every bit as sharply as the body itself. The political and economic structures that prop up race and class differences in health should be named and blamed. "She burst on the scene like a comet, with tremendous intellectual firepower and passion," says Sherman A. James, professor of public policy studies and community and family medicine at Duke University.

In 1986, in the middle of Ronald Reagan's second term, Krieger and her coauthor, physician and public-health researcher Mary Bassett, published a paper titled "The Health of Black Folk: Disease, Class, and Ideology in Science." It argued that the higher

a dark vest; a fedora when she was outdoors. Her short black hair, flecked with gray, was combed back. Rimless glasses perched in front of expressive dark eyes.

The Boston Elders' director, April Taylor, a tall, high-spirited woman, was excited to greet Krieger. "I've followed Nancy's work for a long time," she said. "Isn't that crazy? To say you love someone's epidemiology?"

Though Krieger began her speech on a personal note—"Think for a moment about the stories our bodies tell," she said—she soon took up more weighty matters. Midway through, she flashed a chart titled "The Jim Crow Effect: Temporal Lags in Black/White Disparities in Life Expectancy: United States, 1900-2000." Jim Crow laws, in effect from the 1880s to the 1960s, enforced racial segregation in marriage, public facilities, and virtually every realm of life. Krieger's slide showed that in each year of the last century, by depressingly fixed margins, blacks lived shorter lives than whites. In 2000, the life expectancy of blacks equaled the life expectancy of whites in 1960. Today, U.S. blacks live an average of 71 years, while whites live 78 years. The first generation of African Americans to be born post-Jim Crow is only 40 years old. "This means that people born before the 1960s, including you, carry within their bodies the history of the Jim Crow era," Krieger explained.

The room got quiet.

Another slide showed a census tract map of Boston, with rising proportions of "excess" premature mortality—shown in deepening shades of red—in lower-income districts, compared to the richest census tracts. In essence, the map portrayed the economic geography of early death. Krieger cited a figure known euphemistically as the "Population Attributable Fraction," or

Nancy Krieger at  
the Harvard School of  
Public Health



PAF, of premature mortality due to census-tract poverty. Translated, it says that 30 percent of those who died under age 65 in the city's poorest areas would still be alive if the premature death rates in their neighborhoods had been the same as those in Louisburg Square. Though researchers have used the PAF for decades to examine a variety of exposures and outcomes—from smoking and death rates to high cholesterol and heart disease—Krieger was the first person to calculate the PAF for poverty and premature mortality in Boston—or to think about calculating it. “Thirty percent is a pretty stark contrast,” she said.

“Sure is,” said a man in the back. “If the white folks moved to the black areas, would they die any earlier?”

“That’s a great question,” Krieger said. “If they were born and lived under the same conditions as the African Americans living in those neighborhoods, they would have a worse mortality rate as well.”

A woman raised her hand. “This report is very good and honorable,” she told Krieger. “Who do you give this report to?” Though Krieger didn’t elaborate, the answer is: to a peer-re-

viewed scientific journal, with the hope that subsequent publication and media publicity will compel health officials, lawmakers, and advocacy groups to do something.

**D**URING THE PAST 20 YEARS, for reasons that remain unclear, asthma rates have steadily crept up in the United States. The disease is chronic and often unbearable: muscles of the bronchial tubes tighten and thicken, air passages become inflamed and mucus-filled, and the victim coughs, wheezes, and ultimately gasps for air. The most common asthma triggers are well-known: mold (from dampness and poor ventilation), dust mites (from old carpeting and unwashed linen), cockroaches and rodents (from infestations in dilapidated homes), tobacco smoke, toxic indoor chemicals, and ozone and diesel particulates in congested urban areas. This list explains why the disease disproportionately strikes poor people and minority populations. In King County, Washington, children from low-income neighborhoods are three times more likely to be admitted to the hospital for asthma than children from well-heeled communities.

Jim Krieger is a slight man, his expression reflective yet impish, wire rims resting on an aquiline nose, gray-tipped beard on sunken cheeks. His most conspicuous feature, though, is his soft voice: so light, high-pitched, airy with a slightly metallic sibilance, that one must and one does pay attention. In the mid 1990s, he hatched a plan to reduce Seattle's asthma rates. The idea was both bold and calculated. He would take on the "social

determinants" behind this major public-health challenge—but he wouldn't call it that. The phrase "social determinants," after all, was too ponderous, too accusatory, too lefty, to play well with policymakers. Nor did it play well with the minorities and low-income residents who were the actual victims of harmful environments. "You can't approach them and say, 'Let's work on social determinants of health,'" Jim says. "Instead, start with what they're concerned about—which is, they can't breathe—and then find the social determinants that affect asthma. Work the issue that way. Back into it."

At the time, asthma was the "disease *du jour*." A wealth of data proved it was increasing, which caught the attention of politicians and health officials. It also helped that most people intuitively understood the connection between housing and health, thanks to nineteenth-century campaigns to control typhus, tuberculosis, and other infections by improving sanitation and living arrangements. And so, beginning in the late 1990s, Seattle's Healthy Homes project received hefty grants from federal and private sources.

The program rested on an approach known as community-based participatory research. Newly minted health workers, who lived in the affected areas and often suffered from asthma, or had family members who did, went house-to-house to educate their neighbors about how to take care of themselves. Krieger's project demonstrated that children from those families who received frequent visits and intense education from health workers spent fewer days with symptoms and took fewer trips to the emergency room. The families learned about taking medicine properly and cleaning up their homes, but also got material help: allergy-control bedding, low-

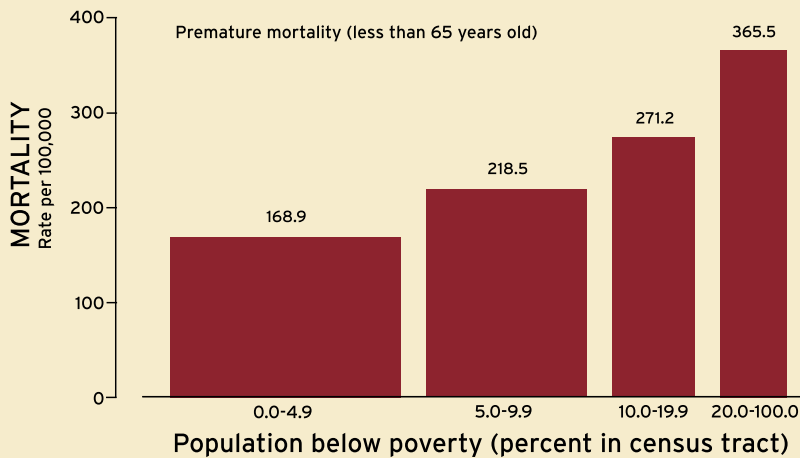
emission vacuum cleaners with microfiltration bags, cleaning kits, roach bait, and rodent traps. The community workers, meanwhile, collected reams of data on the problems they encountered and the results of their interventions, to meet the highest standards of scientific investigation.

The results were dramatic. In King County, the asthma hospitalization rate for children had increased 57 percent from 1987 to 1995. Between 2000, when the community health workers marched into action and the health department bolstered asthma prevention in schools and clinics, and 2004, the rate declined 39 percent.

In 2003, Krieger received an Innovation in Prevention Award from the U.S. De-

## Massachusetts Public Health Disparities

The chart depicts the rates of premature death from 1989 to 1991 in Massachusetts (scale on left) steadily rising among residents who lived in progressively poorer census tracts (shaded bars). The width of the bars reflects the proportion of residents throughout the state living in census tracts at the specified poverty level.

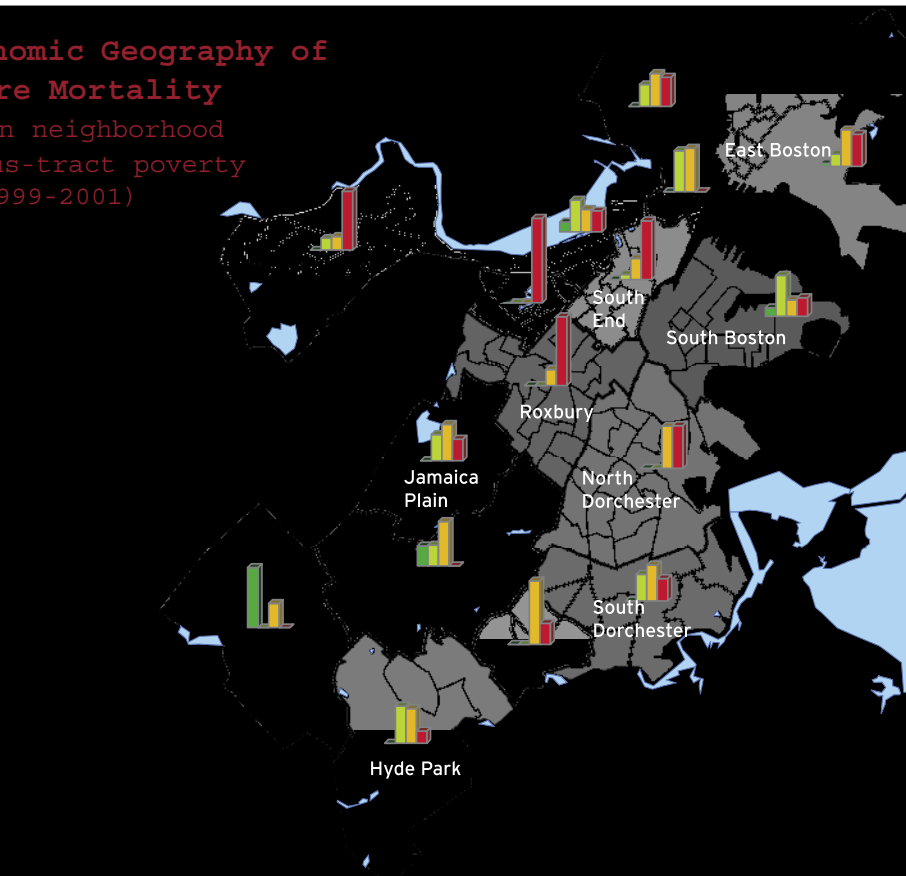


## The Economic Geography of Premature Mortality

(by Boston neighborhood and census-tract poverty levels, 1999-2001)

- % of neighbors living in census tracts with 0-4.9%
- % of neighbors living in CTs with 5.0-9.9%
- % of neighbors living in CTs with 10.0-19.9%
- % of neighbors living in CTs with 20.0-100.0%

Boston neighborhoods with higher rates of premature mortality generally have higher rates of poverty. The map depicts the geographic distribution of premature mortality (the height of the bars) and the proportion of residents living in census tracts at different poverty levels (the color of the bars) in various Boston neighborhoods. The legend above the map shows the color coding for the poverty levels and the height of the bars for the mortality rates.



partment of Health and Human Services. There was irony in his selection. Then-HHS secretary Tommy Thompson had long promoted policies, such as giving obese citizens pedometers to count their daily steps, that were diametrically opposed to the social-determinant model Krieger favored.

**A**LL ALONG, Jim Krieger assumed that Healthy Homes was merely a first step toward solving asthma. Until he began addressing fundamental social determinants of the disease, he wouldn't make much difference. In 2002, his interest and that of the city's public-housing agency coincided. The Seattle Housing Authority (SHA) began sketching out an unprecedented vision. High Point, in West Seattle, then consisted of barracks-like single-story structures originally built as temporary dwellings for Boeing workers after World War II. Sixty years later, buildings designed to last five years had become decrepit public housing. Not surprisingly, 10 to 12 percent of residents had asthma. The SHA determined to tear down the old structures in two phases, the first of which ended last fall. (Affected residents, who were relocated to other public housing in the city, were guaranteed a unit in the new site.) Replacing the old project would be a handsome, mixed-income community spread over 34 city blocks:

earns \$9 an hour pouring wax for decorative candles. Two years ago, her younger son, Steven, now four, was diagnosed with serious asthma after repeated trips to the hospital emergency room and the local health clinic. At the time, Truong and her boys were living in the original High Point project. "Mold and too dirty and too old," Truong said of her former home. "Mold on the ceiling. When I clean them, they come back."

"I heard they were building a new house," she said. "Easy for the kid to breathe. I love it. I want it. Because I don't want my kid to be more sick." And though she herself was never officially diagnosed with asthma, she has noticed that she feels better, too. "When I get into the house, easy for breathing."

Jim Krieger may have overseen construction of the Breathe Easy homes, but the idea originated with a tenant leader and former president of the local community council, Bonita Blake. Before chronic respiratory illness and a car accident disabled her, Blake had been a professional opera singer. Like many leaders in poor communities, she was wary of outsiders who wanted to study her neighborhood's problems and impose their own solutions. But she trusted Krieger. "I just love him," she said. "He spoke gentle to us, with us, on behalf of us. He didn't make us feel guilty or lesser than—I had expected him to do that. I wasn't so

**"He spoke gentle to us, with us, on behalf of us. He didn't make us feel guilty or lesser than—I had expected him to do that."**

green, sustainable, walkable, with expansive parks and majestic old trees, capacious front porches to deter crime, and a street grid connected to the rest of funky West Seattle. It would also include 35 allergy-free townhouses for people with asthma.

When the Housing Authority asked Krieger if he would be interested in the project, "he leapt at it," said Tom Byers, a well-connected local Democrat and partner in a consulting firm, Cedar River Group, who helped shepherd High Point to completion. Byers had made the initial phone call to Krieger. "He said: 'Oh yes, that sounds very exciting. Now, we'd have to look out for this, and we'd have to look out for that. And we will probably need to build a minimum of 60 homes to make the data reliable.'" For a public-health warrior like Krieger, it made no sense to build designer homes for a small group of impoverished asthma sufferers without a study large enough to offer statistical proof of the homes' benefits. If the project panned out, Krieger hoped to see the concept replicated throughout Seattle's low-income communities—and beyond. "He's the people's epidemiologist," Byers said.

The Breathe Easy units, as they came to be called, are a state-of-the-art response to asthma sufferers imprisoned in bad homes: a direct cure for a deleterious social determinant of health. For about \$5,000 extra in construction costs per unit, they are outfitted with filtered ventilation systems, insulated foundations, moisture-removing fans, cherry cabinets free of asthma-triggering glues, low-outgassing paints, easy-to-clean Marmoleum floors—and even landscaping with low-allergenic plants.

Lanh Truong and her two sons were the first to move into a Breathe Easy unit, in December 2005. A meticulous, effervescent 25-year-old, Truong had escaped as a child from Vietnam to a refugee camp in Thailand, eventually landing in Seattle. She

much hearing what he said as much as I heard his heart. He believed in what he was saying. He had a great cause—and he was committed to that cause."

**H**OW DID TWO SIBLINGS like Nancy and Jim Krieger evolve? They grew up on East 96th Street and Fifth Avenue, on the borderline between the Upper East Side of New York City and Spanish Harlem, an urban demarcation where the statistical link between poverty and early death surely resembled that between Louisburg Square and Roxbury. Steps from Mount Sinai Hospital, their apartment building sat on a city block that boasted the highest concentration of physicians in the world. Two of those doctors were their parents, Dorothy Terrace Krieger, director of the Mount Sinai School of Medicine's division of endocrinology and recipient of a special award in 1984 from the Lasker Foundation, and Howard P. Krieger, chair of the neurology department at Beth Israel Medical Center as well as a teacher and researcher. Dorothy Krieger, a driven, artistic, deeply private woman, was considered the intellectual powerhouse of the two. A Barnard College graduate at 18, she was gifted enough to have considered a career as a classical pianist. Scientific competition and other issues eventually corroded the marriage. The Kriegers divorced when Nancy and Jim were in college, and Dorothy Krieger remarried. She died at 58 of breast cancer.

Nancy and Jim grew up with a regimen of elite schools and directed study. Knowledge was meant to benefit the world; medicine was understood to be the noblest profession. Dinnertable talk centered on school, current events, and hospital politics. "Any topic could be discussed. It was very verbal. But you had to

make your case—opinions were not sufficient,” Nancy recalls. “I wouldn’t say the inculcation was completely enjoyable.”

From the start, sister and brother struck out in different directions, a reflection of their personalities. Nancy was solitary, inward, and fiercely strong-minded. At six and a half, according to Dorothy Krieger’s notation in a baby book, Nancy was “vacillating between believing in God, because ‘doesn’t want to be different,’ and not believing because of scientific evidence of process of geology and evolution.” It may have been the last time Nancy vacillated, or feared being different.

As a Harvard undergrad concentrating in biochemistry, Krieger consumed a heady brew of Marxism, feminism, evolutionary biology, history, and campus activism. She came out. She also plunged into experimental theater, doing tech work for classmate Peter Sellars, the avant-garde director, whose work at the time she considered insufficiently political. “We fought a lot,” she said. “We also talked about the nature of theater—making dead things come alive—because we both had interests in the classics as well. I love the world of the theater, and I love the world of making things happen.” After graduation in 1980, she moved to Seattle, where she started to make things happen in an unexpected sphere. It was a shock to the family system when Nancy announced that she would pursue graduate work in epidemiology—“The only time my mother hung up on me. If you’re at the center of academic medicine, public health looks like less than the last hair on the tail of the dog.”

Her University of Washington master’s thesis analyzed the effect of class position on breast-cancer survival. In 1988, she wrote presidential candidate Jesse Jackson’s AIDS platform. At the University of California, Berkeley, where she earned her doctorate in 1989, she peered across the landscape of women’s social roles to explain why breast cancer is more likely to strike black

A year after being awarded her Ph.D., during which time she became an investigator at the Kaiser Foundation Research Institute, in Oakland, Krieger returned to Berkeley to deliver the commencement speech. “On Becoming a Public Health Professional: Reflections on Democracy, Leadership, and Accountability” is required reading in many public-health courses around the country. In it, Krieger asks: “Are the ‘experts’ all white? Are they all men? Are they all affluent? Are they all straight? If so, we have a problem.”

That made her appointment at Harvard, where she joined the faculty in 1995, all the more arresting. She continues to dress in a provocative way—that is, her version of provocative. “For the first several faculty meetings, I made sure to wear a tie.” Krieger’s annual course, “History, Politics, and Public Health: Theories of Disease Distribution and Social Inequalities in Health,” is regularly oversubscribed. Last year she was awarded tenure, an academic vindication for public-health progressives. As one colleague proclaimed at Krieger’s tenure party, holding aloft a glass of champagne: “Every once in a while, justice triumphs.”

**I**N HIS YOUTH, Jim Krieger created a rich friendship network outside a home oriented 100 percent to scholarship. He committed the apostasy of joining his high school’s swimming and soccer teams. And long before his coalition work with asthma, he made a point of meeting people where they were, by fitting in with different cliques: the academic aces, the jocks, the politicos, and the cool crowd. “It was curiosity, more than anything else. I always saw myself as someone who bridged different cultures.”

He also took up photography and joined classmates in a group called the Saturday Housing Project, wielding a Nikon to document shocking conditions in Harlem and the Bronx. The stu-

**“The only time my mother hung up on me. If you’re at the center of academic medicine, public health looks like less than the last hair on the tail of the dog.”**

women under age 40, but more likely to strike white women after 45. Until then, researchers had assumed that racial differences in breast-cancer risk were just that: racial. Krieger focused on class standing and its influence on educational level, fertility rates, abortion, oral contraception, and other seeming imponderables. “For Nancy to look beyond the usual cast of characters, to think about it more broadly, was remarkable,” says S. Leonard Syme, professor of epidemiology and community health at Berkeley’s School of Public Health. “It put breast cancer in the middle of social process.”

On the day Krieger was scheduled to deliver her doctoral defense, an event usually sparsely attended, the faculty filed in to hear her. “We couldn’t get a room big enough,” recalls Syme. “People were sitting on the floor and on the windowsills.”

“They knew this was a voice they had to listen to, whether they liked that voice or not,” adds Meredith Minkler, now a professor of health and social behavior at Berkeley. “Nancy talks very fast. People shouted out: ‘Slow down!’ We were scribbling notes as fast as we could, because we didn’t want to lose any of it.”

dents submitted their reports and pictures to tenants-rights organizations, which used them to argue for repairs. “I remember one bathroom where the toilet wasn’t working, lime green peeling paint coming down all over the place, one bare light bulb hanging from the ceiling,” Krieger said. “The shower was rusty and not working very well, and there was a big leak in that bathroom. It was the only bathroom in a house for six or seven people. Here I was living in an apartment off of Fifth Avenue, and this was less than a mile away.”

The Saturday Housing Project was a “shaping experience,” he said, sowing “a set of core values that I still have to this day: of addressing social inequities in an activist, concrete, doing kind of way.” Advocacy, he saw, produced results. “Some of the clients that we worked with were able to force the landlords to make improvements. [In] other cases, in which the association couldn’t do anything, we were able to assist the family in finding better housing or getting them onto public housing.”

At Harvard, where, like Nancy, he concentrated in biochemistry, Krieger protested against apartheid in South Africa. After graduating in 1978, he joined VISTA to work on health, school,

and housing issues. A chance conversation with an activist physician convinced him that he could do more good working inside the establishment than by knocking on the doors of Somerville triple-deckers. Yet in 1983, he took a year off from his medical school residency at the University of California, San Francisco, and headed to Nicaragua, where the Sandinista revolution had exploded. It was his final transformative push into public-health activism. He toiled in a tiny four-room clinic set in the middle of a sugar-cane plantation. During the day, women and children with anemia, respiratory infections, and intestinal parasites filled the waiting room. At night, men trudged in from the fields with machete wounds. Krieger was swept up in a health revolution, where a nation untouched by the most basic public-health measures was suddenly the target of childhood immunization campaigns, life-saving oral rehydration for deadly diarrheal infections, and other enlightened practices imported by politically impassioned young doctors from the rich world—people like Krieger.

“If you have a transformative period in history like that, where political forces are lined up with social forces,” he says, “then you can make profound change. That gave me a vision about the way things could be. But also it helps me understand better the realities of the last 20 years, which has been a conservative period in our country’s history.” In Seattle, his solution has been to embark on smaller-scale, incremental projects, with the hope that the pendulum will eventually swing and make way, if not for revolution, then for accelerated evolution.

**N**ANCY KRIEGER SAYS she gets many of her insights when engaged in intellectual debate with someone: either in person, or in her head. In a sense, the scrupulous logic and extensive footnoting in her papers may be the legacy of her childhood dinner-table discussions. Today, walks around Jamaica Pond are a reliable source of inspiration. In her left shirt pocket, a small pad of paper and three



Jim Krieger at  
the Breathe Easy  
housing units,  
Seattle

pens are always at the ready. “I don’t like to travel,” she said. “But my mind likes to travel.”

Mostly, it has traveled over uncharted intellectual terrain. Beginning in 1990, Krieger was the first scientist to describe how racial discrimination harms physical health—by explicitly measuring exposure to racial discrimination and testing its association with high blood pressure. “She did things that made some of the leading people in the field quite uncomfortable,” says Duke’s Sherman James. “But she did it so brilliantly that people who are made uneasy by her intellectual challenges could not fault her on the grounds of sloppy thinking.”

Traditionally, epidemiology “adjusted” for race and class: using

statistical sleight of hand, it erased the overwhelming effects of racial discrimination and poverty on populations in order to flush out the specific biological pathways behind disease. Krieger said that race should not be treated as a background influence or biological risk factor to be controlled for, but rather that racism should be analyzed as a causal exposure for disease in its own right. She wanted to measure the effects of discrimination, poverty, and injustice on health *directly*.

In 1996, Krieger published the first, and still largest, study to suggest that bearing the brunt of racial discrimination raises the risk of elevated blood pressure, a partial explanation of why blacks suffer more hypertension than whites. She showed that racial discrimination is just as harmful as any of the usual culprits: lack of exercise, smoking, a high-fat or high-salt diet.

"It was controversial," says James. Although the statistical outcomes were surprising, they were also nuanced. "The findings were very complex—and a lot of people have difficulty dealing with that kind of complexity." Even more noteworthy, the paper was based on data collected in one of the gold-plated studies in the history of epidemiology: the Coronary Artery Risk Development in Young Adults (CARDIA) study. The analysis was not only a technical *tour de force*, but a red flag for critics, who charged that her conclusions went beyond the evidence.

To answer them, Krieger developed a scientifically validated research instrument for measuring people's experiences of racial discrimination—one now used by researchers studying a wide array of health outcomes, from hypertension to tobacco use to depression. And she continued to ponder the deeper meaning behind the data, including the hint that repressing the anger and humiliation of racial discrimination exacts a physical toll. "The

also flushes out small, often overlooked, pockets that may need extra attention. Health departments from Boston to Brazil, from China to Costa Rica, are using her techniques. "I'm sitting here in the health department, and I want her to teach me," says Bruce Cohen, director of the division of research and epidemiology at the Center for Health Information and Statistics at the Massachusetts Department of Public Health. "I want to be able to replicate what she does, with fewer resources than she has, so I can use our data to identify target populations for our programs more effectively."

In 2000, Krieger published the first U.S. study to calculate on a state-wide level how poverty raises the risk of becoming infected with the AIDS virus. "Partly as a result of the research that Nancy has done, we have been able to make the case that the number-one public-health issue in Boston is racial and ethnic healthcare disparities," says John Auerbach, executive director of the Boston Public Health Commission. "Several years ago, we would never have been able to make that case."

More recently, Krieger has used geocoding to paint a fine-grained portrait of preventable suffering. In Massachusetts and Rhode Island, she showed that *more than half* the cases of childhood lead poisoning, sexually transmitted infections, tuberculosis, nonfatal gun-related injuries, and HIV/AIDS deaths among the poorest residents would not have occurred if their risk had been the same as that of people living in the wealthiest enclaves.

Yet Krieger's theoretical papers may be even more influential. Most epidemiology theory comes from the grand old men of the profession, at the end of storied careers. Krieger began penning her decidedly unpontifical ideas in her thirties. The most famous was published in 1994: "Epidemiology and the Web of Causation:

**"A person is not one day African American, another day born low birth weight, another day raised in a home bearing remnants of lead paint..."**

evidence is there in the bodies, but people can't say, at times, what happened to them," she says. "That's what solidified for me the idea that bodies can tell stories that people sometimes can't, or won't, or aren't able to, or are not free to tell."

In the late 1990s, Krieger set out to devise a method to portray the link between a community's health status and its socioeconomic class. She was building on work she had started as a master's degree student in 1984, frustrated by the dearth of socioeconomic data in U.S. health records. The Public Health Disparities Geocoding Project, launched in 2004, is a major advance in public-health research. (Its methods are freely available at [www.hsph.harvard.edu/thegeocodingproject/](http://www.hsph.harvard.edu/thegeocodingproject/).) Though the technical details are complicated, Krieger's concept boils down to this: one's street address turns out to be a pretty good indicator of one's health. Within a federal census tract (an area that usually includes about 4,000 people of similar income and living conditions), the poverty rate corresponds closely with residents' health status.

Krieger's linkage of census data with public-health surveillance information helps officials track whether the health gap between rich and poor is getting smaller or bigger, or whether government policies are making the situation better or worse. It

Has Anyone Seen the Spider?" Drawing deeply on history and philosophy, the article in *Social Science and Medicine* dismantles the central tenet of modern epidemiology: the belief that population patterns of health and disease spring from a complex (and rather gauzy) "web" of risk and protective factors. Krieger suggests the web approach is both short-sighted and cowardly because it focuses on individuals and ignores how and why diseases vary and shift across populations and over time. It looks at lots of narrow mechanisms and not at the overarching forces that set those mechanisms into play.

Instead, she asks, "Who or what is the 'spider?'" What societal forces create the risk factors that eventually sift down to the organs and cells and DNA in our bodies? And how are those forces sowing disease across populations? "When you look at it after reading it, you say: Of course. But no one really saw it until then," says her former Berkeley mentor Len Syme. "Everywhere I go in the world, I see that paper sitting on people's desks."

In the "Spider" paper, Krieger also introduced "ecosocial theory," which ties together many of her intellectual insights. She argues that an individual's health can't be torn from context and history. We are both social and biological beings, she says—and the social is every bit as "real" as the biological. Soci-

ety, in fact, intimately connects with biology from the moment we are born—or even before. Explaining the comparatively high risk of hypertension among African Americans, Krieger wrote: “A person is not one day African American, another day born low birth weight, another day raised in a home bearing remnants of lead paint, another day subjected to racial discrimination at work (and in a job that does not provide health insurance), and still another day living in a racially segregated neighborhood without a supermarket but with many fast food restaurants. The body does not neatly partition these experiences—all of which may serve to increase risk of uncontrolled hypertension.”

Understanding the deepest roots of disease, in Krieger’s universe, requires asking questions about social structure, cultural norms, ecologic milieu, and genetic variability—not piecemeal, but all at once. In a 2004 study, for instance, Elizabeth Barbeau, director of tobacco-control research at Boston’s Dana-Farber Cancer Institute, found that class strongly influences the likelihood of giving up smoking—the very kind of role Krieger’s theories would predict. “People in working-class occupations actually attempted to quit just as often as people in higher occupational groups. But they were not as successful in doing so,” Barbeau explains. Why not? Maybe because they didn’t have health insurance to pay for nicotine patches or smoking-cessation counseling. Or because their workplaces still permitted smoking. Or because their jobs were so monotonous that lighting up was the only way to break the tedium.

Or take San Francisco bus drivers, 90 percent of whom suffer hypertension by age 60, not to mention lower back pain, respiratory disease, gastrointestinal distress, and alcoholism. “At some point you have to say, ‘Wait a minute. Where’s the spider?’” says Len Syme. “The fundamental, underlying problem is a job that is causing a higher rate of everything.” In this case, Krieger’s hypothesized arachnid was a rigid and arbitrary schedule that drivers could not humanly keep up with.

In the late 1990s, pundits from several conservative think tanks launched incendiary salvos against Nancy Krieger’s work. They argued that her research undermined Americans’ cultural beliefs in self-reliance. Typical was lawyer Heather MacDonald’s 1998 article “Public Health Quackery,” in the Manhattan Institute’s *City Journal*: “Behind all their talk of racism and sexism, Krieger and her colleagues’ real prey is individual responsibility. Traditional epidemiology looks at both individual risk behaviors and the environment to determine the source and pattern of disease. But the modern miasmaticians assert that to study individual risk factors, such as drug use or smoking, ‘blames the victim’—at least when that victim is poor, female, or black. When such victims get sick, society is to blame. And so the public health revisionists are generating a remarkable body of excuses for the most avoidable and dangerous behaviors, particularly those relating to HIV/AIDS.”

Eventually the attacks fizzled out, most likely because Krieger built a massive foundation of empirical research and methods to support her vaulting theories. “I was going to do this work. Or I was not going to be allowed to do this work. But I wasn’t going to do something else,” Krieger says. “It’s very clear that you could only get away with this stuff if you’re really good. This is not about doing ‘politically correct’ science: it is about doing correct science.”

**I**N JANUARY, Jim Krieger returned to Seattle from a month’s hiking in the Andes with his partner, Kim, a public-health program director. As it happened, Nancy was also in Seattle, en route to a talk in Vancouver. At dinner, over pasta and wine, the siblings’ resonant lives and divergent personalities were on display. Nancy radiated a feeling of deep stillness, even when she was in motion. Jim exuded a coiled kinetic energy, even when sitting still.

The family dynamic, they agreed, was complicated. Although Nancy was encouraged to pursue any interest, Jim was explicitly pointed toward a medical-research career. During a high-school summer science camp, his parents were disappointed that the program wasn’t demanding enough. “They told me I was wasting my time,” he recalls, “not doing good enough experiments.” As if reliving the experience, Jim shifted to the present tense. “You prove your value through your intellectual achievements. They don’t give you attention, affection, love, whatever—you have to earn it.”

By happenstance or by design, sister and brother ended up in the same profession, fighting the same villains, doing like-minded but unlike work on opposite coasts. Were they competing, or avoiding competition? Both said that even though the competitive bait had been set at an early age, they didn’t bite. “The intellectual was the easy part,” Nancy said. “Much more difficult was the emotional part. There was a very limited amount of parental attention to go around, and there was competition for that. You can’t win that competition. You can live it—but nobody wins, and everybody loses.”

Despite that awareness, Nancy and Jim never lost their emotional connection.

The next day, during a walk around Phase I of the new High Point, the cool air rang with a medley of contractors’ saws and nail guns. To the west stood the gray-green, snow-capped Olympics hovering over Puget Sound. To the east, the Cascades. In every block Jim noticed little improvements since he’d last seen the grounds: new plantings, drainpipes, paths cleared through the woods. “This is really looking good,” he said. Nancy’s mind was churning with political questions: the power shifts that had permitted such handsome housing for poor people, how different ethnic groups would or would not coalesce in the new community. She also felt a sense of possibility.

Earlier, Nancy had said that Jim’s work was a “touchstone” for her. “I’ve always looked up to my brother. I think he’s principled. He’s displayed political acumen. And he’s pushing the edges of what a health department can do.”

Similarly, Jim had said, “I like reading what Nancy writes. It’s important for people in public health to have theoretical constructs, big-picture vision. It can be very motivating, morale-building. You feel you’re plugged into something bigger than you are.”

Strolling past freshly painted townhouses, Nancy told Jim she was proud of him. He accepted the compliment—he’s been getting better at accepting compliments—but reminded her that it wasn’t just him, that lots of people were involved. She said, “Still, here it is.”

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*Boston-based journalist Madeline Drexler is the author of Secret Agents: The Menace of Emerging Infections (Penguin). She has a visiting appointment at the Harvard School of Public Health.*