



HOMELESS WOMAN in San Francisco.

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New studies suggest that the stress of being poor has a staggeringly harmful influence on health

By Robert Sapolsky

Sick of POVERTY

Rudolph Virchow, the 19th-century German neuroscientist, physician and political activist, came of age with two dramatic events—a typhoid outbreak in 1847 and the failed revolutions of 1848. Out of those experiences came two insights for him: first, that the spread of disease has much to do with appalling living conditions, and second, that those in power have enormous means to subjugate the powerless. As Virchow summarized in his famous epigram, “Physicians are the natural attorneys of the poor.”

Physicians (and biomedical scientists) are advocates of the underprivileged because poverty and poor health tend to go hand in hand. Poverty means bad or insufficient food, unhealthy living conditions and endless other factors that lead to illness. Yet it is not merely that poor people tend to be unhealthy while everyone else is well. When you examine socioeconomic status (SES), a composite measure that includes

income, occupation, education and housing conditions, it becomes clear that, starting with the wealthiest stratum of society, every step downward in SES correlates with poorer health.

This “SES gradient” has been documented throughout Westernized societies for problems that include respiratory and cardiovascular diseases, ulcers, rheumatoid disorders, psychiatric diseases and a number of cancers. It is not a subtle statistical phenomenon. When you compare the highest versus the lowest rungs of the SES ladder, the risk of some diseases varies 10-fold. Some countries exhibit a five- to 10-year difference in life expectancy across the SES spectrum. Of the Western nations, the U.S. has the steepest

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gradient; for example, one study showed that the poorest white males in America die about a decade earlier than the richest.

So what causes this correlation between SES and health? Lower SES may give rise to poorer health, but conversely, poorer health could also give rise to lower SES. After all, chronic illness can compromise one’s education and work productivity, in addition to generating enormous expenses.

Nevertheless, the bulk of the facts suggests that the arrow goes from economic status to health—that SES at some point in life predicts health measures later on. Among the many demonstrations of this point is a remarkable study of elderly American nuns. All had taken their vows as young adults and had spent many years thereafter sharing diet, health care and housing, thereby controlling for those lifestyle factors. Yet in their old age, patterns of disease, incidence of dementia and longevity were still significantly predicted by their SES status from when they became nuns, at least half a century before.

Inadequate Explanations

SO, TO USE A MARVELOUS PHRASE common to this field, how does SES get “under the skin” and influence health? The answers that seem most obvious, it turns out, do not hold much water. One such explanation, for instance, posits that for the poor, health care may be less easily accessible and of lower quality. This possibility is plausible when one considers that for many of the poor in America, the family physician

Overview/*Status and Health*

- Researchers have long known that people with low socioeconomic status (SES) have dramatically higher disease risks and shorter life spans than do people in the wealthier strata of society. The conventional explanations—that the poor have less access to health care and a greater incidence of harmful lifestyles such as smoking and obesity—cannot account for the huge discrepancy in health outcomes.
- New studies indicate that the psychosocial stresses associated with poverty may increase the risks of many illnesses. The chronic stress induced by living in a poor, violent neighborhood, for example, could increase one’s susceptibility to cardiovascular disease, depression and diabetes.
- Other studies have shown a correlation between income inequality and poor health in the U.S. Some researchers believe that the poor feel poorer, and hence suffer greater stress, in communities with wide gaps between the highest and lowest incomes.

does not exist, and medical care consists solely of trips to the emergency room.

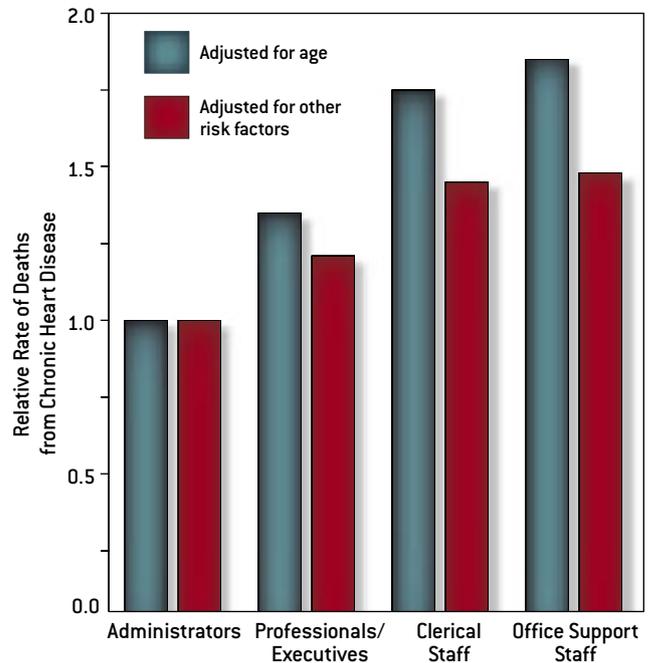
But that explanation soon falls by the wayside, for reasons made clearest in the famed Whitehall studies by Michael G. Marmot of University College London over the past three decades. Marmot and his colleagues have documented an array of dramatic SES gradients in a conveniently stratified population, namely, the members of the British civil service (ranging from blue-collar workers to high-powered executives). Office messengers and porters, for example, have far higher mortality rates from chronic heart disease than administrators and professionals do [see top illustration at right]. Lack of access to medical attention cannot explain the phenomenon, because the U.K., unlike the U.S., has universal health care. Similar SES gradients also occur in other countries with socialized medicine, including the health care Edens of Scandinavia, and the differences remain significant even after researchers factor in how much the subjects actually use the medical services.

Another telling finding is that SES gradients exist for diseases for which health care access is irrelevant. No amount of medical checkups, blood tests and scans will change the likelihood of someone getting type 1 (juvenile-onset) diabetes or rheumatoid arthritis, yet both conditions are more common among the poor.

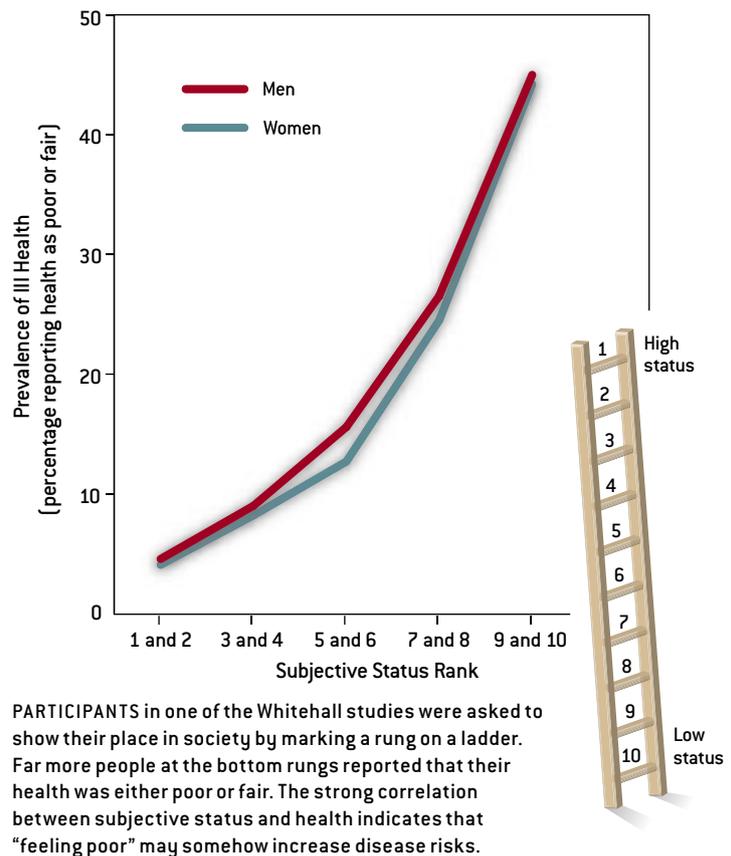
The next “obvious” explanation centers on unhealthy lifestyles. As you descend the SES ladder in Westernized societies, people are more likely to smoke, to drink excessively, to be obese, and to live in a violent or polluted or densely populated neighborhood. Poor people are also less likely to have access to clean water, healthy food and health clubs, not to mention adequate heat in the winter and air-conditioning in the summer. Thus, it seems self-evident that lower SES gets under the skin by increasing risks and decreasing protective factors. As mordantly stated by Robert G. Evans of the University of British Columbia, “Drinking sewage is probably unwise, even for Bill Gates.”

What is surprising, though, is how little of the SES gradient these risk and protective factors explain. In the Whitehall studies, controlling for factors such as smoking and level of exercise accounted for only about a third of the gradient. This same point is made by studies comparing health and wealth among, rather than within, nations. It is reasonable to assume that the wealthier a country, the more financial resources its citizens have to buy protection and avoid risk. If so, health should improve incrementally as one moves up the wealth gradient among nations, as well as among the citizens within individual nations. But it does not. Instead, among the wealthiest quarter of countries on earth, there is no relation between a country’s wealth and the health of its people.

Thus, health care access, health care utilization, and exposure to risk and protective factors explain the SES/health gradient far less well than one might have guessed. One must therefore consider whether most of the gradient arises from a different set of considerations: the psychosocial consequences of SES.



WHITEHALL STUDIES show that low-ranked British civil servants (office messengers and other support staff) are almost twice as likely to die from heart disease as administrators of the same age. Differences in risk factors—for example, higher smoking rates among the support staff—account for less than half the gap in mortality rates.



PARTICIPANTS in one of the Whitehall studies were asked to show their place in society by marking a rung on a ladder. Far more people at the bottom rungs reported that their health was either poor or fair. The strong correlation between subjective status and health indicates that “feeling poor” may somehow increase disease risks.

EMILY COOPER; SOURCES: MICHAEL G. MARMOT, University College London (top graph); “SUBJECTIVE SOCIAL STATUS: ITS DETERMINANTS AND ITS ASSOCIATION WITH MEASURES OF ILL-HEALTH IN THE WHITEHALL II STUDY,” BY A. SINGH-MANOX, N. E. ADLER AND M. G. MARMOT, IN *SOCIAL SCIENCE AND MEDICINE*, VOL. 56, 2003 (bottom graph)



CHRONIC STRESS may explain how poverty “gets under the skin” and exerts a harmful influence on health. The risk of stress-sensitive diseases increases if individuals lack social support, have no outlets for their frustration and feel that their circumstances are worsening—exactly the conditions in many poor communities in the U.S.

Psychosocial Stress

IDEALLY, THE BODY is in homeostatic balance, a state in which the vital measures of human function—heart rate, blood pressure, blood sugar levels and so on—are in their optimal ranges. A stressor is anything that threatens to disrupt homeostasis. For most organisms, a stressor is an acute physical challenge—for example, the need for an injured gazelle to sprint for its life or for a hungry predator to chase down a meal. The body is superbly adapted to dealing with short-term physical challenges to homeostasis. Stores of energy, including the sugar glucose, are released, and cardiovascular tone increases to facilitate the delivery of fuel to exercis-

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ing muscle throughout the body. Digestion, growth, tissue repair, reproduction and other physiological processes not needed to survive the crisis are suppressed. The immune system steps up to thwart opportunistic pathogens. Memory and the senses transiently sharpen.

But cognitively and socially sophisticated species, such as we primates, routinely inhabit a different realm of stress. For us, most stressors concern interactions with our own species, and few physically disrupt homeostasis. Instead these psychosocial stressors involve the anticipation (accurate or otherwise) of an impending challenge. And the striking characteristic of such psychological and social stress is its chronicity. For most mammals, a stressor lasts only a few minutes. In contrast, we humans can worry chronically over a 30-year mortgage.

Unfortunately, our body’s response, though adaptive for an acute physical stressor, is pathogenic for prolonged psychosocial stress. Chronic increase in cardiovascular tone brings stress-induced hypertension. The constant mobilization of energy increases the risk or severity of diseases such as type 2 (adult-onset) diabetes. The prolonged inhibition of digestion, growth, tissue repair and reproduction increases the risks of various gastrointestinal disorders, impaired growth in children, failure to ovulate in females and erectile dysfunction in males. A too-extended immune stress response ultimately suppresses immunity and impairs disease defenses. And chronic activation of the stress response impairs cognition, as well as the health, functioning and even survival of some types of neurons.

An extensive biomedical literature has established that individuals are more likely to activate a stress response and are more at risk for a stress-sensitive disease if they (a) feel as if they have minimal *control* over stressors, (b) feel as if they have no *predictive information* about the duration and intensity of the stressor, (c) have few *outlets* for the frustration caused by the stressor, (d) interpret the stressor as evidence of circumstances *worsening*, and (e) lack *social support* for the duress caused by the stressors.

Psychosocial stressors are not evenly distributed across society. Just as the poor have a disproportionate share of physical stressors (hunger, manual labor, chronic sleep deprivation with a second job, the bad mattress that can’t be replaced), they have a disproportionate share of psychosocial ones. Numbing assembly-line work and an occupational lifetime spent taking orders erode workers’ sense of control. Unreliable cars that may not start in the morning and paychecks that may not last the month inflict unpredictability. Poverty rarely allows stress-relieving options such as health club memberships, costly but relaxing hobbies, or sabbaticals for rethinking one’s priorities. And despite the heartwarming stereotype of the “poor but loving community,” the working poor typically have less social support than the middle and upper classes, thanks to the extra jobs, the long commutes on public transit, and other burdens.

Marmot has shown that regardless of SES, the less au-

tonomy one has at work, the worse one's cardiovascular health. Furthermore, low control in the workplace accounts for about half the SES gradient in cardiovascular disease in his Whitehall population.

Feeling Poor

THREE LINES OF RESEARCH provide more support for the influence of psychological stress on SES-related health gradients. Over the past decade Nancy E. Adler of the University of California, San Francisco, has explored the difference between objective and subjective SES and the relation of each to health [see bottom illustration on page 95]. Test subjects were shown

a simple diagram of a ladder with 10 rungs and then asked, "In society, where on this ladder would you rank yourself in terms of how well you're doing?" The very openness of the question allowed the person to define the comparison group that felt most emotionally salient.

As Adler has shown, a person's subjective assessment of his or her SES takes into account the usual objective measures (education, income, occupation and residence) as well as measures of life satisfaction and of anxiety about the future. Adler's provocative finding is that subjective SES is at least as good as objective SES at predicting patterns of cardiovascular function, measures of metabolism, incidences of obesity and

THE GOOD AND BAD EFFECTS OF STRESS

The human body is superb at responding to the acute stress of a physical challenge, such as chasing down prey or escaping a predator. The circulatory, nervous and immune systems are mobilized while the digestive and reproductive processes are suppressed. If the stress becomes chronic, though, the continual repetition of these responses can cause major damage.

EFFECTS OF ACUTE STRESS

Brain
Increased alertness and less perception of pain

Thymus Gland and Other Immune Tissues
Immune system readied for possible injury

Circulatory System
Heart beats faster, and blood vessels constrict to bring more oxygen to muscles

Adrenal Glands
Secrete hormones that mobilize energy supplies

Reproductive Organs
Reproductive functions are temporarily suppressed

EFFECTS OF CHRONIC STRESS

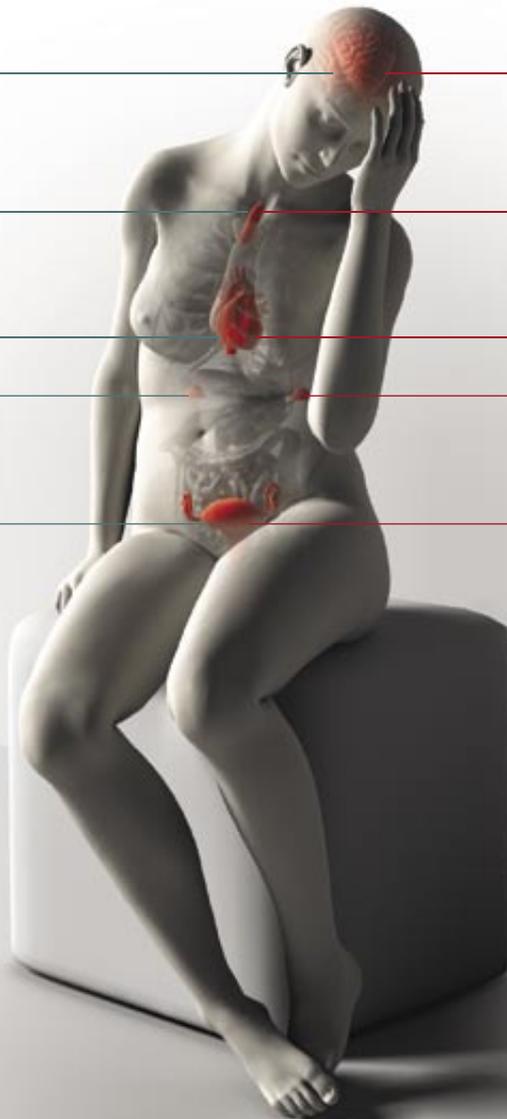
Brain
Impaired memory and increased risk of depression

Thymus Gland and Other Immune Tissues
Deteriorated immune response

Circulatory System
Elevated blood pressure and higher risk of cardiovascular disease

Adrenal Glands
High hormone levels slow recovery from acute stress

Reproductive Organs
Higher risks of infertility and miscarriage



levels of stress hormones—suggesting that the subjective feelings may help explain the objective results.

This same point emerges from comparisons of the SES/health gradient among nations. A relatively poor person in the U.S. may objectively have more financial resources to purchase health care and protective factors than a relatively wealthy person in a less developed country yet, on average, will still have a shorter life expectancy. For example, as Stephen Bezruchka of the University of Washington emphasizes, people in Greece on average earn half the income of Americans yet have a longer life expectancy. Once the minimal resources are available to sustain a basic level of health through adequate food and housing, absolute levels of income are of remarkably little importance to health. Although Adler's work suggests that the objective state of *being* poor adversely affects health, at the core of that result is the subjective state of *feeling* poor.

Being Made to Feel Poor

ANOTHER BODY OF RESEARCH arguing that psychosocial factors mediate most of the SES/health gradient comes from Richard Wilkinson of the University of Nottingham in England. Over the past 15 years he and his colleagues have reported that the extent of income inequality in a community is even more predictive than SES for an array of health measures. In other words, absolute levels of income aside, greater disparities in income between the poorest and the wealthiest in a community predict worse average health. (David H. Abbott of the Wisconsin National Primate Research Center and I, along with our colleagues, found a roughly equivalent phenomenon in animals: among many nonhuman primate species, less egalitarian social structures correlate with higher resting levels of a key stress hormone—an index for worse health—among socially subordinate animals.)

Wilkinson's subtle and critical finding has generated considerable controversy. One dispute concerns its generality. His original work suggested that income inequality was relevant to health in many European and North American countries and communities. It has become clear, however, that this relation holds only in the developed country with the greatest of income inequalities, namely, the U.S.

Whether considered at the level of cities or states, income inequality predicts mortality rates across nearly all ages in the U.S. [see illustration on opposite page]. Why, though, is this relation not observed in, say, Canada or Denmark? One possibility is that these countries have too little income variability to tease out the correlation.

Some critics have questioned whether the linkage between income inequality and worse health is merely a mathematical quirk. The relation between SES and health follows an



INCOME INEQUALITY appears to exacerbate the stress of poverty. As the divide between the rich and poor grows wider, social support typically becomes less available and the frustrations of the poor intensify.

asymptotic curve: dropping from the uppermost rung of society's ladder to the next-to-top step reduces life expectancy and other measures much less drastically than plunging from the next-to-bottom rung to the lowest level. Because a community with high levels of income inequality will have a relatively high number of individuals at the very bottom, where health prospects are so dismal, the community's average life expectancy will inevitably be lower than that of an egalitarian community, for reasons that have nothing to do with psychosocial factors. Wilkinson has shown, however, that decreased income inequality predicts better health for both the poor and the wealthy. This result strongly indicates that the

association between illness and inequality is more than just a mathematical artifact.

Wilkinson and others in the field have long argued that the more unequal income in a community is, the more psychosocial stress there will be for the poor. Higher income inequality intensifies a community's hierarchy and makes social support less avail-

able: truly symmetrical, reciprocal, affiliative support exists only among equals. Moreover, having your nose rubbed in your poverty is likely to lessen your sense of control in life, to aggravate the frustrations of poverty and to intensify the sense of life worsening.

If Adler's work demonstrates the adverse health effects of feeling poor, Wilkinson's income inequality work suggests that the surest way to feel poor is to be *made* to feel poor—to be endlessly made aware of the haves when you are a have-not. And in our global village, we are constantly made aware of the moguls and celebrities whose resources dwarf ours.

John W. Lynch and George A. Kaplan of the University of Michigan at Ann Arbor have recently proposed another way that people are made to feel poor. Their "neomaterialist" in-

The surest way to feel poor is to be endlessly made aware of the haves when you are a have-not.

terpretation of the income inequality phenomenon—which is subtle, reasonable and, ultimately, deeply depressing—runs as follows: Spending money on public goods (better public transit, universal health care and so on) is a way to improve the quality of life for the average person. But by definition, the bigger the income inequality in a society, the greater the financial distance between the average and the wealthy. The bigger this distance, the less the wealthy have to gain from expenditures on the public good. Instead they would benefit more from keeping their tax money to spend on their private good—a better chauffeur, a gated community, bottled water, private schools, private health insurance. So the more unequal the income is in a community, the more incentive the wealthy will have to oppose public expenditures benefiting the health of the community. And within the U.S., the more income inequality there is, the more power will be disproportionately in the hands of the wealthy to oppose such public expenditures. According to health economist Evans, this scenario ultimately leads to “private affluence and public squalor.”

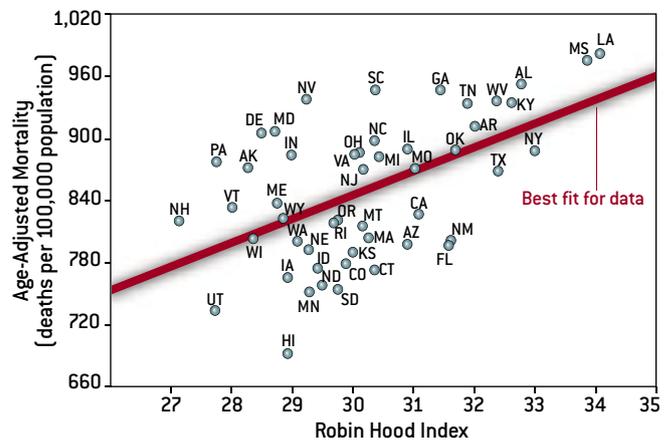
This “secession of the wealthy” can worsen the SES/health gradient in two ways: by aggravating the conditions in low-income communities (which account for at least part of the increased health risks for the poor) and by adding to the psychosocial stressors. If social and psychological stressors are entwined with feeling poor, and even more so with feeling poor while being confronted with the wealthy, they will be even more stressful when the wealthy are striving to decrease the goods and services available to the poor.

Social Capital

A THIRD BRANCH OF SUPPORT for psychosocial explanations for the relation between income inequality and health comes from the work of Ichiro Kawachi of Harvard University, based on the concept of “social capital.” Although it is still being refined as a measure, social capital refers to the broad levels of trust and efficacy in a community. Do people generally trust one another and help one another out? Do people feel an incentive to take care of commonly held resources (for example, to clean up graffiti in public parks)? And do people feel that their organizations—such as unions or tenant associations—actually have an impact? Most studies of social capital employ two simple measures, namely, how many organizations people belong to and how people answer a question such as, “Do you think most people would try to take advantage of you if they got a chance?”

What Kawachi and others have shown is that at the levels of states, provinces, cities and neighborhoods, low social capital predicts bad health, bad self-reported health and high mortality rates. Using a complex statistical technique called path analysis, Kawachi has demonstrated that (once one controls for the effects of absolute income) the strongest route from income inequality to poor health is through the social capital measures—to wit, high degrees of income inequality come with low levels of trust and support, which increases stress and harms health.

RATING THE STATES



ROBIN HOOD INDEX is a measure of income inequality; it is the percentage of total community income that must be taken from the rich (those with above-average incomes) and given to the poor (those below the average) to achieve an equal distribution. U.S. states (blue dots) with a high Robin Hood index also tend to have high mortality rates.

None of this is surprising. As a culture, America has neglected its social safety nets while making it easier for the most successful to sit atop the pyramids of inequality. Moreover, we have chosen to forgo the social capital that comes from small, stable communities in exchange for unprecedented opportunities for mobility and anonymity. As a result, all measures of social epidemiology are worsening in the U.S. Of Westernized nations, America has the greatest income inequality (40 percent of the wealth is controlled by 1 percent of the population) and the greatest discrepancy between expenditures on health care (number one in the world) and life expectancy (as of 2003, number 29).

The importance of psychosocial factors in explaining the SES/health gradient generates a critical conclusion: when it comes to health, there is far more to poverty than simply not having enough money. (As Evans once stated, “Most graduate students have had the experience of having very little money, but not of poverty. They are very different things.”) The psychosocial school has occasionally been accused of promulgating an antiprogressive message: don’t bother with universal health care, affordable medicines and other salutary measures because there will still be a robust SES/health gradient after all the reforms. But the lesson of this research is not to abandon such societal change. It is that so much more is needed. SA

MORE TO EXPLORE

Mind the Gap: Hierarchies, Health and Human Evolution. Richard Wilkinson. Weidenfeld and Nicolson, 2000.

The Health of Nations: Why Inequality Is Harmful to Your Health. Ichiro Kawachi and Bruce P. Kennedy. New Press, 2002.

The Status Syndrome. Michael Marmot. Henry Holt and Company, 2004.

Why Zebras Don’t Get Ulcers: A Guide to Stress, Stress-Related Diseases and Coping. Robert Sapolsky. Third edition. Henry Holt and Company, 2004.