

Why Living in a Poor Neighborhood Can Change Your Biology

The sheer stress of an environment contributes to obesity and diabetes.

By Andrew Curry Photo by Peter Baker June 14, 2018

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It was the most ambitious social experiment ever conducted by the United States Department of Housing and Urban Development. And one of the most surprising.

In 1994, HUD randomly assigned 4,600 poor, mostly African-American families in Baltimore, Boston, Chicago, Los Angeles, and New York to one of three groups. One group received housing vouchers intended to help them move to low-poverty neighborhoods. Another group received vouchers without geographic restrictions. A final control group didn't receive vouchers at all.



Called “Moving to Opportunity,” the study was designed to answer a question that had divided social scientists and policymakers for decades: Did getting people off of welfare and other forms of social assistance depend on changing their social context?

TOWN WITHOUT PITY: A rundown,

abandoned house in Detroit symbolizes the kind of poor American neighborhood that fuels destructive levels of stress. Peter Baker

More than a decade later, the researchers found that a lot of things hadn't changed. Many people offered housing vouchers didn't move. The people who did move to better neighborhoods didn't change their diets or daily lifestyles. Their kids showed no improvement in reading or math scores. And moving didn't make people any more or less economically self-sufficient, the question the study was designed to answer.

But as the experiment went on, researchers began encountering anecdotal evidence that surprised them. **The people who moved out of poor neighborhoods were healthier.** When they went back and measured the differences between people who got vouchers and people who didn't, the results were remarkable: The people who got vouchers to move to low-poverty neighborhoods had significantly lower rates of obesity and Type 2 diabetes.

Robert Whitaker, a pediatrician and public-health expert at Temple University, co-authored a report on the HUD study for the *New England Journal of Medicine* in 2011. "By dint of the design, the cause of the difference in diabetes and obesity was the voucher and the move to a less-distressed neighborhood," Whitaker says. **"The amazing thing is that the cause of the difference in obesity and diabetes was the move."**

How could this be? Ethnic disparities in diabetes and obesity—Hispanics and blacks in the U.S. are up to 45 percent more likely to be obese than whites, and nearly twice as likely to have Type 2 diabetes—have long been blamed on diet, access to health care, and even the lack of good grocery stores in America's poorest neighborhoods. Genes, too, have long been suspected to play a role.

But the HUD study, and subsequent research, have shown that something more than race, individual behavior, or genetics is taking a toll on the health of people who live in poor neighborhoods: stress.

Perceived discrimination contributes to poorer mental and physical health among ethnic minorities.

When study participants moved to low-poverty neighborhoods, they reported feeling safer, less depressed, and less anxious—in other words, less stressed. “Somehow, our social environment is getting under people’s skin and causing a cascade of things to occur in the body,” says Rebecca Hasson, director of the Childhood Disparities Research Laboratory at the University of Michigan. “Ethnic minorities are exposed to a lot more stressors. Is that related to their elevated diabetes risk?”

To understand how stress affects health, it’s important to know that one hormone, cortisol, plays an outsized role. In an emergency, cortisol provides a jolt to the body’s systems that floods it with energy. “That generalized response releases energy substrates to the muscles, so you can fight or run away,” says Hasson. “Usually that’s in response to a physical stressor, like a bear chasing you.” In the effort to escape the bear, the body burns off the blood sugar that cortisol helped release, coming down tired and shaky but safe. (If you manage to escape, of course.)

If cortisol was reserved for bear attacks, we’d have no problems. But you don’t need a bear to unleash cortisol. The perception of stress alone is enough to trigger a flood of the hormone.

Researchers’ favorite technique for raising cortisol levels in a lab, for example, is something called the Trier Social Stress Test, a 10-minute exercise that combines public speaking and mental arithmetic performed in front of a panel of stone-faced judges. The test has proven capable of yielding bear attack-level cortisol responses in thousands of test subjects since German researchers introduced it in 1993.

In much the same way, being late for school, unable to make your car payment, worried about where your next meal will come from, or feeling unjustly scrutinized because of your skin color aren’t immediate physical threats. But the brain still responds by signaling the adrenal glands to release cortisol. “Those energy substrates are still in high circulation so you can run away,” Hasson says. “But if you don’t, or can’t, run away, you’re always in this high-alert situation, whether or not you’re conscious of it.”

It's a phenomenon that neuroscientist Robert Sapolsky took on in his 1994 book *Why Zebras Don't Get Ulcers*. The short answer? Zebras don't worry about being chased by lions until they're actively being chased by a lion. As far as we know, only humans worry the rest of the time, keeping their stress levels high and increasing inflammation and illness.

Over time, the damage can be profound. "The same systems that help us adapt and deal in situations of danger can cause us problems when they're abused or dysregulated," says Rockefeller University neuroscientist Bruce McEwen, who coined the term "allostatic load" to describe the toll chronic stress takes on our bodies and our brains.

With research showing that poor neighborhoods and discrimination have a physical impact, the Let's Move message comes up short.

Consistent exposure to cortisol may re-wire the brain, for example, shrinking the pre-frontal cortex and bulking up the amygdala, the walnut-sized nodes in the brain that regulate emotions like fear and pleasure. Over time cortisol can increase the risk for depression and mental illness.

And cortisol's physiological effects could explain the powerful links between stress and metabolic illnesses like Type 2 diabetes, obesity, and heart disease. In mice, stress amps up cravings for energy-dense foods; in people, comfort- or stress-eating is a familiar phenomenon.

Persistently elevated cortisol levels have been closely tied to weight gain, increased abdominal fat, and other aspects of metabolic syndrome, a collection of things that includes obesity and pre-diabetes. "Even if you're not stress-eating, there's a direct link between cortisol and Type 2 diabetes risk, and cortisol and obesity," Hasson says.

The reasons why are physiological. When it's released in response to stress, cortisol signals the body to shift energy production into overdrive. It's a signal for organs and various tissues in the body to accelerate production of glucose, the sugar that fuels our muscles,

by breaking down carbohydrates and protein. As part of its role in freeing up energy, chronic exposure to cortisol also increases cravings for high-sugar, high-fat foods, and increases the body's resistance to insulin, the hormone that signals the body's cells to absorb sugar.

Insulin resistance, in turn, plays a key role in Type 2 diabetes: Forced to churn out more and more insulin to compensate, the cells that make insulin eventually wear out and die. In its early stages, drugs that increase sensitivity to insulin, along with diet and exercise, can restore some cell function in people with Type 2; later, people with Type 2 diabetes need insulin injections to keep high blood sugar in check.

If we know chronic stress makes people sick, is it possible that blacks and Hispanics are sicker than whites because they're more stressed? Because they're more likely to be poor, blacks and Hispanics are more likely to be exposed to [the chronic stressors of poverty](#)—and to cortisol, with all of its negative effects.

“A low income environment—households under \$20,000—that's not necessarily perception, that's a high-stress factor,” says Hasson. A recent Pew Charitable Trusts study found that 66 percent of African Americans born between 1985 and 2000 lived in neighborhoods where at least 20 percent of people were poor. The figure for white kids born in the same time span was 6 percent.

Poverty plays a role, but there's also ample evidence that racism and the perception of being at the bottom of society's ladder can be damagingly stressful. In a 2009 analysis, psychologists found that increased levels of perceived discrimination contributed to poorer mental and physical health among ethnic minorities in dozens of different studies. “The perception of discrimination is related to heightened physiological stress responses ... [and] associated with more negative mental and physical health,” the authors concluded.

Studies have also shown that higher socioeconomic status lowers the risk of diabetes across all ethnic groups. African-Americans and whites living at or near the poverty line had higher rates of diabetes than their wealthier peers.

“People are told that if they just exercise more, eat better, if they’d just pull themselves up by their bootstraps, they’d feel better.”

The role of genetics in higher rates of diabetes among some ethnic groups has long been under investigation. In the 25 years since the Human Genome Project was launched, scientists have identified dozens of genes associated with Type 2 diabetes. But most are widely distributed, not concentrated in one group or another, and account for a tiny fraction of the differences in risk.

If the differences in diabetes risk were exclusively genetic, researchers would expect the rates in Africa to be much higher. But that’s not the case: Black Africans have lower rates of cardiovascular disease, Type 2 diabetes, and depression than their distant cousins in the U.S. And Hasson says Type 2 diabetes among blacks and Hispanics drops just as fast as among whites in response to changes in exercise or diet—powerful evidence that there’s no inherent physiological difference at play.

More remarkable, epidemiological evidence shows that first-generation immigrants, whether black, Hispanic, or Asian, are healthier and live longer than their U.S.-born descendants.

It’s the flipside of the Moving to Opportunity coin on a macro scale: For minorities, the U.S. is the bad neighborhood. “African-Americans do perceive discrimination, and it gets under their skin,” says McEwen. “Native-born African-Americans react differently than African-born or Caribbean-born blacks. They haven’t been exposed to these effects as much, and maybe they don’t perceive discrimination in the same way.”



MOVING ON UP: Scientists were at first surprised by the health of people who moved from poor neighborhoods to more affluent ones like Mount Laurel, New Jersey, seen here. Although they didn't change their diets or lifestyles, they were healthier.

Why? Less stress. Denise Barricklow, Director of Fundraising and Communications Fair Share Housing Development

Jose R. Fernandez, a specialist in the genetics of obesity and a professor at the University of Alabama at Birmingham, says it's too early to rule genes out as a contributing factor. He's spent a decade and a half hunting for genes that contribute to racial differences in obesity and diabetes.

He, too, thinks stress and discrimination play a significant role in the increased risk African Americans and Hispanics face—to a

point. “It would be a naïve perspective to say a complex condition like diabetes doesn’t have an environmental cause, and that a big part of the environment is the social environment we face,” he says. “But I don’t think it establishes complete causality. Social and environmental variables may be interacting with genetic background.”

Jose C. Florez, Chief of the Diabetes Unit at the Massachusetts General Hospital, explains, “Genetic predisposition may increase risk, but that manifests itself most powerfully in a bad environment. It can be masked if the environment is a healthy one.”

For decades, health professionals and policy makers have focused on changing individual behaviors: Less fried food and more exercise, community gardens, and diabetes education for all. Perhaps no program is as identified with the individual approach to preventing obesity and Type 2 diabetes as Michelle Obama’s “Let’s Move.” With the telegenic First Lady as its figurehead, the program has put a spotlight on encouraging kids and adults to exercise more and eat less.

Hasson, of the University of Michigan, praises Obama. “She’s bringing attention to the fact that people need to get out and start moving, and people are starting to ask: “How can we motivate people to start moving again?” Hasson says. “That’s opened the floodgates for research into creating healthier environments.”

But with research showing that poor neighborhoods, poverty, and discrimination have a physical impact, the Let’s Move message comes up short. It remains at odds with the idea that some factors are outside our control—or at least much harder to change.

“People are told that if they just exercise more, eat better, if they’d just pull themselves up by their bootstraps, they’d feel better,” says Elizabeth Goodman, a professor of Pediatrics at Harvard Medical School, who leads a research program that studies the effects of social status on children’s health. “But it’s about the context, not just about the person.”

Eliminating discrimination and alleviating inequality are far more daunting challenges than society has had to face. But improving human health may depend on it. “I don’t know if it’s possible for our bodies to undo the damage that will have been done by living in a disadvantaged environment,” Goodman says.

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