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OUTLOOK

Can genetics help eliminate inequality?

Review by Jerry A. Coyne

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Behavioral geneticist Kathryn Paige Harden has spent much of her career documenting significant genetic components of human behavior, personality and physical traits. In principle, this research should appeal to many conservatives. Historically, the right has considered a great deal of human variation to be genetically determined and often intractable, meaning social intervention can't remedy genetic inequalities.

But Harden's book, "The Genetic Lottery: Why DNA Matters for Social Equality," is aimed at the left, which largely rejects genetic influences on behavior, because "hereditarianism" was once associated with eugenic policies that led to the sterilization or execution of people deemed mentally or physically inferior. Harden agrees that genetics plays a big role in creating inequalities that affect our success in life, but she rejects the conservative claim that genetic differences nullify the value of social intervention. Rather, she is a progressive liberal dedicated to creating a fairer and more equitable society. And so her book has two parts: a description of the genetic differences that divide us, followed by an outline of interventions that might unite us.

This is a precarious position, surely destined to draw flak from both sides. Her stand raises two questions. How solid are her claims about the genetic basis of human inequality? Then, if they're solid, can social interventions mitigate or eliminate the effects of genetic differences — effects she considers fundamentally unfair because they rest on the "luck" of how genes sort themselves when eggs and sperm are formed?

From adoption and twin studies, we've known for a long time that many important traits that differentiate us — including physical features, medical conditions, IQ and mental illness — are governed, at least in part, by genes that differ among individuals. About 80 percent of differences in height among adults, 40 percent of differences in blood pressure, 50 percent of differences in IQ and 40 percent of differences in neuroticism are due to genetic variation. (Harden is careful to note that these figures apply only within the sampled population, almost always of European descent, and can say nothing about the basis of variation among populations or ethnic groups, which differ not just in genes but in environments.)

These figures have encouraged conservatives to adhere to a genetic determinism that supposedly props up the status quo, though they're wrong to think you can't change traits whose variation is largely based on genes. Shortsightedness, for instance, is in part genetically determined. The solution? Spectacles, giving us visual equity.

Harden uses state-of-the-art DNA-based methods to determine which bits of the genome contribute to variation among individuals. It's just a matter of identifying DNA variants — a G at a particular position, or a T — that are associated with whatever trait you're studying. Take height. We sequence the DNA of people with varying heights and look to see whether that G (or the T) tends to appear more frequently in tall people than short people. Because the traits we're interested in, including height, are affected by many different genes, the impact of each variant will be tiny. But cumulatively, the result of this kind of analysis, as Harden lucidly explains, is a measure called a "genotypic score." In the absence of direct information on a person's height, their genotypic score — G's or T's or C's or A's at variable positions across the genome — can help predict how tall they are (or, in the case of a baby, how tall they will be).

Genotypic scores can be calculated for any trait whose variation is influenced by genes, even in the slightest way: schizophrenia, height, IQ, academic achievement, sexual orientation, alcoholism, longevity, BMI, political beliefs and so on. Harden's main focus, though, is on educational attainment (years of schooling), whose genotypic score predicts a person's share "in national prosperity." A study of more than 1 million individuals found 1,271 segments of DNA significantly associated with schooling, with about 12 percent of the observed variation in educational attainment being genetic. This is likely to be an underestimate of the genetic contribution, but it's clear that the vast majority of variation in people's education — perhaps as much as 88 percent — is not captured by genotypic scores. For me, the message is simple: Let's worry about the tractable part — the nongenetic component that surely involves variable environments. There's plenty we can do, after all, to make environments more equitable, and the work won't take decades.

Harden, however, is determined to grapple with the genes. Should we stratify children in school according to their genotypic scores? No — such genetic elitism is repugnant to Harden. For her, the solution must involve new educational schemes that maximize the achievement of students with the lowest genotypic scores.

Such an educational silver bullet is fine in theory but not so easy to find or implement. What would it involve? First, sequencing the DNA of millions of students, which raises problems of money and privacy. Second, implementing dozens of trial-and-error programs, repeatedly changing the educational environment (which includes thousands of components) and observing the outcomes. This would take forever. And we're overlooking two groups. In working to maximize the genotypically disadvantaged, aren't we ignoring genotypically "gifted" students? Further, we have almost no information on genotypic scores and their components in populations of disadvantaged minorities. Surely neglecting these groups is not what we should be doing.

I'm not convinced by Harden's thinking on education. Medicine, however, is a different matter. Your genotypic score for conditions such as diabetes, hypertension and heart disease, summarizing the effects of many contributory genes, could prompt doctors to start monitoring you early. I agree with Harden wholeheartedly here: We need as much information as possible, genetic or otherwise, if we're to make truly informed choices. Medicine, after all, has ways of fixing things. In the past, a child with a metabolic genetic disease, phenylketonuria (PKU), was effectively born with a death sentence. Today, a simple genetic test permits early diagnosis and a simple treatment — avoiding certain foods. Hundreds of such diseases can be detected by sequencing the genomes of newborns or even fetuses. The conclusion: Genes need not have the upper hand in the nature/nurture struggle. After all, doctors, dentists and optometrists spend a lot of their time correcting genetically based inequalities.

I happen to share much of Harden's ideology, and I wish her well. As I noted earlier, both the right and the left will find much to object to in this book. The resulting fracas might have been useful had she achieved what she set out to do — establish the fact of genetic unfairness and develop prescriptions to overcome it — yet she does not deliver on her second goal. Harden's book is a thought-provoking read but in the end demonstrates only the incredible difficulty of using empirical data, both genetic and environmental, to level the educational playing field.

The Genetic Lottery

Why DNA Matters for Social Equality

By Kathryn Paige Harden

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