How to Diagnose Abhorrent Science

by LUCAS J. MATTHEWS, JAMES TABERY, and ERIC TURKHEIMER

What makes a scientific research program not merely controversial but something far worse? A diagnostic framework places research along two axes of a value-harm map, locating the work of the "new genomic race researchers" in the area for abhorrent science—research that is both harmful and valueless.

From 2014 to 2017, University College London held a series of secretive conferences on intelligence.[1] The 2016 program opened with a quotation attributed to prominent psychologist and eugenicist Edward E. L. Thorndike: "Selective breeding can alter man's capacity to learn, to keep sane, to cherish justice or to be happy. There is no more certain and economical a way to improve man's environment as to improve his nature."[2] These clandestine eugenics conferences, which have since been investigated and suspended, were spearheaded by researchers who have been leading efforts to reinvestigate the genetics of racial differences in cognitive ability with new genomic data: Emil Kirkegaard, Davide Piffer, and the late Richard Lynn, among others. Presentations covered a range of topics from dysgenic fertility in China to destabilization in Europe from non-Western immigrants, whose presence, an abstract in the 2016 conference program declared, "threatens the sustainability of European democracy, welfare, and civilisation."[3]

Lucas J. Matthews, James Tabery, and Eric Turkheimer, "How to Diagnose Abhorrent Science," *Hastings Center Report* 54, no. 6 (2024): 18-29. DOI: 10.1002/hast.4946

These conferences were a modern renewal of an uninterrupted history of contentious race science that dates back decades, from early-twentieth-century eugenic ideas about different races with different genetic constitutions to Enlightenment-era ideas about different races with different origin stories.[4] Readers are probably most familiar with more recent episodes from the last fifty years. The uproar in the 1970s caused by Arthur Jensen's hypotheses[5] about a genetic basis for differences among racial groups in IQ scores—repeated in 1994 with the publication of *The Bell Curve: Intelligence and Class Structure in American Life*, by Richard Herrnstein and Charles Murray[6]—was followed by somewhat of a hiatus. Extensive counterarguments had been made; Herrnstein and Jensen died, as did Phillippe J. Rushton, another key player in race science. There were no new data. The "IQ gap"—substantially lower IQ test scores on average for Black than white Americans—persisted, perhaps diminishing slightly but not dramatically.[7] Structural racism in American society, needless to say, persisted as well.

Among individual people as opposed to groups, IQ test scores remained heritable in the weak statistical sense, according to traditional twin and adoption studies.[8] But this much had been known for practically a century.[9] Biological breakthroughs that would reveal the basis of intelligence in the brain or genome were often promised but never realized.[10] Most of academe outside the immediate fields studying intelligence and behavioral genetics probably thought that the issue had been resolved for the better: race was a social construct, IQ tests were invalid, twin studies were methodologically flawed, *The Bell Curve* was thoroughly debunked.[11] Scholars could be both scientifically informed and progressively minded. The liberal social science establishment could breathe easy.[12]

Not so fast: "Race science" is back. While the old guard still gets shouted down by protesters in public forums,[13] a new wave of race researchers has emerged, using questionable scientific techniques to investigate alarming hypotheses regarding the genomic basis of differences in cognitive abilities between racial and ethnic groups. There are many reasons for the return of race science. For one, it never really went away. Researchers with intellectual ties to the Jensen era continued to generate a body of research about relationships between IQ scores, race, and national origin.[14] Mainstream scientists of human intelligence and the genetics of behavior are probably more conservative, scientifically and politically, than academe at large, and many investigators never gave up on the idea that group differences in behavior might prove to have a genetic basis.[15] The internet provided a platform for the publication of race studies that would have a difficult time surviving peer review.[16] Some of the best-known young investigators of hypotheses regarding race—for example, Kirkegaard, Piffer, and John Fuerst—self-publish much of their work in openly racist journals (such as *Mankind Quarterly*), or in journals they edit themselves (such as *OpenPsych* and the *Winnower*), or on their blogs and social media accounts.[17]

The recent resurgence of race science is also attributable to the development of new kinds of evidence, technology, and scientific methodology.[18] Behavior genetics has undergone a major transition, as twin and family studies have been supplanted by DNA-based methods, thanks to the scientific revolution in genomics that followed the Human Genome Project.[19] Group differences in IQ notwithstanding, the revolution has had profound effects on the effort to understand the relationship between DNA and human behavior. During the Jensen era, the genetics of behavior was studied using the tools of traditional quantitative genetics: comparing the similarity of twins and other family members with varying degrees of genetic relationship. The major conclusion reached by these studies—that differences in behavior are almost always partly heritable—was well-known before the discovery of DNA.[20]

Nowadays, molecular genetics makes it possible to search the entire genome for associations between DNA and variation in any human characteristic, with intelligence (often in the form of its proxies, like educational attainment) prominent among them.[21] When conducted as a means of understanding the behavior of individual people, the new DNA-based genomics of behavior represents a new stage in the ongoing social scientific enterprise of investigating the role that genetics plays in determining the probability that individual people will achieve a variety of psychological and social outcomes.[22]

Just as traditional twin-based behavior genetics was put to work in the service of racist hypotheses about the innate inferiority of groups defined by their race or ethnicity, the new genomic data is looked to by the most recent generation of race researchers for vindication.[23] Proponents of this research grant that it is "controversial" while contending that controversial science is part and parcel of the normal and, indeed, healthy scientific process. They have asserted, for instance, that "one of the most morally controversial areas of science is the study of group differences in psychology, particularly in intelligence";[24] that "[d]ifferences between human racial groups are perhaps the most controversial topic in all of the social sciences, with almost every conceivable fact being contested by two or more opposing factions";[25] and that "arguments in favor of restricting research on group differences in intelligence have generally given short shrift to the potential and actual serious harms that have resulted from the current practice of stigmatizing and dismissing controversial work."[26]

Some journal editors have also characterized the research as being "controversial" in nature. When publishing an article[27] on the genetic bases of race differences, for example, the editors of *Philosophical Psychology* included an editorial that used the terms "controversy" or "controversial" three times but still concluded

A new wave of race researchers has emerged, using questionable scientific techniques to investigate alarming hypotheses regarding the genomic basis of differences in cognitive abilities between racial and ethnic groups.

that the ideas "deserve to be disputed rather than disparaged."[28]

The continued propagation of such research poses the problem of how to respond to it, a problem faced in many contemporary domains where the values of the public come up against a desire to find reasonable boundaries of scientific, scholarly, or political discourse. Framing the problem in this way suggests one solution, implicitly endorsed by the "just controversial" position: there are no boundaries, and public debate—in our case, the marketplace of scientific ideas—is best accepted as an unregulated free-for-all, whatever the cost in misinformation and denigration. We reject that position as more of an abdication than a solution, but, at the same time, we fully recognize the importance of scholarly inquiry that is as unfettered as possible while remaining true to standards of accuracy.

Our goal in this article is to propose a conceptual framework for thinking about these problems, which we call the "value-harm map." The value-harm map permits evaluation of scientific research on two axes—value and harm. We contend that most scientific research is both valuable and harmless and consequently noncontroversial. A smaller but significant portion of scientific research is controversial when it is either valuable but harmful or valueless but harmless. It is the rare instance in which a research program is *both* valueless and harmful, in such cases, we argue, it becomes objectionable to the point of abhorrence. Thus, the value-harm map should help diagnose scientific research into three types: noncontroversial, controversial, and abhorrent.

We do not wish to relitigate the long discussion of the scientific validity of race, although such issues cannot be completely abstracted from our main goals. So, for example, we will not consider in detail whether race is a biologically valid construct,[29] the appropriateness of DNA ancestry testing,[30] the relationship between race and ancestry,[31] whether the statistical assumptions of twin studies invalidate their conclusions,[32] or whether contemporary epigenetics has obviated traditional concerns with the separate roles of the nature and nurture of human individual differences.[33] We also set aside several ethical topics that are usually subsumed under the rubric of "human research participant" concerns; these include, for example, the privacy of genomic data or the harm that might be done to individuals in the course of giving them IQ tests.[34] Evaluative criteria and institutions for such concerns are already in place. We will also not emphasize the real-world steps—concerning hiring, retention, tenure, publication, or funding—that might follow a determination that a program of research is abhorrent, although we recognize that any proposal that abandons the free-for-all model will inevitably lead to difficult decisions about such steps.

Finally, we acknowledge that our use of the term "abhorrent" may invoke for some readers Leon Kass's famous argument for the wisdom of repugnance.[35] Kass argued that some practices invoke moral disgust, which should be interpreted as evidence for the repugnant nature of those practices. Our argument works in the opposite direction. Our claim below is not that the new genomic race science invokes moral disgust and so should be understood as abhorrent. Our claim is that the new genomic race science is abhorrent because it is both harmful and valueless and that its abhorrent nature warrants moral disgust.

Noncontroversial Science, Controversial Science, and Abhorrent Science

Different scientific research programs elicit more or less critical scrutiny. Again, the vast majority of scientific research is noncontroversial. Scientists go about their business trying to find some new compound, or better understand how humans think about saving for retirement, or develop a new antibiotic. If successful, that noncontroversial research may make news reports, or it may not.

Scientific research that generates controversy comes in a variety of forms.[36] When scientists sequenced the genome of the influenza virus that caused the 1918 pandemic, critics raised concerns that genomic information would fall into the wrong hands and be used for bioterrorism.[37] Gene editing technologies, such as CRISPR-Cas9, have been proposed to create organisms that can breed with invasive species and drive them into extinction (with the use of a gene drive), but critics worry that it will be difficult and perhaps impossible to contain that technology and the organisms it produces.[38] Research that is not inherently harmful but has no obvious value—say, crab sex research[39]—is sometimes targeted as controversial because it is perceived as being a waste of resources. To understand the nature of controversial science, it is necessary to unpack these ideas of harm and value.

Harm. Some scientific research poses a risk of harm. Harm comes in a variety of forms: physical, psychological, social, medical, or financial. In addition, different entities, such as individual people, communities, nonhuman animals, embryos, and ecosystems, can be affected by harm. The risk of harm associated with scientific research comes in degrees, and there are various measures of harm to consider. Harm may be more or less likely and more or less severe. It may affect many or few entities. Critics raised concerns about sequencing the influenza virus responsible for the 1918 pandemic because of the potential harm the virus posed. Yet the likelihood that that harm would transpire was quite small.

Value. Some scientific research is valuable. We mean "valuable" in a very broad sense. Research can be practically valuable, leading to medical interventions, technological applications, or policy guidance. It can also be theoretically valuable, facilitating conceptual advances in a science. Just as different entities may be harmed by scientific research, different entities stand to benefit from such research. Value comes in degrees, with various measures of value to consider. The impact of the valuable outcome can be more or less significant and affect varying numbers of entities. A gene drive that eliminates invasive mammals from New Zealand would do a great deal to help restore that island ecosystem to its precolonial state. It's potentially so valuable, in fact, that the New Zealand government considered including this gene drive as a part of their Predator Free 2050 plan. Conversely, a genome-wide association study (GWAS) that identifies regions of the human genome associated with the ability to smell asparagus metabolites in human urine may satisfy some curiosity, but it has no obvious value beyond that, as the authors of such a study seem to grant with their tongue-in-cheek title, "Sniffing Out Significant 'Pee Values.'"[40]

One aspect of the value dimension is especially important for the matter at hand. Scientific conclusions can be valuable simply by being true, and scientific research can be valuable based only on its ability to elucidate that truth. The idea of truth as value is sometimes invoked in discussions of race and human behavior: Why should there be any criterion for evaluating a research program other than the truth of the conclusions it reaches? This argument seems epistemically virtuous, and in principle, we agree with it. Nothing we assert should be taken as an endorsement of suppressing findings that are true, at a high level of certainty made possible by good empirical science. The value of a research program—trivia like crab sex notwithstanding—can be established based on nothing more than its ability to reach true conclusions.

Saying this, however, is a reminder that definitive proof of scientific conclusions is a rarity in human behavioral research. Social scientific research into the ways personality influences job success or how marital quality influences recovery from depression may have value for all sorts of reasons, but rigorous elucidation of truth isn't among them. Human behavioral science is, in the absence of randomized experiments, intentional breeding, dissection, or random assignment to living conditions, inherently speculative. Usually, the low certainty of social science doesn't matter because the research in question is equally low on the potential-for-harm dimension, allowing it to be appreciated for whatever soft scientific value it may have, even in the face of manifest uncertainty.

In most cases—perhaps all—assessment of the harm associated with scientific research will affect assessment of the value associated with that same research.

Value-harm interdependence and scientific validity. In most cases—perhaps all—assessment of the harm associated with scientific research will affect assessment of the value associated with that same research. The relative harmlessness of scientific research on crab sex goes hand in hand with the relatively limited value of the research. Conversely, that potential applications of CRISPR-Cas9 gene-editing research for gene drives are harmful goes hand in hand with the inherent value of the research: if CRISPR-Cas9 were of limited value, it would likely be of limited potential harm.

Although a rigorous philosophical assessment of scientific validity and its relationship to value is beyond the scope of this project, a few examples point to the potential independence of the two concepts. The GWAS of asparagus anosmia provides an example of a valid scientific research project that exhibits limited overall value. For all practical purposes, the research is scientifically valid—the authors developed a careful research design; followed meticulous and robust methodological practices, including systematic data collection and appropriate statistical analyses; published the research in reputable, peer-reviewed journals; and so forth. However, we contend that if one were to place genomic studies of asparagus anosmia on a spectrum from minimally valuable to maximally valuable, they would likely fall on the former end of the spectrum, in comparison to most scientific research endeavors.

On the contrary, the potential value of scientific research or theories of limited validity warrants consideration. It can be argued that studies yielding invalid results can offer valuable lessons by enabling scientists to glean insights from their errors, fostering critical discourse about the formulation of hypotheses and research methodologies, and serving as catalysts for the exploration of new avenues of investigation. Moreover, the indirect utility of certain invalid research merits examination. For instance, investigations into the efficacy of prayer, while not meeting the rigorous standards of empirical inquiry due to the inherent limitations in demonstrating causal connections with divine intervention, may still provide meaningful contributions. Despite the scientific impossibility of discerning the direct influence of divine forces, such inquiries can shed light on the intricacies of the placebo phenomenon and the psychological and emotional implications associated with prayer practices.

The value-harm map. Combining considerations of harm and value allows for diagnosing what makes some science controversial (see figure 1). Some science is noncontroversial because it is both unlikely to produce harm and likely to produce something valuable (see figure 1, upper-left quadrant). Most well-known research programs, like the study of the antibiotic nature of penicillin, fall into this category, but most nonfamous scientific research falls into this category as well. If you haven't heard of the research, then it's probably noncontroversial, and it's noncontroversial because it has at least the potential to produce some value without doing considerable harm.

Research can be controversial in one of two ways. First, it can be controversial because it has the potential to produce harm but is likely to generate something valuable (see figure 1, bottom-left quadrant). The sequencing of the influenza virus responsible for the 1918 pandemic falls into this category. The potential for harm was described above, but the value was clear too. Understanding more about what made an influenza virus cause a pandemic could be extremely valuable for assessing new influenza viruses as they come along, so as to judge their health risk by way of their similarity to or difference from the past virus.[41]

Research that is not likely to produce harm but is unlikely to produce something valuable is also controversial, but in a different sense (see figure 1, upper-right quadrant). The controversy in these cases is about whether the time, money, and effort invested are worth it when no appreciable value can be identified or expected. There are, for example, investigations of the effectiveness of prayer as a means of intervening in the world;[42] there are also Joseph Rhine's infamous investigations of extrasensory perception.[43] The University of Virginia Division of Perceptual Studies conducts research on mystical experiences,[44] out-of-body experiences,[45] telepathy,[46] parapsychology,[47] children's past-life memories,[48] and mediumship.[49] Reasonable people can disagree about exactly how valuable any of these programs are. Although their value may be questionable, so is their potential for harm, aside from the resources they waste. Controversy surrounds research programs of this nature, as they lack a distinct demonstrable value yet are deemed benign.

The New Genomic Race Science: A Case Study in Abhorrent Research

There is one more area in the value-harm map: scientific research that has little value and poses significant harm (see figure 1, bottom-right quadrant). It is this science that we call "abhorrent." It is abhorrent because it serves no end other than to cause harm. Precisely when scientific research crosses over from valuable to valueless or from harmless to harmful (and, thus, from controversial to abhorrent) is open to debate—hence the blurry boundaries between the quadrants of the value-harm map. Our purpose is not to precisely quantify the axes but, rather, to establish that there exists scientific research that is so clearly harmful and devoid of value that it occupies a unique location on the map.

Our case study is the genomic race science that we described at the outset, the newest incarnation of a long history of race research that is as old as human biology and anthropology.[50] Contemporary genomic race science traces back to a program of late-nineteenth-century human genetics devoted to confirming the racist claim that Black people were both biologically different from and inferior to white people.

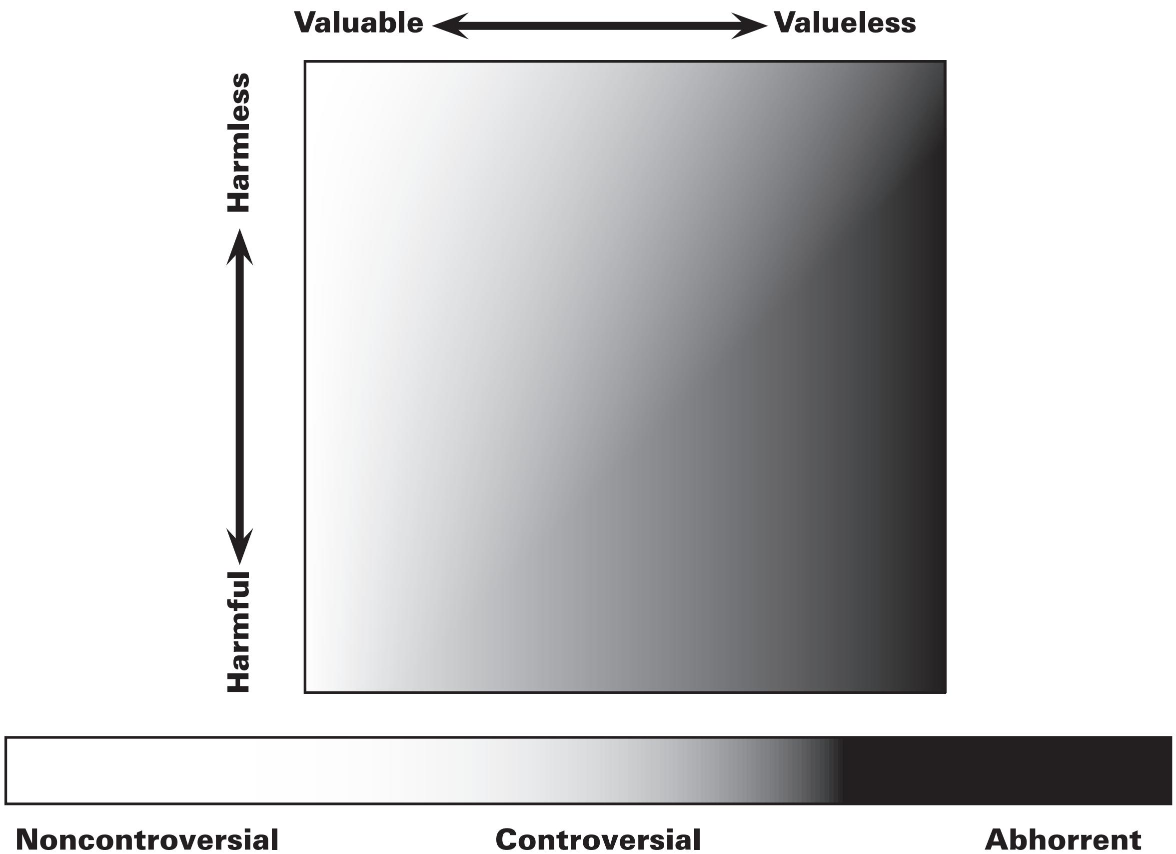
Eugenicists of the early twentieth century had a fixation with race. They believed that races were clearly defined or even separately evolved and that the prevalence of desirable traits (like large brains) and undesirable traits (like criminality) could be tracked in different races, starting in the womb.[51] Biological claims were used to justify policies that targeted Black Americans. More than half the states of America had antimiscegenation laws, which aimed to limit "race mixing" by prohibiting interracial marriage.[52] Involuntary sterilization was also legalized across the United States, and in many regions, particularly in the South, Black Americans were disproportionately targeted on eugenic grounds.[53]

Even though race science became stigmatized in the mid-twentieth century, many researchers with an interest in the biological underpinnings of race differences continued looking for genetic causes.[54] They just stopped calling themselves "eugenicists" and "race scientists." Jensen's approach to race science relied on heritability estimates derived from twins and adoptees. In his estimation, IQ had a high heritability—as high as 80 percent. This meant that the group difference for IQ between Black Americans and white Americans was unlikely to be entirely due to environmental differences between the groups.

What is the new genomic race science? In examining the new genomic race science, it is essential to recognize its evolution and distinguish its contemporary features from the rich history of race science described above. Rather than delving into intricate technicalities of modern genomics, we will introduce a few pivotal concepts. The current iteration of race science relies predominantly on the methodologies and evidence arising from contemporary genomics. Unlike in the era of Jensen's quantitative genetics, which leaned heavily on twin and family studies, researchers now turn to the outcomes of GWAS, which pinpoint statistical associations between minute variations in the human genome, known as "single nucleotide polymorphisms" (SNPs), and behavioral traits or outcomes like height (or IQ).

A critical outcome of GWAS is the formulation of polygenic scores (PGS). At its core, a PGS serves as a genomic predictor, assigning an individual's risk for a specific trait or outcome on a percentile scale, ranging from very low to very high, based on a sample of DNA. The contribution of individual SNPs to a particular trait or outcome is quantified by their effect size. A PGS, then, is simply the

Figure 1.
The Value-Harm Map



cumulative sum of all effect sizes associated with SNPs linked to a given trait or outcome. For instance, a PGS for IQ encapsulates the aggregation of myriad minuscule effect sizes derived from SNPs statistically linked to IQ in the results of a GWAS.

The nuances of these cutting-edge genomic methodologies aren't important here, but this key perspective is: what distinguishes the "new" in genomic race research is the incorporation and reliance on the concepts and techniques of contemporary genomics, such as GWAS, SNPs, and PGS. Understanding this shift provides a foundation for comprehending the advancements and implications within the context of our case study.

The new genomic race science is harmful. The new genomic race science is harmful in a number of ways. Most obviously and dangerously, it fuels the weaponization of genetics and genomics. When consumed by alt-right extremists and white nationalists, it has fed white supremacist ideologies. It contributed to the murder of ten Black people in Buffalo in 2022.[55] A recent qualitative study of online ethnographic domains revealed that contemporary genomics—including papers published by new genomic race researchers—is "mobilized" by white nationalists in various online forums, archives, and blogs.[56] The human biodiversity movement leverages empirical evidence to advance hereditarian explanations for racial disparities in social and biological outcomes. A key resource for white nationalists is a repository established by one of the movement's founders for papers by new genomic race researchers. Many of these researchers' articles are published in openly biased academic journals, recognized for accommodating "controversial" race science, such as *OpenPsych* and *Mankind Quarterly*.

The harm, however, needn't be overt violence. The new genomic race science does harm more insidiously when it contributes to the long and disturbing history of research that has been used to promote or justify discriminatory ideologies and policies. Early research on race and IQ was used to justify demonstrably harmful eugenic policies, including antimiscegenation and forced-sterilization laws in the United States. Although such policies are no longer in place, it should not be difficult to see the degree to which research presented as "science" purporting to demonstrate that some races are inferior to others has, is, and will continue to give rise to social, psychological, and even physical harm. In and of itself, racism is a major source of human harm. The new genomic race science is harmful because it advances and promotes racist, discriminatory, and prejudicial attitudes, beliefs, ideologies, and volitions.

The harms caused by racism are extremely well-documented in three areas: medical, psychological, and social.[57] Glaring racial disparities in health outcomes are characteristic of medical harms caused by racism.[58] Racial disparities in health outcomes indicate that diseases that vary equally across races exhibit variable mortality rates across races.[59] The association between racial disparities in health outcomes and racism is also extremely well-documented in studies on racial disparities in diagnosis and treatment of disease. In general, whatever the disease may be, racial disparities in diagnosis and treatment are demonstrative of the following pattern: white people are significantly more likely to be diagnosed and treated for a disease than are Black people.[60]

Psychological harms of racism are also well-documented.[61] Racist beliefs, ideologies, and volitions are sources of discrimination, prejudicial attitudes, and stigma, which in turn result in maltreatment and a greater number of traumatic or stressful life events (such as acts of violence) for members of groups subject to racism. Broadly construed, the combined effects of such detrimental events result in an overall negative impact on psychological well-being, which may be seen in measures of self-esteem, depression, anxiety, or other psychological states.[62]

Racism is also a major source of social harm.[63] Social harms are best represented by drastic racial disparities in social goods, such as voting rights, education, health care, employment, housing, incarceration, and income or wealth inequality. Black Americans are poorer than non-Hispanic white Americans and live in substantially less valuable homes.[64] Historically, Black Americans have had egregiously unequal voting rights compared to other racial groups. Despite decades of political efforts to rectify racial income inequality, white Americans still outperform Black Americans in hourly wages for the same jobs in both private and public sectors.[65] Racial disparities in incarceration rates in the United States were extremely pronounced from 1880 to 1950[66] and still persist today, with the incarceration rate of Black youth being 4.6 times higher than that of white youth.[67] Such disparities are not the result of greater involvement in drug use or trade but, rather, result from "discretionary decision making by law enforcement agencies as well as enactment of harsh sentencing policies by both state and federal lawmakers."[68]

As mentioned above, many of the researchers who comprise the new genomic race research program either helped organize or participated in the series of clandestine, invitation-only (and now defunct) meetings of the London Conference on Intelligence, which hosted presentations on a range of controversial topics from the genetics of racial differences in intelligence to eugenics. Further, many of the researchers or the journals in which they publish are funded by agencies and organizations with racist and white supremacist ties, such as the Pioneer Fund and the Ulster Institute for Social Research. Therefore, although the new wave of genomic race researchers is more careful than previous researchers about making explicitly racist claims in print, their social, organizational, and institutional venues of public uptake remain intertwined with racist, discriminatory, prejudicial, white nationalist, and eugenic ideologies.

The new genomic race science is valueless. There was a time when race scientists believed in the practical benefits and policy implications of their work. The original eugenic justifications of race science have been abandoned or, at the very least, are rarely spoken out loud. Jensen, in 1969, asked, "How Much Can We Boost IQ and Scholastic Achievement?" He was shining an accusatory spotlight on compensatory education programs, such as Head Start, that attempted to eliminate the IQ gap between Black and white Americans by spending federal dollars on the cognitive-educational environment of Black youth. In his view, taxpayer dollars should not be wasted on futile attempts to eliminate the IQ gap by improving this environment for Black youth; the gap was at least in part genetic. Instead, Jensen suggested, there should be different educational tracks for Black and white youths, each uniquely geared toward their innate biological capacities.[69] Such explicit calls for race-based social policies are rarely heard nowadays, even at the fringes of scientific discourse. Sympathetic discussions of racial hypotheses now include the caveat that people (like job applicants) deserve to be considered as individuals, based perhaps on their IQs, but not on their race.[70]

So why conduct race research if it has no practical value? The implicit answer is that the question of genetic origins of racial differences in intelligence is now a matter of basic science. If the genetic basis of racial differences is true, and if there are research paradigms that can demonstrate that it's true, then why not do the science and let the chips fall where they may? As we stated in the explication of the value dimension in the map, we agree in principle. If there were research programs that could provide reasonably definitive answers to these questions in a nonbiased way, it would be difficult to justify not conducting them, and scientific genies are difficult to keep in the bottle in any event. But there are no genies. To be clear, we recognize that it is possible to collect data that are less than completely irrelevant to the question of group differences in intelligence, in the social scientific sense we have described. One could hand out questionnaires asking people whether it seemed to them that group X is more intelligent than group Y, but doing so wouldn't be remotely conclusive, so it wouldn't have substantial scientific value, and any limited value it might have would not outweigh the obvious harm it would cause. But the race scientists aren't just handing out questionnaires.

Variance and causes revisited. The new race scientists appeal to genomic data to build evidence for the claim that differences in cognitive ability between racial groups are caused, in part, by genetic differences between those groups. The hypothesis sounds like it makes sense, but what exactly does it mean for a group difference to be partially genetic? Coming to grips with the genetic hypothesis is at the heart of the question of the value of the research programs it motivates. But the conceptual ambiguity of genetic hypotheses about group differences means that any currently imaginable empirical result will fail to get the race researcher to the intended outcome of proving genetically based group differences in behavior. You cannot get there from here.

We will assert a straightforward meaning of the claim that a group difference in a behavior has a genetic basis: it means that some portion of the difference that is currently observed would remain even if all environmental differences between the groups could somehow be eliminated or controlled. Think about what this means for differences in intelligence between Black and white Americans. Over the last five hundred years, Black people have been kidnapped in Africa, shipped to the Americas under unspeakable conditions, enslaved, disenfranchised, segregated, and discriminated against. For the last fifty of those five hundred years, very partial legal remediations have been in place. Does anyone doubt the "environmental effects" of that history on contemporary populations? There is no way to equalize those historical conditions experimentally or to control for them statistically. The very idea is ridiculous. The problem is only made worse by the fact that causal environmental effects on intelligence, while not exactly easy to study in humans, have been quite well established using a variety of quasiexperimental designs.[71]

The insurmountable inferential obstacle imposed by irreducible environmental effects renders any imaginable investigation of genetic explanations of group differences inconclusive. Garden-variety heritability of IQ differences among individuals is a demonstration that degree of genotypic similarity (in the form of either familial structure or molecular data arrayed on SNP chips) is correlated with degree of similarity in IQ. Although the relation between group membership and IQ cannot be reduced to a percentage in quite the same way as an individual-level heritability can, an IQ difference between groups that differ genetically is itself a variety of correlation between genotype and IQ. Ultimately, this is the basis of the race scientists' intuition that group differences must be at least partly genetic. Intelligence is heritable in individuals, and groups differ in both genotype and IQ, so why wouldn't the group difference be genetic? As the science podcaster Sam Harris said to *The Bell Curve* author Murray, it is "just straight biology."[72]

The conceptual ambiguity of genetic hypotheses about group differences means that any currently imaginable empirical result will fail to get the race researcher to their intended outcome of proving genetically based group differences in behavior.

But it isn't straight biology, for the usual reason that correlation doesn't imply causation. Ultimately, the straight-biology argument is defeated by a reductio: all human behavioral differences are heritable; all group differences in behavior, from the consequential to the trivial, are partially genetic. Yet if everything is partially genetic, nothing is. The argument from environmental confounds of correlational observations also offers the hereditarians a way out. If, outside the context of race, hereditarians could identify a gene with a generalizable and quantifiable (and especially a positive) effect on intelligence, the hereditarians would be halfway there. Much as we might doubt the likelihood of success, they would hear no objections to their effort from us. Gene hunting might be controversial, but it isn't abhorrent. If such a gene were ever documented, it would be a short step to testing whether it occurred more frequently in some groups than others.

Comparing polygenic scores. Aside from problems with causal interpretations of GWAS results,[73] the new genomic race research program conducts analyses well-known by the broader genomics and population genetics communities to be problematic: extrapolating genetic results to populations of ancestry different from the original GWAS sample. To date, a vast majority of the SNPs identified by GWAS have been derived in genetically homogenous populations comprising individuals of European ancestry.[74] Yet GWAS results are subject to a problem of portability: results estimated in one population do not generalize to others.[75] Polygenic scores derived from one single-ancestry population are next to meaningless when applied to populations of ancestry different from the original GWAS sample. For example, PGS for height derived from populations of European ancestry inaccurately predict Africans to be shorter than Europeans and slightly taller than East Asians.[76]

Although this problem of portability is well-documented and more or less universally accepted in population genetics,[77] these methodological cautions are routinely flouted by the new genomic race researchers who make inferences about populations of non-European ancestry from genomic data derived from populations of European ancestry. Consider Piffer,[78] who uses the SNPs that had been shown to be correlated (almost exclusively in European samples) with educational attainment to compute a polygenic score that he then compares to the average IQ scores in thirty-seven countries. The mean polygenic score and the mean IQ are highly correlated.

There is a lot one could say about this study, none of it good. For present purposes, however, our point is not, or not only, that the conclusions Piffer draws are incorrect, in the sense that, if he had conducted or interpreted the study correctly, he would have reached environmental rather than genetic conclusions. Instead, we say this: once one is finished comparing invalidly estimated polygenic scores with invalidly estimated mean IQ scores, the results are not so much incorrect as they are irrelevant. It doesn't matter what the correlation is between those two ill-gotten columns of data. The study simply has no scientific value.

Admixture studies. A somewhat more plausible form of genomic race analysis is called an "admixture study." "Admixture" refers to the mixing of genetic ancestries that exist to one degree or another in everyone. In some biological or medical contexts, admixture can be used as a legitimate and valuable scientific tool for identifying genes responsible for medical conditions, as David Reich famously did with prostate cancer.[79] Some of the new genomic race researchers use the same tools, only in a simpler and less methodologically scrupulous way.[80] In samples of African Americans, manifesting an admixture of African and European ancestry, Kirkegaard et al. estimate percentage of European ancestry and correlate it with IQ. Finding those correlations to be small but positive and statistically significant, they conclude that their results are "consistent with" a genetic explanation of differences between African and European populations; the more European the DNA, the higher the IQ scores.

But wait a second. How do African American populations get "admixed" in the first place? The answer to that question is certainly very complex, but one thing for sure is that populations haven't been admixed at random. Presumably, African-European admixture has occurred over the generations because of consensual and nonconsensual interbreeding, and it is perfectly plausible that certain Europeans and Africans were variously selected for interbreeding and that the interbreeding granted the offspring of those pairings some of the unquestionable environmental racial advantages of their European parent. In any genuinely scientific analysis of this problem, the absence of environmental effects would be an assumption without which the whole enterprise makes no sense; in these admixture studies, environmental effects are the alternative hypothesis.

Kirkegaard et al. are aware of the problem. A longer form of their conclusion is telling: "While the results we found are consistent with an evolutionary model, there are some potential alternative explanations, namely: phenotypic discrimination, confounding due to immigration status, confounding due to geographic location, and intergenerational environmental transmission."[81] They then proceed to apply statistical controls for the competing environmental hypotheses, make post hoc theoretical arguments, compare their results with the previous literature, and call for future research with larger and more representative samples.

To be fair, the feckless attempt to clean up the inconclusiveness of one's main analysis in the discussion section is a hallmark of normal social science, and, if truth be known, the authors do a reasonable job of it by the usual standards. If it didn't matter so much, if this were another of the thousands of inconclusive nonexperimental studies of human behavior that are published every year, it could be chalked up as not very valuable in its lack of rigor but mostly harmless in its consequences—perhaps controversial, but not worse. Unfortunately for all concerned, the conclusions of this study do matter. These questions are nothing to speculate about. The study is of little value because it is incapable of discriminating the alternative hypotheses, predicting cognitive differences given genetic ancestry, or providing meaningful explanations of racial disparities in IQ.

Additional putative examples of abhorrent science. This analysis focuses on genomic race science as a case study of abhorrent research, using a value-harm map that can be applied broadly. Examples of similarly abhorrent research may include antivaccine studies, gay conversion therapy research, and historical instances like the U.S. Public Health Service Untreated Syphilis Study at Tuskegee. Each case exhibits limited or questionable value, with antivaccine research fostering misinformation, gay conversion therapy being widely recognized as ineffective, and the Tuskegee experiments having continued despite the availability of penicillin. The harms are clear: antivaccine research contributes to vaccine hesitancy, gay conversion therapy causes severe psychological harm, and untreated syphilis causes harms as severe as death.

A Delicate Balance

Something we stated at the outset bears repeating. Our analysis makes recommendations for the terms of the discussion about race research and is not intended to determine its outcome in any instance beyond the several examples we have presented. Particular research programs will continue to be controversial, as they should be. People can disagree in good faith about the value and potential harms of scientific endeavors. Scientific truth will out, and we will say again that nothing in our analysis should be taken as endorsement of suppressing the truth. But, for better or for worse, in the domain of human behavioral science, scientific truth—as opposed to data collection—is a difficult goal to achieve. The truth values of social scientific conclusions are ambiguous, and as a result, the desirability of research programs in which anything is at stake cannot escape the precarious balance of value and harm.

Researchers behind the new genomic race science defend their work from critics by claiming that it's "just controversial." Indeed, they wear controversy as something of a badge of honor—a sign that they are willing to bravely follow the data no matter where that data go, even if the destination is socially and morally tumultuous. The conceptual framework we have introduced here—the value-harm map—however, suggests a very different way of understanding these researchers' efforts. Whether a program of research is just controversial (or something worse) hinges on a balance between its practical or theoretical value and the magnitude and probability of the harms it may produce. On this analysis, the new genomic race science is not just controversial science but, rather, abhorrent science. It is abhorrent because it is both valueless and harmful.

Acknowledgments

We are grateful for the helpful feedback from Aaron Panofsky, Brian d'Onofrio, Erik Parens, Jonathan Kaplan, Joyce Havstad, Paige Harden, Paul Appelbaum, and Steve Downes. Funding that made this research possible includes a grant for the Genetics & Human Agency project from the John Templeton Foundation and the National Human Genome Research Institute grant #K01-HG011683.

Notes

1. K. Rawlinson and R. Adams, "UCL to Investigate Eugenics Conference Secretly Held on Campus," *Guardian*, January 10, 2018.

2. Included with an image of Thorndike, this quotation was printed on the first page of the 2016 London Conference on Intelligence program. The conference took place at the University College London, in the G22 Lecture Theatre, in the Pearson Building, May 13 to 15, 2016; see https://www.dcscience.net/London-conference-of-Intelligence-2016.pdf.

3. The abstract, which appears on p. 6 of the program cited above, is for the talk "Differential Demographic Analysis of the Destabilisation of Europe," by Helmuth Nyborg.

4. T. Duster, *Backdoor Eugenics* (New York: Routledge, 2003); T. Duster, "Social Diversity in Humans: Implications and Hidden Consequences for Biological Research," *Cold Spring Harbor Perspectives in Biology* 6, no. 5 (2014): doi:10.1101/cshperspect.a008482; J. P. Jackson and N. M. Weidman, *Race, Racism, and Science: Social Impact and Interaction* (New Brunswick, NJ: Rutgers University Press, 2004); D. Roberts, *Fatal Invention: How Science, Politics, and Big Business Re-Create Race in the Twenty-First Century* (New York: New Press, 2012); S. Krimsky and K. Sloan, *Race and the Genetic Revolution: Science, Myth, and Culture* (New York: Columbia University, 2011); S. M. Downes and E. Turkheimer, "An Early History of the Heritability Coefficient Applied to Humans (1918-1960)," *Biological Theory* 17, no. 2 (2022): 126-37.

5. A. Jensen, "How Much Can We Boost IQ and Scholastic Achievement," *Harvard Educational Review* 39, no. 1 (1969): 1-123.

6. R. Herrnstein and C. Murray, *The Bell Curve: Intelligence and Class Structure in American Life* (New York: Simon & Schuster, 1994).

7. W. T. Dickens and J. R. Flynn, "Black Americans Reduce the Racial IQ Gap: Evidence from Standardization Samples," *Psychological Science* 17, no. 10 (2006): 913-20.

8. Downes and Turkheimer, "An Early History of the Heritability Coefficient Applied to Humans."

9. R. J. Sternberg, *Handbook of Intelligence* (Cambridge, MA: Cambridge University Press, 2000).

10. N. J. Mackintosh, "The Biology of Intelligence?," *British Journal of Psychology* 77, no. 1 (1986): 1-18.

11. B. Devlin et al., *Intelligence, Genes, and Success: Scientists Respond to The Bell Curve* (Copernicus, NY: Springer Science & Business Media, 2013).

12. A. Morning, "And You Thought We Had Moved beyond All That: Biological Race Returns to the Social Sciences," *Ethnic and Racial Studies* 37, no. 10 (2014): 1676-85.

13. Charles Murray, coauthor of *The Bell Curve*, was shouted down by protesters at Middlebury College. See E. Volokh, "Protesters at Middlebury College Shout Down Speaker, Attack Him and a Professor," *Washington Post*, March 4, 2017.

14. R. Lynn, *Race Differences in Intelligence: An Evolutionary Analysis,* vol. xiii (Augusta, GA: Washington Summit Publishers, 2006); R. Lynn and H. Cheng, "Differences in Intelligence across Thirty-One Regions of China and Their Economic and Demographic Correlates," *Intelligence* 41, no. 5 (2013): 552-59; R. Lynn et al., "Regional Differences in Intelligence in 22 Countries and Their Economic, Social and Demographic Correlates: A Review," *Intelligence* 69 (2018): 24-26; R. Lynn et al., "Regional Differences in Intelligence, Income and Other Socio-Economic Variables in Turkey," *Intelligence* 50 (2015): 144-49; R. Lynn and T. Vanhanen, *IQ and Global Inequality*, vol. xx (Augusta, GA: Washington Summit Publishers, 2006); R. Lynn, "In Italy, North-South Differences in IQ Predict Differences in Income, Education, Infant Mortality, Stature, and Literacy," *Intelligence* 38, no. 1 (2010): 93-100.

15. R. J. Haier, *The Neuroscience of Intelligence* (Cambridge, MA: Cambridge University Press, 2017); H. Rindermann et al., "Survey of Expert Opinion on Intelligence: Intelligence Research, Experts' Background, Controversial Issues, and the Media," *Intelligence* 78 (2020): doi:10.1016/j.intell.2019.101406.

16. A. Panofsky, K. Dasgupta, and N. Iturriaga, "How White Nationalists Mobilize Genetics: From Genetic Ancestry and Human Biodiversity to Counterscience and Metapolitics," *American Journal of Physical Anthropology* 175 (2020): 387-98.

17. J. G. R. Fuerst and E. O. W. Kirkegaard, "Admixture in the Americas: Regional and National Difference," *Mankind Quarterly* 56, no. 3 (2016): 255-373; J. G. R. Fuerst and E. O. W. Kirkegaard, "The Genealogy of Differences in the Americas," *Mankind Quarterly* 56, no. 3 (2016): 425-81; E. O. W. Kirkegaard, "Polygenic Scores, Genetic Engineering, Validity of GWAS Results across Major Racial Groups and the Piffer Method," *Winnower* (2015): https://emilkirkegaard.dk/en/2015/09/polygenic-scores-genetic-engineering-validity-of-gwas-results-across-major-racial-groups-and-the-piffer-method-2/; E. O. W. Kirkegaard, "Race Differences: A Brief Review," *Mankind Quarterly* 60, no. 2 (2019): 142-73; E. O. W. Kirkegaard and J. G. R. Fuerst, "Inequality in the United States: Ethnicity, Racial Admixture and Environmental Causes," *Mankind Quarterly* 56, no. 4 (2016): 580-606; E. O. W. Kirkegaard et al., "The Intelligence of Biracial Children of U.S. Servicemen in Northeast Asia: Results from Japan," *Psych* 1, no. 1 (2019): 132-38; E. O. W. Kirkegaard et al., "Biogeographic Ancestry, Cognitive Ability and Socioeconomic Outcomes,"

Psych 1, no. 1 (2019): 1-25; J. Lasker et al., "Global Ancestry and Cognitive Ability," *Psych* 1, no. 1 (2019): 431-59; D. Piffer and E. O. W. Kirkegaard, "The Genetic Correlation between Educational Attainment, Intracranial Volume and IQ Is Due to Recent Polygenic Selection on General Cognitive Ability," *Open Behavioral Genetics* (2014): doi:10.26775/obg.2014.04.12.

18. J. Tabery, "Why Is Studying the Genetics of Intelligence So Controversial?," in "The Genetics of Intelligence: Ethics and the Conduct of Trustworthy Research," special report, *Hastings Center Report* 45, no. S1 (2015): S9-14; J. Tabery, "Genetics," in *Stanford Encyclopedia of Philosophy*, Stanford University, article first published August 13, 2019, https://plato.stanford.edu/entries/genetics/.

19. J. Dongen et al., "The Continuing Value of Twin Studies in the Omics Era," *Nature Reviews Genetics* 13, no. 9 (2012): 640-53; S. M. Downes and L. J. Matthews, "Heritability," in *Stanford Encyclopedia of Philosophy*, Stanford University, article first published July 15, 2004, https://plato.stanford.edu/archIves/sum2020/entries/heredity/.

20. Downes and Turkheimer, "An Early History of the Heritability Coefficient Applied to Humans."

21. J. J. Lee et al., "Gene Discovery and Polygenic Prediction from a Genome-Wide Association Study of Educational Attainment in 1.1 Million Individuals," *Nature Genetics* 50, no. 8 (2018): 1112; R. Plomin and S. Stumm, "The New Genetics of Intelligence," *Nature Reviews Genetics* 19, no. 3 (2018): 148-59; C. A. Rietveld et al., "GWAS of 126,559 Individuals Identifies Genetic Variants Associated with Educational Attainment," *Science* 340 (2013): 1467-71; C. A. Rietveld et al., "Replicability and Robustness of Genome-Wide-Association Studies for Behavioral Traits," *Psychological Science* 25, no. 11 (2014): 1975-86; G. Davies et al., "Genetic Contributions to Variation in General Cognitive Function: A Meta-analysis of Genome-Wide Association Studies in the CHARGE Consortium (N = 53949)," *Molecular Psychiatry* 20, no. 2 (2015): 183-92; S. Sniekers et al., "Genome-Wide Association Meta-analysis of 78,308 Individuals Identifies New Loci and Genes Influencing Human Intelligence," *Nature Genetics* 49, no. 7 (2017): 1107-12; J. E. Savage et al., "GWAS Meta-analysis (N = 279,930) Identifies New Genes and Functional Links to Intelligence," *bioRxiv* (2017): doi:10.1101/184853.

22. E. Turkheimer, "Genome Wide Association Studies of Behavior Are Social Science," in *Philosophy of Behavioral Biology*, ed. K. S. Plaisance and T. A. C. Reydon (New York: Springer, 2012).

23. Panofsky et al., "How White Nationalists Mobilize Genetics."

24. N. Cofnas, "Science Is Not Always 'Self-Correcting,'" *Foundations of Science* 21, no. 3 (2016): 477-92, at 478.

25. Kirkegaard et al., "Race Differences."

26. N. Cofnas, "Research on Group Differences in Intelligence: A Defense of Free Inquiry," *Philosophical Psychology* 33, no. 1 (2020): 125-47, at 133.

27. Ibid.

28. C. Leeuwen and M. Herschbach, "Editors' Note," *Philosophical Psychology* 33, no. 1 (2020): 148-50, at 149.

29. Duster, *Backdoor Eugenics*; Duster, "Social Diversity in Humans"; D. A. Bolnick et al., "The Science and Business of Genetic Ancestry Testing," *Science* 318 (2007): 399-400; Roberts, *Fatal Invention*; A. Morning, "And You Thought We Had Moved beyond All That: Biological Race Returns to the Social Sciences," *Ethnic and Racial Studies* 37, no. 10 (2014): 1676-85; J. M Kaplan, *The Limits and Lies of Human Genetic Research: Dangers for Social Policy* (New York: Routledge, 2000); J. M Kaplan, "Race, IQ, and the Search for Statistical Signals Associated with So-Called 'X'-Factors: Environments, Racism, and the 'Hereditarian Hypothesis,'" *Biology & Philosophy* 30, no. 1 (2015): 1-17.

30. Bolnick et al., "The Science and Business of Genetic Ancestry Testing"; J. Hochschild and M. Sen, "To Test or Not? Singular or Multiple Heritage? Genomic Ancestry Testing and Americans' Racial Identity," *Du Bois Review* 12, no. 2 (2015): 321-47.

31. M. Yudell et al., "Taking Race out of Human Genetics," *Science* 351 (2016): 564-65; A. Panofsky and C. Bliss, "Ambiguity and Scientific Authority: Population Classification in Genomic Science," *American Sociological Review* 82, no. 1 (2017): 59-97.

32. Kaplan, *The Limits and Lies of Human Genetic Research*; N. Block and G. Dworkin, "IQ: Heritability and Inequality, Part 1," *Philosophy & Public Affairs* 3, no. 4 (1974): 331-409; N. Block and G. Dworkin, "IQ, Heritability and Inequality, Part 2," *Philosophy & Public Affairs* 4, no. 1 (1974): 40-90.

33. E. Charney, "Behavior Genetics and Postgenomics," *Behavioral and Brain Sciences* 35, no. 5 (2012): 331-58.

34. Z. Lin et al., "Genomic Research and Human Subject Privacy," *Science* 305 (2004): 183; S. L. Bender et al., "For Underprivileged Children, Standardized Intelligence Testing Can Do More Harm than Good: Reply," *Journal of Developmental and Behavioral Pediatrics* 16, no. 6 (1995): 428-30.

35. L. R. Kass, "The Wisdom of Repugnance," *New Republican* 216, no. 22 (1997): 17-26.

36. A. J. London, *For the Common Good: Philosophical Foundations of Research Ethics* (Oxford, New York: Oxford University Press, 2021).

37. K. Smith, "Concern as Revived 1918 Flu Virus Kills Monkeys," *Nature* 445 (2007): 237.

38. B. L. Webber et al., "Opinion: Is CRISPR-Based Gene Drive a Biocontrol Silver Bullet or Global Conservation Threat?," *PNAS* 112 (2015): 10565-67.

39. Y. Liu et al., "Comparative Transcriptome Analysis Reveals Sex-Biased Gene Expression in Juvenile Chinese Mitten Crab Eriocheir Sinensis," *PLoS ONE* 10, no. 7 (2015): doi:10.1371/journal.pone.0133068.

40. S. C. Markt et al., "Sniffing out Significant 'Pee Values': Genome Wide Association Study of Asparagus Anosmia," *BMJ* 355 (2016): doi:10.1136/bmj.i6071.

41. J. K. Taubenberger et al., "Reconstruction of the 1918 Influenza Virus: Unexpected Rewards from the Past," *mBio* 3, no. 5 (2012): doi:10.1128/mBio.00201-12.

42. A. Chittaranjan and R. Radhakrishnan, "Prayer and Healing: A Medical and Scientific Perspective on Randomized Controlled Trials," *Indian Journal of Psychiatry 51, no. 4 (2009): 247-53.*

43. J. B. Rhine, *Extra-Sensory Perception* (Boston: Boston Society for Psychic Research, 1934).

44. B. Greyson et al., "Mystical Experiences Associated with Seizures," *Religion, Brain & Behavior* 5, no. 3 (2015): 182-96.

45. B. Greyson et al., "Out-of-Body Experiences Associated with Seizures," *Frontiers in Human Neuroscience* 8 (2014): doi:10.3389/fnhum.2014.00065.

46. B. Greyson, "Telepathy in Mental Illness: Deluge or Delusion?," *Journal of Nervous and Mental Disease* 165, no. 3 (1977): 184-200.

47. I. Stevenson, "Cryptomnesia and Parapsychology," *Journal of the Society for Psychical Research* 52, no. 793 (1983): 1-16.

48. J. B. Tucker and F. D. Nidiffer, "Psychological Evaluation of American Children Who Report Memories of Previous Lives," *Journal of Scientific Exploration* 28, no. 4 (2014): 583-94.

49. E. W. Kelly and D. Arcangel, "An Investigation of Mediums Who Claim to Give Information about Deceased Persons," *Journal of Nervous and Mental Disease* 199, no. 1 (2011): 11-17.

50. S. J. Gould, *The Mismeasure of Man* (New York: Norton, 1981).

51. D. J. Kevles, *In the Name of Eugenics: Genetics and the Uses of Human Heredity* (Cambridge, MA: Harvard University Press, 1995).

52. P. A. Lombardo, "Miscegenation, Eugenics, and Racism: Historical Footnotes to Loving v. Virginia," *U.C. Davis Law Review* 21 (1987): 421-52; P. Pascoe, *What Comes Naturally: Miscegenation Law and the Making of Race in America* (New York: Oxford University Press, 2009).

53. R. Hansen and D. King, *Sterilized by the State: Eugenics, Race, and the Population Scare in Twentieth-Century North America* (Cambridge, MA: Cambridge University Press, 2013).

54. Tabery, "Genetics."

55. R. Wedow, D. O. Martschenko, and S. Trejo, "Scientists Must Consider the Risk of Racist Misappropriation of Research," *Scientific American*, May 26, 2022.

56. Panofsky et al., "How White Nationalists Mobilize Genetics."

57. Y. Paradies et al., "Racism as a Determinant of Health: A Systematic Review and Meta-analysis," *PLoS ONE* 10, no. 9 (2015): doi:10.1371/journal.pone.0138511; Y. Paradies, "A Systematic Review of Empirical Research on Self-Reported Racism and Health," *International Journal of Epidemiology* 35, no. 4 (2006): 888-901; D. R. Williams et al., "Racism and Health: Evidence and Needed Research," *Annual Review of Public Health* 40, no. 1 (2019): 105-25.

58. R. Yearby, "Race Based Medicine, Colorblind Disease: How Racism in Medicine Harms Us All," *American Journal of Bioethics* 21, no. 2 (2021): 19-27; Williams et al., "Racism and Health: Evidence and Needed Research."

59. C. G. Yedjou et al., "Health and Racial Disparity in Breast Cancer," in *Breast Cancer Metastasis and Drug Resistance: Challenges and Progress,* ed. A. Ahmad (Cham, Switzerland: Springer International Publishing, 2019).

60. A. R. Green et al., "Implicit Bias among Physicians and Its Prediction of Thrombolysis Decisions for Black and White Patients," *Journal of General Internal Medicine* 22, no. 9 (2007): 1231-38; K. A. Schulman et al., "The Effect of Race and Sex on Physicians' Recommendations for Cardiac Catheterization," *New England Journal of Medicine* 340, no. 8 (1999): 618-26; M. Ryn et al., "Physicians' Perceptions of Patients' Social and Behavioral Characteristics and Race Disparities in Treatment Recommendations for Men with Coronary Artery Disease," *American Journal of Public Health* 96, no. 2 (2006): 351-57.

61. M. T. Schmitt et al., "The Consequences of Perceived Discrimination for Psychological Well-Being: A Meta-analytic Review," *Psychological Bulletin* 140, no. 4 (2014): 921-48; E. A. Pascoe and L. S. Richman, "Perceived Discrimination and Health: A Meta-analytic Review," *Psychological Bulletin* 135, no. 4 (2009): 531-54.

62. Y. Paradies, "A Systematic Review of Empirical Research on Self-Reported Racism and Health," *International Journal of Epidemiology* 35, no. 4 (2006): 888-901; H. L. Jones et al., "Race-Related Stress, Racial Identity Attitudes, and Mental Health among Black Women," *Journal of Black Psychology* 33, no. 2 (2007): 208-31.

63. J. Sidanius and F. Pratto, *Social Dominance: An Intergroup Theory of Social Hierarchy and Oppression* (Cambridge, MA: Cambridge University Press, 2001).

64. M. Cruz-Viesca et al., "Fifty Years after the Kerner Commission Report: Place, Housing, and Racial Wealth Inequality in Los Angeles," *Russell Sage Foundation Journal of the Social Sciences* 4, no. 6 (2018): 160-84.

65. G. Wilson et al., "Racial Income Inequality and Public Sector Privatization," *Social Problems* 62, no. 2 (2015): 163-85; Cruz-Viesca et al., "Fifty Years after the Kerner Commission Report."

66. C. Muller, "Northward Migration and the Rise of Racial Disparity in American Incarceration, 1880-1950," *American Journal of Sociology* 118, no. 2 (2012): 281-326.

67. J. Rovner, *Racial Disparities in Youth Incarceration Persists* (Washington, DC: Sentencing Project, 2021).

68. M. Mauer, "Addressing Racial Disparities in Incarceration," *Prison Journal* 91 (2011): 87S-101S, at 99S.

69. Jensen, "How Much Can We Boost IQ and Scholastic Achievement."

70. See, for example, E. Turkheimer, K. P. Harden, and R. E. Nisbett. "Charles Murray Is Once Again Peddling Junk Science about Race and IQ," *Vox*. May 18, 2017.

71. S. J. Ritchie and E. Tucker-Drob, "How Much Does Education Improve Intelligence? A Meta-analysis," *PsyArXiv* (2017): doi:10.1177/0956797618774

72. S. Harris, "Forbidden Knowledge," interview with Charles Murray on Making Sense with Sam Harris, podcast audio, April 23, 2017.

73. L. J. Matthews and E. Turkheimer, "Across the Great Divide: Pluralism and the Hunt for Missing Heritability," *Synthese* 198, no. 3 (2021): 2297-2311; L. J. Matthews and E. Turkheimer, "Three Legs of the Missing Heritability Problem," *Studies in History and Philosophy of Science* 93 (2022): 183-91.

74. A. B. Popejoy and S. M. Fullerton, "Genomics Is Failing on Diversity," *Nature News* 538, no. 7624 (2016): 61-164.

75. L. J. Matthews, "Half a Century Later and We're Back Where We Started: How the Problem of Locality Turned in to the Problem of Portability," *Studies in History and Philosophy of Science Part A* 91 (2022): 1-9.

76. A. R. Martin et al., "Human Demographic History Impacts Genetic Risk Prediction across Diverse Populations," *American Journal of Human Genetics* 100, no. 4 (2017): 635-49.

77. H. Mostafavi et al., "Variable Prediction Accuracy of Polygenic Scores within an Ancestry Group," *bioRxiv* (2019): doi:10.7554/eLife.48376.

78. D. Piffer, "A Review of Intelligence GWAS Hits: Their Relationship to Country IQ and the Issue of Spatial Autocorrelation," *Intelligence* 53 (2015): 43-50.

79. N. Mancuso et al, "The Contribution of Rare Variation to Prostate Cancer Heritability," *Nature Genetics* 48, no. 1 (2016): 30-35; M. L. Freedman et al., "Admixture Mapping Identifies 8q24 as a Prostate Cancer Risk Locus in African-American Men," *PNAS* 103, no. 38 (2006): 14068-73.

79. Kirkegaard et al., "Biogeographic Ancestry, Cognitive Ability and Socioeconomic Outcomes."

81. Ibid.