ARTICLES

THE RETURN OF BIOLOGICAL RACE? REGULATING INNOVATIONS IN RACE AND GENETICS THROUGH ADMINISTRATIVE AGENCY RACE IMPACT ASSESSMENTS

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I. INTRODUCTION

In April 2011, I published an article in *Slate*[1] that commented on the new Dietary Guidelines released by the Department of Agriculture and Department of Health and Human Services.[2] These guidelines made several recommendations with the admirable purpose of encouraging Americans to take bold steps to improve their health, such as eating smaller portions and consuming more fruits and vegetables.[3] Yet one of the guidelines' "Key Recommendations" stood out: "Reduce daily sodium intake to less than 2,300 milligrams (mg) and further reduce intake to 1,500 mg among

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1. Osagie K. Obasogie, *Black Salt: Should the Government Single Out African-Americans for Low Sodium Diets?*, SLATE (Apr. 18, 2011, 3:07 PM), http://www.slate.com/id/2291513.

2. *See* U.S. DEP'T OF AGRIC. & DEP'T OF HEALTH & HUMAN SERVS., DIETARY GUIDELINES FOR AMERICANS, 2010 (2010), *available at* http://www.cnpp.usda.gov/Publications/DietaryGuidelines/2010/PolicyDoc/PolicyDoc.pdf [hereinafter DIETARY GUIDELINES FOR AMERICANS].

3. *Id.* at viii–xi.

persons who are 51 and older and *those of any age who are African American* or have hypertension, diabetes, or chronic kidney disease."[4]

There are certainly prudent medical reasons why older individuals and those with preexisting conditions should consume less salt.[5] But, should this apply to all Black people? In the *Slate* article, I examined the scant support for treating race as a biological risk factor and the overwhelming evidence suggesting that social determinants of health[6]—poverty, stress linked to discrimination, and lack of access to healthy food in urban environments, among other factors—may better explain Blacks' higher rates of hypertension and other sodium-related chronic diseases.[7] Although I expected this perspective to generate pushback in the online comments section, the *Slate* article elicited something unusual and unexpected: interest from a White supremacist website.[8] White-Pride.org reposted the article in its entirety, alongside articles titled *Blacks Made Up Majority of All Serial Killers Last Decade*; *Obama Spent March Obsessed with Basketball, Not Learning About Who He Was Bombing*; and *Obama "Birth Certificate" Contains Adobe Illustrator Editing Data*. It initially seemed strange to me that a website devoted to news and commentary of this character would be interested in an article about government recommendations pertaining to salt intake. But their interest eventually became clear as some comments implied skepticism toward any claim that social determinants cause racial disparities. Instead, the comments suggested that fundamental differences between Whites and minorities explained Blacks' poor health outcomes, and these outcomes were simply an indication of Blacks' overall inferiority.

A colleague of mine experienced a similar situation. Esteban González Burchard, a geneticist at the University of California, San Francisco,

4. *Id.* at 21 (emphasis added).

5. *See* Obasogie, *supra* note 1. *See also Salt: Most Americans Should Consume Less Sodium*, CDC, http://www.cdc.gov/salt (last updated Dec. 21, 2011).

6. The World Health Organization defines social determinants of health as:

> [T]he conditions in which people are born, grow, live, work and age, including the health system. These circumstances are shaped by the distribution of money, power and resources at global, national and local levels, which are themselves influenced by policy choices. The social determinants of health are mostly responsible for health inequities—the unfair and avoidable differences in health status seen within and between countries.

Social determinants of health, WORLD HEALTH ORG., http://www.who.int/social_determinants/en (last visited Dec. 2, 2012).

7. Obasogie, *supra* note 1.

8. *See* WHITE-PRIDE, http://white-pride.org/2011/04/should-the-government-single-out-african-americans-for-low-sodium-diets (last visited Apr. 20, 2011). This website has since been taken down and is no longer accessible.

researches asthma disparities in Latino communities; Puerto Ricans have the highest asthma prevalence, morbidity, and mortality, while Mexicans have the lowest.[9] Much of Burchard's research focuses on finding the genetic differences that may explain these disparities both within and among racial groups in order to develop treatments to improve minority health.[10] Imagine Burchard's surprise when he received an e-mail in 2007 from former Louisiana politician—and former Grand Wizard for the Ku Klux Klan—David Duke,[11] commending him for his research:

> I do think your work and others who show real biological differences between races is important. You show that race is truly real, not a societal construct or some sort of conspiracy theory. As you know, there are about 135 breeds (races) of dogs that are all part of the same species. They can all interbreed just as the human races can. Who can deny the differences in appearance, character, and physiology between dog breeds that can vary as much as the Maltese and the Great Dane? . . . Are we so blinded by egalitarian dogma that we can't see the obvious differences in human races and their expressions in culture? As you are well aware, dog races, similarly to human races, have diseases that are specific to them.
>
> The truth is, when it comes to human racial differences, we live in a world in which believing that "there is no such thing as human races" has become a religion, and those who recognize the realities of human races have become heretics who are called "racists."[12]

Another colleague, Dorothy Roberts, a professor of law and sociology at the University of Pennsylvania, experienced a similarly strange dynamic at an April 2006 conference on race-based medicine at the Massachusetts Institute of Technology.[13] Roberts presented a paper on the lack of

9. Esteban González Burchard et al., *Lower Bronchodilator Responsiveness in Puerto Rican than in Mexican Subjects with Asthma*, 169 AM. J. RESPIRATORY & CRITICAL CARE MED. 386 (2004).

10. *See e.g.*, Rajesh Kuman et al., *Genetic Ancestry in Lung-Function Predictions*, 363 NEW ENG. J. MED. 321 (2010); Rasika A. Mathias et al., *A Genome-Wide Association Study on African-Ancestry Populations for Asthma*, 125 J. ALLERGY & CLINICAL IMMUNOLOGY 336 (2010); Haig Tcheurekdjian et al., *ALOX5AP and LTA4H Polymorphisms Modify Augmentation of Bronchodilator Responsiveness by Leukotriene Modifiers in Latinos*, 126 J. ALLERGY & CLINICAL IMMUNOLOGY 853 (2010).

11. B. Drummond Ayres Jr., *Political Briefing; Republicans Decide To Ignore David Duke*, N.Y. TIMES, Apr. 18, 1999, http://www.nytimes.com/1999/04/18/us/political-briefing-republicans-decide-to-ignore-david-duke.html; David Firestone, *A Dealing with David Duke Haunts Louisiana Governor*, N.Y. TIMES, June 22, 1999, http://www.nytimes.com/1999/06/22/us/a-dealing-with-david-duke-haunts-louisiana-governor.htm.

12. David Duke, *Race & Medicine: A Reply from David Duke*, DAVID DUKE (Mar. 10, 2007, 4:52 AM), http://www.davidduke.com/general/race-and-medicine-a-reply-from-david-duke-to-a-quote-of-dr-esteban-burchard_1886.html.

13. Anne Pollock, Medicating Race: Heart Disease and Durable Preoccupations with Difference (May 1, 2007) (unpublished Ph.D. dissertation, Massachusetts Institute of Technology) (on file with author); DOROTHY ROBERTS, FATAL INVENTION: HOW SCIENCE, POLITICS, AND BIG BUSINESS RE-CREATE RACE IN THE TWENTY-FIRST CENTURY 183–85 (2011).

consensus within the African American community on race-based medicine, or drugs that claim to be tailored to treat diseases in specific racial groups.[14] Roberts described the diverse viewpoints within the Black community—from those who were skeptical of treating social categories of race as biologically-relevant labels to those who believe race-based medicine is an important step in resolving racial disparities in health. At the end of the talk, Juan Cofield, President of the NAACP's New England Chapter, stood up and vigorously criticized Roberts by shouting, "There is consensus in the Black community that [BiDil, the first race-based medication for Blacks with heart failure,] is good for black people."[15] He then accused Roberts, who has had a celebrated career promoting racial justice and fighting health care inequalities, as irresponsibly jeopardizing Black people's lives and suggested that their blood would be on her hands.[16] Without blinking, Roberts calmly replied: "there isn't a consensus [about BiDil] among black people *in this room*,"[17] let alone among all members of the Black community, as Cofield suggested.

These three situations reflect a growing crisis in lay and scholarly perspectives on race: a renewed legitimacy in what can be called "biological race," or the idea that social categories of race reflect inherent biological differences that explain racial groups' disparate social and health outcomes. Ever since the end of World War II—when the Holocaust exposed the horrors that ideas about biological race can produce—laws and social norms sympathetic to the idea that race is a social construction have fostered egalitarian sentiments. The social constructionist view explicitly rejects biological race, promoting instead the notion that different outcomes and abilities between races are linked to the privileges and burdens that society places on each group.[18] This idea has been the intellectual foundation for advances in civil rights, human rights, and constitutional law.[19] Modern notions of social and legal equality are premised on the concept that race reflects mere superficial differences and that variations in human abilities do not fall along racial lines.

But new developments in genetic research are rehabilitating biological explanations for racial differences and disparities, creating unprecedented

14. ROBERTS, *supra* note 13, at 184. *See also* Pollock, *supra* note 13.

15. Pollock, *supra* note 13. *See also* ROBERTS, *supra* note 13, at 184 ("Juan Cofield stood up in the audience and emotionally objected. 'There *is* consensus supporting BiDil,' he shouted at me.").

16. ROBERTS, *supra* note 13, at 184.

17. Pollock, *supra* note 13.

18. *See infra* Part II.G.

19. *See infra* Part II.G.

tensions for the regulatory state. For example, race-based medicines promise drugs that are tailored for optimal use in particular groups,[20] genetic ancestry tests claim to offer the ability to determine individuals' racial and ethnic origins,[21] and certain applications of DNA forensics leverage biological understandings of race to identify criminal suspects.[22] Compared to historical discussions on biological race, these new developments present a dramatic shift in tone. Past claims concerning biological race were used explicitly to subordinate racial minorities while current claims are often articulated as efforts to help reduce inequality by, for example, providing innovative mechanisms to resolve health disparities. What connects past and present, however, is a persistent belief in racial typologies, or that social categories of race reflect distinct biological groupings that are linked to essential traits and behaviors. It is through this shared thread of typological thinking that past ideas concerning racial hierarchy and meanings can be preserved in new technologies that may be facially benign or beneficent.

This tonal shift is significant because the line between discriminatory and ostensibly beneficial uses of biological race is neither bright nor intuitive. For example, the aforementioned federal dietary guidelines treat race as a biological risk factor of the same consequence as advanced age or having diabetes for the laudable purpose of reducing health disparities in sodium-related diseases.[23] On the other hand, those on White-Pride.org may embrace the very same biological understanding of racial disparities in health, but for a different reason: to assert Whites' inherent superiority.[24] Similarly, Burchard's research looking for genetic variations linked to asthma is motivated by an attempt to reduce racial disparities, while Duke's support of this type of research most likely stems from a White-supremacist belief that minorities' health problems are a function of their inferior physiology. And, although Roberts's skepticism toward race-based medicine follows, in part, from a concern that the questionable science behind this approach might reinvent biological notions of race in a manner that ultimately disserves minority communities,[25] the NAACP and other

20. *See infra* Part III.A.
21. *See infra* Part III.B.
22. *See infra* Part III.B.
23. DIETARY GUIDELINES FOR AMERICANS, *supra* note 2, at 55.
24. See the discussion of White-Pride.org, *supra* note 8.
25. ROBERTS, *supra* note 13, at 185 ("NitroMed did not make money from a drug that was developed to treat heart failure in black patients. It made money by converting a drug for heart failure into a drug for African Americans based on unsubstantiated claims about racial difference.").

groups claiming to represent the Black community have endorsed race-based medicine as a way to resolve racial disparities in health outcomes.[26]

These tensions raise a critical legal and regulatory question: given the extraordinary amount of suffering linked to past government-enforced notions of biological race—from slavery to eugenics to Tuskegee—how are we to know when these new articulations further racial subordination or advance racial justice? This dichotomy draws attention to the remarkable stakes involved in devising sound regulatory approaches to vet new innovations premised upon biological understandings of racial difference and disparities. Overly permissive oversight mechanisms may allow problematic claims about race and genetics to engender discrimination and exacerbate racial inequality. On the other hand, excessively strict regulations may prevent potentially beneficial applications from helping those most in need. Because the intent behind the development of new technologies is not dispositive of the actual effect they will have on minorities or public conceptions of race, a broader assessment of these new technologies' impact is needed to inform regulatory decision-making.

This Article proposes race impact assessments as a new regulatory model for administrative agencies that creates a collaborative and deliberative space for multiple stakeholders to provide recommendations to regulators about how to balance the risks and benefits of new technologies that have the potential to give undue legitimacy to biological race. I draw upon prior impact assessment work in environmental law and other fields in which government agencies thoroughly assess new innovations' broader impact before going forward. For example, just as an environmental impact assessment pursuant to the National Environmental Policy Act ("NEPA") would look at the many ways a proposed federal highway might affect the surrounding environment and ecosystems, I similarly argue that proper regulation of new technologies that implicate race must also engage in a prospective assessment of their potential impact on racial minorities and public understandings of race.

By proposing race impact assessments in this Article, I make a critical departure from mainstream legal and policy discussions on regulating the use of racial categories in science in at least two ways. First, the scholarly conversation and regulatory focus regarding developments pertaining to

26. *Id.* at 184 ("According to [the NAACP's] view, the urgent crisis of African American heart disease must take precedence over political objections to the use of race as biomedical category. Indeed, these objections are seen as a form of racial discrimination or betrayal on grounds that they block black heart patients' access to the medicines they need.").

race and genetics have disproportionately centered on biomedicines (such as BiDil) without simultaneously examining how other biotechnologies are also giving new legitimacy to biological race.[27] Genetic ancestry tests that use a direct-to-consumer model to give individuals information on their racial and ethnic backgrounds are reinforcing public understandings of race as a biologically-based, genetic entity that can be known by simply swabbing one's cheek and mailing the results to a laboratory. Similarly, criminal investigators are using biotechnologies that implicate race in forensic investigations, which can influence public understandings of racial difference and has a distinct impact on minority communities. For example, law enforcement officials are using genetic analyses of unknown biological samples at crime scenes to develop visual depictions of possible suspects. This can include characteristics such as skin color, eye color, and facial features that ostensibly point directly to a suspect's racial appearance.[28] By arguing for race impact assessments that examine regulatory needs in all three areas—biomedicine, genetic ancestry tests, and DNA forensics—this proposal is able to assess these technologies' synergistic effects across multiple fields and provide a more holistic regulatory mechanism that balances risks and benefits.

Secondly, a significant and influential thread of the literature on regulating race-based biotechnologies draws upon constitutional law for a set of normative rules to govern if, how, and when new applications that use race as a biological marker of human difference should be made publically available.[29] As a second departure, this Article's proposed model does not rely on constitutional law to provide a set of normative rules to govern these technologies. Rather, I argue that administrative agencies—the Food and Drug Administration ("FDA") with regard to race-based medicine, the Federal Trade Commission ("FTC") with regard to genetic

27. *See, e.g.*, M. Gregg Bloche, *Race-Based Therapeutics*, 351 NEW ENG. J. MED. 2035 (2006); Richard S. Cooper et al., *Race and Genomics*, 348 NEW ENG. J. MED. 1166 (2003); Carlos Bustamante et al., *Genomics for the World*, 475 NATURE 163 (2011).

28. Gautum Naik, *To Sketch a Thief: Genes Draw Likeness of Suspects*, WALL ST. J., Mar. 27, 2009, at A9.

29. *See* Jonathan Kahn, *Genes, Race, and Population: Avoiding a Collision of Categories*, 96 AM. J. PUB. HEALTH 1965 (2006) [hereinafter Kahn, *Genes, Race, and Population*]; Erik Lillquist & Charles A. Sullivan, *The Law and Genetics of Racial Profiling in Medicine*, 39 HARV. C.R.-C.L. L. REV. 391 (2004); Osagie K. Obasogie, *Beyond Best Practices: Strict Scrutiny as a Regulatory Model for Race-Specific Medicines*, 36 J.L. MED. & ETHICS 491 (2008); Kimani Paul-Emile, *The Regulation of Race in Science*, 80 GEO. WASH. L. REV. 1115 (2012); Dorothy Roberts, *Legal Constraints on the Use of Race in Biomedical Research: Toward a Social Justice Framework*, 34 J.L. MED. & ETHICS 526 (2006); David E. Winickoff & Osagie K. Obasogie, *Race Specific Drugs: Regulatory Trends and Public Policy*, 29 TRENDS IN PHARMACOLOGICAL SCI. 277 (2008).

ancestry tests, and the Federal Bureau of Investigation ("FBI") with regard to DNA forensics—should be used as normative spaces to conduct race impact assessments that collaboratively investigate and discuss the potential impact these technologies might have for racial minorities and the idea of race.

This Article proceeds in four additional parts. In Part II, I provide a brief history of biological race and law's complicity in promoting racial typologies. By uncritically accepting scientific claims premised upon biological race, law has played a central role in promoting this pernicious way of thinking about human difference. This rich history situates this Article's broader claim that state and federal governments' past involvement in subordinating racial minorities through legal enforcements premised upon biological race obligate them to now implement oversight mechanisms such as race impact assessments to prevent such subordination from reoccurring. In Part III, I discuss three developments in human biotechnology that draw upon biological race and may have a particular impact on racial minorities: race-based medicine, genetic ancestry tests, and DNA forensics. In that section, I assess the scientific promise and limitations of these developments and highlight the concerns they raise with respect to renewing legitimacy in biological race in ways that may be harmful. In Part IV, I propose race impact assessments as a regulatory model for administrative agencies to balance these technologies' potential risks and benefits. I then conclude with a discussion about why this proposed model is urgent for the future of racial justice.

II. LAW, SCIENCE, AND BIOLOGICAL RACE: HISTORY AS CONTEXT

This Section briefly examines the ascension of biological understandings of racial difference in the United States in the nineteenth and twentieth centuries, with a particular emphasis on the central role that law and science played in producing and embedding its significance. This is far from an exhaustive history; several books have been devoted to describing the development of racial thought in the West.[30] Rather, this Section is designed to briefly sketch the trajectory of racial thought that has oriented itself around biology in order to understand the continuities and

30. *See, e.g.*, GEORGE M. FREDRICKSON, THE BLACK IMAGE IN THE WHITE MIND: THE DEBATE ON AFRO-AMERICAN CHARACTER AND DESTINY, 1817–1914 (1971); WINTHROP D. JORDAN, WHITE OVER BLACK: AMERICAN ATTITUDES TOWARD THE NEGRO, 1550–1812 (1968) [hereinafter JORDAN, WHITE OVER BLACK].

discontinuities between past and current articulations of biological race. The legal moments attended to in this Section—anti-miscegenation laws, immigration laws, and eugenics—serve as guideposts for understanding the unholy alliance between law and science in fostering the growth of biological race. The main point is that biological understandings of racial difference emerged at specific historical moments in response to particular social, economic, and political conditions filtered through scientific articulations of biological race. These understandings were promoted and maintained through the force of law to justify racial subordination. Law's central role in absorbing, disseminating, and embedding past scientific justifications for biological race explains why it must now carefully attend to modern discussions of biological race as a way to atone for its past complicity in furthering racial injustice.

A. SCIENTIFIC RACISM AND DARWINISM

With regard to American race relations, religious and cultural differences have framed social categories of race as a reflection of inherent group differences since England's earliest contact with people of color in Africa and the New World in the sixteenth and seventeenth centuries.[31] Distinctions between Christians and heathens on the one hand and civilized and savage peoples on the other gave content to what became increasingly racialized group distinctions that were thought of as innate differences driven by inborn abilities and disabilities.[32] These perceived lines of difference served as a basis from which to determine human worth that, along with various social dynamics and economic needs, led to the development of racialized slavery in much of the New World and the American colonies.[33]

Science has a long history of using quantitative methods to show that there are measureable physical distinctions between racial groups that explain differences and disparities in social and health outcomes. The

31. "[T]he English experience was markedly different from that of the Spanish and Portuguese who for centuries had been in close contact with North Africa and had actually been invaded and subjected by people both darker and more 'highly civilized' than themselves." WINTHROP JORDAN, THE WHITE MAN'S BURDEN: HISTORICAL ORIGINS OF RACISM IN THE UNITED STATES 10 (1974) [hereinafter JORDAN, WHITE MAN'S BURDEN].

32. *Id.* ("Englishmen and Christians everywhere were sufficiently acquainted with the concept of heathenism that they confronted its living representatives without puzzlement. Certainly the rather sudden discovery that the world was teeming with heathen people made for heightened vividness and urgency in the longstanding problem; but it was the fact this problem was already well formulated long before contact with Africa which proved important in shaping English reaction to the Negro's defective religious condition.").

33. *See generally,* JORDAN, WHITE OVER BLACK, *supra* note 30.

scientific method was used during the nineteenth century to both supplement and move away from purely religious or cultural explanations to frame racial differences and disparities as objectively knowable and measureable products of nature.[34] Instead of merely referencing the Bible or cultural notions of savagery, science became an increasingly powerful way to objectively legitimize status-quo racial hierarchies.[35]

Scholars have documented this practice across many disciplines for decades. Stephen Jay Gould's *The Mismeasure of Man* details the ways in which biological notions of race were used in the nineteenth century to sustain racial hierarchies.[36] Gould draws attention to how respected researchers like Samuel Morton, a Philadelphia physician who significantly influenced early American anthropology, measured the average head size of various races (the idea being that large heads signify greater cognitive ability) to establish a ranking system that provided seemingly objective data to explain and justify White racial dominance.[37] Morton's research was central to nineteenth-century American polygenesis—the then-popular theory that each race had separate origins—by legitimating the social order through measurable scientific claims.[38] It is difficult to overstate his impact on public and scholarly understandings of race at the time. The *New York Tribune* wrote as an obituary that "probably no scientific man in America enjoyed a higher reputation among scholars throughout the world than Dr. Morton."[39]

Morton's work is by far not the only example of how the scientific method came to play a prominent role in shaping scholarly and lay

34. *See generally*, LEE D. BAKER, FROM SAVAGE TO NEGRO: ANTHROPOLOGY AND THE CONSTRUCTION OF RACE, 1896-1954 (1998).

35. *Id.*

36. STEPHEN JAY GOULD, THE MISMEASURE OF MAN 83 (1996).

37. Morton amassed a dataset consisting of over six-hundred skulls, mostly from Native Americans, to show "that a ranking of races could be established objectively by physical characteristics of the brain, particularly by size." *Id.* Gould's argument that Morton fudged his measurements to fulfill white supremacist ideologies has recently been reexamined, with the authors arguing, "Morton did not manipulate data to support his preconceptions." Jason E. Lewis et al., *The Mismeasure of Science: Stephen Jay Gould versus Samuel George Morton on Skulls and Bias*, 9 PLOS BIOLOGY 1 (2011). Upon reviewing this article by Lewis et al., the editors of *Nature* concluded that, taken at face value, their "critique leaves the majority of Gould's work unscathed" and noted the article's limitations in that the authors "couldn't measure all of [Morton's] skulls, [meaning that] they do not know whether the average cranial capacities that Morton reported represent his sample accurately." The *Nature* editors also stated that although Lewis et al. accuse Gould of being driven by certain commitments in his reassessment of Morton's data, "Lewis and his colleagues have their own motivations." Editorial, *Mismeasure for Mismeasure*, 474 NATURE 419 (June 23, 2011).

38. GOULD, *supra* note 36, at 84.

39. *Id.* at 83.

understandings of race during this period.[40] Science came to play an even stronger role in conceptualizing racial differences after the 1859 publication of Charles Darwin's *On the Origins of Man*. Darwin's theory is quite simple: organisms' traits are hereditary, adapting to environmental pressures and changing over time to confer survival advantages (evolution) through natural selection or sexual reproduction.[41] Darwin was not the first to propose an evolutionary model for organisms' development. His contribution was to theorize how evolution happens through natural selection; mating between the strongest and most attractive individuals provides survival advantages to subsequent generations and improves organisms' overall strength and vitality.[42]

Darwinism helped resolve a virulent debate among race commentators at the time: whether all humans had one single origin (monogenism) or whether each race had different and unrelated biological origins (polygenism).[43] Darwinism presented the great compromise that superseded this theoretical impasse. Evolution by natural selection allowed monogenists to "win" part of the argument that man has one origin from which racial hierarchies with superior and inferior races evolved, while polygenists "won" in that the heritability of differences in ability appeared to be supported by the idea that great evolutionary distances separated the races.[44] Put bluntly, the racist tendencies underlying each theory led to their consensus around evolution to the extent that "it provided an even better rationale for their shared racism."[45]

The close connection Darwin drew between human evolution and the ability to empirically document its different stages fueled a flame of measuring racial differences that had already been burning since the early nineteenth century. Scientists like Morton and his successors thought that if the races represented the stages of human evolution, measuring these differences would be absolutely crucial to giving these social observations

40. For a thorough examination of the different ways in which scientific measurements were used to identify racial difference, see THE NATURE OF DIFFERENCE: SCIENCES OF RACE IN THE UNITED STATES FROM JEFFERSON TO GENOMICS (Evelynn M. Hammonds & Rebecca M. Herzig eds., 2008).

41. *See generally* CHARLES DARWIN, ON THE ORIGIN OF SPECIES (1859).

42. *See* Herbert Hovenkamp, *Evolutionary Models in Jurisprudence*, 64 TEX. L. REV. 645, 651 (1985) ("The theory of natural selection in biology required only the production of numerous organisms and an environment so impoverished that it could accommodate only a few of them. The organisms thrown into this predicament were forced to compete, with the result that only a small number survived and reproduced.").

43. GOULD, *supra* note 36, at 105.

44. *Id.*

45. *Id.*

scientific backing.[46] Thus, as Thomas Gossett notes, the "nineteenth century [became] a period of exhaustive and, as it turned out, futile search for criteria to define and describe race differences."[47]

The ascension of measurement as defining proper scientific thought reified the notion that observing the status quo leads to racial truth concerning groups' inherent abilities, which intensified the scrutiny given to racial bodies that predicated post-Civil War race relations. Racial bodies and their performances became subject to exacting visual attention as part of an effort to explain racial minorities' natural state as degraded and inferior.[48] In post-Civil War America, this type of policing became a new type of social control. The Civil War and ensuing constitutional Amendments may have formally liberated Blacks, but science became the new basis for continuing their social and legal degradation. Blacks' limited progress was explained as so natural, normal, and predictable by scientific observations that even laypeople could appreciate it by simply looking out into the world.

Indeed, legal historian Ariela Gross notes that after the Civil War, "the color line replaced the boundary between free and slave, race replaced slave status, and a regime of whiteness replaced the regime of slavery as the weapon of oppression."[49] Gross argues that science played a key role in these transformations in that "it was [during] the post-Civil War period that racial science triumphed and became the single argument for explaining 'race.'"[50] This is a subtle but important point that deserves attention. Although the Civil War and Reconstruction Amendments provided powerful mechanisms to make Blacks full citizens, there were equally powerful opposing forces determined to maintain racial subordination. The increasingly sophisticated notion of race-as-biology played this key role: providing a rational and objectively verifiable measurement system that

46. THOMAS GOSSETT, RACE: THE HISTORY OF AN IDEA IN AMERICA 68–69 (1963).

47. *Id.* at 69. Gould corroborates this sentiment by noting that the second half of the nineteenth century was distinguished by:

> the allure of numbers, the faith that rigorous measurement could guarantee irrefutable precision, and might mark the transition between subjective speculation and a true science as worthy as Newtonian physics. Evolution and quantification formed an unholy alliance. . . . By the end of Darwin's century, standardized procedures and a developing body of statistical knowledge had generated a deluge of more trustworthy numerical data.

GOULD, *supra* note 36, at 106.

48. *See generally*, Ariela Gross, *Litigating Whiteness: Trials of Racial Determination in the Nineteenth-Century South*, 108 YALE L. J. 109 (1998).

49. *Id.* at 177.

50. *Id.*

demonstrated racial minorities' inferiority as natural, inherent, and heritable. Within this warped Darwinian framework, this not only justified the status quo, but gave moral impetus to the belief that to try to change these status relationships would be contrary to evolutionary progress and, thus, society itself.

B. SOCIAL DARWINISM AND EUGENICS

The social sciences became particularly useful in justifying inequalities "in terms of a natural hierarchy of class and race caused by a struggle for existence wherein the fittest individuals or races advanced while the inferior became eclipsed."[51] These popular terms—"the struggle for existence" or more often "the survival of the fittest"—are often attributed to Charles Darwin, but actually belong to Herbert Spencer.[52]

Spencer, an Englishman, had a profound impact on American social sciences. Although Darwin often balked at directly applying his evolutionary thought to social relations, Spencer developed his own quasi-evolutionary theories before Darwinism hit the scene that treated social organisms the same way Darwin approached biological ones.[53] Thus, Spencer advocated what came to be known as Social Darwinism: "the idea of natural selection was translated to a struggle between individual members of society[;] . . . nature's indispensable method for producing superior men, superior nations, and superior races."[54] In the context of both Darwin's rock-star status in the United States and the postwar need for rational explanations of human difference, Spencer's "biological analogy" was, to put it mildly, the right theory at the right time. The parallels Spencer made between the natural and social sciences were simply too elegant and seductive for Americans to resist.[55]

Race became a key framing for Social Darwinism. For example, Spencer analogized the evolutionary gap between savage and civilized minds as being akin to the gulf in cognitive abilities between juveniles and

51. BAKER, *supra* note 34, at 27.

52. JOSEPH GRAVES, THE EMPEROR'S NEW CLOTHES: BIOLOGICAL THEORIES OF RACE AT THE MILLENNIUM 75 (2003).

53. HERBERT SPENCER, SOCIAL STATICS: OR, THE CONDITIONS ESSENTIAL TO HUMAN HAPPINESS SPECIFIED, AND THE FIRST OF THEM DEVELOPED 426 (1851) ("Regarding society as an organism, . . . it is impossible artificially to use up social vitality for the more active performance of one function without diminishing the activity with which other functions are performed. So long as society is let alone, its various organs will go on developing in due subordination to each other.").

54. GOSSETT, *supra* note 46, at 145.

55. *See id.* at 144–75.

adults.[56] Here, as throughout this period, social scientific measurements merged with Social Darwinist theory to reveal the evolutionary and biological hierarchies embedded in these race discourses through quantified comparisons of geographically separated and visually distinguishable groups.[57]

With the intellectual and "scientific" basis for conceptualizing and measuring racial hierarchy establishing itself throughout the nineteenth century, the question at the turn of the twentieth century became quite pragmatic: What should be done about it? This context gave rise to the eugenics movement, which was an international effort to use science and medicine to justify limiting the reproduction—and existence—of individuals deemed to be of an inferior racial stock while promoting the reproduction of those thought to be racially superior.[58] Also known as "racial hygiene," eugenics came to dominate social, political, and legal thought in the early twentieth century across America and Western Europe, leading law and public policy to become complicit in the devastating and brutal treatment of the most vulnerable populations.[59] The incorporation of scientific understandings of biological race into American law and public policy during this period can be seen in at least three ways: immigration restrictions, forced sterilizations, and anti-miscegenation laws.

1. Immigration Restrictions

Immigration was an important aspect of late-nineteenth and early-twentieth-century eugenics ideology because population control was seen as central to managing the United States' racial composition.[60] Chinese laborers were drawn to the West Coast after the Civil War to assist with railroad construction, mining, and other manual labor.[61] At first, Americans welcomed this cheap and plentiful labor, but soon disparaged it as economic conditions worsened.[62] Anti-Chinese sentiments spurred by

56. Herbert Spencer, *The Comparative Psychology of Man*, J. ANTHROPOLOGICAL INST. OF GR. BR. & IR., 301, 303–04 (1876).

57. *See* GOSSETT, *supra* note 46, as 144–75.

58. Garland E. Allen, *Eugenics and Modern Biology: Critiques of Eugenics*, 1910–1945, 75 ANNALS HUM. GENETICS 314 (2011).

59. *Id.*

60. Ian F. Haney López writes, "The racial composition of the U.S. citizenry reflects in part the accident of world migration patterns. More than this, however, it reflects the conscious design of U.S. immigration and naturalization laws." IAN F. HANEY LÓPEZ, WHITE BY LAW: THE LEGAL CONSTRUCTION OF RACE 37 (1996).

61. Kitty Calavita, *The Paradoxes of Race, Class, Identity, and "Passing": Enforcing the Chinese Exclusion Acts, 1882–1910*, 25 LAW & SOC. INQUIRY 1, 4 (2000).

62. *Id.*

organized labor and general social anxieties toward racial otherness led to an understanding of Chinese individuals as a separate and biologically different group.[63] Much of this anxiety stemmed from the disproportionate number of Chinese men immigrating: the 1890 Census showed 102,620 Chinese men versus 3868 Chinese women present in the United States.[64]

This imbalance resulted in a heightened threat of sexual competition and mixed-race offspring thought to be biologically inferior, leading to various state and local restrictions on Chinese immigration that eventually percolated to the federal level.[65] For example, an 1877 Congressional report by the Joint Special Committee to Investigate Chinese Immigration noted that, "there is not sufficient brain capacity in the Chinese race to furnish motive power for self-government. Upon the point of morals, there is no Aryan or European race which is not far superior to the Chinese . . . ."[66] This was followed by a series of Chinese Exclusion Acts beginning in 1882 that limited Chinese laborers' ability to enter the United States. The Supreme Court upheld the constitutionality of these acts in 1889 in *Chae Chan Ping v. United States*:

> The differences of race added greatly to the difficulties of the situation. . . . It seemed impossible for them to assimilate with our people or to make any change in their habits or modes of living. As they grew in numbers each year the people of the coast saw, or believed they saw, in the facility of immigration, and in the crowded millions of China, where population presses upon the means of subsistence, great danger that at no distant day that portion of our country would be overrun by them unless prompt action was taken to restrict their immigration.[67]

This sentiment toward Chinese individuals as an unassimilable and biologically distinct racial group persisted in further legislative acts and judicial decisions throughout this period. Justice Harlan's 1896 dissent in *Plessy v. Ferguson*, where he advocated colorblindness in questioning the constitutionality of separate but equal railroad accommodations for Whites and Blacks, noted that "there is a race so different from our own that we do not permit those belonging to it to become citizens of the United States. . . . I allude to the Chinese race."[68] This notion of intractable difference as a predicate for racial exclusion via immigration policies was

63. *See id.*
64. *Id.*
65. *Id.*
66. *Id.* (quoting U.S. CONG. JOINT SPECIAL COMM. TO INVESTIGATE CHINESE IMMIGR., S. REP. NO. 44-689 (1877)).
67. Chae Chan Ping v. United States, 130 U.S. 581, 595 (1889).
68. Plessy v. Ferguson, 163 U.S. 537, 561 (1896) (Harlan, J., dissenting).

also captured through various aspects of popular culture. For example, in this advertisement from circa 1900, the message that "they must go" conflates the product's pest control abilities with broader political sentiments concerning biological difference and Chinese exclusion.[69] Chinese people are depicted as more rodent-like than human.

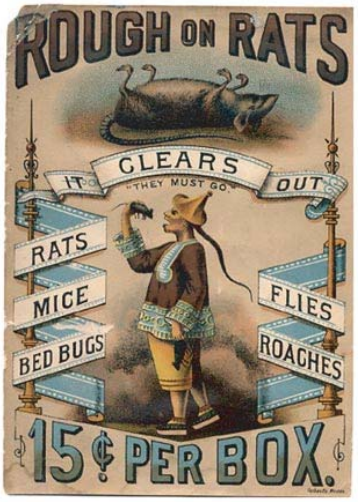

Figure 1: Advertisement[70]

However Chinese people were not the only group targeted for immigration restrictions. At the same time, White racial purity was idealized in particular ways. It "favored the 'Nordics' of northern and western Europe over the 'undesirable races' of eastern and southern Europe."[71] The late nineteenth and early twentieth centuries witnessed a large influx of immigrants from eastern and southern Europe, creating hysteria similar to that on the West Coast pertaining to Chinese immigration.[72] Many feared that the idealized Nordic bloodstream would be diluted and overrun by White Europeans of a lesser stock.[73] Yale

69. David Segal, *Uncle Ben, CEO?*, SLATE, Apr. 20, 2007, http://www.slate.com/articles/arts/culturebox/2007/04/uncle_ben_ceo.html (follow hyperlink to slide show essay).

70. *Id.*

71. Mae M. Ngai, *The Architecture of Race in American Immigration Law: A Reexamination of the Immigration Act of 1924*, 86 J. AM. HIST. 67, 69 (1999).

72. DANIEL J. KEVLES, IN THE NAME OF EUGENICS: GENETICS AND THE USES OF HUMAN HEREDITY 96 (1985).

73. *Id.* at 96–97.

historian Daniel Kevles notes that, with regard to immigration debates in Washington in the 1920s, "[o]n both sides of Capitol Hill biological and racial arguments figured prominently in the floor debate. . . . Congressman Robert Allen, Democrat of West Virginia, declared: 'The primary reason for the restriction of the alien stream . . . is the necessity for purifying and keeping pure the blood of America.'"[74] These discussions led to the passage of the Immigration Act of 1924,[75] which restricted immigration from Eastern Europe.[76] It was signed by President Calvin Coolidge, who previously as vice president said that "America must be kept American. Biological laws show . . . that Nordics deteriorate when mixed with other races."[77]

2. Forced Sterilizations

While most people associate the eugenics movement with the horrors of Nazi Germany, many fail to acknowledge that the world's first eugenics sterilization law was implemented in Indiana in 1907 and that the Nazis looked to American eugenicists for guidance on how to pursue racial hygiene.[78] In fact, forced sterilization laws were extremely popular in the United States. Between 1907 and 1963, more than 60,000 Americans were sterilized against their will pursuant to state laws.[79] The number of state laws and compulsory sterilizations accelerated after the 1927 Supreme Court decision *Buck v. Bell*,[80] where the Court upheld the forced sterilization of an ostensibly feebleminded Carrie Buck because, as Justice Oliver Wendell Holmes famously declared, "[i]t is better for all the world, if instead of waiting to execute degenerate offspring for crime, or to let them starve for their imbecility, society can prevent those who are manifestly unfit from continuing their kind. . . . Three generations of imbeciles are enough."[81]

Although compulsory sterilizations affected many groups, from the disabled to those who were simply poor and without opportunities for self-betterment, biological notions of race, inferiority, and human difference

74. *Id.* at 97.
75. Immigration Act of 1924, 43 Stat. 153 (repealed 1952).
76. KEVLES, *supra* note 72, at 97.
77. *Id.*
78. EDWIN BLACK, WAR AGAINST THE WEAK: EUGENICS AND AMERICA'S CAMPAIGN TO CREATE A MASTER RACE 280 (2003).
79. Hoangmai H. Pham & Barron H. Lerner, *In the Patient's Best Interest? Revisiting Sexual Autonomy and Sterilization of the Developmentally Disabled*, 175 W. J. MED. 280, 280–81 (2001).
80. *Id.* at 280.
81. Buck v. Bell, 274 U.S. 200, 207 (1927).

drove these practices' ideological implementation.[82] The "defects" that these polices sought to eliminate were thought to be heritable through reproduction. But even within the broad range of affected groups, racial minorities disproportionately bore the brunt of these policies. The social and physical defects sought to be eliminated—such as criminality, feeblemindedness, and loose sexual morals—were thought to be disproportionately present among people of color. For example, between 1937 and 1968, federal funds were used to sterilize over 35 percent of women in Puerto Rico who were in their reproductive years.[83] Native American women were similarly targeted for eugenic sterilization as early as the 1930s.[84] Between the early 1970s and early 1980s, the Indian Health Services forcibly sterilized 42 percent of all Native American women of childbearing age.[85] Black people have also been disproportionally targeted. For example, Harriet Washington notes, "When the North Carolina Eugenic Commission sterilized 8,000 mentally retarded persons throughout the 1930s, 5,000 were black."[86] Forced sterilization became so routine in some Southern Black communities that they were commonly referred to as "Mississippi [a]ppendectom[ies]."[87] Therefore, the very biological characteristics that the State sought to reduce were themselves racialized.

82. *See id.*

83. Katharine Karse, *The Politics of Women's Health: Sterilization Abuse*, WOMEN'S HEALTH ACTIVIST (Nat'l Women's Health Network), Jan.–Feb. 1996, *available at* http://www.ourbodiesourselves.org/book/companion.asp?id=31&compID=55. Angela Hooton puts Latina women's experience with forced sterilization in a broader context:

> Thousands of Latinas, specifically Puerto Rican, Dominican and Mexican-American women, suffered from forced or coercive sterilization from the 1950s until the late 1970s. Many of these women were sterilized in public hospitals immediately following childbirth. Evidence indicates that some women were not aware that the procedure was happening or that it would be permanent. For example, one of the most egregious sterilization practices occurred at the Los Angeles County Medical Hospital, where Mexican-origin women were sterilized during or immediately following childbirth, without adequate information or necessary translation.

Angela Hooton, *A Broader Vision of the Reproductive Rights Movement: Fusing Mainstream and Latina Feminism*, 13 AM. U. J. GENDER SOC. POL'Y & L. 59, 70–71 (2005) (internal citations omitted).

84. Lindsay Glauner, Comment, *The Need for Accountability and Reparation: 1830–1976 the Unites States Government's Role in the Promotion, Implementation, and Execution of the Crime of Genocide Against Native Americans*, 51 DEPAUL L. REV. 911, 939 (2002).

85. *Id. See also* Jane Lawrence, *The Indian Health Service and the Sterilization of Native American Women*, 24 AM. INDIAN Q. 400 (2000).

86. HARRIET A. WASHINGTON, MEDICAL APARTHEID: THE DARK HISTORY OF MEDICAL EXPERIMENTATION ON BLACK AMERICANS FROM COLONIAL TIMES TO THE PRESENT 203 (2006).

87. *Id.* at 204.

3. Anti-Miscegenation Laws

Attempts to legally restrict interracial marriage, sex, and reproduction date back to the seventeenth century, with the first anti-miscegenation statute legislated in Maryland in 1661. Virginia followed suit in 1662.[88] While opposition to interracial sex and marriage had some theological influences,[89] notions of biological race and the desire to prevent the degradation of White racial purity were present from the very beginning. For example, a 1691 Virginia statute banished Whites who married interracially with Blacks, American Indians, or those of a mixed race "for [the] prevention of that abominable mixture and spurious issue."[90] Keith E. Sealing notes that up until 1967, when anti-miscegenation laws were held unconstitutional in *Loving v. Virginia*,[91] they were justified by themes resonating back to the colonial times, regardless of their basis in science or religion:

> First, there is a natural hierarchy of all beings in the universe. Second, humans are part of this chain. Third, "race" is a valid concept. Fourth, the races can be ranked hierarchally: Whites are the superior race, Asians/Indians are second, and Blacks last. Fifth, this ranking of the races is immutable. Sixth, miscegenation, the crossing of the races, produces crosses that are inferior to either parent. Seventh, mixed races have lower fertility. Eighth, mixing of the races brings the better down to the level of the lower, rather than improving the lower.[92]

The eugenics movement brought renewed interest in government regulation of reproduction through marriage; "by 1914, some thirty states had enacted new marriage laws or amended old ones."[93] This coincided with the fact that "[*e*]*very* state whose [B]lack population reached or exceeded 5 percent of the total eventually drafted and enacted anti-miscegenation laws."[94] Eugenicists often played a significant role in passing anti-miscegenation laws during this period in that "they were part

88. RACHEL F. MORAN, INTERRACIAL INTIMACY: THE REGULATION OF RACE AND ROMANCE 19 (2001).

89. The scriptural basis for Blacks' state of inferiority and servitude stems from the story of Noah cursing Ham for seeing him naked while drunk. *See Genesis* 9:20–27.

90. A. Leon Higginbotham, Jr. & Barbara K. Kopytoff, *Racial Purity and Interracial Sex in the Law of Colonial and Antebellum Virginia*, 77 GEO. L.J. 1967, 1995 (1989) (quoting Act SVII entitled "An Act for Suppressing Outlying Slaves" from THE STATUTES AT LARGE; BEING A COLLECTION OF ALL THE LAWS OF VIRGINIA, VOL. III, 86–87 (1823)).

91. Loving v. Virginia, 388 U.S. 1 (1967).

92. Keith E. Sealing, *Blood Will Tell: Scientific Racism and the Legal Prohibitions Against Miscegenation*, 5 MICH. J. RACE & L. 559, 560–65 (2000).

93. KEVLES, *supra* note 72, at 99.

94. RANDALL KENNEDY, INTERRACIAL INTIMACIES: SEX, MARRIAGE, IDENTITY, AND ADOPTION 219 (2003).

of a coalition that put the laws on the books, and they provided prior (or, at times, post hoc) biological rationalizations for what other interest groups wanted."[95]

C. CONCEPTIONS OF RACE AFTER WORLD WAR II

It is largely believed that biological understandings of race completely disappeared after the end of World War II in 1945, as the consequences of eugenic policies' most horrific implementation—the Holocaust—were fully revealed to the world. However, certain eugenic practices, such as state-level forced sterilization, did not end until the 1970s.[96] The 1950 United Nations Educational, Scientific and Cultural Organization ("UNESCO") Statement on Race is often referenced as the proverbial obituary for biological race. In this document, a group of esteemed scientists declared:

> The biological fact of race and the myth of "race" should be distinguished. For all practical purposes "race" is not so much a biological phenomenon as a social myth. The myth of "race" has created an enormous amount of human and social damage. . . . It still prevents the normal development of millions of human beings and deprives civilization of the effective co-operation of productive minds. The biological differences between ethnic groups should be disregarded from the standpoint of social acceptance and social action.[97]

Not all scientists agreed with this bold statement about the biological irrelevance of race,[98] and that pushback was incorporated into subsequent UNESCO statements.[99] Nevertheless, the scientific community's overall sentiment at the time was that the old, crude biological understanding of race was no longer accepted. Or, as the *New York Times* proclaimed when

95. KEVLES, *supra* note 72, at 100.

96. For example, North Carolina continued its forced sterilization program until the 1974. *NC Justice for Sterilization Victims Foundation*, N.C. DEP'T ADMIN., http://www.sterilizationvictims.nc.gov (last visited Dec. 2, 2012).

97. Statement by Experts on Race Problems, UNESCO Doc. SS/1, at 3–4 (July 20, 1950), *available at* http://unesdoc.unesco.org/images/0012/001269/126969eb.pdf.

98. JENNY REARDON, RACE TO THE FINISH: IDENTITY AND GOVERNANCE IN AN AGE OF GENOMICS 29 (2005).

99. *Id.* at 30–31. Reardon writes:

> Following its publication on 18 July 1950, the First UNESCO Statement on Race received heavy criticism, especially from physical anthropologists and geneticists. For many of these scientists, the critical problem with the First UNESCO Statement was that while it advocated giving scientists a greater role in defining race in society, ironically it limited their ability to define race in their own research.

Id. at 29 (internal citations omitted).

reporting on the UNESCO statement's release in 1950: "No Scientific Basis for Race Bias Found by World Panel of Experts."[100]

In addition to marking the end of the widespread recognition of biological race, the UNESCO statement is also seen as the moment where the social-constructionist view on race became widely accepted. This perspective views race as a social, political, and legal fabrication rather than a fixed biological fact. While scholars such as Franz Boas argued against biological race decades before the end of World War II,[101] many people point to the UNESCO Statement and its surrounding discourse as the intellectual tipping point whereby social constructionism became the dominant perspective. For example, in his history of scientific racism, Elazar Barkan, a professor of international and public affairs at Columbia University, writes that with the 1950s UNESCO Statement, "[t]he reversal in the scientific credo on [biological] race since the early 1920s had been completed."[102]

During this postwar period, most scientists stopped talking about races in favor of populations. Population genetics is widely interpreted as representing a crucial scientific turn away from examining qualitative or typological categories of difference and toward measuring quantitative differences in the distribution and frequency of genetic variations among and between certain groups.[103] Rather than focusing on categorizing people by phenotype, population genetics is thought to have put scientific racism in the past by focusing its attention on the genotypes of various populations.[104] But, a number of scholars question this interpretation. Instead of marking a clear move in an anti-racist direction,[105] they argue

100. *No Scientific Basis for Race Bias Found by World Panel of Experts*, N.Y. TIMES, July 18, 1950, at 1.

101. *See* REARDON, *supra* note 98, at 90.

102. ELAZAR BARKAN, THE RETREAT OF SCIENTIFIC RACISM: CHANGING CONCEPTS OF RACE IN BRITAIN AND THE UNITED STATES BETWEEN THE WORLD WARS 341 (1992).

103. REARDON, *supra* note 98, at 32–33. "[H]istorians of race and science draw upon five dichotomies to distinguish an ideological typological approach from a scientifically sound population approach: race/population; race/culture; classificatory/empirical; history/natural selection; phenotype/genotype." *Id.* at 33.

104. *Id.*

105. In describing the anti-racism that is often presumed to have been ushered in with a population focus, Lisa Gannett, Associate Professor of Philosophy at Saint Mary's University, writes:

> "Population thinkers" are considered to be averse to the imposition of artificial and arbitrary "typologies" on heterogeneous biological nature. For this reason, they are supposed to be open to recognizing the . . . empirical evidence that genetic variability is distributed statistically across the species, and thus the invalidation of classification schemes that attempt to categorize each and every human being as belonging to a discrete racial kind or "type" that is homogeneous for certain characteristics. "Population thinkers" appreciate that

that the shift in the life sciences from "race" to "population" is ambiguous and that typological approaches to human difference continue to influence population approaches to race and genetics.[106] As University of California, Santa Cruz, sociologist Jenny Reardon concludes in her historical account of this period and its reverberating effects on modern race and genetics research agendas:

> [N]o consensus about the role of race in studying human origins and diversity emerged following World War II. Physical anthropologists and geneticists did not all agree—contrary to prevalent historical opinion—that race had no biological meaning, and should be replaced by a study of populations. Not even did all agree that typologies had no use in science. Rather, most sought to redefine scientific ideas and practices for studying race (including typologies) in the wake of what many perceived as the abuse of these ideas and practices by eugenicists, segregationists, and the Nazis.[107]

This lack of actual agreement in the life sciences concerning the biological significance of race (in the face of assumed consensus in virtually all other fields) sets the stage for understanding its continuing significance in the twenty-first century. The point is not to frame the post-World War II period as an overly broad dichotomy between public articulations that race is biologically insignificant and ongoing research specifically premised on the idea that race reflects inherent and heritable differences. Rather, it is simply to note that the standard narrative that biological race disappeared after World War II is at best incomplete and, at worst, deceptive in that it can obscure connections between past and present racial typologies in science. In particular, this dichotomy highlights the perfidious relationship between race and science in contemporary research and why continued discussion and oversight of this issue is needed. With this understanding of biological race and its contested intellectual history, we can now examine new developments in race and genetics to think through their points of convergence and divergence with past discussions on biological race.

> two individuals from different groups can be genetically more similar than two individuals from the same group because of the extent to which allele frequency distributions in populations are overlapping.

Lisa Gannett, *Racism and Human Genome Diversity Research: The Ethical Limits of "Population Thinking"*, 68 PHIL. SCI. S479, S489 (2001).

106. *Id.* at S488–89 (internal citation omitted).

107. REARDON, *supra* note 98, at 42.

III. BIOLOGICAL RACE IN THE TWENTY-FIRST CENTURY

Developments in human biotechnology across the past decade have renewed claims that social categories of race reflect inherent biological differences that explain disparities in social and health outcomes. This Section assesses three of these new technologies: race-based medicine, genetic ancestry tests, and certain aspects of DNA forensics. While each of these applications developed separately, they are united by a shared effort that reinvigorates the racial typologies thought to be dismissed in the 1950s: that racial differences are real, meaningful, and measureable at the molecular level. This Section examines the claims made by each technology, their supporting science, and the concerns raised in order to better understand the potential risks and benefits associated with rearticulating biological race in these new terms.

A. RACE-BASED MEDICINE

1. Claims Made

Race-based medicine hit the scene in 2005, when BiDil became the first drug to receive FDA approval to treat a specific racial group: African Americans suffering from congestive heart failure.[108] Congestive heart failure affects the heart's ability to efficiently pump blood throughout the body and is caused largely by deteriorating heart muscle.[109] Although millions of Americans suffer from this condition,[110] BiDil's FDA approval was largely driven by data demonstrating that Blacks are twice as likely to suffer from heart failure as Whites.[111] NitroMed,[112] the company that originally developed BiDil, used this claim throughout the regulatory process to imply that biological mechanisms led Blacks to have a different experience with the disease and to justify the unprecedented regulatory move to label this new drug for a specific race.[113]

108. Jonathan Kahn, *Race in a Bottle*, SCI. AM., Aug. 2007, at 40 [hereinafter Kahn, *Race in a Bottle*].

109. *Id.*

110. "[A]n estimated 5,700,000 Americans ≥20 years of age have [heart failure]." Véronique L. Roger et al., *Heart Disease and Stroke Statistics—2012 Update: A Report Filed From the American Heart Association*, CIRCULATION, Jan. 3/10, 2012, at e2, e102, *available at* http://circ.ahajournals.org/content/125/1/e2.

111. Jonathan Kahn, *Getting the Numbers Right: Statistical Mischief and Racial Profiling in Heart Failure Research*, 46 PERSP. BIOL. & MED. 472, 474 (2003) [hereinafter Kahn, *Getting the Numbers Right*].

112. Deerfield Capital acquired NitroMed, a Massachusetts-based biotechnology firm, in 2009 for approximately $36 million. *Deerfield Wins NitroMed with Sweetened Offer*, DEALBOOK, Feb. 2, 2009, http://dealbook.nytimes.com/2009/02/02/deerfield-wins-nitromed-with-sweetened-offer.

113. Kahn, *Race in a Bottle*, *supra* note 108, at 44.

The story behind BiDil's clinical development is important for understanding how and when this groundbreaking claim of race specificity became relevant. BiDil combines two standard therapies to treat heart failure—hydralazine and isosorbide dinitrate—into one pill.[114] These generics have been used for decades across all races to treat heart failure.[115] BiDil began with two clinical trials in the 1980s: V-HeFT I and V-HeFT II.[116] The V-HeFT I trial lasted from 1980 to 1985 and found that patients who received the hydralazine/isosorbide dinitrate ("H/I") combination therapy had lower mortality outcomes.[117] V-HeFT II, lasting from 1986 to 1989, compared this same combination therapy to an ACE inhibitor[118] called enalapril. The trial showed that H/I was more effective.[119] However, it is important to keep in mind that "[t]he V-HeFT investigators did not build the trials around race or ethnicity. They enrolled both Black and White patients and in the published reports of the trials' successes, they did not break down the data by race. Rather, they presented H/I (the BiDil drugs) as generally efficacious in the population at large, without regard to race."[120]

In 1989 Dr. Jay Cohn, who led the two V-HeFT studies, received a patent on the method of administering the H/I combination therapy to treat heart failure, without reference to race.[121] Cohn then licensed the drug to Medco Research, a biotechnology company that then manufactured the components into one pill that became BiDil.[122] The FDA rejected BiDil's approval in 1997, noting problems with the statistical design of the V-

114. *Id.* at 40.

115. *Id.*

116. *Id.* at 41.

117. Jay N. Cohn et al., *Effect of Vasodilator Therapy on Mortality in Chronic Congestive Heart Failure*, 314 NEW ENG. J. MED. 1547, 1551 (1986).

118. Commonly called "ACE inhibitors," angiotensin-converting enzyme inhibitors "help relax blood vessels" and are used to "treat a variety of conditions," including heart failure. *Angiotensin-Converting Enzyme (ACE) Inhibitors*, MAYO CLINIC, http://www.mayoclinic.com/health/ace-inhibitors/HI00060 (last updated Dec. 16, 2010).

119. Jay Cohn et al., *A Comparison of Enalapril with Hydralazine-Isosorbide Dinitrate in the Treatment of Chronic Congestive Heart Failure*, 325 NEW ENG. J. MED. 303, 307 (1991).

120. Jonathan Kahn, *From Disparity to Difference: How Race-Specific Medicines May Undermine Policies to Address Inequalities in Health Care*, 15 S. CAL. INTERDISC. L.J. 105, 109 (2005) [hereinafter Kahn, *From Disparity to Difference*].

121. *See* Kahn, *Race in a Bottle*, *supra* note 108, at 42.

122. *Id.* For a more detailed description of these events, see Jonathan Kahn, *How a Drug Becomes "Ethnic": Law, Commerce, and the Production of Racial Categories in Medicine*, 4 YALE J. HEALTH POL'Y L. ETHICS 1 (2004).

HeFT trials.[123] Cohn then went back to the V-HeFT data and found that African Americans gained a particular benefit from the combination therapy.[124] He then filed for and was granted a patent identical to the first one, except that the use was now for African Americans suffering from heart failure, which had the financial and commercial benefit of extending his patent rights an additional thirteen years.[125] Cohn licensed BiDil to NitroMed, who conducted a clinical trial—the African American Heart Failure Trial ("A-HeFT")—to test BiDil's race-specific benefit.[126] The A-HeFT trial only included participants that self-identified as African American.[127] The trial yielded data demonstrating a 43 percent reduction in mortality, leading the FDA to approve a race-specific indication for use by Blacks with heart failure.[128]

BiDil's clinical trial design, results, and subsequent FDA approval supports at least three different claims about the biological significance of race in relation to racial disparities in disease progression and health outcomes. Because BiDil is the first drug to be (1) patented as race-specific, (2) approved by the FDA as race-specific, and (3) marketed as race-specific, it has come to reflect the legal, regulatory, and economic sanctioning of race as a biologically significant category of human difference that meaningfully affects human health. Through this framing, social categories of race appear to be significant markers for otherwise hard-to-detect biological differences in human populations. Neither Cohn nor any of his collaborators have been able to identify the biological markers responsible for Blacks' receptiveness to BiDil.[129] But this lack of specificity seemed to be of little consequence for regulators, who embraced the typological sensibilities embedded in biological understandings of race. They assumed that self-identified race mirrored some underlying "real" biological difference that shapes health disparities and drug reaction.[130] For example, the chair of the FDA Cardiovascular and Renal Drugs Advisory

123. Kahn, *Race in a Bottle*, *supra* note 108, at 42 (noting that the trials were "designed not to meet the regulatory standards for FDA approval but to test the hypothesis that vasodilators could treat heart failure").

124. *Id.*

125. *Id.* at 42–43.

126. *Id.* at 42.

127. *Id.*

128. *Id.*

129. In fact, Cohn has said that he prescribes BiDil to some of his White patients, noting, "I actually think everybody should be using it." Denise Gellene, *Heart Pill Intended Only For Blacks Sparks Debate*, L.A. TIMES, June 16, 2005, http://articles.latimes.com/2005/jun/16/business/fi-bidil16.

130. *BiDil African-American Subset is Surrogate for Genomics, Cmte Chair Says*, 67 THE PINK SHEET 3, 3 (2005).

Committee, which endorsed BiDil's approval, noted that the committee treated self-identified race in the A-HeFT trial as "a surrogate for genomic based medicine,"[131] although no genetic data was presented to the committee.[132]

2. The Science Behind Race-Based Medicine

Although BiDil's clinical trials did not identify the genetic variations that produce racial disparities in heart failure mortality or those that lead BiDil to work better in Black populations, the drug was nonetheless heralded as the first in a long line of ostensibly forthcoming personalized medicines.[133] Truly personalized medicines are the province of the emerging field of pharmacogenomics, which studies how individual genetic variations might affect persons with a particular genetic makeup.[134] Individuals' genetic sequences contain strings of nucleic acids (Adenine, Thymine, Cytosine, and Guanine) that may be similar for several hundred bases.[135] They will differ at about one in every 1200 bases;[136] one person might have, for example, Thymine at a particular location instead of Cytosine. These genetic variations are known as alleles, and an individual's collection of alleles or genetic variations make up their genotype.[137] Understanding the location and effects of these genetic variations is important because they can affect drug toxicity, predict the efficacy of certain therapies, and identify useful drug targets.[138]

Patient-specific treatments have not developed as quickly as researchers and academics anticipated. It is in this context that researchers have tried to develop genetically tailored medications at a further level of

131. *Id.*

132. *See id.*

133. For example, the *New York Times* began their story about the FDA's approval of BiDil by noting, "The Food and Drug Administration took a controversial step toward a new frontier of personalized medicine yesterday, approving the first drug ever intended for one racial group, African-Americans." Stephanie Saul, *F.D.A. Approves a Heart Drug for African-Americans*, N.Y. TIMES, June 24, 2005, at C2.

134. William E. Evans & Mary V. Relling, *Moving Towards Individualized Medicine With Pharmacogenomics*, 429 NATURE 464 (2004).

135. *See The New Genetics: Chapter 1: How Genes Work*, NAT'L INST. GEN. MED.SCI., http://publications.nigms.nih.gov/thenewgenetics/chapter1.html (last reviewed June 9, 2011).

136. *What Is The HapMap?*, INTERNATIONAL HAPMAP PROJECT, http://hapmap.ncbi.nlm.nih.gov/whatishapmap.html.

137. *See Genotype: Talking Glossary of Genetic Terms*, GENOME.GOV, https://www.genome.gov/Glossary/index.cfm?id=93 (last visited Dec. 2, 2012).

138. "One of the most promising areas of genomic medicine is the ability to match an individual's genetic profile to the likely effect of particular drugs." Kathy L. Hudson, *Genomics, Health Care, and Society*, 365 NEW ENG. J. MED. 1033, 1036 (2011).

abstraction to target specific populations instead of individuals.[139] Population geneticists' ability to identify the sets of alleles that tend to be inherited together in specific groups identifiable by social categories of race is merging with pharmacogenomicists' interest in determining the alleles that affect drug efficacy and response. This gives biomedicine the presumed ability to use race as a proxy for population-specific variants that might identify which groups respond best to certain medications or genetic interventions.

3. Risks and Benefits of Race-Based Medicines

Racial disparities in health are real and persistent.[140] As such, race-based medicine provides one potential avenue to resolve these disparities when other efforts simply are not able to address the problem. This partly explains why many groups claiming to represent the African American community were excited by BiDil's FDA approval, including the NAACP and the Association of Black Cardiologists.[141]

But with such strong claims about the biological significance of race, it is important to look closely at BiDil as a case study on the questionable premises underlying race-based medicine. First, the moral impetus justifying a race-specific approach to resolving heart failure—the commonly cited 2:1 disparity in heart failure outcomes between Blacks and Whites—is simply inaccurate. For example, NitroMed announced in a 2001 press release that it had received a letter from the FDA affirming BiDil's ability to be approved as a new race-specific drug.[142] The release said that "death rates from heart failure are more than twice as high in black patients than in white patients" and speculated that this disparity may be caused by "a pathophysiology found primarily in black patients that may involve nitric oxide (NO) insufficiency."[143] This disparity, and NitroMed's speculation concerning its biological underpinnings, were then repeated in various media outlets.[144]

139. *See, e.g.*, Esteban Burchard et al., *The Importance of Race and Ethnic Background in Biomedical Research and Clinical Practice*, 348 NEW ENG. J. MED. 1170 (2003).

140. *See Addressing Racial and Ethnic Disparities in Health Care Fact Sheet*, U.S. DEP'T FOR HEALTH & HUM. SERVS. AGENCY FOR HEALTHCARE RES. & QUALITY, http://www.ahrq.gov/research/disparit.htm (last visited Dec. 2, 2012).

141. Juan Cofield, President of the New England Area NAACP chapter, has publically stated "I would like to see the name BiDil as common in our community as Viagra is in the general public." Dan Devine, *NAACP Goes to the Grassroots for BiDil*, BAY ST. BANNER (Oct. 5, 2006), http://www.baystate-banner.com/archives/stories/2006/10/100506-07.htm.

142. Kahn, *Getting the Numbers Right*, *supra* note 111, at 474.

143. *Id.* (quoting the 2001 NitroMed press release).

144. *Id.* at 475 (surveying various publications that had reprinted the 2:1 ratio).

But, a closer look at the data suggests that there is no significant racial disparity in heart failure outcomes. In fact, the 2:1 number comes from a string of misquotes referencing decades-old data.[145] In 1998 the CDC placed the ratio at 1.1:1, which essentially means that there is no racial difference in outcomes.[146] NitroMed later revised its claim to say, "The African-American community is affected at a greater rate by heart failure than that of the corresponding Caucasian population. African Americans between the ages of 45 and 64 are 2.5 times more likely to die from heart failure than Caucasians in the same age range."[147] Though this is accurate, "[t]he age group 45 to 64 only accounts for about 6% of heart failure mortality, and for those over 65, the statistical differences between 'African Americans and Caucasians' nearly completely disappear."[148] These findings significantly undermine the moral justification for a race-specific approach.

Second, the design of the A-HeFT clinical trial used to demonstrate BiDil's race specific impact was flawed. By only enrolling patients that self-identified as African American without any comparison group, the clinical trial, by definition, cannot speak to whether the drug works better in one group than another. As law professor Jonathan Kahn notes, "[t]he only responsible scientific claim that can be made on the basis of these trials is that BiDil works in some people who have heart failure, period."[149] The FDA has vigorously defended its decision to approve BiDil's race-specific labeling and the evidence from A-HeFT used to justify this decision.[150] Scientists for the FDA said that conducting a separate trial to specifically compare outcomes between Blacks and Whites "would have required years of work, many thousands of patients, and wholly unreasonable delay in approval of a treatment whose effectiveness had

145. *Id.* at 475–78.

146. *Changes in Mortality from Heart Failure—United States, 1980–1995,* MMWR, Aug. 7, 1998, at 633-37. *See also* Kahn, *Getting the Numbers Right*, *supra* note 111, at 473–74.

147. Press Release, NitroMed, Inc., BiDil(R) Named to American Heart Association's 2004 'Top 10 Advances' List (Jan. 11, 2005), *available at* http://www.prnewswire.com/news-releases/bidilr-named-to-american-heart-associations-2004-top-10-advances-list-54001632.html.

148. Troy Duster, *Race and Reification in Science*, 307 SCIENCE 1050, 1050 (2005).

149. Kahn, *From Disparity to Difference*, *supra* note 120, at 106.

150. Two FDA scientists, Robert Temple and Norman Stockbridge, wrote in the *Annals of Internal Medicine*:

> Approval of BiDil was not based on a single trial where all data came from the black patient population, as has been suggested. The FDA's encouragement of A-HeFT, a single-population trial, arose from recognition that a larger study of black and white patients was not likely to yield any additional useful information.

Robert Temple & Norman L. Stockbridge, *BiDil for Heart Failure in Black Patients: The U.S. Food and Drug Administration Perspective*, 146 ANNALS INTERNAL MED. 57, 58 (2007).

been well-documented in the group for which it was intended."[151] However, this defense only further highlights the FDA's assumptions regarding the biological significance of race when such drug approval determinations should be based on stronger and more direct evidence.

Third, the assumption that social categories of race can be used as a proxy for significant genetic variation at the population level is flawed. The connection between social categories of race and population differences is unfounded. There are certainly genetic differences between population groups as a result of various dynamics (such as migration and reproduction) that may lead certain markers to appear more often in particular groups. But it is a large leap to suggest that these population dynamics meaningfully align with social categories of race, especially when the meaning and salience of these categories stem from social, political, and economic factors. Francis Collins, former director of the National Institutes of Health, argues:

> "Race" and "ethnicity" are poorly defined terms that serve as flawed surrogates for multiple environmental and genetic factors in disease causation, including ancestral geographic origins, socioeconomic status, education and access to health care. Research must move beyond these weak and imperfect proxy relationships to define the more proximate factors that influence health.[152]

The concerns associated with BiDil's FDA approval highlight three broader issues raised by race-based medicines that may belie the effort to reduce health disparities. First, the emphasis placed on reducing health disparities through genetic interventions can obscure known social determinants of health outcomes. A substantial body of evidence has shown that "[f]actors such as income and education, and how they play out in housing and neighborhood, directly exert a powerful influence on health disparities in the United States—potentially as powerful as medical care or genetics."[153] High profile cases such as BiDil draw substantial attention and many dollars toward speculating about the possible genetic causes of health disparities when those resources could be better allocated to address known social factors that can be improved to reduce gaps in health outcomes.

151. *Id.* at 57.

152. Francis S Collins, *What We Do and Don't Know About 'Race,' 'Ethnicity,' Genetics and Health at the Dawn of the Genomic Era*, 36 NATURE GENETICS SUPP. S13, S13 (2004).

153. ROBERT WOOD JOHNSON FOUND., OVERCOMING OBSTACLES TO HEALTH: STORIES, FACTS AND FINDINGS 3 (2008), *available at* http://www.commissiononhealth.org/PDF/ObstaclesToHealth-Highlights.pdf.

This leads to the second concern that continued speculation concerning the biological roots of racial disparities in health may shift responsibility for remediation from sustained public health initiatives to private biomedical ventures. As demonstrated by BiDil's transformation from a race-neutral to a race-specific drug, commercial incentives can lead to premature and unsubstantiated articulations of biological race, which go against the public interest. Third, weak claims about the biological relevance of racial disparities in health can prematurely legitimize biological explanations of racial disparities in other areas such as aptitude and criminality, which ultimately disserve minority communities.

B. GENETIC ANCESTRY TESTS

1. Claims Made

Genetic ancestry tests are part of a growing field of what some academics have called "recreational genetics," where individuals use direct-to-consumer genetic tests to learn about their genetic predispositions without direct interactions with medical professionals.[154] Some of these tests are health-related, but a growing number are recreational in the most literal sense. For example, Atlas Sports Genetics offers a test that allows parents to determine the sports in which their child might be genetically predisposed to excel.[155] Genetic ancestry tests have developed within this burgeoning market to give individuals a better sense of their racial and ethnic heritage.[156] Companies that provide this service have amassed databases containing genetic information from indigenous populations around the globe and compare individuals' genetic markers to these reference populations in order to find similarities that suggest an ancestral link.[157]

Genetic ancestry companies often make fantastic claims about their ability to precisely link consumers' genes to past ancestors in a manner that provides robust insight into their identity and heritage.[158] These claims

154. Deborah A. Bolnick et al., *The Science and Business of Genetic Ancestry Testing*, 318 SCI. 399, 399 (2007).

155. Juliet Macur, *Born to Run? Little Ones Get Tested for Sports Gene*, N.Y. TIMES, Nov. 30, 2008, http://www.nytimes.com/2008/11/30/sports/30genetics.html. This test "is done by swabbing the inside of the child's cheek to obtain a DNA sample that is then returned to a lab for analysis for ACTN3, one of the more than 20,000 genes that make up the human genome. A 2003 study linked ACNT3 to athletic performance." *Id. See also What is ACTN Sports Gene?*, ATLAS SPORTS GENETICS, http://www.atlasgene.com (last visited Dec. 2, 2012).

156. Bolnick et al., *supra* note 154, at 399.

157. *Id.*

158. *E.g.*, *The Story Behind Your Y-DNA (Male Ancestry)*, DNA WORLDWIDE,

have led nearly half-a-million people to purchase these tests since 2002.[159] Moreover, these tests have been used for a variety of purposes beyond pure recreation. For example, individuals who otherwise identify as White have used these tests to show that they have some meaningful amount of shared genetic ancestry with a minority group in order to increase their chances of being admitted to a university under an affirmative action program or to be eligible for financial aid intended for minority students.[160] Individuals have also claimed to be Native American so that they can partake in various benefits and opportunities reserved for established Native tribes.[161] Indeed, several companies market specifically to Native Americans.[162]

African Americans are also targeted by genetic ancestry companies. Given that many African Americans cannot trace their ancestry back more than a few generations due to the slave trade, ancestry testing is seen as a way to surpass history's roadblocks to give Black Americans a sense of their ancestral linkage to the African continent.[163] This can have a tremendous impact on Blacks' sense of identity.[164]

http://www.dna-worldwide.com/ancestry-testing/male-ancestry/male-dna-story (last visited Dec. 2, 2012) (claiming that "Your Y-chromosome made you the man you are today. Quite literally. It contains the genetic switch that sent you down the path of turning you into a baby boy. But before it reached you, your Y-chromosome had been on an incredible journey").

159. Troy Duster, *Ancestry Testing and DNA: Uses, Limits, and Caveat Emptor*, *in* RACE AND THE GENETIC REVOLUTION: SCIENCE, MYTH, AND CULTURE 99, 99 (Sheldon Krimsky & Kathleen Sloan eds., 2011).

160. Amy Harmon, *Seeking Ancestry in DNA Ties Uncovered by Tests*, N.Y. TIMES, Apr. 12, 2006, http://www.nytimes.com/2006/04/12/us/12genes.html.

161. Kim TallBear & Deborah A. Bolnick, *Native American DNA Tests: What Are the Risks to Tribes?*, NATIVE VOICE, Dec. 3–7, 2004, at D2.

162. Genelex, a company that offers genetic ancestry tests, ran this advertisement in *Indian Country Today*, a newsmagazine for Native Americans:

> Do you need to confirm that you are of Native American descent? Recent advances in genetic ancestry testing have put the answer to this question at your fingertips. Whether your goal is to assist in validating your eligibility for government entitlements such as Native American Rights or just to satisfy your curiosity, our Ancestry DNA test is the only scientifically rigorous method available for this purpose in existence today.

Kimberly TallBear, *Native-American-DNA.com*, *in* REVISING RACE IN A GENOMIC AGE 235, 243 (Barbra A. Koenig, Sandra Soo-Jin Lee & Sarah S. Richardson eds., 2008).

163. Bolnick et al., *supra* note 154, at 399.

164. In the PBS special *African-American Lives*, the results of ancestry tests were revealed to several Black celebrities. When told that these tests could tell her about her heritage, Whoopi Goldberg exclaimed, "It's possible to find out what I am and who I am and what part? Oh my goodness!" The results, however, are not always positive. When Oprah Winfrey's results showed that she was not Zulu, as she has previously believed, she was visibly disappointed. *African-American Lives* (PBS television broadcast Feb. 2006).

2. The Science Behind Genetic Ancestry Tests

Genetic ancestry testing can be understood as the commercial iteration of scholarly research in population genetics, a field that examines how evolutionary forces, such as migration and reproduction, shape the distribution and frequency of various genes within particular populations.[165] Over time, these evolutionary dynamics can lead certain markers to become strongly associated with the group itself.[166] This uneven distribution of genetic markers can provide clues to their geographic origins, which can then point to the most closely associated population.[167] Several large scale attempts, including the International HapMap Project[168] and the Human Genome Diversity Project,[169] have tried to map the genetic variations most closely linked to global human populations in a manner that ultimately gives greater biological coherence to social categories of race.

An increasing amount of research is beginning to demonstrate connections between population differences and racial groupings. Esteban Burchard and his colleagues note, "Studies in population genetics have revealed great genetic variation within racial or ethnic subpopulations, but also substantial variation among the five major racial groups."[170] This has been demonstrated in at least three types of studies. First, population geneticists studying global indigenous groups have created ancestral tree diagrams "showing that the human population has major branches corresponding to the major racial groups, with sub-branches within each racial group associated with indigenous groups."[171] Second, researchers have used cluster analyses that look for patterns of similarity between population groups that "have . . . consistently resulted in the delineation of

165. *See* L.L. Cavalli-Sforza et al., *Call for a Worldwide Survey of Human Genetic Diversity: A Vanishing Opportunity for the Human Genome Project*, 11 GENOMICS 490, 490 (1991).

166. *See id.*

167. *Id.*

168. The goal of the International HapMap Project is to "determine the common patterns of DNA sequence variation in the human genome and to make this information freely available in the public domain." Int'l HapMap Consortium, *The International HapMap Project*, 426 NATURE 789, 789 (2003).

169. In his article outlining the origins and development of the Human Genome Diversity Project, Cavalli-Sforza explains that the "Human Genome Diversity Project (HGDP) provides a resource that is aimed at promoting worldwide research on human genetic diversity, with the ultimate goal of understanding how and when patterns of diversity were formed." L. Luca Cavalli-Sforza, *The Human Genome Diversity Project: Past, Present and Future*, 6 NAT. REV. GENETICS 333, 333 (2005). Cavalli-Sforza also notes that the HGPD "has the added benefit of providing information that is likely to prove useful to several areas of biomedical research." *Id.*

170. Esteban González Burchard et al., *The Importance of Race and Ethnic Background in Biomedical Research and Clinical Practice*, 348 NEW ENG. J. MED. 1170, 1172 (2003). These five major groups include "African American, White, Asian, native Hawaiian or other Pacific Islanders, and American Indian or Alaska native." *Id.*

171. *Id.*

major genetic clusters that are associated with racial categories."[172] Third, studies that look at the distribution of genetic variations across racial groups have been able to identify variants that are more likely to be race-specific.[173] As a whole, these three groups of studies provide the scholarly architecture to frame some population geneticists' assertion that social categories of race are meaningful and observable at the molecular level.

Working from these insights, genetic ancestry companies typically use three types of techniques to deduce individuals' ancestry. First, mitochondrial DNA ("mtDNA") tests focus on the DNA passed specifically from mother to child to test maternal links.[174] Second, Y-chromosome tests determine paternal ancestry by examining markers passed from father to son.[175] Last, admixture tests look at markers on non-sex chromosomes containing DNA contributions from both parents to provide percentages of a person's ancestry from each of the five main continental groups.[176]

With mtDNA and Y-chromosome testing, companies can determine consumers' ancestry by comparing the individuals' haplotypes (a set of associated variations) to the haplotypes from samples taken from groups indigenous to a particular geographic location.[177] This method is useful for determining whether any two people are related. In the ancestry-testing context, however, it is used to link individuals to certain populations in order to estimate the geographic origins of their genetic makeup.[178] In contrast, admixture mapping looks at 175 autosomal markers, which are genetic variants thought to be closely related to particular continental populations.[179] The genetic variants chosen to identify individual ancestry,

172. *Id.*

173. *Id.* Burchard and his co-authors explain:

> Allele[s] with a frequency of 20 percent or greater in one racial group, the odds are in favor of seeing the same variant in another racial group. However, variants with a frequency below that level are more likely to be race-specific. This race-specificity of variants is particularly common among Africans, who display greater genetic variability than other racial groups and have a larger number of low-frequency alleles. These results indicate that the frequency of variant alleles underlying disease or normal phenotypes can vary substantially among racial groups, leading to differences in the frequency of the phenotypes themselves.

Id. (citation omitted).

174. Bolnick et al., *supra* note 154, at 399.

175. *Id.*

176. *Id.*

177. *Id.*

178. *Id.*

179. *Id.*

known as Ancestry Informative Markers ("AIM"),[180] are "those that have the most uniqueness, or the largest differences in allele frequency among populations."[181] For example, a company's database of genetic samples from populations across the globe might show that an individual shares markers with groups from East Asia but not Europe, leading to test results that suggest the individual has Asian ancestry. Admixture tests focus on the relatively few genetic markers that are seemingly connected to specific populations and are thought to provide a better overall sense of a person's ancestry.[182]

3. Risks and Benefits of Genetic Ancestry Testing

Genetic ancestry tests have the potential benefit of giving individuals a better sense of their ancestry and racial heritage, which can be quite fulfilling for people who feel disconnected from a larger community. However, these technologies' scientific limitations, along with the often questionable marketing claims made to consumers, suggest that these tests risk reinventing biological race in new but no less problematic terms. For example, while genetic ancestry testing companies often resist using the word "race" in favor of terms such as "biogeographical ancestry," it is not uncommon for users to consider these products to be tests of racial purity and mixture.[183]

Concerns about genetic ancestry tests start with the often unnoticed gap or logical leap between scholarly conversations about population-wide genetic differences and the ability of tests to meaningfully reveal individuals' ancestral origins. The genetic boundaries that may appear to mark population differences are not clear-cut, making the interpretation of individual ancestry even more problematic. Anthropologist Deborah Bolnick notes that although ancestry tests "emphasize[] the *individual* as the crucial unit of analysis, individual ancestry inference is closely tied to our understanding of human *groups* and the distribution of genetic variation among them."[184] This broad concern shapes the critique of particular techniques used to determine individual ancestry. Mitochondrial

180. *Id.* at 400.

181. ANTHONY FRUDAKIS, MOLECULAR PHOTOFITTING 44 (2008).

182. *See* Bolnick et al., *supra* note 154, at 399.

183. *See, e.g.*, U.S. Patent Application No. 10/644,594, at 233 (filed Nov. 18, 2004) (using the term "biogeographical ancestry" in a patent application for an admixture test).

184. Bolnick et al., *supra* note 154, at 399. The authors also point out that it is impossible to link an individual's DNA to that of a larger group "unless one first distinguishes groups that differ genetically in some way. Thus, even such individually oriented genetic research has implications for our understanding of race and the pattern of human biological diversity." *Id.*

and Y-chromosome testing examine only a very small portion of an individual's genome—a thin slice of the diverse genetic contributions that we receive from our parents, grandparents, great-grandparents, and so forth.[185] For example, if an individual goes back nine generations, there are 512 great-great-great-great-great-great-great-great-grandparents who are each equally influential to that person's genetic makeup. However, mitochondrial and Y-chromosome testing, taken together, can only provide information for two of these individuals: the strain of genetic information passed on from mother to child and the strain that is passed on from father to son along the Y-chromosome. This information travels unchanged throughout generations (mother, maternal grandmother, maternal great-grandmother, etc. and father, paternal grandfather, and paternal great-grandfather, etc.) and only represents information for two ancestors even though the number of overall ancestors contributing to a person's genome doubles each generation.[186] If each of an individual's ancestors contributes equally to his or her genetic make-up, why emphasize the information gleaned from only two of them through mitochondrial and Y-chromosome testing? In the example where we go back nine generations with 512 individuals contributing to a person's genetic makeup, what about the other 510 people? Although genetic ancestry companies market their mitochondrial and Y-chromosome tests as being able to tell individuals something definitive about their race or ancestry, they are only able to examine less than 1 percent of a person's genetic background.[187] Thus, the strength of the assertions made by the genetic ancestry companies often does not acknowledge these significant limitations.

Admixture testing is thought to resolve these problems because it looks at genetic markers that are influenced by both parents, providing a blend of information that goes beyond that available through mitochondrial and Y-chromosome testing.[188] But admixture testing discusses ancestry in terms of percentages; for example, reporting that someone is 85 percent European and 15 percent African.[189] This presumes that racial purity existed at some prior point in a manner that mirrors the long-discredited polygenesis theory. This can mislead individuals into thinking that biologically distinct racial groups are real and that social categories of race

185. *Id.*
186. *See id.*
187. *Id.*
188. *See id.*
189. *Id.* at 400.

have meaning at the molecular level.[190] Moreover, the biological difference between racial groups that admixture testing purports to objectively discover is actually the motivating assumption behind these tests' configuration. Anthropologist Duana Fullwiley provides a startling example by demonstrating how one now-defunct ancestry company collected and interpreted its data:

> [T]he very continents and peoples chosen for [DNAPrint's AIMs] product were selected due to their perceived proximity to what we in North America imagine race to be. Although the language of scientists who invented this panel of AIMs is now that of "biogeographical ancestry," the conceptual configuration of human racial typology remains intact.[191]

These residual notions of racial typology are further evidenced by the company's patent application for its admixture test, where it euphemistically defines "BioGeographical Ancestry" as "the heritable component of 'race.'"[192]

In addition to these concerns about technique, genetic ancestry testing as a whole raises several broader issues. First, very few, if any, genetic variations appear only within socially defined racial groups.[193] Researchers may be able to show the frequency of particular variations in certain populations, but connecting an individual to a specific group—such as a socially-defined racial group—is a process fraught with potentially perilous assumptions.[194] These variations have yet to be shown to map precisely onto social categories of race—categories that are typically defined by

190. *See id.* Bolnick and her co-authors note that admixture test creates "the appearance of genetically distinct populations," by focusing on "ancestry informative markers" ("AIMs") that are believed to be indicative of specific "parental" populations. *Id.* However, the development of these "parental" populations seems to have been artificially selected, and there is little evidence that such "parental" populations ever existed. *Id.*

191. Duana Fullwiley, *The Biologistical Construction of Race: 'Admixture' Technology and the New Genetic Medicine*, 38 SOC. STUDIES OF SCI., 695, 706 (2008). *See also* Duana Fullwiley, *Can DNA 'Witness' Race? Forensic Uses of an Imperfect Ancestry Testing Technology*, COUNCIL FOR RESPONSIBLE GENETICS (2008), http://dash.harvard.edu/bitstream/handle/1/3008240/Fullwiley_DNAWitnessRace.pdf (providing an illuminating discussion about how the assumptions behind the construction of AIMs as markers drives the findings of individuals' ancestry in a manner that reflects a distinctively American understanding of racial typology).

192. U.S. Patent Application No. 10/644,594, at [007] (filed Nov. 18, 2004).

193. Bolnick et al., *supra* note 154, at 400.

194. *Id.* Bolnick and her co-authors note that the companies that create these tests are quick to link the occurrence of a certain allele or haplotype with a particular population, despite the fact that "high genetic diversity exists within populations and gene flow occurs between populations." *Id.* Additionally, these companies "sometimes fail to mention that an allele could have been inherited from a population in which it is less common," and consumers are not made aware of the potential shortcomings of these tests. *Id.* (internal citation omitted).

physical appearance, political forces, and other social conventions.[195] Given that these tests examine less than 1 percent of a person's genetic background, there can be a tremendous gap between the limited information conveyed by these tests and how consumers interpret the findings.[196]

Second, the results a company gives to consumers about their racial or ancestral backgrounds are only as useful as the database samples compiled by the company.[197] The business of genetic ancestry testing relies entirely on comparing individual profiles against a database made up of relatively small samples of populations from across the globe.[198] These databases serve as genetic reference points under the assumption that the profiles in the database reflect a reasonable spectrum of human genetic diversity.[199] But these commercial databases are far from reflecting the true range of genetic diversity across global populations.[200] Just because an individual "matches" in one location does not mean that he or she does not match in others.[201] This, in part, explains why it is not uncommon for individuals who take multiple tests to receive different results.[202]

The third and final issue is that the claims made by genetic ancestry companies are often not supported by the available science. It is not uncommon for companies to make bold statements about their ability to accurately pinpoint a person's ancestry. For example, an advertisement by Genetic Testing Laboratories ("GTL") claims that its Ancestral Origins DNA Ancestry Testing Service can "[d]iscover your [anthropological] links. . . . [T]his simple DNA Ancestry test . . . illustrates your unique geogenetic heritage from both a per-population view, and an overall regional view."[203] However, claims such as these can mislead consumers because they neglect to reveal that "present-day patterns of residence are rarely identical to what existed in the past, and social groups have changed

195. *Id.*

196. *Id.* at 399.

197. *Id.*

198. "[E]ven databases with 10,000 to 20,000 samples may fail to capture the full array of human genetic diversity in a particular population or region." *Id.*

199. *Id.*

200. *See id.* Bolnick and her co-authors point out that, while these tests can identify "some of the groups and locations around the world" a test-taker shares genetic similarities with, they are "unlikely to identify all of them." *Id.*

201. *Id.* at 400.

202. *See* Ron Nixon, *DNA Tests Find Branches But Few Roots*, N.Y. TIMES, Nov. 25, 2007, at 3-1.

203. *Ancestral Origins DNA Ancestry Testing*, GENETIC TESTING LABORATORIES, https://www.gtldna.net/ancestral-origins-dna-ancestry.html (last visited Oct. 24, 2011).

over time, [both] in name and composition. Databases of present-day samples may therefore provide false leads."[204] Bolnick and her co-authors note:

> Worldwide patterns of human genetic diversity are weakly correlated with racial and ethnic categories because both are partially correlated with geography. Current understandings of race and ethnicity reflect more than genetic relatedness, though, having been defined in particular sociohistorical contexts (i.e., European and American colonialism). In addition, social relationships and life experiences have been as important as biological ancestry in shaping individual identity and group membership.[205]

Thus, it is not only scientifically imprecise to use contemporary racial categories and population distribution as reference points to understand past identities and locations, but it also contradicts current scholarly understandings concerning migration patterns and other evolutionary and sociological dynamics.

C. DNA FORENSICS

1. Claims Made

Criminal investigators have used scientific evidence to identify and convict criminals for centuries.[206] However, when DNA technologies were introduced in the 1980s for forensic purposes, scholars and the courts met them with substantial skepticism.[207] Traditional forensic approaches such as latent fingerprinting were seen as more trustworthy and certain than DNA technologies.[208] Fast-forward three decades and the converse is true: DNA is now the gold standard of evidence.[209] This shift toward overvaluing DNA evidence has been so profound that some worry about a "CSI effect," where prosecutors find it increasingly difficult to secure a

204. Bolnick et al., *supra* note 154, at 400 (internal citation omitted).

205. *Id.* (internal citation omitted).

206. Am. Coll. of Forensic Examiners, *1248 Early Forensic Study*, HISTORY OF FORENSICS, http://historyofforensics.com (last visited Dec. 2, 2012).

207. Michael Lynch, *God's Signature: DNA Profiling, the New Gold Standard in Forensic Science*, 27 ENDEAVOR 93, 93 (2003).

208. *See id.*

209. Michael Lynch, professor of Science and Technology Studies at Cornell University, suggests that "[t]he acceptance of DNA profiling as a certain, error-free method of personal identification has profoundly influenced the degree of trust invested in it, compared with other forms of criminological evidence." *Id.* Additionally, forms of evidence that had long been used to show guilt, such as "handwriting analysis, lie detector tests, fiber analysis, ballistics, blood-spatter analysis, [and] bite-mark analysis," have now been "called into question in comparison with the new 'gold standard' of DNA profiling." *Id.* at 93–94.

conviction without offering DNA evidence to a jury.[210] The definitive claim made across all forensic techniques involving DNA is that it is a virtually infallible arbiter of identifying subjects to determine their guilt or innocence.

2. The Science Behind DNA Forensics

Humans are over 99 percent similar to one another in terms of their genetic makeup.[211] However, the less-than 1 percent difference remaining represents millions of individual points of genetic variation that can be used to uniquely identify individuals.[212] Buried within our genomes are chromosomal regions called loci. Loci are sites for short tandem repeats ("STRs")—"stretches of DNA where the DNA replicating mechanism appears to 'stutter,' resulting in different numbers of copies of repeated sequences."[213] A four-base sequence such as CGAT might repeat several times at a locus; each sequence and its repetition is considered a variant.[214] These variants mark nearby genes because their location on the chromosome is known; a person's unique genetic profile can be deduced by the number of variants across a particular set of chromosomal loci.[215] Accuracy in DNA testing is improved by checking a greater number of loci.[216] Thirteen loci is the U.S. federal government's standard for identification; the chance that two unrelated individuals coincidentally match at all thirteen locations is astronomically low—one in several billion.[217] Since biological samples can be amplified, only trace amounts of blood or saliva left at a crime scene are needed to make comparisons to known profiles.[218] Polymerase chain reaction ("PCR") is a technique that can be used to mimic cells' natural replication process in order to generate

210. Michael Mann, Student Article, *The "CSI Effect": Better Jurors Through Television and Science*?, 24 BUFF. PUB. INT. L.J. 211, 214–15 (2006). The "CSI effect," named after the syndicated television show, has led many people to think that "scientific evidence is available and irrefutable in every criminal proceeding." *Id.* This may lead some jurors to have "heightened expectation of what they will see when they enter a courtroom," and often leaves them looking for this type of definitive scientific evidence in real life cases. *Id.*

211. ROCHE, GENES AND HEALTH (2007), *available at* http://www.roche.com/genes_and_health.pdf.

212. *Id.*

213. Henry T. Greely et al., *Family Ties: The Use of DNA Offender Databases to Catch Offenders' Kin*, 34 J.L. MED. & ETHICS 248, 249 (2006).

214. *Id.* at 249–50.

215. *Id.* at 250.

216. *See id.*

217. *Id.*

218. *See* DAVID H. KAYE, THE DOUBLE HELIX AND THE LAW OF EVIDENCE 180 (2010).

enough cellular material from trace amounts to make adequate comparisons.[219]

Although DNA typing is typically very reliable, several problems can arise related to the handling and interpretation of the evidence, which can shape overall determinations of an individual's guilt or innocence.[220] This includes problems with contamination (mixing of samples), clerical errors, misinterpreting old or small samples, or coincidental matches.[221] It is useful to take a closer look at DNA forensics' various applications in order to appreciate the different techniques used to identify criminals and how this might aggravate concerns pertaining to the reemergence of biological race.

a. DNA Databases

Since the 1990s, DNA databases have been used by local, state, and federal law enforcement to store convicted criminals' genetic profiles.[222] This approach has been the most widespread in the United Kingdom where genetic profiles of nearly 8 percent of the population (4.9 million people) are on file.[223] This figure represents the United Kingdom's aggressive policy of retaining profiles from anyone detained by the police.[224] In the early days of DNA forensics, the United States only retained profiles from individuals convicted of serious felonies such as rape.[225] In 1998, the FBI launched CODIS, which is a federal repository for offenders' genetic profiles that shares information with state and local databases.[226] Every state now has statutory provisions permitting the collection of DNA from suspects or convicts.[227] The bar for inclusion varies; at least thirty-four states authorize retaining DNA from individuals convicted of any felony,

219. *Id.* at 178–91.

220. *See infra* Part III.C.2.a.

221. *See infra* Part IV.B.

222. Helen Wallace, *Prejudice, Stigma, and DNA Databases*, *in* RACE AND THE GENETIC REVOLUTION: SCIENCE, MYTH, AND CULTURE 68, 68 (Sheldon Rimsky & Kathleen Sloan eds., 2011).

223. *Id.* at 70.

224. *Id.* at 70–72.

225. "State DNA databases, which began almost exclusively as collections of adult sexual offenders' DNA profiles, have now expanded to include many or all convicted felons, juvenile offenders, those convicted of certain misdemeanors, and even arrestees." Mark A. Rothstein & Meghan K. Talbott, *The Expanding Use of DNA in Law Enforcement: What Role for Privacy?* 34 J.L. MED. & ETHICS 153, 153 (2006).

226. *What is CODIS?*, DNA INITIATIVE, http://www.dna.gov/solving-crimes/cold-cases/howdatabasesaid/codis (last visited Dec. 2, 2012). *See also* Michael Seringhaus, Op-Ed., *To Stop Crime, Share Your Genes*, N.Y. TIMES, Mar. 14, 2010, at A23.

227. Seringhaus, *supra* note 226.

while at least thirty-eight states permit taking DNA samples from individuals convicted of certain misdemeanors.[228]

Several new state and federal laws are now authorizing the retention of DNA from individuals merely arrested for certain crimes; DNA is kept on file regardless of whether the person is ever charged or convicted. For example, a 2006 amendment to the Violence Against Women Act allows the Department of Justice to retain DNA from people arrested or held by federal agents.[229] Following this lead, thirteen states—including California, Kansas, and North Dakota—now collect DNA from arrestees.[230] This has the intended effect of radically expanding the number of genetic profiles stored by state, local, and federal governments.[231] From the perspective of law enforcement, including arrestees in DNA databases increases the chances of finding a match while posing no threat to innocent individuals given the precision of DNA forensics. This claim will be examined later in this section.

b. Cold Hits, Partial Matches, and Familial Searches

One presumed benefit of expanding the number of profiles in DNA databases through arrestee inclusion policies is the increased success of cold hit and partial match searches. Cold hits occur when:

> [T]he major or only evidence is biological material linking the defendant to the offense. In these cases, the government has no investigatory leads, but develops a genetic profile based upon some material left at a crime scene. The government then runs that forensic profile in a database and uncovers a "match"—a stored sample associated with a known person or offender.[232]

With more profiles included in forensic databases, law enforcement hopes to increase the chances that crime scene samples with currently unknown identities will point toward a potential suspect.

It is also useful to distinguish between full and partial matches. Full matches are the most robust; they occur when two profiles match across the

228. Seth Axelrad, *Survey of State DNA Database Statutes*, AM. SOC. L. MED. & ETHICS (2005), *available at* http://www.aslme.org/dna_04/grid/guide.pdf (for data, see *Grid: Survey of DNA Database Statutes*, AM. SOC. L. MED. & ETHICS, http://www.aslme.org/dna_04/grid/statute_grid.html (last visited Dec. 2, 2012)).

229. Karen J. Maschke, *DNA and Law Enforcement*, *in* FROM BIRTH TO DEATH AND BENCH TO CLINIC: THE HASTINGS CENTER BIOETHICS BRIEFING BOOK FOR JOURNALISTS, POLICYMAKERS, AND CAMPAIGNS 45, 46 (Mary Crowley ed., 2008).

230. *Id.*

231. *Id.* at 45.

232. Erin Murphy, *The New Forensics: Criminal Justice, False Certainty, and the Second Generation of Scientific Evidence*, 95 CALIF. L. REV. 721, 740 (2007).

thirteen CODIS markers.[233] Partial matches occur when two profiles match at fewer than thirteen markers.[234] Experts have testified that as few as a nine-locus match can be used to definitively identify someone.[235] Familial searches leverage the fact that close relatives (such as siblings or a child and a parent) share half of the same short tandem repeat lengths and genetic variants, while uncles, aunts, and other more distant relatives share about one quarter.[236] For example, partial matches at six or seven CODIS markers might not point directly to a suspect. But it might point to their brother or mother, which can lead investigators to the person who committed the crime.[237] This technique was successfully used to solve the Grim Sleeper case, in which serial killer Lonnie Franklin—alleged to have murdered ten women over twenty-two years in Southern California[238]—was captured by partially matching DNA from the crime scenes to a California prisoner, which suggested a close relative was the culprit.[239] Franklin is the prisoner's father.[240]

c. Molecular Photofitting

New genetic technologies are using information in biological samples left at crime scenes to go beyond finding suspects through cold hits or partial matches. Technologies similar to admixture mapping are being used to develop descriptions of suspects' phenotypes or physical appearances. [241] One technology, called molecular photofitting, is an approach that attempts to "produce forensically (or biomedically) useful predictions of physical features or phenotypes from an analysis of DNA variation. . . . [to provide]

233. WILLIAM C. THOMPSON, THE POTENTIAL FOR ERROR IN FORENSIC DNA TESTING (AND HOW THAT COMPLICATES THE USE OF DNA DATABASES FOR CRIMINAL IDENTIFICATION), COUNCIL FOR RESPONSIBLE GENETICS 5 (2008), *available at* http://www.councilforresponsiblegenetics.org/pageDocuments/H4T5EOYUZI.pdf.

234. *Id.*

235. *Id.* at 21.

236. Greely et al., *supra* note 213, at 251–52.

237. *See id.* at 252.

238. Edecio Martinez, *"Grim Sleeper" Arrest: Who is Lonnie Franklin, Jr.?*, CBS NEWS (July 8, 2010, 11:47 AM), http://www.cbsnews.com/8301-504083_162-20009945-504083.html.

239. David Lazer & Frederick R. Bieber, *'Familial Searching,' Its Promise and Perils*, L.A. TIMES, July 10, 2010, http://articles.latimes.com/2010/jul/10/opinion/la-oe-lazer-grim-sleeper-dna-20100710.

240. *Id.*

241. These technologies "have been based primarily on genetic information about a sample source's recent ancestry, and to a lesser extent, on genetic information about her morphology. Forensic analysts use ancestry and morphology information to infer a suspect's race and general appearance." Pilar N. Ossorio, *About Face: Forensic Genetic Testing for Race and Visible Traits*, 34 J.L. MED. & ETHICS 277, 281 (2006).

a summary list of physical traits like height, weight, hair color, eye color, and race, and a fuzzy or low-resolution photograph."[242]

This technology was used to capture another serial killer, Derrick Todd Lee.[243] Eyewitness accounts, along with previous studies showing that most serial killers are White, suggested that the person responsible for several murders in Baton Rouge, Louisiana, was a White male.[244] However, researchers at the now-defunct[245] DNAPrint Genomics used this technology to assess the ancestry informative markers of the biological sample left at a crime scene.[246] Their findings suggested that the suspect was not White, but a light-skinned Black man—one with 85 percent African and 15 percent Native American ancestry.[247] This reoriented law enforcement's search, leading to Lee's arrest and conviction.[248]

Figure 2: On the left is a police sketch of Baton Rouge serial killer, based on eyewitness accounts. On the right is convicted serial killer Derrick Todd Lee.[249]

242. FRUDAKIS, *supra* note 181, at 16.

243. Nancy Touchette, *Genome Test Nets Suspected Serial Killer*, GENOME NEWS NETWORK (June 13, 2003), http://www.genomenewsnetwork.org/articles/06_03/serial.shtml.

244. *Id.*

245. *DNAPrint Genomics Goes Bust*, GENOMEWEB (Mar. 3, 2009), http://www.genomeweb.com/node/912684?emc=el&m=325264&l=1&v=e993a10706.

246. Touchette, *supra* note 243.

247. *Id.*

248. *Id.*

249. *Id.*

3. The Risks and Benefits of DNA Forensics: The Racial Context of a Tarnished Gold Standard

a. Whose DNA is in the Database? The Relevance of Race

Genetic technologies have played a key role in both identifying suspects and exonerating falsely accused individuals.[250] However, Blacks' and Latinos' routine and disproportionate contact with law enforcement provides an important context from which to understand DNA forensics' broader implications for racial minorities and biological understandings of racial difference. In a 2008 study by the Pew Center for the States, researchers showed that "for the first time, more than one in every 100 adults is now confined in an American jail or prison."[251] The 2.3 million incarcerated American adults outnumber countries with what many consider to be more draconian legal systems, such as China (1.5 million incarcerated) and Russia (890,000).[252] But there is concern not only with the number of people in prison, but also the disproportionate incarceration of racial minorities. The Pew Study shows that one in 245 Whites are likely to be imprisoned at some point in their life compared with one in 41 Blacks and one in 96 Hispanics.[253] The numbers are even more distressing for Black men between twenty and twenty-four, who have a one in 9 chance of being incarcerated, and Black men between ages thirty-five and thirty-nine, who have a one in 10 chance of being incarcerated.[254] Women of color are also incarcerated disproportionately. For example, one in 355 White women between ages thirty-five and thirty-nine will face incarceration, as compared to one in 100 for similarly-aged Black women.[255]

These numbers draw attention to law enforcement's longstanding practice of targeting communities of color, particularly as a function of the war on drugs.[256] These policing practices not only lead to racially

250. *See* INNOCENCE PROJECT, 250 EXONERATED: TOO MANY WRONGFULLY CONVICTED (2010), *available at* http://www.innocenceproject.org/docs/InnocenceProject_250.pdf.

251. PEW CTR. ON THE STATES, ONE IN 100: BEHIND BARS IN AMERICA 2008, at 3 (2008), *available at* http://www.pewcenteronthestates.org/uploadedFiles/One%20in%20100.pdf.

252. *Id.* at 5.

253. *Id.* at 34.

254. *Id.*

255. *Id.*

256. *See* JUST. POL'Y INST., THE VORTEX: THE CONCENTRATED RACIAL IMPACT OF DRUG IMPRISONMENT AND THE CHARACTERISTICS OF PUNITIVE COUNTIES (2007), *available at* http://www.justicepolicy.org/images/upload/07-12_REP_Vortex_AC-DP.pdf. The Justice Policy Institute notes that state and federal incarcerations stemming from drug offenses rose 21 percent between 1995 and 2003 and that there was a 47 percent increase for those in jail on drug charges during this period. *Id.* at 2. It also notes that "African Americans are disproportionately incarcerated for drug offenses in the U.S., though they use and sell drugs at similar rates to whites." *Id.* In 2003, African

disproportionate numbers in convictions, but also in arrests and detainments. They also suggest a similar minority overrepresentation in state and federal DNA databases. Although Blacks only make up 13 percent of the population, it has been estimated that they constitute 40 percent of the profiles in DNA databases maintained by the federal government.[257] Racial minorities' disproportionate representation in DNA databases suggests that this technology will increasingly place these communities under a new and pervasive form of genetic surveillance. These technologies' shortcoming and overstatements regarding their precision[258] will undoubtedly have a disproportionate effect on minority communities.[259]

b. Technical Shortcomings Associated With DNA Forensics

It is in this context that we can begin to assess DNA forensics' shortcomings to understand how these applications may lead to new forms of racial injustice. Each of these technologies has played a significant role in identifying and ultimately convicting criminals. Yet, they also have significant technical deficiencies that belie the claims of infallibility surrounding DNA databases.[260] First, the astronomical statistics used to suggest the unlikelihood of coincidental matches occurring in DNA databases may not be as strong as they initially appear.[261] The premise behind amassing large DNA databases is that individuals' profiles across at least nine loci are dissimilar enough to only pose an infinitesimally low risk for coincidental matches.[262] However, recent data from three state databases show otherwise. Arizona's state database of 65,493 offenders had 122 pairs of profiles matching at nine loci, twenty pairs at ten loci, and two pairs of siblings each matching at eleven and twelve loci, respectively.[263] Illinois's state database of 220,000 profiles had 903 pairs matching at nine

Americans made up 13 percent of the total population, but accounted for more than half of the sentenced drug offenders in state prisons. *Id.*

257. Greely et al., *supra* note 213, at 258.

258. *See infra* Part IV.B.

259. *See* D.H. Kaye & Michael E. Smith, *DNA Identification Databases: Legality, Legitimacy, and the Case for Population-wide Coverage*, 2003 WIS. L. REV. 413, 452–53 (2003). Kaye and Smith note that "[a]rrest, prosecution, and conviction are so pervasive in black communities that, on any given day, a black American is five times more likely to be in jail than is a white. *Id.* (internal citations omitted). The authors add that, "[w]ithout seismic changes in Americans' behavior or in the criminal justice system, nearly 30% of black males, but less than 5% of white males will be imprisoned on a felony conviction at some point in their lives." *Id.*

260. Jon Jefferson, *Cold Hits Meet Cold Facts: Are DNA Matches Infallible?*, TRANSCRIPT, Spring 2008, at 29, 30–31.

261. *Id.*

262. *Id.* at 32.

263. *Id.* at 32–33.

or more loci.[264] Maryland's state database of 30,000 profiles had thirty-two pairs matching at nine loci and three matching at all thirteen.[265] How do we explain this unexpectedly high number of ostensibly unique profiles in the same database matching each other? It is not clear, which is why a growing number of scientists have requested greater access to government operated forensic databases to better understand this problem.[266] Thus far, the government has declined.[267]

The problem of coincidental matches is pressing because the potential overestimation of their rarity may lead to false convictions. There are significant questions about the appropriate way to express this probability. For example, police identified John Puckett in 2004 through a cold hit DNA database search in California that matched his profile to crime scene evidence from a 1972 murder at 5.5 loci.[268] The prosecutor told jurors that there was only a one in 1.1 million chance that the match was coincidental.[269] No other evidence connected Puckett to the crime and he was convicted of murder based largely on this cold hit evidence.[270] This points to a debate about whether general population figures should be used as a reference point in calculating these statistics (as they were in the Puckett case) or the number of profiles in the relevant database. The problem in using general population figures as a reference point is explained by William C. Thompson, Professor of Criminology, Law, and Society at the University of California, Irvine:

> [S]uppose that a partial DNA profile from a crime scene occurs with a frequency of 1 in 10 million in the general population. If this profile is compared to a single innocent suspect, the probability of a coincidental match is only 1 in 10 million. . . . By contrast, when searching through a database as large as the FBI's National DNA Index System (NDIS), which reportedly contains nearly 6 million profiles, there are literally millions of opportunities to find a match by coincidence. Even if everyone in the database is innocent, there is a substantial probability that one (or more)

264. Linda Geddes, *For Justice, Share DNA Databases*, NEW SCIENTIST, Jan. 6, 2010, at 8, *available at* http://www.newscientist.com/article/mg20527424.700-unreliable-evidence-time- to-open-up-dna-databases.html (under the title "Unreliable Evidence? Time to Open up DNA Databases").

265. *Id.*

266. *See* D.E. Krane et al., Letter to the Editor, *Time for DNA Disclosure*, 326 SCI. 1631 (2009).

267. *See id.*

268. Jason Felch & Maura Dolan, *When a Match Is Far from a Lock*, L.A. TIMES, May 4, 2008, http://articles.latimes.com/print/2008/may/04/local/me-dna4.

269. *Id.*

270. *Id.*

> will have the 1-in-10 million profile. Hence, a match obtained in a database search might very well be coincidental.[271]

If the size of the database is taken into account in Puckett's case—a practice recommended by expert committees convened by the FBI[272] and National Research Council[273] but rarely followed—the probability that the database has at least one profile that might coincidentally match the crime scene evidence if the assailant's profile is not present becomes one in three.[274]

Familial searches also raise significant concerns. Since Black and Latino profiles are disproportionately represented in DNA databases, the expanded net of suspects created by familial searches is more likely to affect extended families in minority communities who may have nothing to do with the alleged crimes.[275] Familial searching places "a new category of people . . . under lifetime genetic surveillance. [DNA databases'] composition would reflect existing demographic disparities in the criminal justice system, in which arrests and convictions differ widely based on race, ethnicity, geographic location, and social class. Familial searching potentially amplifies these existing disparities."[276] Racially skewed policing practices in the United Kingdom substantiate this concern, where "nearly four in 10 black men . . . are on the police's national [DNA] database—compared with fewer than one in 10 white men."[277] As noted earlier in this section, a similar racial architecture is evolving in local, state, and federal databases in the United States, giving rise to substantial civil liberty concerns about the way in which this technology is used. Familial searches include greater proportions of minority communities as possible suspects because these searches implicate those who are merely related to

271. THOMPSON, *supra* note 233, at 10. The one in 1.1 million figure in the Puckett case used the population figure as a referent.

272. FBI DNA Advisory Bd., *Statistical and Population Genetics Issues Affecting the Evaluation of the Frequency of Occurrence of DNA Profiles Calculated from Pertinent Population Database(s)*, FORENSIC SCI. COMM., July 2000, *available at* http://www2.fbi.gov/hq/lab/fsc/backissu/july2000/dnastat.htm.

273. NAT'L RESEARCH COUNCIL, THE EVALUATION OF FORENSIC DNA EVIDENCE: AN UPDATE (1996), *available at* http://www.nap.edu/openbook.php?record_id=5141.

274. Felch & Dolan, *supra* note 268. *See also* David Kaye, *Taking Liberties With the Numbers*, SCI. & L. BLOG, April 18, 2009, *available at* http://lawprofessors.typepad.com/science_law/2009/week16/index.html.

275. Greely et al., *supra* note 213, at 258.

276. Frederick R. Bieber, Charles H. Brenner & David Lazer, *Finding Criminals Through DNA of Their Relatives*, 312 SCIENCE 1315, 1316 (2006).

277. James Randerson, *DNA of 37% of Black Men Held by Police*, THE GUARDIAN (Jan. 4, 2006), http://www.guardian.co.uk/world/2006/jan/05/race.ukcrime.

someone in the database. Simon Cole, Associate Professor of Criminology, Law, and Society at the University of California, Irvine, notes:

> Familial searching exacerbates the discriminatory effects of database composition. . . . [I]nclusion of an individual in a database effectively adds that individual's close relatives to the database as well. In the context of an arrestee database, in a society in which young African-American males have a one in three chance of experiencing some form of state custody, this could quickly result in effectively incorporating entire neighborhoods and ethnic communities into the database.[278]

The concerns with molecular photofitting are similar to those with genetic ancestry testing to the extent that they rely upon a similar underlying technology of admixture testing; estimations are crude and based on databases with significant limitations, are often proprietary, and are not routinely subjected to peer review.[279] These concerns are amplified significantly when moved from the context of recreational genetics to criminal investigations. Some geneticists have questioned the underlying theory of admixture testing, which is based on assumptions about human population structure that are incongruent with mainstream evolutionary understandings of human ancestry.[280] This raises a profound question at the intersection of law and science: Is it appropriate to use a technology to identify and convict individuals that is based on a theory that is not fully in line with basic Darwinian premises at the heart of modern science?

By treating racial identity as something that can be measured and verified through scientific methods, DNA forensic applications such as molecular photofitting play a direct role in reconstituting the biological significance of racial difference. But other dynamics such as DNA databases' expanding uses and racially disproportionate composition may play a more insidious role in the re-emergence of biological race by emphasizing links between race and criminality. This can shape both public perceptions and future research agendas in terms of how we understand the relationship between race, crime, and genetics.

278. Simon A. Cole, *How Much Justice Can Technology Afford? The Impact of DNA Technology on Equal Criminal Justice*, 34 SCI. & PUB. POL'Y 95, 102 (2007) (internal citation omitted).

279. Bolnick et al., *supra* note 154, at 400 (discussing shortcomings of admixture testing).

280. Kenneth M. Weiss & Jeffrey C. Long, *Non-Darwinian Estimation: My Ancestors, My Genes' Ancestors*, 19 GENOME RES. 703, 705, 708 (2009) (noting that these tests place "heavy emphasis on the idea that the world once harbored distinct and independently evolved populations that have now undergone admixture of an unstated type," despite the fact that this concept of genetic ancestry is "more in line with race concepts held by European explorers and traders than with the recent genetic evidence supporting the serial sampling model of human evolutionary history").

Sociologist Troy Duster argues that the confluence of these forensic applications raises the specter of a twenty-first century phrenology, noting that, while "[o]ne could do a SNP profile of rapists and sex offenders, and find some markers that they putatively share," these markers will be "precisely that, 'markers,' and not explanatory of 'the causes' of violent crime."[281] Such a proposal would not be unprecedented. In the 1990s, several federal administrators proposed a failed plan called the Violence Initiative, which was based on two premises: "The first was that much of violent behavior in the inner city may have biological or genetic origins. The second premise was that 'factors of individual vulnerability and predisposition to violent behavior exist—factors that may be detected at an early age.'"[282] Frederick Goodwin, then head of the Alcohol, Drug Abuse, and Mental Health Administration and Violence Initiative noted in a 1992 address that the Initiative's purpose was to "design and evaluate psychosocial, psychological, and medical interventions for at-risk children before they become labeled as delinquent or criminal. This is the basic point of it all . . . identifying at-risk kids at a very early age before they have become criminalized."[283] Given that today's DNA databases function as an existing repository of what many consider to be criminal genes, future research linking genes and criminal outcomes is not far-fetched. Nor is it far-fetched to think that these databases' racially disproportionate composition will place race at the center of this discussion.

IV. TOWARD RACE IMPACT ASSESSMENTS

A. THE PERSISTENCE OF TYPOLOGICAL THINKING ABOUT RACE IN SCIENCE

Race-based medicines, genetic ancestry tests, and DNA forensics can each potentially benefit racial minorities and society in general by providing life-saving medicines targeted for vulnerable and underserved populations, increasing individuals' knowledge about their ancestry, and

281. Troy Duster, *Selective Arrests, An Ever-Expanding DNA Forensic Database, and the Specter of an Early-Twenty-First Century Equivalent of Phrenology*, *in* DNA AND THE CRIMINAL JUSTICE SYSTEM: THE TECHNOLOGY OF JUSTICE 315, 315 (David Lazer ed., 2004).

282. Vernellia R. Randall, *Slavery, Segregation and Racism: Trusting the Health Care System Ain't Always Easy! An African American Perspective on Bioethics*, 15 ST. LOUIS U. PUB. L. REV. 191, 227 (1996).

283. Garland E. Allen, *Modern Biological Determinism: The Violence Initiative, the Human Genome Project, and the New Eugenics*, *in* THE PRACTICES OF HUMAN GENETICS 1, 1 (Michael Fortun & Everett Mendelsohn eds., 1999) (quoting Frederick K. Goodwin, Conduct Disorder as A Precursor to Adult Violence and Substance Abuse: Can the Progression be Halted, Address to the American Psychiatric Association (May 5, 1992)).

offering tools to law enforcement to help solve crimes. However, these technologies are also united by a tendency to promote typological perspectives on race that are reminiscent of the nineteenth and early twentieth centuries when "pure" or "real" races were thought to independently exist and each race was thought to share a set of unique biological traits that could be identified and measured.[284] This contrasts with mainstream scientific perspectives that view the distribution of human traits on a continuum that does not have the discrete breaks that typologists find indicative of biological race.[285]

Despite this tension, biological race continues to be salient in lay and scientific discourses. Increasing public exposure to race and genetics research is shaping lay opinions about the relevance of genes to racial disparities in social and health outcomes.[286] At the same time, scientists continue to espouse typological approaches that give coherence to biological understandings of racial difference. Sociologist Ann Morning, who has conducted research on scientists' perspectives on race, observes that:

> [S]ocial and biological scientists hold a wide range of beliefs about the nature of racial difference; contrary to some scholars' expectations, they are far from any consensus, either within or between disciplines. . . . [T]he essentialist proposition that races are biologically grounded entities remains a compelling view for many contemporary scientists.[287]

This all leads to an important question: Given law's past complicity in furthering racial subordination through promoting biological race, what normative role should government take in regulating new biotechnologies that advance biological understandings of racial difference? This is a difficult question because the social and scientific contexts have changed between past articulations of biological race and today's innovations, but the potential risks to racial minorities remain quite similar. While overly strict regulations might unduly prevent access to life-saving or life-enhancing technologies, overly permissive approaches may lead to new

284. Ernst Mayr, *Typological Versus Population Thinking*, *in* CONCEPTUAL ISSUES IN EVOLUTIONARY BIOLOGY 325, 327 (Elliott Sober ed., 3d ed. 2006) ("The typologist stresses that every representative of a race has the typical characteristics of that race and differs from all representatives of all other races by the characteristics 'typical' for the given race. All racist theories are built on this foundation. Essentially, it asserts that every representative of a race conforms to the type and is separated from the representatives of any other race by a distinct gap.").

285. *See id.* at 326–28.

286. *See generally*, Celeste M. Condit et al., *The Role of "Genetics" in Popular Understandings of Race in the United States*, 13 PUB. UNDERSTANDING OF SCI. 249 (2004).

287. ANN MORNING, THE NATURE OF RACE: HOW SCIENTISTS THINK AND TEACH ABOUT HUMAN DIFFERENCE 221 (2011).

forms of racial subordination and promote an impoverished understanding of race among the public.

B. REGULATORY GULF: EXPANDING USES, DIMINISHING OVERSIGHT

Biotechnologies that implicate race are expanding in their use and development. For example, biologists Sarah Tate and David Goldstein observed in a 2004 *Nature Genetics* article that, while controversial, "[a]t least 29 medicines (or combination of medicines) have been claimed, in peer-reviewed scientific or medical journals, to have differences in either safety or, more commonly, efficacy among racial or ethnic groups."[288] This suggests that more race-based medicines such as BiDil are in development and may very well be on their way.[289] Additionally, genetic ancestry tests are also becoming increasingly popular. Bolnick and several colleagues note that "[a]t least two dozen companies now market 'genetic ancestry tests,' . . . [and that m]ore than 460,000 people have purchased these tests over the past 6 years, and public interest is still skyrocketing."[290] Most recently, scholar Henry Louis Gates Jr. and others joined 23andMe as advisors to the direct-to-consumer genetics company's "Roots into the Future" program, which hopes to attract 10,000 African Americans to its ancestry testing services.[291]

New applications of DNA forensics are probably expanding the fastest. For example, Murphy notes that while

> it took Virginia nearly eight years, from 1993 to 2001, to reach its first 1,000 'cold hits,' the state reached its second 1,000 in a matter of eighteen months. Since 2001, the laboratory has averaged at least one 'cold hit' a day, and as of July 2002, that figure had doubled to two and one half hits a day.[292]

288. Sarah K. Tate & David B. Goldstein, *Will Tomorrow's Medicines Work for Everyone?*, 36 NATURE GENETICS SUPP. S34, S34 (2004). They then note that "these claims are universally controversial and there is no consensus on how important race or ethnicity is in determining drug response." *Id.*

289. For an example of ongoing research on race-based pharmacogenomics, see Jieming Chen et al., *Interethnic Comparisons of Important Pharmacology Genes Using SNP Databases: Potential Application to Drug Regulatory Assessments*, 11 PHARMACOGENOMICS 1077 (2010).

290. Bolnick et al., *supra* note 154, at 399.

291. According to 23andMe's announcement of the project, *Roots into the Future* will "help determine how genetic factors contribute to the development of disease in this population," and "aligns with 23andMe's broader mission of empowering individuals to understand their own genetic data." 23andMe, *Roots into the Future: A New 23andme Research Initiative for African-Americans*, SPITTOON (July 26, 2011, 5:00 AM), http://spittoon.23andme.com/2011/07/26/roots-into-the-future/. Those who participate in the project will receive "free access to their personal genetic data used for the research, as well as health and ancestry interpretations of the data." *Id.*

292. Murphy, *supra* note 232, at 740.

Applications such as molecular photofitting are being developed to achieve higher levels of sophistication, while practices like familial testing are becoming increasingly commonplace in criminal investigations.[293] For example, the California Attorney General's office has issued guidelines for familial testing for its state database,[294] which will likely accelerate the use of this technology by state and local law enforcement.[295]

At the same time that these technologies are expanding, regulatory oversight of their scientific rigor and public impact remains inadequate. The FDA does not subject new drug applications seeking race-specific labeling to any other standard outside the agency's traditional emphasis on safety and efficacy.[296] Direct-to-consumer genetic tests have been criticized by some federal agencies including the FTC,[297] but the specific issues related to race and genetic ancestry have not been a significant part of the conversation. Genetic ancestry tests fall outside of the FDA's regulatory authority because "[a] genetic test is only subject to FDA oversight if it is a medical device . . . whereas a test to determine ancestry is not a device."[298] Moreover, the FBI, in coordination with state and local law enforcement agencies, continues to expand DNA forensics into questionable areas such as familial testing and molecular photofitting. These applications can

293. *See supra* Part III.C.2.b.

294. *See* Information Bulletin from Lance Gima, Chief, Bur. Forensic Svcs. & Edmund G. Brown, Jr., Cal. Att'y Gen. to All Cal. Law Enforcement Agencies & Dist. Atty's Offices, *DNA Partial Match (Crime Scene DNA Profile to Offender) Policy* (2008), *available at* http://ag.ca.gov/cms_attachments/press/pdfs/n1548_08-bfs-01.pdf.

295. *See* Maura Dolan, *State to Double Crime Searches Using Family DNA*, L.A. TIMES (May 9, 2011), http://www.latimes.com/news/local/la-me-familial-dna-20110509,0,3088333,full.story.

296. *See* Winickoff & Obasogie, supra note 29, at 278 (arguing that "the FDA should deploy a heightened standard of efficacy when approving race-specific indications").

297. *See At Home Genetic Tests: A Healthy Dose of Skepticism May Be the Beset Prescription*, FEDERAL TRADE COMMISSION (July 2006), http://www.ftc.gov/bcp/edu/pubs/consumer/health/hea02.shtm. In a notice to consumers, the FTC wrote:

> According to the Food and Drug Administration (FDA), which regulates the manufacturers of genetic tests; and the Centers for Disease Control and Prevention (CDC) . . . some of these tests lack scientific validity, and others provide medical results that are meaningful only in the context of a full medical evaluation. The FDA and CDC say that because of the complexities involved in both the testing and the interpretation of the results, genetic tests should be performed in a specialized laboratory, and the results should be interpreted by a doctor or trained counselor who understands the value of genetic testing for a particular situation.

Id.

298. Jeffrey Shuren, Dir., Ctr. for Devices & Radiological Health, F.D.A. Statement Before the U.S. House of Representative Subcommittee on Oversight and Investigations Committee on Energy and Commerce: Direct-to-Consumer Genetic Testing and the Consequences to the Public (July 22, 2010), *available at* http://www.fda.gov/NewsEvents/Testimony/ucm219925.htm.

significantly impact minority communities, as well as alter public understandings of race.[299] Therefore, a more robust regulatory response is needed to ensure that these innovations do not legitimize biological understandings of race in a manner that supersedes their potential benefits.

C. EXISTING PROPOSALS

While the issue of race and genetics has received substantial attention from legal scholars, there have been relatively few proposals for how law can balance the benefits and potential harms of human biotechnologies that implicate race. Scholars have attempted to provide broad regulatory guidance for how racial categories should be used in human biotechnology beyond the various federal mandates that require the inclusion of minorities in clinical trials.[300] For example, Dorothy Roberts assesses various legal constraints on race-based research—including regulations on federally-funded research, civil rights statutes, and state laws—to suggest a social justice framework based upon Equal Protection norms.[301] This social justice approach "explore[s] how the law might seriously enforce the view that race is an unscientific and pernicious classification of human beings at the same time that systemic racism produces health inequities."[302] Law professor Jonathan Kahn similarly draws on Equal Protection norms to propose a series of guidelines for how and when scientists use social categories of race in connection with biomedical research.[303] He argues for requiring "a tight fit (a) between the population, racial/ethnic, and genetic categories being used and (b) between the genetic category identified and the disease state/health issue or other biological activity being analyzed."[304] Law professors Erik Lillquist and Charles Sullivan offer a comprehensive examination of existing legal regimes to discuss various constraints associated with using race in biomedical research.[305] They argue that "[r]acial differences in treatment (including diagnostic screening) should be permissible only in rare circumstances where there is a bona fide treatment rationale . . . [and] race [is] the *best available method at the time*."[306] In assessing the Court's colorblind norms in its Equal Protection jurisprudence, law professor Kimani Paul-Emilie develops the notion of

299. *See supra* Part III.C.2.b.
300. Kahn, *Genes, Race, and Population*, *supra* note 29, at 7 (internal citation omitted).
301. *See generally* Roberts, *supra* note 29.
302. *Id.* at 531.
303. Kahn, *Genes, Race, and Population*, *supra* note 29, at 9.
304. *Id.*
305. Lillquist & Sullivan, *supra* note 29, at 483.
306. *Id.*

"racial pragmatism" to find a set of residual guidelines for when the government may appropriately take race into consideration in biomedical research.[307] My own work in this area employs the notion of strict scrutiny found in Equal Protection law to develop oversight mechanisms for drugs seeking race-specific indications,[308] and also to set a standard of review for FDA advisory committees.[309]

Each of these proposals offers significant insight on how to fill the remarkable gap in regulatory oversight regarding race and human biotechnology. However, at least two characteristics may lead these efforts to not be fully responsive to existing challenges. First, existing proposals for greater oversight of new genetic technologies that implicate biological race tend to focus on biomedicines without examining how these issues play out in other realms—most notably, genetic ancestry tests and DNA forensics. Taken together, race-based medicines, ancestry tests, and DNA forensics have synergistic effects that are much greater than the individual applications, yet the trend is to analyze each application in isolation. By failing to develop regulatory mechanisms that approach the race and genetics issue holistically in terms of the multiple sites where these technologies can recreate notions of biological race, existing proposals may not be able to have their intended impact. Second, these proposals tend to look to existing laws—especially Equal Protection jurisprudence—for a source of normative guidelines from which to abstract and apply to the emerging and quickly changing area of race and human biotechnology. This approach has limitations, as it looks backward and sideways to how law has treated race to think prospectively and normatively about how regulators ought to oversee these technologies. This approach lacks the flexibility to adjust to fundamentally different contexts and claims connected to these technologies. What is needed is not only normative guidelines, but also a deliberative space where we can fluidly discuss oversight mechanisms, specific challenges raised by new technologies, and the technologies' impact on certain communities.

307. Paul-Emile, *supra* note 29.

308. Winickoff & Obasogie, *supra* note 29, at 278.

309. For my argument that advisory committees should use a "strict scrutiny framework" to review new drugs that propose race-specific indications, see Osagie K. Obasogie, *Beyond Best Practices: Strict Scrutiny as a Regulatory Model for Race-Specific Medicines*, 36 J.L. MED. & ETHICS 491, 496 (2008).

D. THE NEED FOR ADMINISTRATIVE AGENCY IMPACT ASSESSMENTS ON RACE AND HUMAN BIOTECHNOLOGY

Each application discussed in this Article falls under the administrative authority of an existing government agency that can set standards for how the public engages these innovations: the FDA for race-based medicines, the FTC for genetic ancestry tests, and the FBI for DNA forensics. As discussed earlier in this section, existing regulatory approaches to these applications by these agencies are thin; race simply is not taken seriously as a regulatory matter despite the potential risks that these applications portend for reinventing biological race in a manner that may disadvantage minorities.

To avoid these risks and to give minorities access to potential benefits that may stem from these technologies, I propose race impact assessments as a new tool for administrative agencies that are responsible for overseeing any new biotechnology that implicitly or explicitly makes a claim about the biological significance of social categories of race, or that may disproportionately affect minority communities. Generally, impact assessments are evaluative mechanisms used by government agencies to analyze the risks and benefits of new proposals so as to promote individual and social well-being. Most notably, environmental impact assessments have played a significant role in making sure that government agencies consider the potential consequences that a new project or initiative might have on the environment before moving forward.[310] The National Environmental Policy Act ("NEPA"), signed into law in 1970,[311] requires federal agencies to determine whether certain proposed actions—road construction, building construction, etc.—might have an adverse effect on the human environment.[312] NEPA's most significant legal requirement is

310. Impact assessments have been used widely in environmental studies, where environmental impact assessments have been used to analyze "the environmental implications of a decision to enact legislation, to implement policies and plans, or to initiate development projects." Peter Wathern, *An Introductory Guide to EIA*, *in* ENVIRONMENTAL IMPACT ASSESSMENT: THEORY AND PRACTICE 3, 3 (Peter Wathern ed., 1998). However, this Article focuses on the use of impact assessment in analyzing issues that directly affect human social, legal, or health outcomes.

311. National Environmental Policy Act of 1969, Pub. L. No. 91-190, 83 Stat. 852 (codified as amended at 42 U.S.C. §§ 4321, 4331–35, 4341–47 (2012)).

312. NEPA requires agencies to "include in every recommendation or report on proposals for legislation and other major federal actions significantly affecting the quality of the human environment" an environmental impact statement. 42 U.S.C. § 4332(C). These statutory requirements have been defined within the Code of Federal Regulations. 40 C.F.R. § 1502.3. For specific definitions, see § 1508.23 (defining "on proposals"), § 1508.17 (defining "for legislation"), § 1508.18 (defining "other major federal actions"), § 1508.27 (defining "significantly"), §§ 1508.3, 1508.8 (defining "affecting" and "effects"), and § 1508.14 (defining "the quality of the human environment").

the Environmental Impact Statement ("EIS").[313] Generally, agencies will first conduct an initial environmental assessment.[314] This initial assessment determines if a proposed action might have an adverse effect on the human environment that requires an EIS.[315] The more rigorous EIS process seeks to flesh out the potential harms of a proposed action and determine if viable and less disruptive alternatives exist.[316] According to 40 C.F.R § 1502.1, the purpose of an EIS is to "serve as an action-forcing device to insure that the policies and goals defined in the Act are infused into the ongoing programs and actions of the Federal Government."[317] Brian Cole and his co-authors note that "[t]he authors of NEPA recognized . . . that [the] problems in one sector are shaped to a large extent by actions in other sectors[,] . . . [whereby] the assessment and consideration of environmental impacts has become a routine part of decision making in federal, state, and local agencies."[318] Thus, the major achievement of environmental impact assessments has been to change the culture of administrative agencies by raising awareness and improving sensitivity to the way that federal actions can damage the environment and to the crucial role that regulatory agencies can play in mitigating these harms.

Much of this cultural change has occurred through the interdisciplinary and cooperative nature of environmental impact assessments as dictated by federal law.[319] By simultaneously engaging in prospective assessment of potential impacts and making these findings publically available for comment and feedback, environmental impact statements have been able to institutionalize environmental concerns and an ethos of public engagement into regulatory agencies' organizational behavior.[320] In doing this, NEPA and its environmental impact statements

313. 42 U.S.C. § 4332(C)(i).

314. 40 C.F.R. § 1508.9.

315. *Id.* Some proposals may not require an initial environmental assessment or an EIS if they fall into a categorical exclusion or "a category of actions which do not individually or cumulatively have a significant effect on the human environment." *Id.* § 1508.4. Other proposals may not require an EIS if after an environmental assessment, agencies conclude with a "finding of no significant impact." *Id.* § 1508.13.

316. 42 U.S.C. § 4332(C)(i)–(iv).

317. 40 C.F.R. § 1502.1.

318. Brian L. Cole et al., *Prospects for Health Impact Assessment in the United States: New and Improved Environmental Impact Assessment or Something Different?*, 29 J. HEALTH POL. POL'Y & L. 1153, 1157 (2004).

319. 40 C.F.R. § 1502.6 (2012) (stating that "[e]nvironmental impact statements shall be prepared using an inter-disciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts").

320. Serge Taylor notes that:

have led to better "integration of environmental goals into agency decision making, improved planning, and transparency and public involvement for improved agency decision making."[321] These successes have led to impact assessment proposals in other areas of federal oversight. For example, health impact assessments ("HIAs") have been proposed to identify activities and policies "likely to have major impacts on the health of a population in order to reduce the harmful effects on health and to increase beneficial effects." [322] HIAs evaluate the potential health impacts of a proposal based on "a broad model of health, which proposes that economic, political, social, psychological, and environmental factors determine population health," and take into consideration the "opinions and expectations of those who may be affected by a proposed policy."[323] Scholars have proposed other types of impact assessments that draw on these themes. For example, social impact assessments have been developed as a way to "analy[ze] . . . and manag[e] the intended and unintended consequences on the human environment of interventions . . . and social change processes so as to create a more sustainable biophysical and human environment."[324] Similarly, human rights impact assessments have been suggested to "help evaluate the effects of public health policies on human rights and dignity."[325]

Impact assessments of this nature share at least three relevant characteristics that are informative for developing race impact assessments. First, impact assessments are evidence-based; data collection is central to the regulatory decision-making process. No one type of data is privileged;

> "[b]efore the National Environmental Policy Act, most federal agencies paid scant attention to environmental values. Since the advent of NEPA, environmental concerns have been officially incorporated into every agency's charter. . . . [W]hen the inside analysts are able to explore the possible environment-development trade-offs of a wide range of alternative designs, environmentally better decisions are likely to result: all projects benefit from relatively inexpensive environmental mitigation. When in addition, environmentally concerned outsiders pay attention to the EIS process, some of the worst projects – those projects with the greatest environmental costs and little political support within the agency and among its other constituents – get eliminated."

SERGE TAYLOR, MAKING BUREAUCRACIES THINK: THE ENVIRONMENTAL IMPACT STATEMENT STRATEGY OF ADMINISTRATIVE REFORM 251 (1984)

321. Cole et al., *supra* note 318, at 1167–68.

322. N. & Y. PUB. HEALTH OBSERVATORY., AN OVERVIEW OF HEALTH IMPACT ASSESSMENT 1 (2001), *available at* http://dro.dur.ac.uk/5613/1/5613.pdf.

323. *Id.*

324. Frank Vanclay, *Social Impact Assessment* 2 (World Comm. On Dams, Working Paper, 2000), *available at* http://www.scribd.com/doc/81829611/Social-Impact-Assessment-Vanclay.

325. Lawrence Gostin & Jonathan M. Mann, *Towards the Development of a Human Rights Impact Assessment for the Formulation and Evaluation of Public Health Policies*, 1 HEALTH & HUM. RTS. 59, 60 (1994).

impact assessments can be quantitative or qualitative. These assessments place a premium on engaging with, and thinking through, various policy proposals' real-world implications. As a second related trait, impact assessments are multidisciplinary. Just as no one type of data is privileged, neither is any one disciplinary approach. To be sure, the strength of impact assessments stem from their use of multiple methods and multiple disciplinary perspectives so as to provide a holistic analysis of the many ways in which health, society, human rights, or any other issue may be affected by a particular proposal. Third, impact assessments are characterized by involving multiple stakeholders. While many of the issues analyzed by impact assessments are highly technical and deeply embedded in cutting-edge science, impact assessments are used to bring a wide range of people—experts, non-experts, community members, and others—in a deliberative and collaborative effort to ensure that decision makers are informed of all perspectives.[326]

These fundamental characteristics of impact assessments produce at least three significant benefits. First, impact assessments help root-out facially innocuous practices that may have harmful effects. By being sensitive to topics such as the environment, health, or human rights and how federal decision making can affect them, policy makers can anticipate and mitigate unintended harms—especially those affecting vulnerable populations. A second benefit is that impact assessments increase cooperation and deliberation between government agencies, experts, and the public. The enhanced contact and communication between these various stakeholders encourages a more deliberative democracy by creating a process involving multiple levels of engagement and accountability.[327] Third, the collaborative effort facilitated by impact assessments encourages multiple government agencies to engage with one another about their shared responsibilities. This decreases the likelihood of important issues falling in between regulatory gaps where agencies can end up pointing the finger at each other.

These traits and benefits suggest that the implementation of race impact assessments would significantly assist administrative agencies in predicting the risks and benefits of biotechnologies that implicate race so as

326. "Involving stakeholders has been recommended as essential for building interest in a project and promoting the potential use of the results. It is important to involve stakeholders from an early stage in the project to promote ownership." J. Mindell et al., *Enhancing the Evidence Base for Health Impact Assessment*, 58 J. EPIDEMIOL. & CMTY. HEALTH 546, 548 (2004).

327. *See, e.g.*, AMY GUTMAN & DENNIS THOMPSON, WHY DELIBERATIVE DEMOCRACY? (2004); AMY GUTMAN & DENNIS THOMPSON, DEMOCRACY AND DISAGREEMENT (1996).

to mitigate the former and promote the latter. Not only do race impact assessments provide an opportunity for a broad appraisal of the scientific claims made by race-based medicines, genetic ancestry tests, and DNA forensics, but they also provide a forum where multiple stakeholders—such as government officials, scientists, constituency based groups, and others—can exchange ideas. These stakeholders will be able to provide guidance on how the public can gain access to biotechnologies' potential benefits without unduly subjecting racial minorities to the risks associated with government reasserting questionable linkages between race and biology.

Impact assessments are not entirely unproblematic.[328] For example, the assessment process can be quite lengthy and take several years. This is particularly troublesome with regards to potentially lifesaving medicines or law enforcement practices that can solve open cases and prevent future crimes. Second, impact assessments are resource-intensive and can be costly. Who is going to pay for these assessments and who has time outside of their regular professional and daily obligations to participate in another round of bureaucratic fact-finding? In addition to these hurdles, there is also a concern that, without any substantive or normative claims supporting them, impact assessments can become a mere procedural tool that may not be able to create the change they seek. The impact assessment process may be vulnerable to co-optation by contrary interests that may work against the very concerns giving rise to the assessment process itself and further legitimize questionable and unquestioned practices.

These are surely important concerns. But they are not insurmountable, given the remarkable stakes at hand. The unchecked proliferation of biological race has been at the center of some of the most brutal acts in human history. While those who promote new biotechnologies that implicate race often have laudable objectives, it is important to remain aware of the possible dangers. Given the government's historical complicity in promoting biological race in a manner that harmed the most vulnerable members of society,[329] it has a moral and ethical responsibility to support race impact assessments to atone for past wrongs and to promote a future where minorities can partake in the benefits of scientific innovation without remaining perpetually vulnerable to its risks. Moreover, while the risk of co-optation is real, improving and diversifying deliberations while

328. For an extended discussion of the challenges associated with environmental impact assessments, see Cole et al., *supra* note 318, at 1169.

329. *See supra* Part II.

making the process more transparent—practices embedded in the impact assessment process—can be effective checks.

E. MODELING RACE IMPACT ASSESSMENTS: INITIAL FRAMING AND FUTURE DIRECTIONS

This Article's aim and scope are purposefully modest in that I have only sought to (1) identify biological race as a historical concern with contemporary significance; (2) describe the ways that the State has promoted biological race to the detriment of vulnerable populations; (3) highlight the reemergence of biological race through the development of new biotechnologies; (4) identify the current regulatory gaps that may inadvertently give renewed legitimacy to biological race and its harmful ideologies; and (5) propose administrative agency race impact assessments as a tool to balance the potential risks and benefits of new biotechnologies that implicate race. It would be premature to propose a full race impact assessment model at this point; successful impact assessments need to develop out of robust empirical examinations of each agency's organizational design and culture in relation to current decision making processes on race related innovations—information that is not yet fully available. Moreover, mature impact assessments require the collaboration of experts across multiple fields and affected stakeholders to create model tools that balance new technologies' potential benefits with the potential risks of reifying social categories of race as biologically significant lines of human difference. However, it may be productive to sketch the next steps that need to be taken to move this conversation forward while also broadly mapping the ways in which race impact assessments might be integrated into federal agencies as part of their review of new technologies that implicate race.

As an initial matter, it is important to note that, before any agency moves forward with an assessment of this nature, it would need some type of statutory authority—like NEPA—from which to proceed. NEPA provides an excellent model that Congress can mimic to charge federal agencies to engage in holistic assessments of projects, innovations, or proposals that fall under their administrative authority that may potentially harm race relations by promoting biological understandings of racial difference and disparities. Like the environment, race can be seen as a shared and connected ecosystem that requires federal protection for the benefit of human health and social relations. Moreover, just as NEPA established a Council on Environmental Quality ("CEQ") within the Executive Branch to assist the President in overseeing NEPA's

implementation across federal agencies,[330] so too could a similar council within the Executive Branch play a key role regarding racial issues.[331] This council could monitor the diverse ways in which race may be implicated in administrative agency decisionmaking—from new drug applications to innovative forensic technologies—and encourage consistency across federal administrative agencies.

Creating this statutory authority is an important first step to making race impact assessments a viable tool for administrative agencies seeking further guidance on how to assess claims pertaining to the biological significance of race. Like NEPA, the point of this statutory language is not to compel federal agencies to take certain pre-determined actions.[332] Rather, it is to institutionalize a process within administrative agencies that gives policymakers and bureaucrats the opportunity to pause, think about the racial implications of their actions, engage outside experts and community stakeholders as part of the data collection process, and to use the results of these consultations and assessment tools to inform whatever final decision they might come to. Thus, the goal of race impact assessments is not to say that race can never be used in new innovations regarding human biotechnology. Instead, it is simply to say that we should think clearly about its use so as to avoid applications that uncritically reify race as a biological trait when all available evidence suggests approaching this trend with skepticism.

To the extent that each administrative agency has a distinct history, organizational structure, and awareness of how race impacts their regulatory authority, much more work is needed to determine the most productive way to develop and incorporate race impact assessments into each agency's decision making process. Since the directives and decision-making structures are fundamentally different in the FDA, FTC, and FBI, there is no one-size-fits-all race impact assessment tool that can be imported into each agency to address these matters. Before impact

330. 42 U.S.C. §§ 4342–4347 (2012).

331. In the environmental context, the CEQ's regulations "set the standard for NEPA compliance." *B. Nepa Regulations*, NATIONAL ENVIRONMENTAL POLICY ACT, http://ceq.hss.doe.gov/welcome.html (last visited Dec. 2, 2012). In addition, the CEQ requires that agencies create their own procedures for implementing NEPA, and makes sure that these procedures "meet the CEQ standard while reflecting each agency's unique mandate and mission." *Id.*

332. "[T]here is no substantive requirement forcing federal agencies to select a course of action that an [environmental impact statement] identifies as environmentally preferable. The purpose of an EIS is to inform agency decision making by identifying probable environmental impacts and making this information . . . available for public scrutiny and debate." Cole et al., *supra* note 318, at 1161 (internal citation omitted).

assessment tools can be created and implemented, there needs to be a careful empirical assessment that maps the ways in which race issues have historically been treated within each agency, the existing mechanisms or procedures (if any) used to examine the legitimacy of race specific claims, and how existing or pending innovations in each field might interact with current regulatory assessments. As a more qualitative assessment, significant field work (such as interviews or focus groups with employees) regarding organizational dynamics and existing procedures for discussing race will help locate the opportunities and challenges associated with institutionalizing an ethos of race sensitivity both within each agency and across all relevant federal agencies.

These future projects need to be undertaken before robust race impact assessment models can be developed. This Article reserves a more detailed articulation of the substance and integration of race impact assessments into administrative agencies until future research can lay the aforementioned empirical groundwork. But for now, it is useful to briefly sketch the work that race impact assessments might do. Take, for example, a hypothetical new drug not unlike BiDil, where the manufacturer seeks a race-specific indication for Latinos with renal disease based on impressive clinical trial results with participants that self-identify as Latino. An FDA-led race impact assessment might begin by identifying relevant stakeholders to participate in not only analyzing the claims' scientific merit and clinical trial results, but also the impact that this particular race-specific indication might have on racial minorities. This would be balanced with the potential benefit produced by the race-specific indication, such as the ability to identify and treat more Latinos suffering from this condition or to increase compliance within this group. Multiple methods would be used to evaluate the evidence—both the statistical assessment of clinical trial data and the qualitative assessment of constituent perspectives. A final report would be presented to FDA officials to aid their determination of whether a race-specific indication is warranted for the drug.

The FTC might engage in a similar process to assess products claiming to use genetic technologies to determine individuals' racial backgrounds. A diverse committee of experts—from population geneticists to legal scholars and philosophers—in addition to laypersons would examine the claims in relation to the strength and limitations of the company's methods and data. The committee would also collect and assess qualitative data from affected stakeholders to analyze the ways this technology might affect certain communities and how the public perceives

the biological relevance of race. The committee would then provide a report to FTC officials to inform their decision about how to oversee the sale and marketing of these products.

The FBI could also use race impact assessments to examine the implications of emerging forensic techniques that may disproportionately affect minority communities. Not only would an external, quantitatively-driven scientific evaluation of techniques help assess whether the race-based or race-impacting methods are valid, but a qualitative assessment of stakeholder sentiments might also help the FBI develop procedures that both assist them in law enforcement and respect community concerns.

V. CONCLUSION

When the first draft of the human genome was completed in 2000 and showed that all humans are 99.9 percent similar at the molecular level,[333] scientists, politicians, and the media rejoiced in declaring that there are no biological differences between racial groups, not unlike the way biological race was publically discredited after World War II.[334] President Bill Clinton summed up the sentiment in a statement made from the East Room of the White House when he pronounced that "modern science has confirmed what we first learned from ancient fates. The most important fact of life on this Earth is our common humanity."[335]

However, just as biological race remained a salient, if not prominent, variable in scientific research after the 1950 UNESCO statement publicly declared its death,[336] so too has it remained a powerful lens through which we understand human difference in the genomic era. Rather than focusing on our shared humanity, researchers have focused intensely on the less than 1 percent of genetic variation thought to explain racial difference and disparities.

There may very well be important innovations emerging from this renewed focus on biological race. But, given the horrific track record that

333. *See* Nicholas Wade, *READING THE BOOK OF LIFE: Now, the Hard Part: Putting the Genome to Work,* N.Y. TIMES, June 27, 2000, at F1. Subsequent research has revised this figure to around 99.5 percent. *See generally*, Samuel Levy et al., *The Diploid Genome Sequence of an Individual Human*, 5 PLOS BIOLOGY 2113 (2007).

334. *See supra* Part II.C.

335. Bill Clinton, Pres. U.S., Tony Blair, P.M. Eng., Dr. Francis Collins, Dir. Nat'l Human Genome Research Inst. & Dr. Craig Venter, Pres. & Chief Sci. Officer Celera Genomics Corp., Remarks on the Completion of the First Survey of the Entire Human Genome Project (June 26, 2000), *available at* http://www.ornl.gov/sci/techresources/Human_Genome/project/clinton2.shtml.

336. *See supra* Part II.C.

we have with using science to measure and define racial difference, the government needs to take strong steps to ensure that these technologies are used responsibly. Administrative agency race impact assessments are an important first step to providing a democratic, deliberative, and collaborative space to collect and analyze the data necessary to inform decision makers on how to sensibly regulate these new innovations.