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RACE IN THE LIFE SCIENCES: AN EMPIRICAL ASSESSMENT, 1950–2000

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The mainstream narrative regarding the evolution of race as an idea in the scientific community is that biological understandings of race dominated throughout the nineteenth and twentieth centuries up until World War II, after which a social constructionist approach is thought to have taken hold. Many believe that the horrific outcomes of the most notorious applications of biological race—eugenics and the Holocaust—moved scientists away from thinking that race reflects inherent differences and toward an understanding that race is a largely social, cultural, and political phenomenon. This understanding of the evolution of race as a scientific idea informed the way that many areas of law conceptualize human equality, including civil rights, human rights, and constitutional law.

This Article provides one of the first large-scale empirical assessments of publications in peer-reviewed biomedical and life science journals to

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examine whether biological theories of race actually lost credibility in the life sciences after World War II. We find that biological theories of race transformed yet persisted in the dominant academic discourse up through modern times—a finding that contradicts the central narrative that the life sciences became "color-blind" or "post-racial" several decades ago. The continued salience of biological race in the life sciences suggests that more attention needs to be paid to the questionable assumptions driving this research on biological race and its potential spillover effects, i.e., how persisting claims of biological race in the scientific literature might reconstitute its significance in law and society in a manner that may be harmful to racial minorities.

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INTRODUCTION

The claim that race is a social construction—that is, a concept created by social and political forces rather than a natural division of human beings—has become accepted wisdom across many disciplines, including law, the social sciences, and the humanities. This consensus is based largely upon a narrative that theories of biological race dominated intellectual thought up until the mid-twentieth century but were eventually replaced by constructionist viewpoints after the gruesome nature of biological race's most notorious implementation (the Holocaust) was revealed to the world.[1] This narrative arc has been central to the way that race has been

1. In one of the more influential books on the ebb and flow of race ideologies in the West in the twentieth century, Elazar Barkan begins by stating that "[t]he Nazi regime has compelled us all to recognize the lethal potential of the concept of race and the horrendous consequences of its misuse. After World War II the painful recognition of what had been inflicted in the name of race led to the discrediting of racism in international politics and contributed to the decline and repudiation of scientific racism in intellectual discourse." ELAZAR BARKAN, THE RETREAT OF SCIENTIFIC RACISM: CHANGING CONCEPTIONS OF RACE IN BRITAIN AND THE UNITED STATES BETWEEN THE WORLD WARS 1 (1992).

conceptualized in the modern era and has shaped the development of many areas of law, including civil rights, human rights, and Fourteenth Amendment equal protection law.

In demonstrating that race is a social system that does not reflect any inherent differences between people comes a moral authority that has motivated various postwar social and legal projects committed to equality and human liberation. As Evelynn Hammonds notes, "The consensus in the social sciences that race is a social concept grew so strong that by the end of the twentieth century it was rarely questioned."[2] This agreement is often thought to specifically transcend the social and life sciences. Any lingering sensibility of race being biological is largely believed to be a remnant of *nonscientific* lay understandings of race perpetuated by an uninformed public. Residual ideas about race marking *natural* differences among groups are therefore thought to be distinct from the work of social and life scientists who are believed to have jointly rejected biological understandings of race and embraced a constructionist perspective decades ago.[3]

Yet, as sociologist Ann Morning observes, "The frequent sociological claim that scientists have abandoned racial essentialism is more often an assumption than an empirically documented finding."[4] There have been historical evaluations providing evidence that complicates this narrative arc concerning the death of biological race and the acceptance of constructionist approaches. For example, Jenny Reardon's *Race to the Finish* provides an eloquent historical account of how post–World War II discussions of race did not reject prewar biological essentialisms.[5] Instead, Reardon argues that a more nuanced negotiation ensued whereby scientists attempted to retain and redefine what was thought to be the underlying biological structure of racial differences through then-emerging techniques and technologies in a manner that separated the so-called fact of biological difference from the various social meanings that had attached to

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2. Evelynn M. Hammonds, *Straw Men and Their Followers: The Return of Biological Race*, IS RACE "REAL"? (June 7, 2006), http://raceandgenomics.ssrc.org/Hammonds/.

3. Ann Morning writes:

> Sociologists often maintain . . . that the idea of race, as constructed, is widely shared across the disciplinary spectrum. In this view, both social and natural scientists have converged on a common interpretation of race as social and not biological in nature. . . . This depiction of an academic consensus on racial construction is routinely juxtaposed with a portrayal of the public as retaining essentialist beliefs—that is, the notion that races do in fact correspond to biologically distinct human groups. . . . The resulting picture is of a unified intellectual community that has debunked old notions of race, whereas "the public has adhered to a rather rigid belief in race as a biological fact."

Ann Morning, *"Everyone Knows It's a Social Construct": Contemporary Science and the Nature of Race*, 40 SOC. FOCUS 436, 436–37 (2007) (quoting CLARA E. RODRIGUEZ, CHANGING RACE: LATINOS, THE CENSUS, AND THE HISTORY OF ETHNICITY 42 (2000)).

4. Ann Morning, *Reconstructing Race in Science and Society: Biology Textbooks, 1952–2002*, 144 AM. J. SOC. S106, S110 (2008).

5. *See generally* JENNY REARDON, RACE TO THE FINISH: IDENTITY AND GOVERNANCE IN AN AGE OF GENOMICS (2005).

phenotypical differences over time.[6] Nancy Stepan offers a similar historical critique, noting that although prewar understandings of biological race focused *qualitatively* on physical distinctions that were thought to signify inherent group differences, the postwar emphasis on the *quantitative* distribution of genes across population groups preserved an ongoing belief in biological difference that gets lost in the traditional constructionist narratives.[7] And, in addition to these historical accounts, contemporary social science research with scientists and physicians has shown that social constructionist perspectives are a minority viewpoint in the profession.[8]

Morning's critique is both apt and penetrating: the widely shared belief that the life sciences made a substantive shift from biological conceptions of race to constructionist perspectives has been accepted without much *empirical scrutiny* of the scholarly record. This Article attempts to address this observation by offering an empirical investigation into how race was conceived during the postwar period in two scientific disciplines (genetics and clinical medicine) to examine whether biological understandings of race dissipated after World War II.[9] Part I provides further context, refines the research question, and lays out the methods used to pursue this investigation of the literature. Part II then discusses the results from our original research, assessing how race discourses developed in the decades following World War II. We then discuss these findings and offer an extended critique in Part III. Part IV concludes with a few thoughts on the significance of this research and how this and similar projects might be used to inform deeper social and political debates concerning racial equality.

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6. *Id.* at 4–16.

7. Stepan provides an insightful look into how many conceptualized the difference between "old" and "new" theories of race before and after the war:

> The old and new biology offered a series of contrasts. The old science of race, for instance, had its disciplinary home in anatomy and morphology. . . . The new biology was based, instead, in experimental and theoretical genetics, and its institutional homes were the university departments of molecular biology rather than medicine, or in departments of biology and anthropology in which the new populational outlook dominated. . . . The fundamental unit of analysis in the old racial science was the human race or racial "type." Races were defined anatomically and morphologically, in terms of the phenotype—that is, by detailed measurement of the shape of the skull, the dimensions of the post cranial skeleton, by stature, and by skin colour. The features measured were taken to be on the whole stable in character, and therefore a good indication of racial identity and affinity. The unit of analysis in the new biology was, by contrast, not the race but the "population," defined not morphologically or behaviorally but genetically and statistically. To the new biologist, every individual in a population was genetically unique, owing to the independent assortment, recombination, and mutation of Mendelian genes controlling traits. Groups of individuals could, however, share a characteristic distribution of genes, and form a population which was statistically differentiated from another population.

NANCY STEPAN, THE IDEA OF RACE IN SCIENCE: GREAT BRITAIN 1800–1960, at 176 (1982).

8. *See generally* ANN MORNING, THE NATURE OF RACE: HOW SCIENTISTS THINK AND TEACH ABOUT HUMAN DIFFERENCE (2011).

9. For a different and more limited survey of how race was used in the research literature during the post–World War II period, see generally Snait B. Gissis, *When Is 'Race' a Race? 1946–2003*, 39 STUD. HIST. PHIL. BIOLOGY & BIOMED. SCI. 437 (2008).

I. RESEARCH QUESTION AND METHODS

Before moving forward, it is important to take a brief step back to highlight the extent to which traditional narratives concerning the emergence, dominance, and disappearance of biological race among scholars have, in some ways, overly simplified the many debates both within and between various fields during this period. To assume that a putative postwar shift away from biological race was a linear process would be a serious mistake; several books have detailed the discordant and uneven nature of this process.[10] While this Article will not retell this history, it takes as its point of critique an important conceptual shift that emerged from this nonlinearity to motivate the traditional narrative arc concerning race in the academy during this period. This overarching conceptual shift drew distinctions between "old" theories of race that were driven by notions of racial typologies defined by exacting scrutiny of human anatomy and "new" postwar theories of race that focused on populations defined by the then-emerging statistical understandings of genes and genetic groupings.[11]

With this move, race "was given a new, genetic meaning [as] it was apparent that 'race' had in the process been transformed as a concept since the genetically defined populations did not correspond to the old anthropological idea of race."[12] Indeed, some population geneticists during this period of transformation thought that this new emphasis on populations was so different from the prewar emphasis of racial typologies that the word race was no longer useful in discussing human biology.[13] This new postwar emphasis on populations and genetics also impacted the field of medicine, where "the new genetics . . . replac[ed] the old eugenical genetics with a new, much more sophisticated and ethically neutral genetic counseling."[14] This new emphasis on human heredity in the research literature was thought to also have moved medicine in a decidedly post-racial direction, as it was thought to have refocused biomedical and clinical understandings of race on treating *individuals* with specific hereditary diseases rather than understanding race as a social or political tool that subordinates or privileges certain *groups* in a manner that impacts their health outcomes.

These developments had the effect of redefining issues of race and human difference as quantitative, measurable, and therefore "objective" differences that were ostensibly free of the bias that characterized earlier periods of scientific racism and the eugenics movement. Consequently, this redefinition left the study of how racial stereotypes and ideologies attach to human differences—i.e., how race is socially constructed—as an endeavor

10. *See generally* BARKAN, *supra* note 1; DANIEL KEVLES, IN THE NAME OF EUGENICS: GENETICS AND THE USES OF HUMAN HEREDITY (1985); STEPAN, *supra* note 7.

11. *See supra* note 7.

12. STEPAN, *supra* note 7, at 177.

13. *Id.* at 177–78.

14. *Id.* at 181.

for social scientists interested in race relations.[15] From this standpoint in the narrative arc, the life sciences became post-racial and color-blind in the sense that their work was thought to no longer be influenced by racial typologies or political ideologies concerning various races. Rather, their research on race and populations became seen as being driven purely by the scientific assessment of statistical data concerning the distribution of human population differences.

It is against this backdrop that we pose the following research question: Does an empirical examination of the post–World War II research literature support this claim that biological understandings of race of the "old" prewar variety disappeared in favor of a more constructionist sensibility that rejected the significance of racial typologies and morphology in understanding human difference and health outcomes? To answer this question, we looked at four preeminent academic medical and genetic journals from 1950 to 2000 to qualitatively assess the dominant discourse during this period with regard to how race was conceptualized in relation to issues of health, medicine, and population difference. The time period for this investigation roughly captures the era between the end of World War II and the completion of the first draft of the Human Genome Project. The Human Genome Project marks a useful endpoint as a moment where researchers provided the first "map" of the human genome (all of the genes in human beings), a development that shifted discussions on human heredity (and, consequently, biological understandings of race) in new and different directions.[16]

Our research team inductively developed a codebook and analyzed a sample of articles from four peer-reviewed medical and genetics journals. These journals were chosen on the basis of their reputation and impact in these fields and because their archives spanned the decades between 1950 and 2000. We reviewed two biomedical journals, *Journal of the American Medical Association* (JAMA) and *New England Journal of Medicine* (NEJM), and two genetics journals, *American Journal of Human Genetics* (AJHG) and *Annals of Human Genetics* (ANHG). To be sure, these journals do not reflect the entirety of diverse conversations concerning race, health, and population difference that occurred across many fields during this period. Nevertheless, the prominent nature of these journals provides a useful dataset that captures important—indeed, influential—discourses that were accepted and circulated among those engaged in biomedical, clinical, and genetic research on race in the postwar era.

To examine trends across each decade, we sampled articles every five years starting in 1950 and ending in 2000 in each of the four journals (i.e.,

15. Stepan notes that "once it was realized that racial prejudice was a function not of biological race or innate racial antipathy, but of social, economic and psychological factors in society, the study of race relations became an important subfield of sociology, economics, political science, and psychology." *Id.* at 182.

16. *See generally* Osagie K. Obasogie, *The Return of Biological Race? Regulating Innovations in Race and Genetics Through Administrative Agency Race Impact Assessments*, 22 S. CAL. INTERDISC. L.J. 1 (2012).

our dataset was formed by articles published in 1950, 1955, 1960, etc.). We employed different criteria for selecting the initial article dataset. In the genetics journals, we analyzed all articles published in those journals for the specified year. In the medical journals, we conducted a key word search[17] to identify our initial set of articles. To the extent that our research question attempts to understand whether the ostensible postwar shift from typological to population concepts of race led to biological race's demise, we initially imposed these criteria on the biomedical journals because they contained fewer articles focused on genetics and were published more frequently than the genetics journals. The initial dataset contained 3354 articles (AJHG (n=1654); ANHG (n=370); JAMA (n=434); NEJM (n=896)).

Each article in the initial dataset was also subjected to qualitative examination to determine whether it qualified for inclusion in our analysis.[18] We briefly reviewed each article in the initial sample and applied additional selection criteria to identify articles that examined race/ethnicity in the context of health or genetics. To be included, the article had to: (1) include a population of African ancestry either in the introduction, methods, or conclusions section of the paper[19] and (2) include a discussion or analysis of at least one population. We defined population broadly as anything more than a single individual; authors could define their study population ethnically, socially, biologically, et cetera. Our final dataset included empirical studies, editorials, and review articles and excluded case studies and empirical studies investigating only a single individual's data. This allowed the data to reflect the broadest sense of the different scholarly outlets in which relevant race concepts were discussed and debated during this period. Our final coding dataset included 291 articles (AJHG (n=165); ANHG (n=30); JAMA (n=35); NEJM (n=61)). The inclusion rate for articles from the initial sample set was between 6.8

17. The keywords used to identify the initial articles for inclusion were: "genet* OR gene OR congenit* OR heritab* OR heredit* OR inherit* OR kindred OR inbreed* OR pedigree OR lineage."

18. A note on inter-rater reliability: in order to determine reliability between the two coders, twenty articles were selected from the included articles and were coded by both coders. After each round of coding, reliability was calculated for each code by using percent agreement and once a reliability level of at least 80 percent was established, reliability testing ceased. Inter-rater reliability ranged from 83 percent for the biological essence code to 100 percent for the social construction code. All articles were given a unique three digit identifier and then randomly assigned to one of the two coders.

19. We restricted our sample to papers that discussed populations of African descent for two reasons. First, Western race relations have largely been driven by black/white conceptions of race, so we were particularly interested in if, how, and in what ways these particular ideologies persisted in the postwar era. This isn't to say that this is the only or even most important racial dynamic during this period. But, it does have historical and social significance worth isolating and considering. The second reason is administrative. Developing adequate search terms that were useful in teasing out how a single population has been treated in the literature over fifty years has its challenges. Attempting to do this for multiple racial groups (along with reviewing, coding, and analyzing) would have presented difficulties of a higher order of magnitude with potentially very little return given our specific research question on whether biological notions of race persisted after World War II—a question that can be just as meaningfully answered by focusing on one group.

percent (JAMA) and 10 percent (AJHG). Thus, articles coded for this study represent a small group of articles published in these journals. Furthermore, the coding dataset of 291 articles was dominated by articles from AJHG.

We analyzed a small subset of articles to develop preliminary codes for characterizing the articles and the concepts of racial difference represented in the article. We identified seven general categories that scientists used to describe racial differences and/or to justify the use of race in their studies. The following codes were developed: biological frequency (n=139);[20] disease frequency (n=127);[21] biological essence (n=143);[22] geographic origin (n=176);[23] social status (cultural or historical) (n=75);[24] descriptor only (n=40);[25] and social construction (n=1).[26] These codes characterize multiple distinct but related concepts of race that co-occur and interact within an article.

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20. We developed two codes to reflect how racial differences were expressed in statistical or quantitative terms: biological frequency and disease frequency. These statements quantified the difference between racially labeled groups, often using quantitative statements about racial difference to buttress categorical differences (e.g., the difference between Caucasians and African Americans). "Biological frequency" statements described racial difference as a frequency or expressed quantitative differences between groups by using a likelihood or rate of a gene or physical trait.

21. Closely related to biological frequency, the code "disease frequency" captured passages that compared racially labeled groups in terms of the incidence, prevalence, or risk of disease. Passages coded to disease frequency expressed racial differences in the frequency, likelihood, or rate of disease, for example by describing the rate of sickle cell disease in African or African American populations.

22. The "biological essence" code captured statements that reflected assumptions about race as a bounded category of individuals or subgroups that share a particular or unique biological characteristic. We developed a broad definition of biological essence that was flexible enough to encompass the historical variation in how biological essence was described within the initial set of code development articles. Statements coded as biological essence reflected racial difference as a qualitative statement about typological, essential, or categorical differences between racial groups.

23. Racial differences expressed in geographic terms were coded as "geographic origin." Within these statements racial groups were bounded by national, continental, or regional borders. These statements reflected race as a bounded population composed of people who are currently in or have originated from a particular place or region.

24. This code captured passages that made references to culture, social, or historical factors that characterize the different racial groups, or distinguish these groups. In these passages, race was bounded by shared socioeconomic status (SES) and cultural beliefs. These included references to "self-identified" race, links between socioeconomic status and race (including efforts to distinguish SES from race as an epidemiological construct), and shared cultural practices surrounding food, marriage, or language. Passages that included only information about population migrations without reference to social or historical forces that caused or precipitated population movements were not included here but rather were coded as "geographic origin."

25. These articles used race as a simple descriptor without giving any elaboration of the meanings of race or the inferences that could be drawn from racial designations. These articles included, for example, epidemiological studies that described their study populations in racial terms, but did not further describe race in any way.

26. Social constructionist statements include any discussions of the idea that race is a historically contingent and socially produced category; the notion that race is not biologically real; that race is the product of ideology and functions as ideology; or that racial labels reflect complex identities or histories.

After the codebook was developed and inter-coder reliability was established, the articles were randomly assigned to one of two primary coders who read and analyzed the articles. They recorded passages that exemplified each concept of racial difference used by authors and developed semi-structured analytic memos for each article. The coders identified passages about racial difference, recorded the passage, and determined which concept of racial difference was reflected in the passage. Each passage described differences in racial groups or elaborated the meaning or definition of a racial group, for example by comparing African Americans and Caucasians or by defining a group through their migration history. In general, concepts of racial difference were reflected in passages about the boundaries of racial groups or categories, comparisons between groups, defining characteristics of groups, or definitional statements about groups. These codes were largely applied to passages within each sampled article, meaning that coders assessed the presence of the (often multiple) concepts of race within the article and provided examples of the code(s) from within the text. The coders identified, collected, and documented passages that substantiated their application of the code(s) within each article. These passages also enabled a close textual analysis of concepts of race, their usages, and the distinct racial discourses that resulted. These findings are discussed in Part II.B.

The number of articles published and the conceptualization of race that was espoused were measured and compared to one another, both journal by journal and as a collective dataset, as a means to understand how race ideas developed in these journals during this period. All descriptive statistics were produced with SPSS version 21, and all graphs with MATLAB version R2014a.

The qualitative analysis focused on the variation within the seven concepts of racial difference and the relations among the use of these concepts within the rhetorical arc of the scientific articles. We did not focus on historical trends across any one concept of racial difference, preferring to read the complete dataset as a whole unit with strong lines of historical continuity. Codes were not considered mutually exclusive; articles often reflected multiple conceptions of race and were coded accordingly. Articles were initially sorted by their dominant orientation/code (e.g., social historical, biological essence) and read together. Each analyst read the memos pertaining to these sets of articles and described subthemes and dynamics of arguments, focusing not only on elaborating the variation within different racial concepts but also on examining the relationships among the different concepts of race within the article.

Through reading these full sets of coded passages, the analysts generated subcodes and themes and then came together to develop a final list of codes. These included subcodes within each concept of race, dynamics of arguments, and code-code relationships. These were documented in memos that included the coders' analysis and quoted citations as exemplars. These memos were intended to answer key questions about how and why particular concepts of race were being used in each article and to document

dynamics that persisted across the journals and the historical period under study. For example, the coders focused on conceptualizations of essence and its relation to other concepts of race, as well as the role of essentialist reasoning within the articles' overall arguments. We identified three central themes or dynamics within the articles published during this period: (1) the co-occurrence of multiple understandings of race, where biological race persists in the postwar period by intertwining with other conceptions of race; (2) "the search for racial purity;" and (3) the leveraging of race to understand disease. All results are detailed in the next part.

II. RESULTS

A. Description of Dataset and Codes

Table 1 describes the final number of articles that met inclusion criteria by year and journal. Overall, there were 291 articles that were included in the dataset for in-depth, textual analysis. Nearly two-thirds of the articles were published in genetics journals (n=195) and one-third were published in medical journals (n=96). Table 1 also provides a measure of the total number of racial conceptualization codes applied to articles and the mean number of codes applied to an article for each year and within each journal type (as well as for the overall sample). The number of different concepts of racial difference applied to a publication is a crude measure of the code density. As described in detail in Part II.B, a minority of articles contained only one discernible concept of race. Most articles demonstrated a complex lattice of racial conceptions that was woven throughout scientific experiments, discourses, and arguments. Each article was coded for approximately 2.41 different concepts of racial difference and differed across medical (mean=1.79) and genetics journals (mean=2.71).

There are several additional points to glean from the data in Table 1. First, there are fewer articles from the 1950s that met the inclusion criteria. Second, articles from genetics journals dominate the dataset within and across all decades. Third, the number of articles included for each five-year timepoint generally increases over time (with a notable exception in 1970). Thus, the final dataset is heavily weighted toward articles from genetics journals and articles from later years (1990–2000).

Table 1: Total Number of Articles, Codes, and Average Number of Articles per Code Presented by Journal Type and Year

Year	All Journals			Genetics Journals			Medical Journals		
	Total # Articles (%)	Total # Codes	Mean # of Codes / Article	Total # Articles (%)	Total # Codes	Mean # of Codes / Article	Total # Articles (%)	Total # Codes	Mean # of Codes / Article
1950	7 (2.4)	18	2.57	7 (3.6)	18	2.57	0 (0.0)	0	0.00
1955	8 (2.7)	23	2.88	5 (2.6)	14	2.80	3 (3.1)	9	3.00
1960	21 (7.2)	47	2.23	17 (8.7)	41	2.41	4 (4.2)	6	1.50
1965	26 (8.9)	50	1.92	16 (8.2)	35	2.19	10 (10.4)	15	1.50
1970	35 (12.0)	79	2.26	18 (9.2)	51	2.83	17 (17.7)	28	1.65
1975	24 (8.2)	58	2.42	15 (7.7)	37	2.47	9 (9.4)	21	2.33
1980	22 (7.6)	52	2.36	12 (6.2)	32	2.67	10 (10.4)	20	2.00
1985	21 (7.2)	44	2.10	9 (4.6)	21	2.33	12 (12.5)	23	1.92
1990	32 (11.0)	77	2.41	20 (10.3)	58	2.90	12 (12.5)	19	1.58
1995	42 (14.4)	103	2.45	31 (15.9)	84	2.71	11 (11.5)	19	1.73
2000	53 (18.2)	150	2.83	45 (23.1)	138	3.07	8 (8.3)	12	1.50
Total	291 (100)	701	2.41	195 (100)	529	2.71	96 (100)	172	1.79

The overall number and frequency of each of the seven different codes for racial difference is shown in Table 2 by journal type and across all journals. It is important to note that ideas concerning biological race—demonstrated by the prevalence of biological frequency (n=139), disease frequency (n=127), and biological essentialism (n=143)—were the dominant codes in the dataset, rivaled only by geographic origin (n=176). These figures provide evidence against the widely shared narrative that theories of biological race dwindled during this period. In fact, these three codes concerning biological race account for 58.2 percent of all codes applied to articles.

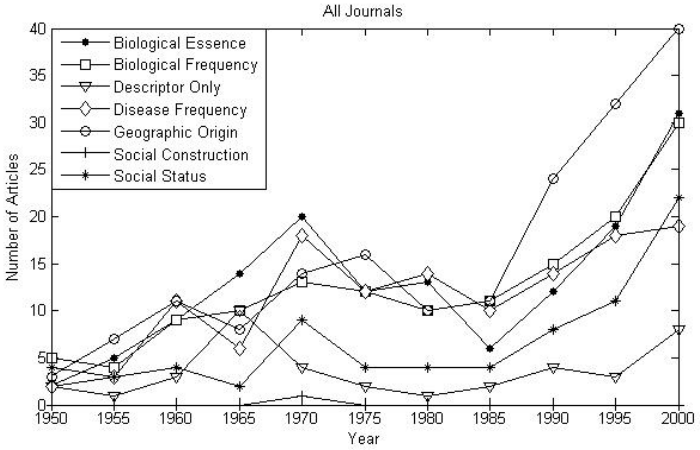
Table 2: Number and Frequency of Articles Coded for Different Concepts of Racial Difference Within and Across Journals

	All Articles (n=291)	**Articles from Genetics Journals (n=195)**	**Articles from Medical Journals (n=96)**
	n (% of articles with code within journal type)		
Biological Frequency	139 (47.8)	120 (61.5)	19 (19.8)
Disease Frequency	127 (43.6)	69 (35.4)	58 (60.4)
Biological Essence	143 (49.1)	122 (62.6)	21 (21.9)
Geographic Origin	176 (60.5)	138 (70.8)	38 (39.6)
Social Status	75 (25.8)	60 (30.8)	15 (15.6)
Descriptor Only	40 (13.7)	20 (10.3)	20 (20.8)
Social Construction	1 (.03)	0 (0)	1 (1.0)
Mean # of Codes per Article	2.41	2.71	1.79

While this Article is focused on an in-depth qualitative, textual analysis of journal publications, it is important to provide sufficient context for examining the strengths, limitations, and potential biases inherent in our dataset. Graph 1 illustrates the number of articles per code for each year across all journals. Though we did not conduct a detailed quantitative analysis of the trends in code use over time or between journals, this plot provides a general overview of how and when different codes were used. There are two important trends to consider here. First, all codes (with the exception of social construction and descriptor only) tend to increase across the timeframe, which is not surprising given the small number of articles included in the dataset from the earlier part of the twentieth century. Second, there is a consistently upward trend for several codes beginning around 1985; most notably, geographic origin, biological essence, and social status codes were increasingly applied in this timeframe. One would need to conduct a detailed quantitative analysis of trends over time controlling for other variables (such as an increase in the overall number of articles published) to accurately interpret this trend. Nevertheless, this data usefully responds to our main research question by demonstrating the

presence and viability of biological understandings of race in the postwar era.

Graph 1: Codes for Concepts of Race Illustrated over Time Across All Journals (n=291)



B. Qualitative Findings

Through qualitative analysis of the articles, we identified three significant themes that persisted in the sampled literature during this period. First, while social scientists describe a growing scientific consensus around a largely singular understanding of race during this time period (i.e., social constructionist), we found multiple distinct concepts of race that were used in a manner that supported each other and were not mutually exclusive. The co-occurrence and mutual support of distinct concepts of racial difference—including biological race—are reflected and embodied within each of the other two themes that we have identified. This layering of racial discourses ultimately sustained biological concepts of race throughout this period, enabling them to endure and persist in current scientific thinking and practices.[27] In detailing our qualitative findings below, we discuss how co-occurring racial discourses maintained biological race throughout the sample.

We termed the second theme that emerged from this research "the search for racial purity." These articles were typically concerned with explaining and investigating biological differences between racial groups and/or the identification of a "pure" or isolated racial/ethnic group. In these articles, researchers drew on biological, sociohistorical, and geographic

27. *See, e.g.*, Eliane Azevêdo, *Subgroup Studies of Black Admixture Within a Mixed Population of Bahia, Brazil*, 44 ANNALS HUM. GENETICS 55, 60 (1980) (using genetic, anthropological, and medical research to support and study black admixture within a population).

understandings of race to examine human genetic diversity and population admixture. Researchers working within this domain relied on the latticing of these racial discourses to frame their investigations of racial purity and admixture in studies of colonialism, migration, and racial classification.[28]

The third theme that we identified involves leveraging or employing race to understand and give meaning to certain disease characteristics or demographics. These articles used concepts of racial difference akin to "old" notions of racial typology to understand disease. As scientists sought to disentangle the causes of racial differences in health or trace the racial origins of disease, different concepts of race commingled within medical discourses.[29] These co-constructions often reified the boundary between the biological and the social, and ultimately reinforced prevailing racial hierarchies in the name of public health.

1. Co-Occurrence of Multiple Concepts of Race

As indicated in the description of the dataset and codes, concepts of racial difference rarely existed in isolation. Almost all of the articles analyzed under this theme contained multiple racial codes that co-occurred within the same article, which demonstrates the complicated nature of race within the post–World War II genetics and medical literature. We argue that notions of biological race survived in the post–World War II period through commingling with other concepts of racial difference, including those rooted in social, cultural, and geographic understandings of difference.

Co-occurrence is a means of life support; as biological race was experiencing its *political* demise after World War II, its pairing with other conceptions kept the *conceptual* flame alive. This is particularly clear in articles where both biological and geographic notions of race were used together. In these articles, geographic distances take on biological significance through the examination of racial differences. Racial differences, here conceptualized at the level of continent-specific polymorphisms, become powerful tools "for inferring the ethnic and geographic origin of modern and ancient humans."[30] Social categories such as race and ethnicity take on biological significance when brought into dialog with geography. These authors utilize multiple racial discourses to follow the dispersal of humans throughout the globe, and thus create a

28. *See, e.g.*, Lance D. Green et al., *mtDNA Affinities of the Peoples of North-Central Mexico*, 66 AM. J. HUM. GENETICS 989, 989 (2000) (investigating the European, African, and Native American genetic contributions to a population in Mexico).

29. Buran Kurdi-Haidar et al., *Origin and Spread of the Glucose-6-Phosphate Dehydrogenase Variant (G6PD-Mediterranean) in the Middle East*, 47 AM. J. HUM. GENETICS 1013, 1013–14 (1990) (examining the co-occurrence of geographic, cultural, and biologically essentialist notions of race within the study of disease, where modern nation-state boundaries and ancient/essentialist notions of Greek civilization come together to explain G6PD deficiency).

30. Yu-Sheng Chen et al., *Analysis of mtDNA Variation in African Populations Reveals the Most Ancient of All Human Continent-Specific Haplogroups*, 57 AM. J. HUM. GENETICS 133, 134 (1995).

genetic history of human populations.[31] This research agenda, which is discussed in more detail in the next section, draws on both geographic as well as sociohistorical discourses to revive race as a biological reality.

Racialized understandings of disease also supported biologically essentialist notions of race. In much the same way that continent-specific polymorphisms were thought to be able to stand in for one's racial origin, the occurrence of disease in a population could also serve to mark one's racial heritage. For example, in a 1965 *American Journal of Human Genetics* article, the researchers investigated "the presence of G6PD deficiency in these two unrelated and supposedly 'pure' Indian[]" groups in Mexico to determine whether this disease was the result of environmental pressure or through "admixture with Negroes" who lived near this native population.[32] While the results were unclear, the authors argued that "[t]he most likely explanation is that the variable frequencies of both anomalies are due to variable degrees of Negro admixture in the four cities examined."[33]

In both of the above examples, biologically essentialist notions of race are supported through the use of other conceptions of race. However, what remains unclear is why sociological understandings of race as a social construction did not take hold during this period. The only article in our sample to directly address this issue was a 1970 editorial published in NEJM by Nicholas M. Nelson. In this editorial, Nelson defends using the category of race in medical research primarily on the grounds that if scientists reject the possibility that race is a biological category for political reasons, then advances in scientific knowledge would be delayed.[34] Nelson argues that in order to maintain the development of scientific knowledge, there must be a separation between "secular" political pressures and the "cathedral of scientific truth."[35] Furthermore, Nelson also argues that attempts to restrict the investigation of race as a biological category elicit "a sociologist's and a socialist's delight" by grounding the explanation of racial disparities in social, economic, and political inequalities instead of fundamental biological differences between racial groups.[36] Thus Nelson's argument for the continued use of biological understandings of race serves as both a defense of science and a defense of status quo racial ideologies against politics. By actively critiquing sociological understandings of racial difference and instead defining these differences primarily in medical and

31. *E.g.*, Luis G. Carvajal-Carmona et al., *Strong Amerind/White Sex Bias and a Possible Sephardic Contribution Among the Founders of a Population in Northwest Colombia*, 67 AM. J. HUM. GENETICS 1287, 1287 (2000) (examining a "population [that] was established in the 16th–17th centuries through the admixture of Amerinds, Europeans, and Africans and grew in relative isolation until the late 19th century").

32. Ruben Lisker et al., *Studies on Several Genetic Hematological Traits of the Mexican Population. VIII. Hemoglobin S, Glucose-6-Phosphate Dehydrogenase Deficiency, and Other Characteristics in a Malarial Region*, 17 AM. J. HUM. GENETICS 179, 179 (1965).

33. *Id.* at 184.

34. *See* Nicholas M. Nelson, *On Racism in Science*, 283 NEW ENG. J. MED. 594, 595 (1970).

35. *Id.*

36. *Id.* at 594.

genetic terms, Nelson breathed life back into the idea that demonstrably social categories of race have a decidedly biological significance.

Further examples regarding the co-occurrence of racial understandings are discussed in the two other themes explored in this section. Yet, it is important to highlight that co-occurrence is not only a means through which these other themes are articulated but is an independent theme in its own right, as it reflects a *substantive* (not simply methodological) mechanism that allows biological understandings of race to flourish at the very moment that social scientific discourses suggested their demise.

2. The Search for Racial Purity

Longstanding ideological investment in racial purity is present throughout the sample. In these articles (n=96), researchers were interested in studying racial differences and purity, generally in the form of specific biological traits or genetic markers. These articles brought together sociohistorical narratives, geographic origin stories, trait frequency data, and genetic analyses to collect and study bodies. These specimens and populations were said to demonstrate racial purity and admixture. Rather than using sociohistorical narratives of race to examine the social construction of racial categories, researchers used historical narratives as a means to investigate the spread of racialized genetic information across space and time. This use of racial concepts permeates the sample and can be seen in two central scientific discourses: (1) conversations of racial purity and infiltration and (2) discourses that defined racial misclassification as a social error that was contrasted with biological facts.

a. Defining Racial Purity and Infiltration

In these articles, researchers used phenotypic or genetic markers as a means to search for and identify racial purity, sometimes interpreted as a type of racial "origin" or stock. For example, in a 1955 ANHG article, *Blood Groups of the Northern Nilotes*, the researchers used cultural and physical similarity to group these people together as a unique population.[37] At the end of the article these authors argued that the Nilotes may "be surviving representatives of an ancient African stock," thus engaging in notions of purity.[38] The authors argued:

> It has been implied that an early race with high *cDe* frequency and no sickling provided a major component of the present-day population of Africa. The study of their blood groups has suggested that the Bushmen are one remnant of such a race; the present survey suggests that the Northern Nilotes, long, and to-day markedly, distinct from the Bushmen,

37. D.F. Roberts et al., *Blood Groups of the Northern Nilotes*, 20 ANNALS HUM. GENETICS 135, 135 (1955).

38. *Id.* at 153.

> may be another relatively undiluted remnant of this hypothetical ancestral stock.[39]

In this example, Bushmen and Northern Nilotes are presented as living genetic fossils of distinct primordial African ancestral stocks, relatively undiluted from the genetic infiltration of other groups, even within Africa itself. The authors leverage the concept of race—here conceptualized in terms of frequency and as essence—to make claims about the historical and genetic origins and, hence, the purity of African populations.

The search for purity can also be seen in investigations of genetic "infiltration." For example, a 1965 article by Salzano and Steinberg employed notions of racial purity and infiltration through the examination of "non-Indian" genes in a "full blood" Indian population.[40] The authors argued that "the introduction of non-Indian genes . . . has as a consequence not only the presence of genes like Gm^b and Gm^{abc}, which perhaps were not present before the contact with whites and Negroes, but also another noteworthy feature, the increase in frequency of gene GM^{ab}."[41] The presence of non-Indian genes within an individual serves to demonstrate the infiltration of white and "Negro" genes into previously pure or original groups.[42] In this example the examination of racial purity once again draws on biological notions (biological essence) of race to frame and interpret the spread of genetic information across space and time. This can be seen even more explicitly in another article in which the population of Brazil is described as containing "48% Caucasian, 34% Negro, and 18% Indian genes."[43]

As mentioned above, authors drew on multiple racial discourses to explore the dispersal of humans throughout the globe primarily in genetic terms, and thus created a genetic history of human populations.[44] This research agenda uses racial categories to frame and interpret the spread of genetic information. This can also be seen in examinations of the "genetic story of colonization" which brings together geographic, sociohistorical, and biological notions of race to examine the flow of racialized genetic information across various time periods and geographies.[45] Histories of colonial exploitation and domination are transformed into analyses of "sexual asymmetries in the direction and extent of gene flow among [native populations] and more recent immigrants from Europe and Africa" so as to better understand the genetic "contributions" that these groups have made to

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39. *Id.* (citation omitted).

40. F.M. Salzano & Arthur G. Steinberg, *The Gm and Inv Groups of Indians from Santa Catarina, Brazil*, 17 AM. J. HUM. GENETICS 273, 274 (1965).

41. *Id.* at 274–75.

42. *See id.* at 277.

43. Nancy E. Simpson & Werner Kalow, *Comparisons of Two Methods for Typing of Serum Cholinesterase and Prevalence of Its Variants in a Brazilian Population*, 17 AM. J. HUM. GENETICS 156, 157 (1965).

44. Carvajal-Carmona et al., *supra* note 31.

45. Mark Seielstad, *Asymmetries in the Maternal and Paternal Genetic Histories of Colombian Populations*, 67 AM. J. HUM. GENETICS 1062, 1063 (2000).

native gene pools.[46] Through the identification of "the effects of European and African genetic infiltration over the past 500 years," other researchers working within this field were able to "retribalize" the Amerindian gene pools by isolating which genes do not belong.[47] Through this process of retribalization, researchers were able to make claims about the "true" genetic makeup of South American populations. For example, Alves-Silva and her colleagues found that "white" Brazilians had an "an astonishingly high matrilineal contribution of Amerindians and Africans" suggesting that "[p]resent-day Brazilians . . . still carry the genetic imprint of the early-colonization phase: the pioneer-colonial population typically had Amerindian ancestry—and, after few generations, increasingly African ancestry—in the maternal line but Portuguese ancestry in the paternal line."[48] In this way, racialized notions of genetic purity and infiltration often go hand in hand with resisting social classifications of race and redefining racial categories primarily through genetic terms.

b. Resisting Social Classifications

In these articles, authors argued that social classifications of race are inadequate and that categories based on genetics are more accurate. These articles tend to challenge the assumed racial classification of a group and put their racial identity "in quotes." These passages referenced the possibility of biased, wrong, or misclassified racial designations, and pointed to the limitations of quotidian or commonsense racial classifications, even going so far as to imply that racial classifications are culturally relative. However, while misclassification is derived from messy social processes and the biases of cultural relativity, these passages were often closely bound to claims about proper, precise, and scientific classifications of race. For example, the authors of a 1965 ANHG article explained:

> During the medical examination, each subject was assigned a racial classification based on pigmentation of the abdomen, hair colour and type, and conformation of the nose and lips. The examining physician was herself a native of Bahia and her judgements, although necessarily subjective, were based on a lifetime of personal experience. The classes were assigned code numbers from 0 (most caucasoid) to 8 (most negroid), and this crude measure was used to test for various racial effects. *Here we shall use gene frequencies to determine more exactly the composition of each racial class.*[49]

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46. *Id.*

47. Ramiro Barrantes et al., *Microevolution in Lower Central America: Genetic Characterization of the Chibcha-Speaking Groups of Costa Rica and Panama, and a Consensus Taxonomy Based on Genetic and Linguistic Affinity*, 46 AM. J. HUM. GENETICS 63, 68 (1990).

48. Juliana Alves-Silva et al., *The Ancestry of Brazilian mtDNA Lineages*, 67 AM. J. HUM. GENETICS 444, 458 (2000).

49. H. Krieger et al., *Racial Admixture in North-Eastern Brazil*, 29 ANNALS HUM. GENETICS 113, 115–16 (1965) (emphasis added) (citation omitted).

This example highlights the role that gene frequencies played in determining the "exact" composition of racial groups outside of the messy and "subjective" social system of categorization. Hence, the use of morphology to assess racial traits—a key aspect of pre–World War II racial biology—found expression in 1965 as an evidentiary backdrop from which to refine scientific understandings of racial difference.

Another ANHG article published in 1980 described the author's concerns about social classification of races biasing results:

> Following the advances of technical laboratory procedures for biological measurements, man's ability to evaluate partially subjective variables has been somewhat neglected in scientific investigations. In physical anthropology and genetics, which were initially based on measurements and numbers, the usefulness of subjective assessment is often questioned. Curiously, Linnaeus was able to classify mankind into racial groups, whilst twentieth-century scientists are unable to recognize the existence of quantitative boundaries between races. Consequently, the subjective identification of major races and racial groups is the only choice available today for population studies seeking to avoid excessive heterogeneity.[50]

Another example of resisting social classification in the search for racial purity can be seen in the 2000 AJHG article, *Y Chromosomes Traveling South: The Cohen Modal Haplotype Origins of the Lemba*.[51] In this paper the authors attempted to determine whether an African group truly had Jewish ancestry.[52] The authors argued that the evidence provided by the oral and cultural traditions of the Lemba in relation to the genetic data regarding the group's Jewish origins is not conclusive.[53] While the study did reveal that the Lemba's oral history was consistent with "an origin in a Jewish population outside Africa and male-mediated gene flow from other Semitic immigrants," it is important to note how genetics, rather than social categorization, once again served as the arbitrator of the true racial origin.[54]

3. Leveraging Race and Disease

These articles used concepts of racial difference to understand disease, often leveraging distinct hypotheses about the causes of racial difference and disparity across populations. In the 110 articles coded to this theme, racial differences, patterns, and comparisons were used to frame and interpret observed differences in disease prevalence and etiology. This occurred when scientists mustered biological explanations to explain away social differences and processes. While theories about the cause of the diseases evolved during this period, multiple concepts of race commingled and mutually reinforced each other. Concepts of race were readily enrolled

50. Azevêdo, *supra* note 27, at 59 (citation omitted).

51. Mark G. Thomas et al., *Y Chromosomes Traveling South: The Cohen Modal Haplotype and the Origins of the Lemba—the "Black Jews of South Africa,"* 66 AM. J. HUM. GENETICS 674 (2000).

52. *Id.*

53. *Id.* at 684–85.

54. *Id.* at 685.

in the scientific and biomedical project of understanding disease epidemiology and biology. As social and biological categories came together, racial categories and etiological differences in disease became intelligible, knowable, and seemingly "real."

We identified two central strategies scientists used to connect race and disease: First, they sought to pinpoint the genetic cause of disease by identifying the racial origins of populations and uncovering genetic disease traits across histories of population migrations. Second, they sought to use biological and social concepts/explanations about the causes of racial differences to disentangle the multiple factors that lead to complex diseases. Within both of these strategies, several concepts of race were explicitly woven together as an explanatory force, as scientists continually sought to use multiple, distinct concepts of race to understand disease.

a. Racial Origins of Genetic Disease

Scientists sought to use racial difference in order to distinguish disease or risk genotypes as belonging to or originating from particular racialized groups. Race is generally talked about in these articles in essentialist terms and is used as a marker for disease risk.[55] In the project of seeking racial origins for disease, individuals are seen as being possible genetic carriers for particular "racialized" illnesses. Examples of this include, but are not limited to: G6PD deficiency for Middle Easterners,[56] ovalocytosis for South-East Asians,[57] and phenylketonuria among Latin Americans.[58] Articles within this theme were generally concerned with notions of purity/admixture, risk, and understanding the disease within the context of racially structured populations. Several of these articles discussed primarily genetic explanations of disease or of risk for disease by, for example, investigating specific genes involved in hypertension[59] or sickle cell disease.[60] For example, after presenting studies indicating a greater frequency of hypertension for "American Negroes," a 1970 NEJM article argued that these data, combined with the association between other "genetically determined characteristics" and blood pressure, "suggest[] that a gene or genes, probably of African origin, may be involved in blood

55. *See, e.g.*, T.A. Tedesco et al., *Human Erythrocyte Galactokinase and Galactose-l-Phosphate Uridylyltransferase: A Population Survey*, 27 AM. J. HUM. GENETICS 737, 738 (1975) (examining possible genetic causes for racial differences in galactosemia).

56. Kurdi-Haidar et al., *supra* note 29, at 1013.

57. Shih-Chun Liu et al., *Molecular Defect of the Band 3 Protein in Southeast Asian Ovalocytosis*, 323 NEW ENG. J. MED. 1530 (1990).

58. Lourdes R. Desviat et al., *Evidence in Latin America of Recurrence of V388M, a Phenylketonuria Mutation with High In Vitro Residual Activity*, 57 AM. J. HUM. GENETICS 337, 337 (1995).

59. Walter K. Long, *African Genes and Hypertension*, 283 NEW ENG. J. MED. 708 (1970).

60. Ronald L. Nagel et al., *Hematologically and Genetically Distinct Forms of Sickle Cell Anemia in Africa: The Senegal Type and the Benin Type*, 312 NEW ENG. J. MED. 880, 884 (1985).

pressure elevation."[61] These articles also often discussed particular genetic variants associated with disease or risk in connection to proposed or suspected racial or geographic origins. For example, a 1980 NEJM article discussed findings from competing authors on the racial origins of increased DRw antigens linked to diabetes.[62] The practice of tracing the racial origins of disease therefore emphasizes how genetic explanations of disease implicate family history in ways that show the deep and tense relationship between familial and racial relations.

Sickle cell disease and G6PD deficiency provide paradigmatic examples of the ways that the scientists associated racial difference and racialized geography with the ancestral or genetic origins of disease. For example, a 1960 study of sickle cell prevalence described its subjects as "putatively full blood Indians" but acknowledged the possibility that "a few genes have been introduced from other populations."[63] The authors continued: "The question of racial purity always arises in population surveys of this sort."[64] Citing the population's "essentially Negroid characteristics," the authors hypothesized these disease-causing genes were introduced by "Negro ancestors."[65] Articles such as this highlight how the practice of tracing racial origins links questions about the causal or biological underpinnings of disease and the "racial origins" of disease genes.

Notions of admixture often created the possibility for (1) race to become a marker of disease and (2) disease to become a marker of race. For example, the authors of a 1955 article about sickle cell disease noted that "investigators have stated emphatically that the presence of sickling is undeniable proof of Negro ancestry."[66] They go on to explain that the "[o]ccasional reports of sickle-cell disease in Caucasians almost invariably come from areas where admixture with Negro blood is quite likely."[67] Arguments along this line exemplify how disease is used to "mark" race, to the extent that the presence of disease betrays one's "true" race or at least encourages scientists to thoroughly investigate. Thirty years later, a 1985 editorial in JAMA shows that medical scientists continued to discuss the sickle cell trait and its role in human evolution. There, Dr. Roth pointed out how "most physicians believe incorrectly that sickle cell problems are limited to persons of acknowledged African ancestry."[68] He argued that because sickle cell genes "traveled widely," they can even be found in a "person who believes himself or herself to be of European origin" and may

61. Long, *supra* note 59, at 709.

62. Michel R. Neufeld et al., *HLA in American Blacks with Juvenile Diabetes*, 303 NEW ENG. J. MED. 111, 111–12 (1980).

63. H. Eldon Sutton et al., *Distribution of Haptoglobin, Transferrin, and Hemoglobin Types Among Indians of Southern Mexico and Guatemala*, 12 AM. J. HUM. GENETICS 338, 339 (1960).

64. *Id.* at 344.

65. *Id.*

66. Amoz I. Chernoff, *The Human Hemoglobins in Health and Disease (Continued)*, 253 NEW ENG. J. MED. 365, 367 (1955).

67. *Id.*

68. Eugene Roth, Jr., *The Sickle Cell Gene in Evolution: A Solitary Wanderer or a Nomad in a Caravan of Interacting Genes*, 253 J. AM. MED. ASS'N 2259, 2259 (1985).

"indeed, morphologically appear[] to be so."[69] Again, fascination with the potential of disease diagnoses to track with imaginary concepts of racial admixture and racial purity thus persisted within medical literature long into the dawn of genomic science. When disease was tied to racial difference through claims such as these, the scientific project of pursuing or searching for racial purity was itself justified by medical or epidemiological necessity.

b. Racial Etiology of Multifactorial Disease

Racial etiology describes articles that use concepts of racial difference as one factor to understand or disentangle the causes of disease. These articles most often focused on multifactorial or "complex" diseases like cancer or diabetes and were sub-coded as using a "gene-environment" understanding of disease. Accordingly, these articles considered multiple risk factors including diet, socioeconomic status, or cultural difference, as well as concepts of race. Throughout these articles, racial differences in disease rates or outcomes led investigators to hypothesize about possible genetic explanations for these patterns.

Several articles used various conceptions of "biological essence" as a way of explaining racial differences, or hypothesized that the differences across racial groups were due to genetic differences by race and not other causes of disease. For example, a 2000 paper that used data from an "international collaborative study of hypertension in blacks" genotyped people they described as Afro-Caribbean in addition to a comparative sample of "individuals of European descent."[70] As part of their genetic analysis, the authors also collected what they called "sociocultural variables" but did not engage in any extended discussion of these factors or discuss social determinants of black-white inequalities in cardiovascular outcomes.[71] They instead turned their focus to a racial analysis of the distribution of genetic polymorphisms associated with elevated angiotensin I-converting enzyme, and they described their study as demonstrating the "advantages of using diverse ethnic groups" to help "dissect the genetic bases of phenotypic traits."[72] Similarly, in a commentary published in NEJM in 1980, investigators contested the hypotheses of their colleagues who had argued that diabetes melietus "among American blacks was due to the interaction of non-HLA-associated diabetogenic genes from the white genome with DRw3 and DRw4 genes of black origin."[73] They instead propose that increases in HLA types in black patients with diabetes in the United States were due to "mixture with HLA-associated diabetogenic genes from whites."[74] Across these examples, published twenty years apart, investments in biological essentialism indicated "African genes" or

69. *Id.*

70. Xiaofeng Zhu et al., *Localization of a Small Genomic Region Associated with Elevated ACE*, 67 AM. J. HUM. GENETICS 1144, 1145 (2000).

71. *Id.*

72. *Id.* at 1151.

73. Neufeld et al., *supra* note 62, at 111.

74. *Id.* at 112.

hypothesized innate racial differences in susceptibility to complex diseases such as diabetes and cardiovascular disease.

Arguments about racial origins of multifactorial disease did not always explicitly draw on notions of racial difference in terms of a statistical frequency but sometimes drew together ideas about shared geographic origin and gene frequency compared across categorically labeled groups. There was significant variation in how authors understood race within their efforts to disentangle multiple causes of disease. Articles such as these illustrate a more nuanced understanding of racial categories and their relationship to various diseases. For example, a 1955 NEJM article about multiple sclerosis noted that it is the most common disease of the central nervous system but also observed the condition's "rarity in the tropics and subtropics."[75] The authors concluded that "[n]o selectivity for race or nationality within any particular area was observed" and that "importance of a genetic factor . . . is equivocal."[76] Racial differences were also often integral to understanding epidemiological patterns. A 1995 review article concerning gastric cancer began by describing the epidemiological patterns of the disease, noting that while the disease was on the decline in many industrialized nations, the nation-level rates varied substantially.[77] They observed that "[i]n the United States, African Americans, Hispanic Americans, and Native Americans are 1.5 to 2.5 times more likely to have gastric carcinoma than are whites."[78] Highlighting the "Genetic and Environmental Risk Factors" that contribute to the disease, they noted that risk was "inversely associated with socioeconomic status" and that decreasing rates in industrialized countries "suggest[] that environmental exposures, which can vary over time, play an important part in the pathogenesis of the disease."[79] They elaborated on this point by citing studies demonstrating a "substantial environmental influence" where "people emigrat[ed] from areas of high risk to areas of low risk."[80]

In their attempts to disentangle the racial etiology of disease, scientists considered multiple risk factors including diet, socioeconomic status, or cultural difference, as well as biologically essentialist concepts of race. Articles early in the sample were concerned with identifying "racial susceptibility" while more recent articles posited that differential disease rates were due to racial/ethnic "genes" or "admixture." Across this period, however, articles consistently used various conceptions of "biological essence" as a way of explaining the extent to which racialized patterns of disease or differences across racial groups were due to seemingly natural biological distinctions that vary by race.

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75. Leonard T. Kurland et al., *Multiple Sclerosis and Amyotrophic Lateral Sclerosis (Concluded): Etiologic Significance of Recent Epidemiologic and Genetic Studies*, 252 NEW ENG. J. MED. 697, 702 (1955).

76. *Id.*

77. Charles S. Fuchs & Robert J. Mayer, *Gastric Carcinoma*, 333 NEW ENG. J. MED. 32, 32 (1995).

78. *Id.*

79. *Id.* at 34.

80. *Id.*

III. DISCUSSION OF QUALITATIVE FINDINGS

As described in detail in Part II, we identified three central themes within our sample. These themes overlap and were intertwined in ways that revealed the close connections between the medical and scientific searches for the ideal body and for racial purity. This connection between the search for purity and the search for the cause of disease persisted throughout the sample period between World War II and the Human Genome Project. Articles of this genre were also found in each decade after 1970. We have shown how ideas of biologically essential or "pure" races were integrated into various hypotheses, study designs, and conclusions about disease. We have also demonstrated how articles that explicitly linked the practices of searching for racial purity with a science of disease posited that miscegenation, "interracial crossing," and admixture were fundamental to this endeavor and to the larger project of genetic science.[81] Geneticists themselves therefore articulated deep connections between bodily purity and racial purity, and understood these projects to be intertwined in ways that enabled one to sustain the other during this time.

In addition to distinguishing and enforcing the boundaries of the social and the biological within their work, scientists also took the nature-culture divide itself as a more direct object of inquiry. That is, in addition to doing work that assumed the social could be distinguished from the biological, researchers directly used culture to uncover the biological or to make a cut between culture and biology. Culture was not simply positioned as an obstacle in the way of science or as messy bias that obscures a biological reality. Instead, culture—along with language and social norms—was more directly embedded in a scientific project aiming to study racial difference. In this way, culture became an object of scientific inquiry.

One of the most prominent ways that geneticists conceptualized race as defined by social and historical factors was through their investigation of the "genetic story of colonization."[82] In these articles, scientists provided detailed attention to historical facts and the details of colonial domination in so far as these accounts lead them to a true "genetic story." These claims embody attempts to use scientific inquiry to convert historical power dynamics into an intercontinental flow of genes. These scientists attempted to uncover and resurrect colonial relations through genetic markers by, for example, tracing European and Amerindian genes through Brazil to show how present day populations "carry the genetic imprint of early-colonization."[83] These accounts privileged the long arm of human migration, emphasizing this timescape over other sociohistorical developments like longstanding policies of racial segregation in the United States. The premise of searching for a genetic trail is also deeply allied

81. *See, e.g.*, Henrique Krieger, *Racial Admixture Effects in North-Eastern Brazil*, 33 ANNALS HUM. GENETICS 423, 423 (1970) (studying the effects of "interracial crossing" in pregnancies).

82. Seielstad, *supra* note 45.

83. Alves-Silva et al., *supra* note 48.

with the impulse to locate biological or genetic essences (e.g., "African genes") within defined territories and populations.

IV. CONCLUSIONS

Contrary to the social constructionist narrative that biological race was no longer accepted or prevalent in science and medicine after World War II, this Article offers initial empirical evidence that biological understandings of racial difference and disparities persisted in the mid- to late-twentieth century. Put bluntly, biological race never went away. It simply left the "prime time" stage afforded to it by certain political movements and embedded itself into post–World War II genetics and medical research. This research shows that other theories of race—historical, geographical, et cetera—were just as prevalent (as a numerical matter) during this period. But what characterizes post–World War II race research is the co-occurrence of competing conceptualizations, whereby biological race and other frameworks were not seen as mutually exclusive. In other words, biological race was still legitimate at this time. But so were other conceptions and uses. Thus, there appears to be a diversification of how race was conceptualized, with biological race still playing a notable role in research practices and scientific knowledge.

The data revealed in this Article are important for understanding how and why theories of biological race remain salient in contemporary times. Often, those who accept that race is a social construction are confused when they hear modern articulations of biological race. For example, how is it possible that the Food and Drug Administration approved BiDil—a drug with a race-specific indication for treating black people suffering from heart failure?[84] How is it possible that commercial genetic ancestry tests can tell people that an analysis of their genes can reveal what race they *really* are?[85] And how is it that certain aspects of DNA forensic analyses suggest that a visual profile—including the race of an unknown suspect—can be drafted simply by an analysis of a biological sample left at a crime scene?[86] While this confusion may be legitimate as a substantive matter, it is important to understand that these modern articulations of biological race are connected to recent and ongoing research in medicine and genetics despite consistent findings that social categories of race do not map discretely onto human difference. The answer revealed by the research presented in this Article is both simple and sobering: biological theories of race persist because they and the troublesome ideologies of human difference that they support were never fully flushed out of the sensibilities of those doing research on race.

These findings may also have important policy implications. To the extent that modern aspirations for racial equality are premised in large part

84. *See generally* JONATHAN KAHN, RACE IN A BOTTLE: THE STORY OF BIDIL AND RACIALIZED MEDICINE IN A POST-GENOMIC AGE (2012).

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

86. *See* Andrew Pollack, *Building a Face, and a Case, on DNA*, N.Y. TIMES, Feb. 24, 2015, at D1.

on the standard social constructionist narrative that biological understandings of race lost legitimacy after World War II, the persistence of biological race in the life sciences poses a particular threat to racial minorities. This Article provides an empirical basis for biomedical and social scientists to take stock of how and why such a dangerous idea has remained and the "work" that it has and continues to do in preventing a full recognition of the social rather than biological determinants of various outcomes, from health to education to crime. This is not to say that all scientific conversations discussing the biological implications of racial categories and categorization are inherently flawed; some of the papers reviewed in this Article provide useful and promising insight into human population differences and patterns of disease. Nevertheless, the latent and reemerging discourse on using social categories of race to mark ostensibly natural boundaries of human difference often serves to place the blame of various racial disparities on group inferiority rather than the social conditions and historical inertia that produce such outcomes. It is this particular dynamic that deserves greater attention and self-reflection in health sciences research. Biological race, as it plays out in this manner, is linked to the maintenance of racial subordination, and racial equality cannot be achieved unless and until such pernicious and unfounded theories of difference and disparity are put to rest.