

Paper Title: Framing the Debate about Genetics, Race, and Health: Effects of Racial Priming on
Public Opinion about Personalized Medicine

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Abstract

Currently, there is a lack of research on the impact of messages about genetics, race, and health on public attitudes and beliefs (Lee, 2003). As progress in the field of genetics continues to occur at a rapid pace, there is growing concern about the consequences of linking race with genetic traits and associated health risks. Certainly, new discoveries on genetic differences among racial and ethnic groups may substantially impact public opinion and health policy preferences. This study assesses the effects of racial priming on Americans' opinions about current health topics related to genetics and medicine. The study uses survey data to examine the contrast effects of racial cues on judgments about personalized medicine and race-based medicine among Whites and African Americans. The study finds important differences between Whites and African Americans in their opinions about personalized medicine before and after exposure to a racial priming message. A central finding is that prior to receiving a message priming race in the context of genetics and health, White participants expressed significantly more positive opinions about personalized medicine as compared to African Americans. However, Whites expressed significantly more negative judgments about personalized medicine after the racial cue, as compared African Americans. The study also examines differences in opinions by political ideology and education. Political ideology is found to have a reverse pattern of effects on favorability among Whites and African Americans. In addition, the study finds a statistically significant interaction effect of participants' race by education for opinions following exposure to the racial prime. The study finds compelling evidence to suggest that racial cues in messages about genetics and medicine influence public opinion. This research is important because recent studies have shown that linking race with genetics can provide justification for a racially inequitable status quo and the continued social marginalization of historically disadvantaged groups (Williams and Eberhardt, 2008).

Introduction

Since the completion of the Human Genome Project, knowledge about the genetic basis of many traits and common diseases has increased substantially (Kessler et al., 2007). As progress in the field of genetics continues to occur at a rapid pace, there is growing concern about the social and ethical consequences of these advances. Certainly, new discoveries on genetic traits and genetic health risks may substantially impact public opinion and health policy preferences. One area of concern that merits additional research is the impact of messages linking genetic traits with racial differences. In the modern age of genetics, the power of race as an exploratory model in medicine and health may operate in ways previously unseen. It is important to consider the social and ethical implications of these modern developments, including the ways in which messages about genetics may inadvertently foster greater social inequality and exacerbate health disparities among minority racial groups.

Currently, there is a lack of research on the impact of messages about genetics, race, and health on public attitudes and beliefs (Lee, 2003). Studies on the effects of messages involving race and genetics have been fairly limited. In fact, many of the social implications related to communicating modern advances in the field of genetics and personalized medicine remain largely unknown. Although studies have shown that racial discrimination may occur in response to linking genetics with racial differences (Williams & Eberhardt, 2008), there has been a lack of research on the effects of racial priming on public attitudes toward genetics and personalized medicine. At the same time, recent developments in the field of genetics and increasing awareness about the use of race as a proxy for genetic similarity may substantially impact public opinion on these current health topics. More empirical research is needed to assess the impact of messages associating genetic traits with racial or ethnic groups.

Personalized Medicine and Race-Based Medicine

The genetics revolution has introduced a slew of ethical, social, and policy issues (Eltis, 2007). Although recent advances in gene-sequencing technology have opened the doors to new forms of personalized medicine, many physicians and medical researchers continue categorizing people along racial and ethnic lines, rather than focusing on individual-level genetic differences. In recent years, there has been a growing movement in medical genetics research and practice to develop, implement, and promote a model of race-based medicine (Condit & Bates, 2005). This practice involves classifying people and their health risks according to racial or ethnic categories, in the absence of individual genetic profiles. Given the challenges associated with the creation and maintenance of personal genetic profiles for patients, doctors and scientific researchers are likely to continue to rely on groupings that are more easily identifiable, such as race. “In the absence of cost effective, ubiquitous genome scanning tests, it may be more accurate to describe the next wave of genomic medicine as population-based, rather than one focused on individual differences” (Lee, 2003, p. 385).

The modern application of genetics research and race-based medicine introduce a number of social and ethical dilemmas in the public sphere. For one, race in itself may be a problematic proxy for personalized genetic profiles. Although the history of human migration and dispersion throughout the world has led to the current array of human populations, genetically based population groupings are not easily translatable onto the grid of race (Lee, 2003). Moreover, linking genetics with racial differences may increase racial prejudice and promulgate greater health disparities across racial and ethnic groups. Condit and Bates (2005) explain that if race-based medicine becomes a widely disseminated standard of care, it may exacerbate health disparities in two ways: 1) greater attention to biological differences along racial lines may

further worsen the discriminatory treatment accorded by some medical personnel to members of minority groups, and 2) race-based medicine may increase the relatively high levels of distrust that minorities already hold toward the medical profession. According to Condit and Bates (2005, p. 98), “the potential of race-based medicine to increase health disparities in these ways depends on attitudes about race, and messages about genetics may shape these attitudes.” It is therefore important to examine the features of messages that influence public opinion about genetics, race and personalized medicine.

Messages about Genetics and Race

A review of the literature finds that very few studies have investigated the effects of priming race on public opinion about genetics and personalized medicine. Only a handful of studies, mostly conducted by Celeste Condit and her colleagues, have begun to examine message effects in the area of genetics, health and race. Research in this area indicates that specific wording, rather than general content, may be an important element of message effects (Condit and Parrott, 2004; Condit et al., 2004b; Abramsky & Fletcher, 2002; Baty et al., 2003). One experiment conducted by Condit and her colleagues (2004a) found that participants who received a public service announcement that specified either ‘Whites’ or ‘Blacks’ as the subject of a public service announcement (PSA) demonstrated elevated levels of racism, genetic basis for racism, and one dimension of genetic discrimination, as compared to those that received a version that contained no race specification and a no-message control. The researchers note, however, that it remains unknown what message components might mitigate these effects, and whether the findings would hold for a general, representative population sample.

Research has also revealed that attitudes regarding genetic discrimination may show complex response patterns to messages about genetics (Condit & Bates, 2005). In an experiment

by Condit and Williams (1997), participants were exposed to one of two modified news stories about people with genetic diseases. Participants exposed to the less discriminatory version of the story produced less negatively 'judgmental' responses to a scale measuring discriminatory affect, as compared to those exposed to a story that used a more prejudiced presentation. The stimulus materials were assembled using direct quotations from magazine articles; the less discriminatory version of the story was based on quotes from magazine articles published from 1989 to 1992, and the more discriminatory article was developed using direct quotes from magazine articles published from 1970 to 1975. The researchers found that the less discriminatory article reduced negative judgmental attitudes among participants. Condit and Williams (1997, p. 232-233) conclude that "the challenge for social policy then becomes not to erase genetics discourse...but rather to discuss carefully what forms of medicalized discourses are most beneficial." More research is needed to assess the ways that racial priming in messages about genetics may impact or shape public opinion about personalized medicine.

Racial Priming and Prejudice

Priming and racial priming are important constructs for studying the effects of messages about race and genetics on public opinion. Priming research posits that exposure to a message increases the availability of information presented in that message, and the more available and accessible the information, the more it influences audiences' attitudes, norms, and self-efficacy (Iyengar & Kinder, 1987). Racial priming research examines how the media environment reinforces or primes negative attitudes about groups with lower life chances in American society (Mendelberg, 2008). Studies have found that media messages have the capacity to prime racial stereotypes (Valentino, 1999; Valentino, Traugott, & Hutchings, 2002). A substantial amount of research in this area has centered on racial priming theory (Mendelberg, 2001), which predicts

that cues in the information environment activate or deactivate citizens' racial predispositions, with consequences for people's opinions, policy preferences and vote choice. The theory suggests that when people make judgments about an issue, racial cues that associate the issue with a particular racial group can lead people to apply their views of other racial groups to form opinions or judgments. Research has shown that racial cues can evoke negative associations even among those that are motivated to resist making such associations (Devine, 1989).

Although surveys reveal that the number of citizens who endorse derogatory statements against minority racial groups or support overtly anti-minority policies has declined over the last several decades, recent scholarship suggests that a new form of subtle prejudice and racism has arisen in the United State (Virtanen & Huddy, 1998). "In part because of changing norms and the Civil Rights Act and other legislative interventions that have made discrimination not simply immoral but also illegal, overt expressions of prejudice have declined significantly over the past 35 years" (Dovidio & Gaertner, 2000, p. 315). However, evidence of racial disparity and discrimination continues to exist (Gaertner & Dovidio, 2005), and one possible explanation for this phenomenon is a change in the nature of racial prejudice from traditional, overt prejudice to more subtle forms of racial prejudice.

New conceptualizations of racial prejudice or racism have taken on a number of different labels in the literature. One area of research that is conceptualized and measured in similar ways includes *symbolic racism* (Sears, 1988), *modern racism* (McConahay, 1986), *racial resentment* (Kinder & Sanders, 1996), and *subtle racism* (Pettigrew & Meertens, 1995). These theories all share an underlying assumption that among Whites, new forms of prejudice embody negative feelings toward African Americans as a group combined with a sense that African Americans violate cherished American values (Henry & Sears, 2002). Another line of research concerns

aversive racism (Gaertner & Dovidio, 1986, 2005; Kovel, 1970). Aversive racism is based on the idea that evaluations of racial/ethnic minorities are characterized by a conflict between Whites' endorsement of egalitarian values and their unacknowledged negative attitudes toward racial/ethnic out-groups; unlike more traditional forms of racism that are characterized by overt hatred for and discrimination against racial/ethnic minorities, aversive racism is characterized by complex, ambivalent racial expressions and attitudes (Gaertner & Dovidio, 1986). In the more subtle forms of prejudice, discrimination is expressed in indirect and rationalizable ways, but the consequences of such actions or judgments may be as significant for minority racial groups and as pernicious as the consequences of the traditional, overt forms of discrimination (Dovidio & Gaertner, 2000). According to Dovidio and Gaertner's (1998) integrated model, political conservatives are typically more likely to express symbolic racism, whereas liberals are more likely to exhibit aversive racism. Whereas aversive racism suggests that Whites may be biased against assisting African Americans when that behavior can be justified in nonracial terms (Henry & Sears, 2002), research has also shown that liberal Whites oftentimes respond with favoritism toward African Americans and often display reverse-discrimination (see Saucier, Miller, & Doucet, 2005).

A substantial body of research has documented that racial attitudes and racial cues can have important consequences for audiences' opinions, attitudes, and policy preferences. For example, Valentino, Hutchings, and White (2002) found that subtle racial cues in political advertisements prime racial attitudes as predictors of candidate preference by making them more accessible in memory. The scholars show that even subtle racial cues can influence support for various 'racialized' policy issues, such as welfare, affirmative action, and crime policy; yet, the researchers found that exposure to racial cues did not impact opinions about issues less relevant

to race, such as abortion, spending on public schools, universal health care, and raising the minimum wage. Several studies have found evidence that racial attitudes or prejudice can influence people's perceptions of racial progress and race-relevant policies (Amodio, Devine, & Harmon-Jones, 2008; Brodish, Brazy, & Devine, 2008). In addition, Gilens (1999) has shown that the media's over-representation of African Americans among the poor is related to White Americans' negative attitudes about helping people in poverty through welfare programs.

A central empirical question that remains unanswered is how racial cues in messages influence public perceptions about genetics and personalized medicine. Although the literature generally offers support for the idea that racial priming affects people's judgments about a variety of issues, very few studies have examined this phenomenon in the context of genetics and health. This study is designed to address this gap in the literature by examining the effects of messages involving racial cues on public opinion about personalized medicine.

Design and Methods

This study evaluates the contrast effects (within-subjects) of racial priming on public opinion about personalized medicine and race-based medicine among African Americans and Whites (refer to Appendix A for stimulus messages and questionnaire). The study was embedded in the Annenberg National Health Communication Survey (ANHCS) as a module during three consecutive months in April, May, and June of 2008. ANHCS is a monthly survey that is designed to assess national trends related to media and health.

Participants

Participants were drawn from a nationally representative sample of American adults (18 years or older) maintained by Knowledge Networks. Knowledge Networks retains a research panel that is representative of the U.S. population, and respondents are recruited based on a

probability sampling technique (random digit dialing, RDD). The sample of subjects who participated in the present study was chosen through stratified random sampling from the Knowledge Networks panel, and the sampling procedure was performed by Knowledge Networks.

A sample of 215 adults (18 years or older) participated in this study. 36% of participants were self-identified Whites (non-Hispanic), 19% were self-identified African Americans (non-Hispanic), 18% were self-identified Hispanics, 17% identified themselves as bi-racial (non-Hispanic), and about 10% identified themselves as other races. The average age of respondents was 46.74 ($SD= 15.6$). Approximately 49% of the sample was female. Participants were generally well-educated, with about a third of the sample having each of the following: a high school education, some college, and a BA or higher; 7% of the sample had less than a high school education.

Procedure

All participants completed the study online. Subjects received an email invitation to participate in the study. For those subjects who did not have access to the Internet, a Web TV appliance was provided with proper instructions. Participants were able to read the study materials and answer all of the questionnaire items online. Prior to exposure to the stimulus messages, respondents completed the ANHCS core questionnaire. The core questionnaire included measures of several background variables such as age, race, gender, education, religion, political partisanship, and political ideology. White respondents were randomly assigned from the Knowledge Networks panel to participate in the study. Due to the smaller number of African American respondents available in the panel, all African Americans in the ANHCS module were assigned to this study.

After completing the core questionnaire, all participants read an introductory statement about personalized medicine ('genetically targeted care') and filled out several survey items on the subject. The term 'genetically targeted care' was developed to provide a neutral term that avoids any positive bias that may be associated with the word 'personalized.' Participants then read a racial priming message that introduced the topic of race-based medicine. Prior to this point in the study, there had been no mention of race. Participants were then asked to complete a series of questionnaire items on their opinions about using race to provide genetically targeted care (or race-based medicine).

Stimulus Messages

The introductory statement offers a general description of personalized medicine, referred to in this study as genetically targeted care. The introduction statement read:

"Some doctors are using genetics as a basis for screening, diagnosing, and prescribing medication. This practice is called genetically targeted care. Because of their genetics, people respond better or worse than others to certain medications and medical treatments. Some say that using genetics to personalize medicine is a good way to tailor treatment to individuals and improve their overall medical care. Others say that genetically targeted care will discriminate against people that are less responsive to medication and limit their access to medical treatment."

The second stimulus message, which occurred after the introductory statement, primed race in the context of personalized medicine, or race-based medicine. This racial priming message was assigned to all participants in the study, and read as follows:

"Currently, it is too costly and difficult for most doctors to obtain genetic profiles for each of their patients. In order to provide their patients with genetically targeted care, some doctors are using race as a substitute for individual genetic profiles because people of the same racial group tend to share many of the same genes."

Measures

As described earlier, this study was embedded in a large-scale ANHCS survey and therefore prior to exposure to the study materials, participants provided information on a range of background variables, including: age, race, gender, education, religion, political partisanship, and political ideology. The data reported here is from a subsample of all White and African American respondents that participated in the study.

Political Partisanship and Political Ideology. Partisanship was measured by a survey item that asked: “Generally speaking, do you think of yourself as a...” (1= Democrat, 2= Republican, 3= Other). Political ideology was measured using the following item: “In general, do you think of yourself as” (1= Extremely Liberal to 7= Extremely Conservative).

About 58% of the White and African American sample considered themselves Democrats, and 40% identified themselves as Republican. Among Whites, 43% were Democrats and 57% were Republicans. African American respondents were mostly Democrats, with only 5% reporting to be Republicans. With regard to political ideology, about 30% of the total sample of Whites and African Americans considered themselves Liberal (coded as 1 to 3), 36% said they were Conservative (coded as 5 to 7), and 34% were Moderates (coded as 4). Among White respondents, 23% were Liberals, 43% were Conservatives, and 34% were Moderates. 46% of African American participants were Liberals, 20% were Conservatives, and 34% were Moderates.

Opinions about Personalized Medicine. Opinions about personalized medicine were measured after the introduction message, and before the racial priming message. To measure general opinions about personalized medicine, participants were asked a forced-choice question: “Which one of the following statements is closest to your viewpoint: 1) Genetically targeted care

will improve people's overall medical care, or 2) Genetically targeted care will discriminate against people that are less responsive to medical treatment?" Respondents were asked to select either the first statement (1) or the second statement (2). Participants were also asked how much they agreed or disagreed with each of the two abovementioned statements; responses to these items were coded on a five point scale from 'Strongly Disagree' (1) to 'Strongly Agree' (5). In addition, participants were asked how much they agreed or disagreed with each of the following statements: 1) "Genetically targeted care will make no difference in people's lives," 2) "People will not be willing to get a genetic test to find out how well they respond to medical treatment," 3) "Genetically targeted care will limit some people's access to medical treatment," and 4) "People will not trust genetically targeted care." Responses to these survey items were coded on a five point scale from 'Strongly Disagree' (1) to 'Strongly Agree' (5).

Opinions about Race-Based Medicine were measured after exposure to the racial priming message. These survey items asked participants how much they agreed or disagreed with each of the following statements: 1) "Using race to provide genetically targeted care is a good way to personalize medicine," 2) "Using race to provide genetically targeted care will limit some racial groups' access to medical treatment," and 3) "People like me would trust medical care that is tailored for them based on their race." Responses to these survey items were coded on a five point scale from 'Strongly Disagree' (1) to 'Strongly Agree' (5). Participants were also asked whether they thought genetically targeted care would do: 1) 'More Harm than Good,' 2) 'More Good than Harm,' 3) 'Both Harm and Good,' or 4) 'Neither Harm nor Good.'

Interest in the Topic was measured by two survey items. The first question asked: "How interested would you be in getting more information about this topic?" The second questionnaire item read: "If the opportunity came up, how interested would you be in discussing this topic with

others?” The two survey items were coded on a five point scale from ‘Not at all Interested’ (1) to ‘Extremely Interested’ (5).

Results

As previously mentioned, the results reported here focus on comparisons of all Whites and African Americans in the study. Table 1 (below) shows that White respondents were, on average, more likely to believe that genetically targeted care (GTC) would improve people’s overall medical care; African American participants were more divided on this question. The observed difference in opinions between Whites and African Americans in response to this question was statistically significant ($\chi^2(1, N = 117) = 6.09, p < .05$).

Table 1: Distribution of Opinion about GTC - Descriptive Statistics, Pearson Chi-Square and Likelihood Ratio

Questionnaire Item:		Race		Total (N)
“Please select the ONE statement that comes closest to your view:”		White	African American	
1	GTC will improve people’s overall medical care.	57 (76%)	22 (54%)	79
2	GTC will discriminate against people that are less responsive to treatment.	18 (24%)	19 (46%)	37
Total (N)		75	41	116

Pearson Chi-Square = 6.09 ($p < .05$)

Likelihood Ratio = 5.97 ($p < .05$)

Two survey questions were examined to assess participants’ opinions about GTC before and after the racial prime stimulus. Survey question #2a measured general opinions about GTC before participants received the racial prime, and stated that GTC will improve people’s overall medical care (GTC Favorable). Question #4a immediately followed the racial priming stimulus, and asked whether respondents thought that using race to provide GTC is a good way to personalize medicine (Race Favorable). Refer to Appendix A for additional detail on the survey questionnaire. It should be noted that although the two survey items measured general

favorability toward GTC before and after exposure to the racial prime, the questions are worded somewhat differently and therefore are not strictly comparable. Given the differences in question wording and the nature of the study’s design, comparisons between GTC Favorable and Race Favorable cannot be unequivocally attributed to the racial prime in the study. However, interesting differences within and between the two questions are presented here.

Table 2 (below) depicts the distribution of mean responses to GTC Favorable and Race Favorable between racial groups. Whereas Whites were on average in greater agreement with GTC Favorable compared to African Americans, African Americans were in greater agreement with Race Favorable than Whites. The table shows that although Whites initially expressed significantly more positive opinions about personalized medicine than African Americans ($t(114) = 3.07, p < .05$), after the racial prime Whites expressed significantly more negative judgments about using race to provide personalized medicine (race-based medicine), as compared to African Americans ($t(115) = -2.09, p < .05$).

Table 2: Mean Responses to GTC Favorable and Race Favorable - Descriptive Statistics and T-Tests

Questionnaire Item	Race	Mean	SD	<i>t</i>
GTC Favorable: GTC will improve people’s overall medical care.	White	3.64	.92	3.07*
	African American	3.07	1.03	
Race Favorable: Using race to provide GTC is a good way to personalize medicine.	White	2.47	1.07	-2.09*
	African American	2.90	1.09	

* $p < .05$

Note: Responses coded as 1 = Strongly Disagree and 5 = Strongly Agree.

To further assess racial differences in opinions about GTC, participants’ responses were examined against background variables (e.g., political ideology, education). Unfortunately, there were no measures of racial attitudes included in the survey; in the absence of such measures, political ideology and education were used for the purpose of analyses. Tables 3 and 4 depict the

mean distribution of responses to GTC Favorable and Race Favorable by political ideology and education. Table 3 (below) compares the distribution of mean responses to GTC Favorable and Race Favorable by political ideology across racial groups. The table reveals that on average White Conservatives and Moderates, as compared to White Liberals, were slightly more in favor of GTC prior to the mention of race (GTC Favorable), but were more opposed to race-based medicine after exposure to the racial prime (Race Favorable). Table 3 shows the opposite pattern of effects for the African American sample: Conservatives and Moderates were on average in greater disagreement with GTC Favorable, but were in greater agreement with Race Favorable, as compared to Liberal African Americans.

Table 3: Mean Responses to GTC Favorable and Race Favorable by Political Ideology

GTC Favorable: “GTC will improve people’s overall medical care.”

	Political Ideology	Mean	N	SD	% of Total N
White	Conservative	3.73	33	.98	30%
	Moderate	3.64	25	.86	23%
	Liberal	3.50	18	.92	16%
African American	Conservative	2.86	7	.90	6%
	Moderate	3.00	12	.95	11%
	Liberal	3.63	16	.72	14%

Race Favorable: “Using race to provide GTC is a good way to personalize medicine.”

	Political Ideology	Mean	N	SD	% of Total N
White	Conservative	2.36	33	1.08	30%
	Moderate	2.38	25	.98	23%
	Liberal	2.78	18	1.17	16%
African American	Conservative	3.14	7	.90	6%
	Moderate	3.33	12	1.07	11%
	Liberal	2.63	16	1.20	14%

Note: Responses coded as 1 = Strongly Disagree and 5 = Strongly Agree.

The effects of respondents' race and political ideology on favorability toward GTC were also examined using regression models. Given the small sample size of some groups, particularly African American Conservatives, political ideology was coded as a dichotomous variable (Conservatives/Moderates vs. Liberals) to stabilize the results of the regression analyses.¹ Table 4 (below) depicts the results of regression models predicting responses to GTC Favorable (Model 1) and Race Favorable (Model 2) by several demographic variables that were centered to avoid multicollinearity. Model 1A ($F(3, 110) = 3.37, p < .05$) was a statistically significant regression model that predicted GTC Favorable by race of respondents, political ideology, and the interaction between race and ideology; Model 1B ($F(4, 110) = 2.99, p < .05$) shows the results of adding education to this regression model. Model 2A was a statistically significant regression model ($F(3, 111) = 3.45, p < .05$) that predicted Race Favorable by respondents' race, ideology, and the interaction term; Model 2B ($F(5, 110) = 2.20, p < .06$) depicts the results of adding education and GTC Favorable to this regression model.

Table 4: Summary of Regression Analyses for Demographic Variables Predicting GTC Favorable (Model 1) and Race Favorable (Model 2)

Independent Variables	GTC Favorable (Model 1)		Race Favorable (Model 2)	
	Model 1A (Beta/ t)	Model 1B (Beta/ t)	Model 2A (Beta/ t)	Model 2B (Beta/ t)
Race	-.26/ -2.68*	-.26/ -2.63*	.26/ 2.68*	.26/ 2.54*
Ideology	.056/ .59	.04/ .47	.018/ .187	.02/ .21
Education	N/A	.13/ 1.34	N/A	-.108/ -1.14
Ideology x Race	.21/ 2.24*	.23/ 2.37*	-.21/ -2.24*	-.23/ -2.29*
GTC Favorable	N/A	N/A	N/A	.03/.26

* $p < .05$

Note: Ideology coded as 1 = Conservative/Moderate, 2 = Liberal. Race coded as 1 = White, 2 = African American.

¹ The Table 4 regression models were also run with ideology coded as a categorical variable (Conservatives, Moderates, and Liberals); the results were not substantially different than those reported, as the omnibus F tests were all statistically significant, but in some cases the t-tests for predictor variables were less robust.

As shown on Table 4, respondents' race and the interaction between race and political ideology accounted for a statistically significant amount of the observed variance in opinions about GTC Favorable and Race Favorable (Models 1 and 2). Controlling for education did not substantially alter any of the observed relationships, as the omnibus F tests for Model 1B and Model 2B are statistically significant and the original predictor variables (race and the interaction effect) also remain statistically significant. With race and ideology in the models, education did not account for a significant amount of variance in participants' favorability toward either GTC or race-based medicine. In addition, controlling for GTC Favorable in Model 2B did not significantly alter the results. Neither education nor GTC Favorable was shown to significantly influence respondents' favorability when race and the interaction between race and political ideology were included in the regression models.

Overall, the favorability questions produced interesting results within each item by race and ideology, and compelling differences between the two questions for Whites and African Americans' opinions before and after the racial prime. Comparing responses to GTC Favorable and Race Favorable by race and ideology, White Conservatives appeared on average to have the largest difference in opinion between the two questions. This finding may indicate that the racial stimulus had a greater impact on White Conservatives' judgments, but the data do not permit adequate statistical tests of this idea. However, the suggestion that White Conservatives may react more strongly to a racial prime is supported by the literature, which finds that White Conservatives tend to make internal attributions about racial topics (Pan & Kosicki, 1996) and are more likely to express symbolic racism (Dovidio & Gaertner, 1998). It is possible that the racial prime prompted Whites, particularly White Conservatives, to conceptualize GTC as a 'race-issue' that was unfavorable or unrelated to their own group- and self-interest. This idea is

also supported by the results of two questions posed at the end of the study, which found that Whites were significantly less likely to be interested in obtaining more information about GTC ($t(59) = -3.54, p < .05$) and discussing the topic with others ($t(64) = -3.26, p < .05$), as compared to African Americans.²

The main effects of education were also examined with regard to GTC Favorable and Race Favorable. Table 5 (below) depicts the distribution of mean responses to the two favorability items for Whites and African Americans by education level.

Table 5: Mean Responses to GTC Favorable and Race Favorable by Education

GTC Favorable: “GTC will improve people’s overall medical care.”

	Education	Mean	N	SD	% of Total N
White	HS or Less	3.50	24	.83	21%
	Some College	3.71	28	.90	24%
	BA or Higher	3.71	24	1.04	20%
African American	HS or Less	2.94	17	1.09	15%
	Some College	3.00	13	1.08	11%
	BA or Higher	3.36	11	.92	9%

Race Favorable: “Using race to provide GTC is a good way to personalize medicine.”

	Education	Mean	N	SD	% of Total N
White	HS or Less	2.80	25	.96	21%
	Some College	2.57	28	1.07	24%
	BA or Higher	2.00	24	1.06	20%
African American	HS or Less	2.29	17	.99	15%
	Some College	3.31	13	.95	11%
	BA or Higher	3.36	11	1.03	9%

Note: Responses coded as 1 = Strongly Disagree and 5 = Strongly Agree.

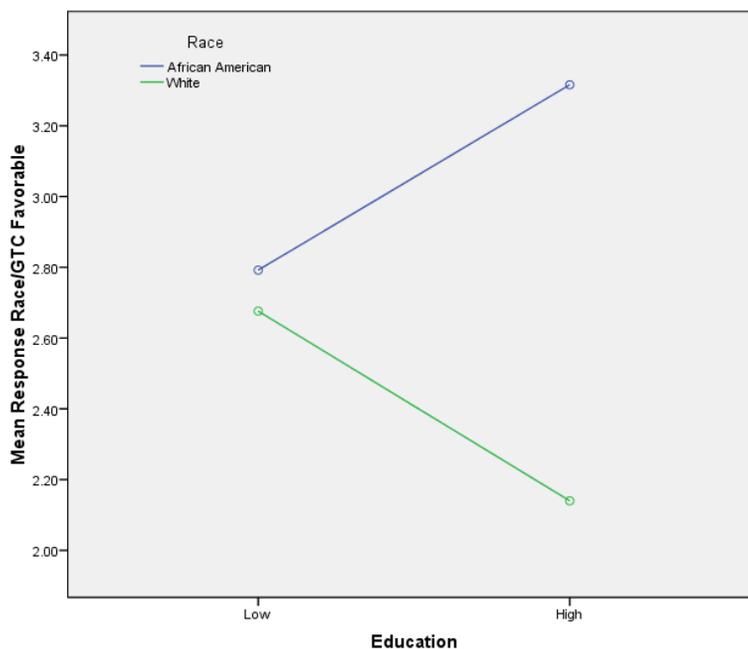
As Table 5 shows, Whites with more education were somewhat more in agreement with GTC Favorable, but were more opposed to Race Favorable as compared to Whites with less education. African Americans with more education were more favorable about GTC before and after the

² Equal variances were not assumed for these two measures of interest in genetically targeted care (GTC).

racial prime, compared to African Americans with less education. On average across all three levels of education, Whites appeared to have less favorable opinions about Race Favorable than GTC Favorable, but African Americans expressed relatively stable opinions across GTC Favorable and Race Favorable.

For responses to the Race Favorable item, there was a statistically significant interaction effect of race by education ($F(3, 117) = 6.95, p < .001$). Figure 1 (below) graphs the interaction of race (African American vs. White) and education level (high vs. low) on opinions about Race Favorable. Whereas African Americans with higher levels of education tended to support Race Favorable, indicating agreement that race is a good way to personalize medicine, Whites with more education tended to strongly disagree with this statement. Figure 1 also shows that Whites and African Americans with low levels of education were fairly close in their opinions about using race to provide GTC. The observed relationship remained constant after controlling for several demographics, including gender, age, political ideology and political partisanship.

Figure 1: Mean Responses to Race Favorable by Education and Race



Overall, some of the observed differences in opinions by education and political ideology may be explained by research on aversive racism and social desirability bias. The literature indicates that aversive racism is characterized by more complex, ambivalent racial expressions and attitudes (Gaertner & Dovidio, 1986). Studies have also shown that White Liberals, and possibly also highly educated Whites, often strive to respond with favoritism toward African Americans and display reverse-discrimination (Saucier, Miller, & Doucet, 2005). Liberal and highly educated Whites were perhaps more sensitized to concerns about overt expressions of racial bias, and they may have assumed that favorability toward using race to provide GTC would be indicative of prejudicial or discriminatory racial attitudes. It remains unclear why African Americans with more education, compared to those with less education, were typically more in favor of GTC both before and after the racial prime. Perhaps the highly educated African American participants had more preexisting knowledge about genetics and personalized medicine, and/or more exposure to news media coverage of these topics.

In addition to measuring respondents' favorability toward GTC, concerns about discrimination as a consequence of GTC were also measured before and after the racial prime. Before exposure to the racial prime, GTC Limit (survey question #3c) asked respondents about their agreement with the statement that GTC will limit some people's access to medical treatment. After the racial priming message, Race Limit (survey question #4b) asked respondents whether they thought that using race to provide GTC will limit some racial groups' access to medical treatment (see Appendix A for additional detail). A regression model was run predicting responses to Race Limit by opinions about GTC Limit, race of respondents, and the interaction between GTC Limit and race (with the predictor variables centered to avoid multicollinearity). The omnibus F test for this regression model was highly statistically

significant ($F(3, 115) = 7.36, p < .001$); however, the model showed that the only statistically significant determinant of Race Limit was responses to GTC Limit ($t(117) = 4.68, p < .001$).

Examining responses to the two discrimination-related questionnaire items separately for Whites and African Americans, the regression models confirmed that GTC Limit (centered) was a statistically significant, positive predictor of responses to Race Limit for both racial groups (White sample: $F(1, 76) = 13.40, p < .001, \text{Beta} = .39, p < .001$; African American sample: $F(1, 38) = 9.00, p < .01, \text{Beta} = .44, p < .01$). When background variables (all centered) were included in the regression models as controls (e.g., education, political ideology, and political partisanship), the regression model remained significant for the African American sample ($F(4, 33) = 2.75, p < .05$), and the White sample ($t(F(4, 76) = 4.60, p < .01$). For the African American sample, however, GTC Limit ($t(40) = 3.2, p < .01$) was the only statistically significant predictor of Race Limit. For the White sample, the model showed that GTC Limit ($t(76) = 3.27, p < .01$), and education ($t(76) = 2.16, p < .05$) were *both* statistically significant determinants of responses to Race Limit. These data suggest that, unlike the African American sample, White participants' concerns about genetic discrimination after exposure to the racial prime was a function of both education and responses to GTC Limit. Among the African American sample, education was not a significant determinant of concerns about race-based medicine; the only significant predictor of discrimination concerns with regard to race-based medicine were the initial concerns African Americans expressed about discrimination as a consequence of GTC.

Results for the combined sample of Whites and African Americans also revealed a statistically significant effect of education on responses to the survey question that measured concerns about discrimination after exposure to the racial prime (Race Limit). A regression

model was run predicting Race Limit by education, race, and the interaction effect (predictor variables were centered); the omnibus test of this model approached statistical significance ($F(3, 117) = 2.31, p = .08$). In this regression model, education ($t(117) = 2.50, p < .05$) was the only statistically significant determinant of concerns about discrimination with regard to race-based medicine. In addition, for the combined sample of White and African American participants, those with higher levels of education were significantly more concerned that GTC would limit some racial groups' access to medical treatment, as compared to those with less education ($F(2, 117) = 4.69, p < .05$). Overall, the results indicate that across racial groups, people with more education responded to the racial prime by expressing more apprehension about race-based medicine than those with less education; however, this effect of education was most evident among White participants.

Conclusions

This study revealed important differences between African Americans and Whites in their opinions about genetics and medicine, and provides new directions for future research in this area. A central finding of this study is that prior to receiving a racial priming stimulus, White participants expressed more positive opinions about personalized medicine as compared to African Americans. Yet, Whites expressed significantly more negative judgments about using race to provide GTC (race-based medicine), as compared African Americans. The results suggest that racial cues in messages about personalized medicine may have differential effects on opinions among Whites and African Americans. It is possible that the racial cue primed minority, or out-group status among Whites, thereby diminishing their favorability toward and interest in genetically targeted care. More research is needed to examine whether White

respondents would have had expressed similar judgments about GTC and race-based medicine if their in-group status had been primed with a racial cue about White people.

The study also found compelling differences in participants' responses to the racial prime by political ideology and education. Political ideology appeared to have the reverse pattern of effects across the mean distribution of favorability judgments among Whites and African Americans. Whereas White Conservatives and Moderates were strongly in agreement with GTC Favorable, they were substantially more opposed to Race Favorable. Conversely, Conservative and Moderate African Americans were initially more opposed to GTC Favorable, but more in favor of Race Favorable than Liberal African Americans. These results may be partially explained by previous research that has shown that individual differences such as political ideology and racial attitudes can influence attitudes about various social and racial issues (e.g., Pan & Kosicki, 1996; Dovidio & Gaertner, 1998; Gilliam & Iyengar, 2000; Shelton, 2005). For example, Dovidio and Gaertner's (1998) integrated model considers the relationship between political ideology and racial attitudes among Whites, and theorizes that Conservatives are generally more likely to maintain symbolic racism and Liberals are more likely to maintain aversive racism.

Although the literature may provide explanations for some of the observed differences in opinions between African Americans and Whites, many questions remain unanswered. It is unclear why in some cases African Americans showed the opposite pattern of effects as Whites by political ideology and education. Unlike Whites, African American Liberals responded to Race Favorable more negatively than Conservative or Moderate African Americans, even when controlling for education. More generally, the study found a statistically significant interaction effect of participants' race by education for opinions about personalized medicine. African

Americans with more education were, on average, more in favor of using race to provide personalized medicine, compared to Whites with equivalent levels of education and African Americans with less education. The study also showed that African Americans and Whites with low education were fairly close in their opinions about race-based medicine. Some of these results may be evidence of aversive racism, which holds that evaluations of racial/ethnic minorities are characterized by a conflict between Whites' endorsement of egalitarian values and their unacknowledged negative attitudes toward racial/ethnic out-groups (Gaertner & Dovidio, 1986). More highly educated Whites may be sensitized to concerns about racial bias, and therefore more likely to oppose 'race-based' issues that may appear prejudicial. The results also seem to indicate that African Americans considered GTC in the context of race prior to the racial prime, but Whites did not consider GTC as a racial issue before exposure to the racial cue. Certainly, more empirical research is needed to assess these claims, including the observed effects and their causal mechanisms.

In sum, this study found compelling evidence to suggest that racial cues in messages about genetics and medicine impact public opinion. The results indicate that racial priming has differential effects on people's judgments about personalized medicine and race-based medicine, with implications for associated health policy opinions. This research contributes to a growing body of empirical work revealing that public attitudes about genetics and race are complex; it is within an intricate structure of attitudes that messages about genetics, health and race function (Condit and Bates, 2005). Moreover, the past experiences of minority groups suggests that modern advances in technology and medicine may introduce new labels (e.g., 'carrier') that result in social and institutional consequences which remain largely unknown. Although scholars express concern over the potential for stigmatization and discrimination to occur in

response to linking genetics differences with racial and ethnic groups, there has been a lack of empirical research on how messages about genetics and medicine may impact people's attitudes and beliefs, as well as existing health disparities (Lee, 2003). The potentially deleterious effects of associating genetics with race in public discourse underscores the importance of research in this area. It remains to be seen whether and how advances in the field of genetics will remedy or exacerbate existing social inequalities and health disparities among minority racial and ethnic groups.

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Appendix A: Study Stimulus and Questionnaire Items

Please Note: All participants read and answered the following stimulus and questionnaire items.

Introduction to Personalized Medicine: “Some doctors are using genetics as a basis for screening, diagnosing, and prescribing medication. This practice is called genetically targeted care. Because of their genetics, people respond better or worse than others to certain medications and medical treatments. Some say that using genetics to personalize medicine is a good way to tailor treatment to individuals and improve their overall medical care. Others say that genetically targeted care will discriminate against people that are less responsive to medication and limit their access to medical treatment.”

Questions for all participants:

1. Please select the ONE statement that comes closest to your view:

Note: Randomize order

1a. Genetically targeted care will improve people’s overall medical care.	1
1b. Genetically targeted care will discriminate against people that are less responsive to medical treatment.	2

2. Now, please tell us how much you agree or disagree with each of those statements:

Note: Same random order as above

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree
2a. Genetically targeted care will improve people’s overall medical care.	1	2	3	4	5
2b. Genetically targeted care will discriminate against people that are less responsive to medical treatment.	1	2	3	4	5

3. How much do you agree or disagree with the following statements:

Note: Randomize order

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree
3a. Genetically targeted care will make no difference in people’s lives.	1	2	3	4	5
3b. People will <u>not</u> be willing to get a genetic test to find out how well they respond to medical treatment.	1	2	3	4	5
3c. Genetically targeted care will limit some people’s access to medical treatment.	1	2	3	4	5
3d. People will <u>not</u> trust genetically targeted care.	1	2	3	4	5

“Currently, it is too costly and difficult for most doctors to obtain genetic profiles for each of their patients. In order to provide their patients with genetically targeted care, some doctors are using race as a substitute for individual genetic profiles because people of the same racial group tend to share many of the same genes.”

4. How much do you agree or disagree with the following statements:

Note: Randomize order

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree
4a. Using race to provide genetically targeted care is a good way to personalize medicine.	1	2	3	4	5
4b. Using race to provide genetically targeted care will limit some racial groups’ access to medical treatment.	1	2	3	4	5

4c. People like me would trust medical care that is tailored for them based on their race.	1	2	3	4	5
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Note: Please randomize participants in Scenario 8 to question '5a' or '5b'

5a.

	More harm than good	More good than harm	Both harm and good	Neither harm nor good
Do you think using race to provide genetically targeted care will do more harm than good, or more good than harm?	•	•	•	•

5b.

	More good than harm	More harm than good	Both good and harm	Neither good nor harm
Do you think using race to provide genetically targeted care will do more good than harm, or more harm than good?	•	•	•	•

6.

Note: Question for all participants assigned to Scenario - Fixed order

	Not at all Interested	A little Interested	Somewhat Interested	Very Interested	Extremely Interested
6a. How interested would you be in getting more information about this topic?	1	2	3	4	5
6b. If the opportunity came up, how interested would you be in discussing this topic with others?	1	2	3	4	5