Genetics, Violence, Race and the Partisan Processing of Responsibility

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Abstract

For decades, scientists have reported links between genes and traits like aggression, homosexuality, and many others. The lay public increasingly encounters these discoveries through popular media, but the question of how people process this information remains unexplored. We use a novel survey experiment to reveal important findings about how people react to information about links between genes and violence. First, political ideology moderates the impact of information about genetic causes. Second, race affects how partisans react to information about the causes of violence. Contrary to previous findings, we show that respondents believe black vignette subjects are less likely to be violent in the future relative to white vignette subjects. Finally, our results show that respondents are skeptical of expert opinion on genetics when that opinion conflicts with their priors, even in cases where information from experts ultimately affects their views.

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1 Introduction

The classical debate over free will is central to American political commitments to liberty and democratic decision-making. Demands to protect individual freedom and to maintain public control over the direction of government carry moral weight only if people are in fact free to exercise their will. But what if our actions are shaped more by our environment - or even our biology - than by our choices? In that type of polity, what is the appropriate role of government and the responsibility of individuals?

Strikingly different views on the question of free will have defined American political cleavages for centuries. In his 1779 “A Bill for Support of the Poor”, Thomas Jefferson describes members of the poorest classes who are poor because they “waste their time in idle and dissolute courses...loiter or wander abroad,” or refuse to “work for reasonable wages, or to betake themselves to some honest and lawful calling...” (Jefferson, 1779). This group, in Jefferson’s view, *chose* poverty, and were unworthy of government assistance. Nineteenth and twentieth century critics of poor laws would later advance the view that the primary causes of poverty were “unjust social conditions,” rather than the choices made by the poor themselves, and called for the need to break the connection between “poverty and guilt” in the public consciousness (Trattner, 1994).

The same political cleavage over the extent of individuals’ capacity for free choice and the societal implications of the answer to that question, persists today. In 2017, Republican Secretary of Housing and Urban Development Ben Carson famously called poverty “more of a choice than anything else,” emphasizing poor decisions made by people living at or below the poverty line as a potential cause of poverty itself. Carson’s comments drew intense backlash from the left.

Debates over what constitutes choice are not confined to the political elite. Social scientists have consistently demonstrated that partisanship shapes the way that people understand poverty and contemporary policies designed to address it (Hopkins, 2009; Zucker and Weiner, 1993; Williams, 1984). Similarly, 51 percent of Republican-identifying respondents to a 2014 survey, compared with 29 percent of Democratic respondents, agreed that poverty is due to a lack of effort rather than to circumstances beyond one’s control (Badger (2014), see also Chow and Galak (2012)). Partisan disagreements over choice extend beyond the context of poverty. For instance, in a 2015 Gallup poll only 40 percent of Republicans and Republican-leaning Independents, compared to 62 percent of Democrats and Democratic-leaning independents, agreed that being gay or lesbian was a trait that a person was born with (Jones (2015), see also Haider-Markel and Joslyn, 2008; Wood and Bartkowski, 2004)

Recent developments in genetic science have added a new layer of complexity to the debate over free will. During the last two decades, geneticists have linked genes (or more frequently, combinations of many genes) to sexual orientation (Ganna et al., 2019; Hamer et al., 1993), violence (Tiihonen et al., 2015; Guo, Roettger and Cai, 2008; Meyer-Lindberg et al., 2006; Wilson and Herrnstein, 1985), and many other traits and behaviors. Considerable evidence suggests that ordinary citizens are incorporating the information from these genetic findings into lay theories of human behavior (Suhay and Jayaratne, 2013; Jayaratne et al., 2006; Condit and Bates, 2005). These lay theories vary significantly in the extent to which they rely on genetic information, the way that they link genes to behaviors, the explanations they provide for why people do what they do, and what appropriate consequences for genetically rooted behaviors should be. Scholars have argued convincingly that partisanship and ideology are important sources of variation underlying these theories of human behavior (Clarkson et al., 2015; Matthews, Levin and Sidanius, 2009; Jost et al., 2003). Yet the *reasons why* partisans might think differently about genetic determinants of behavior, and the *implications* of those disagreements, remain largely unexplored.

The way that individuals think about the underlying causes of violence, homosexuality and other traits matters. Some studies have found that the attribution of homosexuality to genetic and biological causes was associated with higher support for gay marriage (Garretson and Suhay, 2016; Haider-Markel and Joslyn, 2005). Similarly, studies in psychology have found that attributing schizophrenia to genetic causes reduced punitive sentiments among survey respondents (Phelan, 2005). Another study demonstrated that judges evaluating a violent murder case were likely to recommend lower sentences for the perpetrator if they were given a biological explanation for his behavior (Aspinwall, Brown and Tabery, 2012).

In this study, we investigate the relationship between partisanship, genetic information, and policy preferences in the context of violent behavior using a novel survey vignette experiment. Our study yields several key findings that overturn received wisdom about perceptions of genes as a cause of violent behavior. First, we show that highlighting the genetic roots of violent action *does* affect both public perceptions of the individual responsible for that action and public perceptions of policy that might affect him. Second, we demonstrate that partisanship plays a significant role in shaping how much genetic information changes perceptions of violent individuals. In contrast to conventional wisdom, we show that liberals, rather than conservatives, are most affected by genetic explanations for violent behavior. Despite this, we show that people are not generally genetic determinists *even if* finding out that violent tendencies are genetic affects their views of responsibility and policy outcomes. Our findings also shed light on how people think about expert opinion in the context of genetics. Surprisingly, respondents across the ideological spectrum are skeptical of expert opinion when that opinion suggests that vignette subjects have a genetic predisposition to violent behavior. We show *why* this might be the case. The most common reason respondents give for resisting an expert's genetic predisposition diagnosis is that human behavior is complex and having a genetic predisposition toward a certain train does not necessarily mean a person will have this trait. We discuss existing debates over genetic attributions for behavior in Section 2. Section 3 presents our research design and a description of the data. We outline our results in Sections 4 and 5 and discuss them in Section 6.

2 Genetic Attribution Through a Partisan Lens

People instinctively look for causal explanations for the individual and group behavior they observe (Heider, 1944, 1958; Haider-Markel and Joslyn, 2005). Scholars have called the process of figuring out whether actions or traits are the result of biology, environment, social interactions, luck, or other factors "attribution", and it is central to how people think about judging behavior and assigning consequences for it (Phelan, 2005). Attribution theory implies that everyone who gets exposure to information about genes will find a way to incorporate that information into the nearly universal process of figuring out why people do certain things. But decisions about *when* to make genetic attributions for traits or behaviors, *how much* weight to give to genetic attributions relative to alternatives, and with what implications for policy are all functions of our prior beliefs (Ho, Scheufele and Corley, 2010; Ho, Brossard and Scheufele, 2008; Brossard and Nisbet, 2006). Dissimilarity in underlying beliefs may help explain why partisans have come to such different conclusions about which traits are biologically determined, which are choices, and what that implies for policy.

2.1 Individualism vs. Structuralism

Partisan disagreements over the genetic underpinnings of human traits are typically framed in terms of two debates. One formulation of the debate over human behavior hinges on dissenting views of the "controllability" of actions. When it comes to assessing the causes of - and, more importantly, the consequences for - particular traits or actions people explicitly consider the extent to which an individual has control over those traits or actions (Weiner, 1985, 1979). People are more inclined to hold individuals responsible for actions they view as "controllable", and more inclined to be lenient in the consideration of traits or behaviors they view as largely outside of an individual's control. Researchers have presented considerable evidence for the positive correlation between perceived degree of controllability and assignment of responsibility. Studies have shown that framing obesity (DeJong, 1980), hygiene (Levine and McBurney, 1977), sexual orientation (Suhay and Jayaratne, 2013; Haider-Markel and Joslyn, 2008, 2005; Wood and Bartkowski, 2004), violence (Heine et al., 2017; Dar-Nimrod, 2012; Aspinwall, Brown and Tabery, 2012), and many other traits as something beyond the individual's control decreased perceived responsibility for those traits and reduced motivation to punish the people who exhibited them.

The two distinct camps in this version of the debate over free will, individualists and structuralists, differ over how much control they generally perceive individuals have over their actions. Individualists tend to stress that human actions and behaviors are largely a function of personal choices; people have a great deal of agency over their actions, and therefore an equally great level of responsibility for them. Much like liberal environmentalists, structuralists counter with the position that economic, social, cultural, political, and circumstantial factors substantially mitigate the level of control we exercise over our choices. There is some empirical evidence that bolsters this configuration of the debate. For instance, researchers have found that people who profess greater belief in the idea of free will are significantly more likely to express intolerance of what they view as unethical behavior and to endorse harsh criminal punishment (Martin, Rigoni and Vohs, 2017). It is worth noting that belief in free will and structural influence over behavior are not mutually exclusive (Suhay and Jayaratne, 2013; Condit et al., 2009; Jayaratne et al., 2009; Condit et al., 2004). People who express strong beliefs in the idea of free will tend to give personal choice higher weight when they attribute behaviors to causes, while structuralists tend to view structural factors as relatively more important than personal choice.

Empirical research in this area has provided some evidence for systematic associations between individualist (or structuralist) positions and political ideology. People who identify as conservative express higher levels of belief in the idea of "free will" (Clarkson et al., 2015) and tend to claim high levels of personal agency in the choices people make. People who identify as conservative are much more likely than liberals to say that individuals with negatively stigmatized traits such as drug addiction, mental or psychological disabilities, or violent behavior should be held responsible for their actions and punished for those actions where appropriate. Political scientists have presented evidence for this in the context of violent behavior. Broadly, conservatives are more likely than liberals to emphasize controllable, individual explanations for why people commit crimes, and to endorse more punitive approaches to addressing crime (Gabbidon and Boisvert, 2012; Thompson and Bobo, 2011; Grasmick and McGill, 1994; Iyengar, 1989).

Fitting genetics into the framework of this debate is potentially problematic. Genes occupy a unique space here because they are *both* traditionally considered out of our control *and* highly individual. An individualist might accept a genetic explanation for a given behavior because a genetic predisposition implies that the individual - rather than society - is responsible for her behavior. Alternatively, an individualist might reject a genetic explanation because such an explanation implies that a person isn't really in control of her decision to engage in a particular behavior. Similarly, someone who favors structural explanations for behavior might be receptive to genetic explanations because they de-emphasize individual choice, or reject the idea precisely because genetic explanations minimize the role played by social or institutional factors.

2.2 Biological Determinism vs. Liberal Environmentalism

The second debate over free will explicitly focuses on the role of biological destiny.The opposing poles that characterize this debate are genetic (or biological) determinism and what Kinder and Sanders have termed "liberal environmentalism" (Kinder and Sanders, 1996). Biological determinism as we recognize it today has its origins in the zoology and anthropology of the late eighteenth and early nineteenth centuries. Biological determinism holds that "shared behavioral norms, and the social and economic differences between human groups - primarily races, classes, and sexes - arise from inherited, inborn distinctions and that society, in this sense, is an accurate reflection of biology" (Gould, 1996). The group-based implications of this argument are impossible to ignore. Indeed, leading biological determinists of the idea's founding era explicitly promulgated the view that blacks were biologically inferior to whites, and eugenics movements around the globe eagerly adopted biologically deterministic arguments to justify racial separation, sterilization, extermination, and a host of other abominations (Kuhl, 1994; Lewontin, Rose and Kamin, 1984).

While the race-based hierarchy endorsed by early biological determinists has been discredited (Gould, 1996), contemporary researchers have noted that lay survey respondents do understand certain traits to be "more prevalent in one group than another due to genetic factors" (Hochschild and Sen, 2015). Today's version of the genetically-oriented view of human behavior, at least for an individual, might argue that genetic predispositions to certain behaviors make it very likely that those behaviors will manifest (Phelan, 2005; Nelkin and Lindee, 1995; Lippman, 1992). At the group level, some biologists have argued that certain genes do "cluster" (that is, occur more frequently) in specific racial and ethnic groups (Guo et al., 2014; Wade, 2014; Shiao et al., 2012).

Biological determinism immediately fostered fierce opposition. In response to the racism espoused by biological determinists of his time, W. E. B. DuBois argued that a "scientific definition of race is impossible" and construed the "problem of inheritance" for American blacks as something economic, social, and regional (Mostern, 1996). Though his writing pre-dates the phrase, DuBois' position embodies the liberal environmentalist one. Liberal environmentalism emphasizes the roles in human traits and decision-making played by the environment, economic constraints, social conditions, political restrictions, and other forces bigger than the individual. If humans have a “nature”, in this view, that nature is not fixed by a set of genetic or biological endowments, but heavily moderated by circumstance.

Mapping between political partisanship and degree of genetic or biological determinism is not straightforward. Conventional wisdom associates biological determinism with the political right and liberal environmentalism with the political left (Suhay and Jayaratne, 2013; Jayaratne et al., 2006; Nelkin and Lindee, 1995; Lewontin, Rose and Kamin, 1984; Hofstadter, 1944 (1992). The theoretical grounding for this connection relies loosely on forms of social dominance theory. Political psychologists who endorse social dominance theory construe conservatism as a commitment to reducing group conflict through the maintenance of social hierarchies. Conservatives, in this view, are particularly apt to develop “ideological beliefs that justify the hegemony of some groups over others” (Jost et al., 2003, see also Heine et al., 2017; Matthews, Levin and Sidanius, 2009; Pratto, 1999). Accordingly, biological determinism should be an appealing position for conservatives seeking to legitimize existing social hierarchies; if the differences between groups are immutable, biological, and “natural”, then their relative social positions are also natural and should not change.

The empirical evidence concerning the relationship between ideology and biological determinism is both limited and mixed. Some studies have presented evidence for a connection between racial intolerance and belief in genetic root causes for racial differences (Jayaratne et al., 2006; Condit et al., 2004), as well as a willingness among whites to accept genetic explanations for the behavior of blacks (Byrd and Ray, 2015). While studies have shown conservatives are significantly more likely to oppose policies that establish civil rights for LGBTQ people, the same studies have suggested that conservatives are far more likely to *reject* genetic explanations for homosexuality than liberals are (Haider-Markel and Joslyn, 2016, 2008; Wood and Bartkowski, 2004). One recent study demonstrated a positive correlation between conservatism and racial resentment, but suggested a negative correlation between racial resentment and an individual’s propensity to make genetic attributions for particular traits (Schneider, Smith and Hibbing, 2018). Another study found no relationship between ideology and the willingness to attribute traits like physical illness, mental illness, intelligence, personality, and success to genetic or biological causes (Shostak et al., 2009).

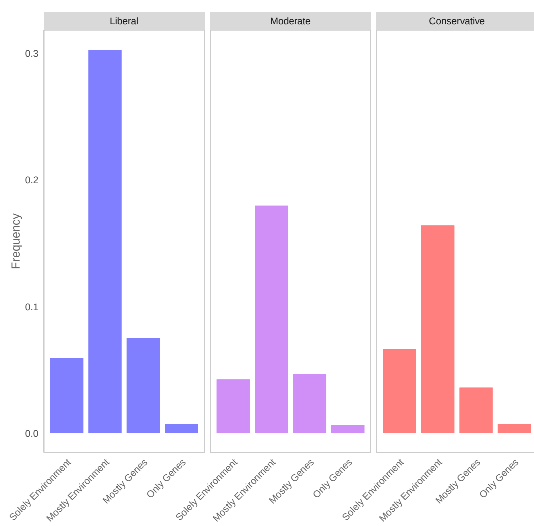
2.3 Re-thinking Research on Genes and Ideology

Reconciling these two theoretical debates with genetics is a challenging project for several reasons. First, these two frameworks generate opposing conclusions about how conservatives might use genetic explanations for human traits. If we believe conservatives are most likely to be biological determinists, we might predict that they are the most apt to adopt genetic explanations for behaviors, particularly when those explanations reinforce existing beliefs about race, gender, or class hierarchies. If we instead believe that conservatives are committed individualists, then we might expect them to express greater resistance to genetic explanations of behavior because such explanations imply that individuals are not really in control of their behavior.

Second, both theoretical frameworks provide only partial insight into how lay partisans might use genetic information. Both sides of the biological determinism vs. liberal environmentalism debate have clear implications for how laypeople might think about the relative importance of genetic or biological differences between *groups*, but they tell us little about how people might think about whether biology influences individual actions or traits. Since previous research has effectively demonstrated that people use heuristic information about groups and individuals differently (Gill, 2003; Izumi and Hammonds, 2007), we cannot assume that group based views associated with biological determinism or liberal environmentalism easily translate into evaluations of individuals. While the individualism vs. structuralism framework *does* provide information about how people might assess the actions of individuals, it has no straightforward predictions about where genetic information might fit into assessments of responsibility or consequences. This becomes problematic for theories about how liberals think about genetic information. Liberal structuralists might accept genetic explanations for behavior on the grounds that genes represent structural factors that cannot be manipulated by their owner, but that can nonetheless influence her behavior. Alternatively, liberal structuralists might reject genetic or biological explanations on the grounds that "structural" explanations for behavior apply exclusively to social or environmental factors that exist outside of the individual.

Finally, the biological determinism framework implies that partisans should have polarized beliefs on the subject of genes. If we accept the mapping from biological determinism to conservatism and the mapping from liberal environmentalism to political liberalism then we should expect conservatives to express the belief that genes play a substantial role in determining behavior and liberals to express the belief that genes play little to no role in the same process. Yet public opinion on the subject of genetic determinism does not fit this pattern (Hochschild and Sen, 2015). A 2008 survey of 1,005 adults, for instance, found no difference in the proportions of liberals and conservatives reporting that "the genes we inherit" are a "more important influence on peoples behavior" [1]. We elicited priors over genetic determinism as a part of this study by asking respondents about the extent to which they believed actions and behavior were determined by genes. Figure 1 displays results by ideology. The preponderance of self-identified liberal, moderate, and conservative respondents in our data reported believing that a person's actions and behavior are mostly a function of her environment. The distribution across the spectrum of responses from liberal environmentalism ("Solely Environment") to biological determinism ("Only Genes") looks essentially the same within each ideological group. We discuss the survey instrument in detail in Section 3; survey questions are available in full text in the Appendix.

Figure 1: Distribution of Genetic Attribution Across Ideology



[1] Virginia Commonwealth University Life Sciences. VCU Life Sciences Survey, Nov, 2008 [survey question]. USVIRGCU.08LIFE.R22. Center for Public Policy, Virginia Commonwealth University [producer]. Cornell University, Ithaca, NY: Roper Center for Public Opinion Research, iPOLL [distributor], accessed Mar-19-2019.

These data suggest most people across the ideological spectrum have a general sense that human behavior is primarily the product of environmental factors. However, as the research surrounding ideology and perceptions of LGBTQ people compellingly demonstrates, the specific trait or behavior in question matters. One possible interpretation of the reason why researchers have observed inconsistent results across studies of the lay public's perception of genes and behavior is that people genuinely believe that genes and environmental factors play equally important roles in the general discussion of human behavior, but that one or the other dominates when it comes to particular individuals or particular traits. Indeed, studies have shown both considerable differences in genetic attribution across traits (Schneider, Smith and Hibbing, 2018), and that framing effects can significantly alter the way respondents think about these questions. Specifically, researchers have shown that existing prejudices affect willingness to make genetic attributions when questions are framed in terms of groups but not when questions are framed in terms of individuals (Singer et al., 2010).

We see this as a reason to approach questions about ideology, genetic attribution, and race in the context of individual issues. While studies which ask respondents to provide genetic or environmental attributions for a wide variety of traits (Schneider, Smith and Hibbing, 2018; Suhay and Jayaratne, 2013; Shostak et al., 2009) provide valuable insights into both the traits that people tend to think are genetically determined and the people most likely to adopt genetic explanations for traits, they provide little information about the political or policy *implications* of these results. We include numerous outcome questions about one specific trait to address when and how information about genetically-driven violent behavior matters. We also eliminate ambiguity about who might be engaged in a particular behavior by asking separate questions about individual actions and group predisposition. Several studies have addressed the relationship between lay ideas about the genetic origins of sexual orientation and policy views on issues that affect the LGBTQ community in more detail (Haider-Markel and Joslyn, 2008, 2005; Wood and Bartkowski, 2004), but we know of no study specifically focused on the question of genes and policy outcomes for violence.

2.4 Race and Violence

"There is an obvious and logical interdependence between what is done about crime and what is assumed to be the reason for our explanation of criminality," argued sociologist George Vold (Vold, 1958). We focus this study on violent crime precisely because it is perhaps the canonical forum in which debates over the causal attribution of behavior have played out. The idea that crime had biological roots was formalized in parallel to biological determinism as an intellectual movement. In the 1870s Italian criminologist Cesare Lombroso began to reject the assumptions previously held by the "classical school" of Enlightenment criminologists and philosophers. Specifically, he rejected their ideas that man was essentially a rational being and committed crimes when he stood to benefit from them. People, in the classical view, had free will and *chose* to commit crimes when they recognized gains from it. Lombroso claimed that crime was not a rational decision; instead, criminality was a heritable trait that could be identified through various physical attributes.

While many of Lombroso's ideas have since been rejected (Heine et al., 2017), numerous modern genetic discoveries have given rise to a new debate about the extent to which violent behavior and crime have biological root causes. Numerous studies have posited links between particular genetic mutations and criminal behavior (Tiihonen et al., 2015; Guo, Roettger and Cai, 2008; Meyer-Lindberg et al., 2006; Wilson and Herrnstein, 1985). Others have warned against over-interpreting these findings by pointing out that the interaction between genetic risk factors and environmental factors matters, and that individuals with genetic risk factors for violence could either be moderated or triggered by exposure to violence (Barnes and Jacobs, 2013). Yet others have stressed methodological flaws or limited evidence (Walters, 1992).

Still, these discoveries have reached the lay public. In 1997, a U.S. News and World Report phone survey of 1,000 adults showed that 73% of respondents believed that violent behavior was determined at least somewhat by heredity and genes. 19% of respondents believed that violent behavior was due mostly or completely to genes and heredity[2]. Scholars have expressed concern that media coverage of genetic discoveries has predisposed the lay public to bias in favor of genetic

[2]U.S. News & World Report/Bozell Worldwide Poll, Feb, 1997. USKRC.041297.R05D. KRC Communications/Research. Cornell University, Ithaca, NY: Roper Center for Public Opinion Research, iPOLL

determinism (Heine et al., 2017; Morin-Chassé, 2014; Conrad, 1997; Hubbard, 1997; Nelkin and Lindee, 1995), but public opinion research on lay views of what causes crime or violent behavior is extremely limited. Researchers began probing public views on the causes of crime or "delinquency" in the 1970s. Early studies identified various domestic shortcomings, such as "poor conditions at home" as common explanations respondents might provide for why people commit crimes (Erskine, 1974). While some identified "personality deficiencies" (such as lack of control or immaturity) as potential causes of criminal behavior, few early studies explicitly examined the extent to which the lay public endorsed specifically genetic or biological theories of what causes crime (Carroll, 1978). One recent study presented respondents with a broad range of social, economic, biological, cultural and other theories of why people engage in crime and found that biological explanations are among the *least* endorsed (Gabbidon and Boisvert, 2012). Even if there is limited evidence that lay people rely heavily on biological explanations for crime, researchers have shown that framing crime or violent behavior in terms of genetic or biological roots has important effects on how people perceive responsibility and consequences. Consistent with the idea that genes might not be "controllable", researchers have suggested that genetic explanations for crime or violence are generally exculpatory, leading to less perceived responsibility (Heine et al., 2017; Dar-Nimrod, 2012) and lower recommended sentences (Berryessa, 2016; Aspinwall, Brown and Tabery, 2012).

Neither public attitudes about the causes of crime, nor the implications of those attitudes are uniform across race, ideology, or gender (Gabbidon and Boisvert, 2012). It is almost impossible to disentangle the conversation about the biological roots and heritability of crime from the same conversation as it applies to race. Race complicates the lay perception of the relationship between genes and violence because the public notion of what violence is and who commits it is highly racialized, but also because attitudes about race itself may be rooted in the public's belief in fundamental genetic and biological differences between themselves and people of other races (Peffley and Hurwitz, 1997). Numerous studies have found that white respondents tend to view black people in particular as more violent than whites (Peffley and Hurwitz, 2002; Gilliam and Iyengar, 2000; Duncan, 1976; Sagar and Schofield, 1980). Furthermore, racial resentment predicts harsher, more punitive views of crime reduction (Unnever, Cullen and Jones, 2008). These results lead us to believe that respondents asked to consider the causes and consequences of violent actions will also consider the race of the individual responsible for those actions. More generally, race may decide which of the two frameworks discussed above respondents might apply when thinking about genetic predispositions. That is, attitudes about particular racial or ethnic groups might motivate respondents to apply the group-based logic of biological determinism to a non-white vignette subject, but to think about structural factors that guide individual behavior if they are asked to evaluate a white vignette subject. What we propose in this paper is the first experimental test of the way that race, ideology, and genetic information interact in the perception of the lay public.

3 Experimental Design and Data Collection

To test the theories of genetic reasoning, partisanship, violence, and race we have described in Section 2, we conducted an online survey experiment following (Phelan, 2005) in which respondents were asked to read the following scenario about a hypothetical individual:

> Connor is a 26-year-old man. He has a job, is not married, and currently lives alone. Back when Connor was in high school, he repeatedly got into physical fights with his classmates. Recently Connor had a fight with a friend in which he injured his friend badly enough that onlookers called the police. Connor was charged with assault and served time in jail. Connor was examined by medical experts while he was in jail.

The name "Connor" is a randomized race treatment meant to connote a putatively white vignette subject. Respondents were randomly assigned to a version of this vignette featuring a putatively black subject (Jamal) or a putatively Hispanic subject (Miguel). In addition, respondents were randomly assigned to one of two genetic treatment conditions. The vignette above ended with one of the two following statements, either (1) a genetics expert said that Connor's tendency to be aggressive has a very strong genetic component or (2) Connor's tendency to be aggressive is not due to genetic factors.

We then asked survey respondents a series of questions about the vignette subject and their views on policies that might affect him. Table 1 provides these outcome questions in full text.

Table 1: Outcome Questions

Question
On a scale of 1 (no responsibility) to 100 (full responsibility), how much personal responsibility does Connor have for his tendency to be aggressive?
In Connor's state, criminal sentences for assault range from 1 month to 30 months in jail. In your opinion, how long should Connor's sentence have been, given that this was his first conviction?
On a scale of 1 (extremely unlikely) to 100 (extremely likely), how likely do you think Connor is to act violently toward someone else after this incident?
On a scale of 1 (strongly oppose) to 100 (strongly support), how much do you support "three strikes laws" in your state? (Three strikes laws make life in prison the minimum sentence for someone who commits a violent felony and already has two prior convictions for violent felonies).
On a scale of 1 (strongly oppose) to 100 (strongly support), how much do you support publicly funded programs to help people like Connor? These programs might include things like job training, rehabilitation, talk therapy, or medication, but they are not limited to those options.
On a scale of 1 (strongly oppose) to 100 (strongly support), how much do you support publicly funded programs that prevent violent behavior? Examples of these programs include: youth counseling, after school sports or other activities, or anger management therapy, but they are not limited to those options.
Many years after this incident, Connor gets certified as a teacher and applies for a teaching position in his local school district. His earlier violent incident is the only crime in his record, but he still has to inform the school. On a scale of 0 (strongly oppose) to 100 (strongly support), would you support a local school's decision to hire Connor as a teacher?
On a scale of 0 (strongly disagree) to 100 (strongly agree), to what extent do you agree with the genetics expert's analysis that Connor's behavior is (or is not) due to genetic factors?

These outcome questions were presented to respondents in random order. Survey respondents were subsequently asked a series of demographic questions and questions about their baseline willingness to attribute behaviors to genetic causes. This survey was administered to a sample of 2,182 respondents across two online platforms: Amazon's Mechanical Turk (1,881 respondents) and Harvard's Digital Lab for the Social Sciences (301 respondents). Our sample skewed liberal. 974 respondents(44.6%) identified as liberal or very liberal; 606 respondents self-identified as moderate (27.7%), and 602 (27.6%) identified as conservative. The vast majority of participants in this survey experiment (79%) are white. 53.6% of respondents identified as female and 46.0% as male. Survey respondents reported an average age of 41.31 with a standard deviation of 14.15 years. Respondents reported a median annual income of $50,000 - $74,999 and the median respondent had an undergraduate degree. The main results we present in this paper pool across respondents from these two platforms. In the Appendix, we show that including an indicator for DLABSS does not change the substantive conclusions for the paper and present more detailed information about sample characteristics.

4 Results

4.1 Power

Interaction effects between genetic information, race, and respondent's ideology are central to our chief hypotheses and present in this study. Our interest in interaction effects exerts pressure on our sample size. Accordingly, one natural question about the results that follow concerns power: can the experiment we ran in this study detect interaction effects - much less triple interaction effects, even if these interaction effects really exist in the population? In short, the answer in this case is yes. We can show this using a benchmark calculation, but readers should refer to Appendix Section A for more detailed power calculations under a variety of assumptions. In this study, all outcomes except for one (sentencing) are scaled from 0 to 100. The average standard deviation for outcome variables on this scale is 26.52 (range: 19.96 - 34.10). We have nearly equal numbers of observations in the genetic treatment (1,084) and non-genetic treatment conditions (1,098). Under these assumptions, we can detect effects of 3.2% (0.12 standard deviations) or higher with 80% power[3]. In practice, most of our effect sizes - including effect sizes for the triple interaction terms - have considerably larger magnitudes (full regression results are presented in Appendix B). For our the responsibility outcome, the triple interaction effect of the genetic predisposition treatment, Hispanic race treatment, and conservative ideology has a magnitude of 11, or 0.55 standard deviations (the standard deviation of the responsibility outcome variable is 19.96). These are relatively large effect sizes, which makes them detectable with 80% power even in a setting with interactions. We report formal estimates for Minimum Detectable Effects ("MDE"), along with the probabilities of making sign and magnitude errors following Gelman and Carlin (2014), in Appendix A.

4.2 Base Results

Because the race and genetic treatments represent the only randomized manipulations in this study, we begin by examining the interactions between these two variables. Table 2 summarizes

[3]Assuming a two-tailed hypothesis test for a difference in means at the 95% level.

OLS regression results for each of the outcome questions reported in Table 1 and the interaction of our race and genetic treatments. Discovering that the vignette subject had a genetic predisposition to violence significantly reduced the amount of responsibility respondents believed the subject had for his actions. Information about genetic predisposition does not, however, seem to affect respondent views in policy areas like sentencing, views on recidivism, three strikes laws, public assistance programs, violence prevention programs, or teacher hiring.

There are several race effects worth highlighting in Table 2. First, respondents assigned to the treatment condition with a black vignette subject were significantly less likely to believe that he would act violently toward someone else in the future (relative to respondents assigned to the white treatment condition). Respondents assigned to this condition were also significantly more likely to support hiring a black vignette subject as a teacher in the future (relative to respondents assigned to the white treatment condition). In addition, respondents assigned to the treatment condition with a Hispanic vignette subject were significantly more likely to recommend higher sentences than respondents assigned to the white treatment condition. We do not see significant evidence for interaction between the race treatment and the genetic treatment. This implies that, at least on average, respondents are not evaluating genetic information differently for subjects of different races. This changes once we allow respondent ideology to interact with both treatments.

Respondents assigned to the genetic condition expressed significant skepticism of the expert's assessment. The implication of this result is that respondents are affected by the genetic information treatment despite being consciously skeptical of the genetic information itself. We discuss mechanisms for this in Section 4.3.4.

4.3 Ideology, Genetic Information, and Race

4.3.1 Responsibility

We asked respondents to evaluate the extent to which the individual they read about in their vignette was responsible for his actions on a scale from 1 (no responsibility) to 100 (full responsibility). Respondents across treatment conditions tended to assign relatively high levels of responsibility to the vignette subject, which we expected given the presentation of the vignette. Average assigned

Table 2: Conditional Average Treatment Effects of the Genetic and Race Treatments

	Dependent variable:							
	Responsibility	Sentence	Violence	Three Strikes	Programs	Violence Prevention	Teaching	Expert Agreement
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Genetic	-6.145^{***}	0.616	1.791	-0.424	0.196	-0.038	1.594	-22.405^{***}
	(1.474)	(0.608)	(1.877)	(2.539)	(1.921)	(1.796)	(2.180)	(1.904)
Black	-1.234	0.672	-3.715^{**}	-1.495	0.520	0.763	5.525^{**}	0.771
	(1.468)	(0.605)	(1.869)	(2.528)	(1.912)	(1.788)	(2.170)	(1.895)
Hispanic	-0.884	1.728^{***}	0.186	1.898	-1.582	-0.924	1.917	-0.606
	(1.456)	(0.601)	(1.855)	(2.509)	(1.898)	(1.775)	(2.154)	(1.881)
Genetic:Black	2.793	-1.336	-0.615	0.268	-0.710	-0.083	0.029	-4.629^{*}
	(2.088)	(0.861)	(2.659)	(3.596)	(2.721)	(2.544)	(3.088)	(2.696)
Genetic:Hispanic	0.116	-0.789	-1.723	-4.958	1.772	2.402	-0.474	-1.698
	(2.069)	(0.854)	(2.635)	(3.564)	(2.697)	(2.522)	(3.061)	(2.673)
Constant	85.916^{***}	8.520^{***}	62.024^{***}	56.843^{***}	74.252^{***}	77.976^{***}	56.534^{***}	72.070^{***}
	(1.031)	(0.425)	(1.312)	(1.775)	(1.343)	(1.256)	(1.524)	(1.331)
Observations	2,182	2,182	2,182	2,182	2,182	2,182	2,182	2,182
R^2	0.018	0.007	0.005	0.002	0.001	0.001	0.007	0.189
Note:								*p<0.1; **p<0.05; ***p<0.01

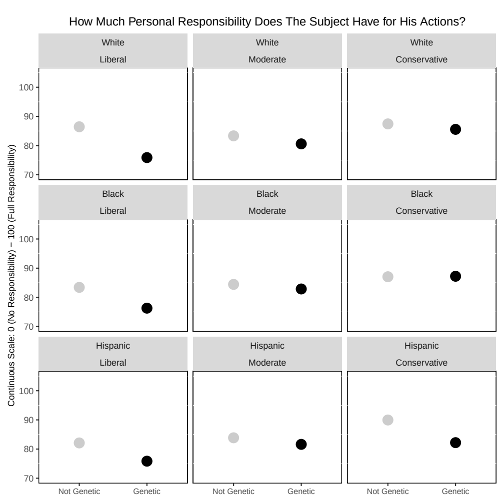
responsibility was 82.6, with a standard deviation of 20.0.

Our results suggest that finding out that the vignette subject is genetically predisposed to violent behavior has a negative effect on liberal survey respondents' willingness to assign him responsibility for his own actions. This is not true for moderates and conservatives. While the main effect of the genetic treatment is negative for all respondents, offsetting, positive interactions between the genetic treatment and being moderate or conservative do not translate into significant overall effects on these respondents' perceptions of responsibility.

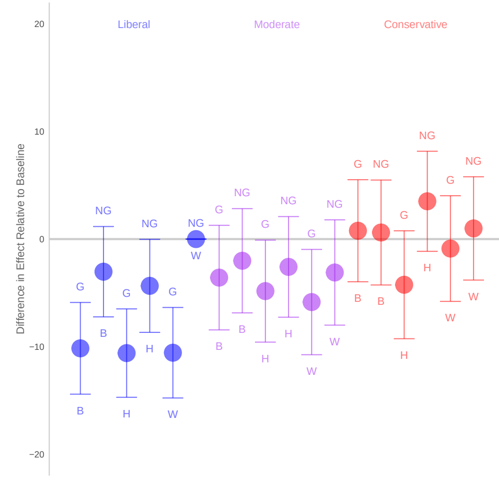
These results are summarized graphically in Figures 2a and 2b. Figure 2a summarizes the average amounts of personal responsibility liberal, moderate, and conservative respondents assigned the vignette subject within each unique ideology and race and genetic treatment condition. The average vertical difference between points represents the difference between average responsibility for subjects with and without a genetic predisposition toward violence within each other condition. This slope is steeper and more negative, on average, for liberal respondents (the leftmost column). Figure 2b summarizes the effects of each combination of ideology, genetic treatment, and race treatment categories. The reference category in this depiction is liberal respondents evaluating a white vignette subject whose violent behavior is not due to genetic causes. Every point estimate in the figure represents the relative difference between the corresponding category and the reference category. Here, “W”, “B”, and “H” denote the white, black, and Hispanic race treatments, respectively. “G” denotes the genetic treatment condition and “NG” denotes the non-genetic treatment condition. Error bars represent 95% confidence intervals around each point estimate. Treatment conditions in which 95% confidence intervals do not cross zero can be interpreted as treatment conditions in which respondents indicate that the vignette subject has a significantly different level of responsibility for his actions than liberal respondents reading about a white subject in the non-genetic treatment condition. Underlying regression results for this model are presented in Table 2 of the Appendix.

These results suggest that the genetic treatment condition significantly affects the assignment of personal responsibility for violent action among liberal respondents. This is not true of moderate or conservative respondents. These results are consistent with existing literature in the sense that this literature would predict that liberals are more apt to adopt structuralist rather than individualist explanations for behavior. Liberals may be interpreting the vignette subject’s genetic predisposition as a factor out of his control, while moderates and conservatives discount that information in favor of the individualistic view that the vignette subject still chose to commit a violent act.

Figure 2: Responsibility Results



(a) Within Group Averages

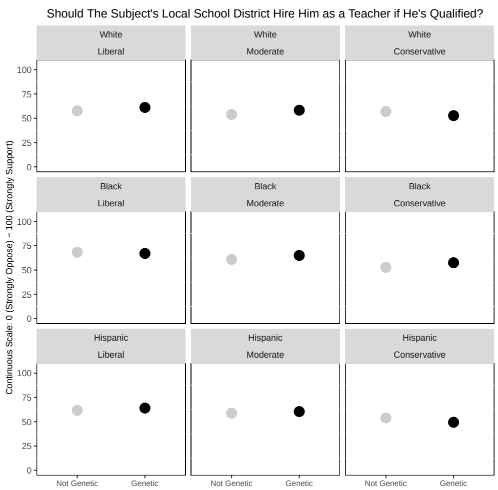


(b) Estimated Effects

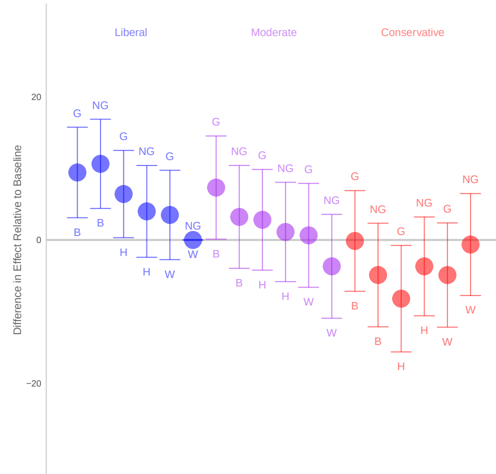
4.3.2 Teaching

We asked our respondents to determine how much they supported a school district's intention to hire the subject of their vignette, provided that the incident described in that vignette was the only one in the subject's history. Disclosing a genetic predisposition to violence does not appear to temper respondents' willingness to hire the vignette subject as a teacher in the future. The main effect of the black race treatment was positive, but enthusiasm about hiring black vignette subjects as teachers in this study is limited to liberal respondents. These results are displayed graphically in Figures 3a and 3b. These results present evidence for the structuralism argument in the context of support rather than punishment. Here, liberal respondents are even more motivated to recommend hiring vignette subjects as teachers when subjects have a genetic predisposition to violence. This may occur because respondents interpret the genetic treatment as a structural barrier the vignette subject has overcome. Respondents are told that the incident described in the vignette is the only crime the vignette subject has committed, and that the vignette subject is fully qualified for employment as a teacher. This runs contrary to predictions about race and violence in the literature, which suggest that white respondents are likely to view black subjects as more violent and dangerous than white subjects. Restricting our data to responses from white survey participants leaves trends by respondent ideology intact: white liberal respondents still support hiring non-white vignette subjects as teachers more than they support hiring white vignette subjects.

Figure 3: Teaching Results



(a) Within Group Averages



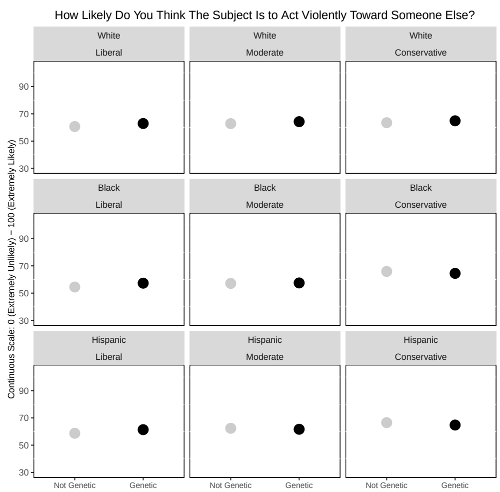
(b) Estimated Effects

4.3.3 Punishment and Mitigation

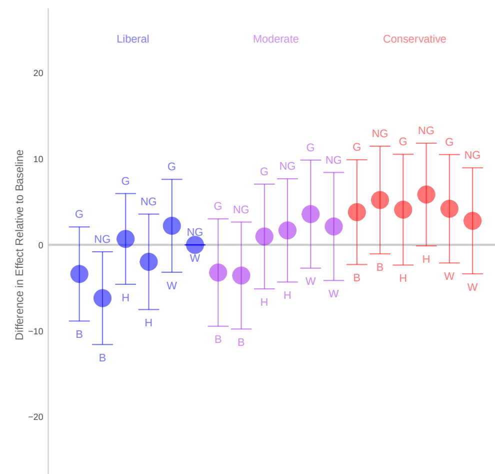
We asked respondents a series of questions focusing on punishment and mitigation. Our goal was to address both punishment and support at the individual level and policy level. We asked whether respondents believed that the vignette subject would commit violent acts in the future and what the vignette subject's sentence should be for the crime described in the vignette. We then asked whether respondents supported three strikes laws in their state. We asked if respondents supported public programs to help individuals like the vignette subject and if respondents supported public programs aimed at violence prevention in general.

Results by ideology are consistent with traditional expectations of partisan policy views; conservative respondents are significantly more likely to apply higher sentences, support three strikes laws, and oppose public programs to assist people with violent tendencies or promote violence prevention. We find that liberal respondents assigned to the black treatment condition are significantly less likely to say that the vignette subject will act violently toward someone else in the future. This is not the case for moderate or conservative respondents. We find no similar effects for the Hispanic treatment condition. These results present some additional evidence against traditional theories of how white respondents view non-whites. Our results show that the main effect of the black race treatment is significantly negative, which means that respondents as a whole believe, on average, that a black vignette subject will be *less* likely to commit violent acts in the future relative to a white vignette subject. These results also imply that respondents do not express much genetic determinism; discovering that a vignette subject has a predisposition toward violence does not lead them to conclude that he is much more likely to commit violent acts as a result. These results are displayed graphically in Figures 4a and 4b. We find no evidence that race, genetic information, and ideology interact to affect respondents' views of sentencing, three strikes laws, or support for public programs.

Figure 4: Future Violence Results



(a) Within Group Averages



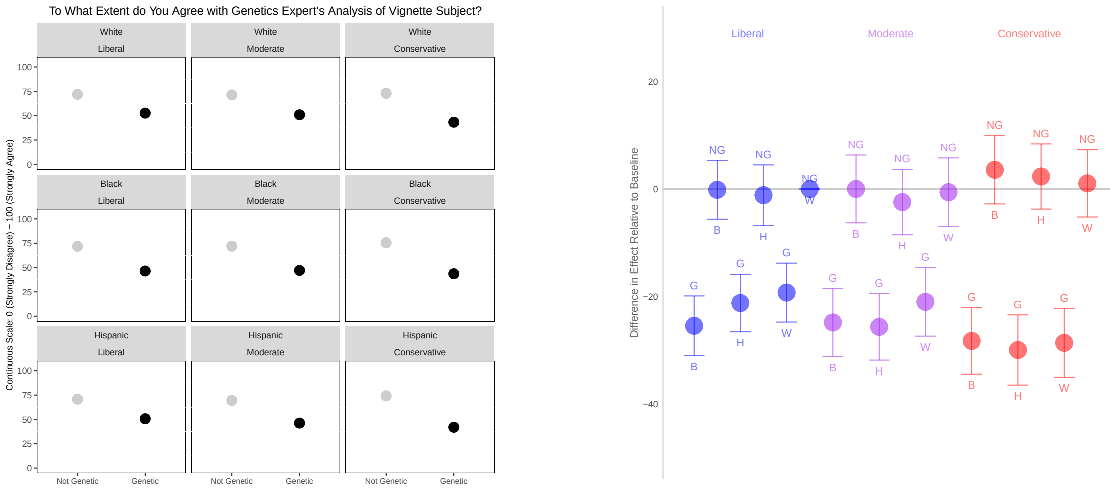
(b) Estimated Effects

4.3.4 Agreement with Experts

Participants in this survey experiment were told that medical experts examined Connor, Jamal, or Miguel while each was in jail. The medical experts in our vignette determined whether or not Connor, Jamal, or Miguel had a genetic predisposition to violence or aggressive behavior. One of the most surprising results in this study is that all of our survey respondents, regardless of ideology or race treatment assignment, expressed skepticism of the expert's opinions when those experts cited a genetic cause for each vignette subject's violent behavior. These findings are displayed graphically in Figures 5a and 5b; the underlying model is summarized in Table 2 of the Appendix.

Several factors would have led us to expect different responses to the genetics expert across the ideological spectrum. One possibility would be that rising skepticism of expertise on the ideological right (Gauchat, 2012) would have led us to predict resistance to the expert among conservative respondents, but not liberal or moderate respondents. Another might hold that, if conservatives were in fact more committed to genetic explanations of behavior, we might see less skepticism among respondents who identify as conservative than among other respondents. In practice, neither of these explanations seems to hold, since both liberal and moderate respondents expressed skepticism about the expert's evaluation. There are several possible explanations for this result. First, respondents may just be reporting inconsistent positions (Converse, 1964). While this is certainly possible, respondents tend to give ideologically consistent responses in other areas. Our results show a strong negative relationship between conservative ideology and support for public programs, which is what we traditionally expect from conservative respondents. An additional possibility is that this question captures responses along different dimensions by ideology. Liberal respondents, for instance, may be using this question as an opportunity to express dissatisfaction with the prison system or medical treatment in prison. Conservative respondents, on the other hand, may be using it to express skepticism of expert diagnosis. Finally, respondents may be reporting conscious rejection of the expert's diagnosis along with a simultaneous, genuine response to the genetic treatment. If this is true, then lay interpretations of genetics may form even in the presence of conscious skepticism over the underlying science. We think this result merits further investigation, and provide an extended analysis of possible underlying mechanisms in Section 5.

Figure 5: Agreement with Experts Results



(a) Within Group Averages

(b) Estimated Effects

5 Perceptions of Expertise

Figures 5a and 5b suggest that respondents to this survey viewed the genetics expert's diagnosis with significant skepticism when that diagnosis proposed a genetic basis for violent behavior. To begin addressing the underlying reasons for this, we asked a subset[4] of our respondents a series of questions about how they used the expert's information and what their general views were on genetic science, expertise, the prison system, and other parts of the survey's contextual information that might have affected their responses. The complete survey instrument used in this study is available in the Appendix.

5.1 Using Expert Information

One explanation for such high levels of disagreement with the genetics expert's genetic diagnosis is a procedural one: respondents may not have read or considered the expert's diagnosis at all. If this

[4]Mechanical Turk participants were recruited in two waves. After observing that our first 818 Mechanical Turk respondents and 301 DLABSS respondents resisted the expert's genetic diagnosis, we ran an additional wave of this survey on Mechanical Turk and included a set of questions about expertise. All of the analysis in this section is based on the 1,063 Mechanical Turk responses to the expertise questions we fielded in the second wave of this survey.

was the case, then respondents would simply be using our question about their level of agreement with the genetics expert to communicate their priors about the role of genes in behavior. The lop-sidedness of the disagreement with our genetics expert would make sense under this assumption; Figure 1 shows that most of our respondents, regardless of their political ideology, believe that a person's actions and behavior are primarily a product of environmental factors.

To test for wether or not respondents might be ignoring the expert altogether, we included a validation question in the second wave of our Mechanical Turk survey. After respondents report their level of agreement with the expert, they are asked to indicate whether or not the expert in their survey reported that the vignette subject's aggressive tendency was due to genetic factors. 960 of 1,063 respondents (90.3%) correctly identified the expert's diagnosis with which they were treated, which suggests that respondents *were* attentive to that portion of the survey's contextual information. Part of the reason this proportion is so high is that the wording of the question immediately preceding this one revealed the expert's diagnosis when it asked respondents to agree or disagree. Still, our objective with this question is not to verify that subjects can retain information revealed to them in the course of the study for long periods of time as much as it is to help rule out the possibility that respondents ignored a piece of contextual information altogether. This level of recall suggests that respondents did receive the information about our expert and her diagnosis.

The fact that respondents registered this information does not guarantee that they actually used it to help answer outcome questions in this survey. While the extent to which respondents thought about the expert's diagnosis when they answered outcome questions is not observable to us in real time, we can get some idea of whether or not respondents actually did this by asking them to self-report. We asked respondents to report whether they used the expert's information when they answered questions about the vignette subject and policies that might affect him. 636 of 1,063 respondents (59.8%) reported actively using the expert's information. While this is a majority of respondents, these results suggest that many respondents chose to rely on their priors *despite* treatment with information from an expert. We address this more explicitly in the following section.

5.2 Reasons for Disagreement

We asked the respondents who disagreed (that is, reported a level of agreement with the expert that was equal to or less than 50 on our scale) a series of questions designed to determine what respondents viewed as their chief reason for disagreeing. If a respondent disagreed with the genetics expert, she would be asked for the category that contained the most important reason she might have disagreed with the expert. Figure 6 indicates that the general reasons respondents disagreed with the genetics expert had more to do with genetic science than the prison system or characteristics of experts themselves[5]. Respondents who suggested their disagreement was motivated by something else were asked to provide a description of their reasoning in free text. While respondents gave a range of answers, most of them focused on the idea that environmental factors matter and that individuals still have considerable control over their decisions (and thus responsibility for them) . Figure 7 represents the most commonly used words in the free-text responses for this question. These results are consistent with the idea that people are relying on their priors about genetics and free will.

Respondents who indicated that something about the state or nature of genetic science drove their disagreement with the expert were subsequently asked what about genetic science drove their views. Respondents could indicate: "Even if scientists make a true connection between genes and behaviors, it does not mean that a person with specific genes will always display those behaviors." (labeled "Determinism" in Figure 8); "Scientists do not know enough about why people commit crimes." (Limited Knowledge); "The science behind genetics is not sound." (Poor Science), or Something Else. Respondents overwhelmingly chose the determinism response, which suggests that while they generally believe that science is both sound and capable of yielding information about criminal behavior, they don't believe the biological determinants of criminal behavior are predictive.

[5]Note that the responses presented in Figure 6 represent *both* respondents in the genetic condition and the non-genetic condition. This plot includes the 145 people whose experts claimed that the vignette subject's behavior had no genetic explanation and disagreed with their experts on this matter. Restricting the sample to respondents in the genetic treatment condition does not significantly change this distribution.

Figure 6: General Reasons for Disagreement with Genetics Experts

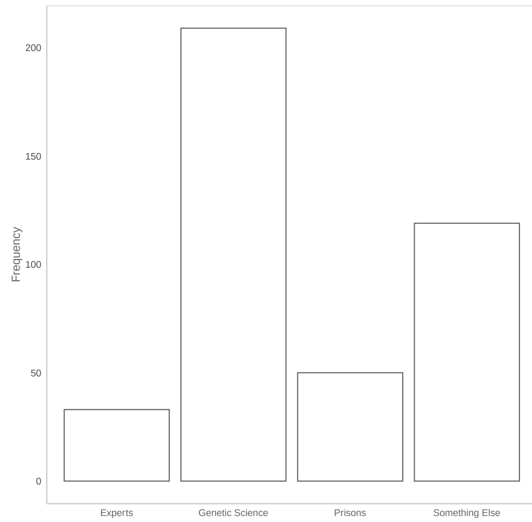
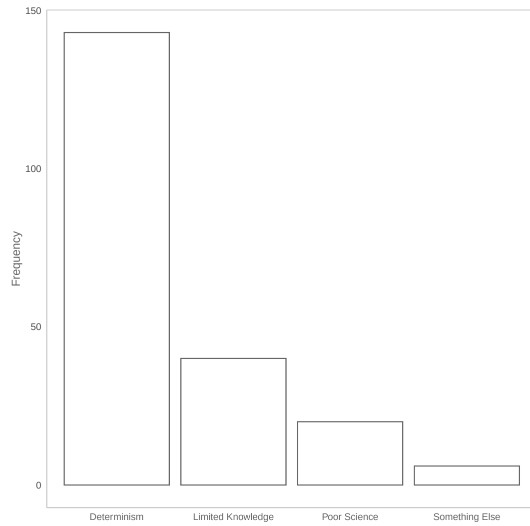


Figure 7: General Reasons for Disagreement with Genetics Experts: Free Text

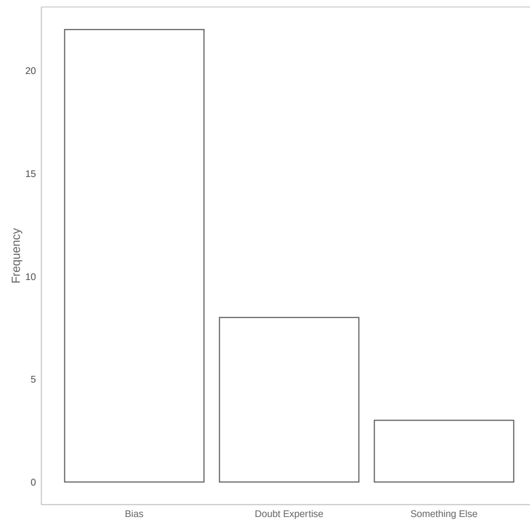
Figure 8: Reasons Genetic Science Drives Disagreement with Experts



Relatively few respondents indicated that the reason they disagreed with the expert was something about either the expert as an individual or something about experts generally. We asked respondents who selected that experts drove their disagreement what it was about experts that gave them pause. Respondents could say that " Genetics experts are biased" (Bias), "Genetics experts do not know more about genes than regular people do" (Doubt Expertise), or Something Else. Figure 9 suggests that most respondents who were concerned about the experts were concerned about bias. We also asked these respondents whether their views on experts, if they selected one of these, also applied to experts in other fields. 23 of the 33 respondents who suggested they have concerns about experts indicated that they did believe experts in other fields were likewise biased.

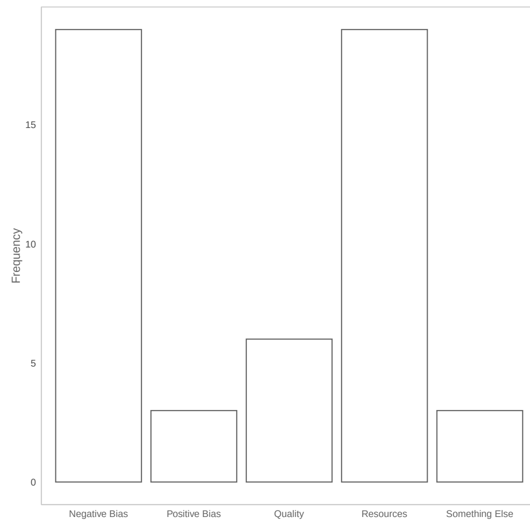
One important contextual feature of our vignette experiment is its prison setting. In the context of this study, the expert who delivers a determination about the biological determinants of our vignette subjects behavior is employed by a prison. This might be a possible driver of disagreement with the expert in our study, particularly for liberal respondents, who are more likely than conservatives to express concern about the prison system. In fact, more respondents who disagreed with the expert expressed concern with the prison system than those who doubted experts or expertise.

Figure 9: Reasons Views of Expertise Drive Disagreement with Experts



We asked these respondents what about the prison system drove their views. Respondents could enter "Genetics testing in prison is likely to be mishandled in a way that helps prisoners" (Positive Bias); "Genetics testing in prison is likely to be mishandled in a way that hurts prisoners" (Negative Bias); "Prisons do not employ the most qualified genetics experts" (Quality); "Prisons do not have the resources to do accurate genetic testing" (Resources), or Something Else. Figure 10 suggests that respondents were most concerned by the possibility that some feature of the prison system might lead to the mishandling of the genetic testing process or results in a way detrimental to prisoners and the possibility that prisons did not have the resources to do accurate genetic testing.

Figure 10: Reasons Views of Expertise Drive Disagreement with Experts



6 Discussion and Conclusion

Our findings suggest that the public's understanding of genetic predispositions is more nuanced than what both existing formulations of the "nature versus nurture" debate in the literature might suggest. We show that laypeople *do* consider information about genetic predisposition in the context of violence. Exposure to information about a possible genetic predisposition toward violent behavior significantly reduces the amount of responsibility, or blame, respondents place on a violent individual. This is what attribution theory might predict. Yet we also show that this effect varies with a respondent's ideology. Liberal respondents, rather than moderates or conservatives, drive the absolution effect on responsibility that we observe. This ideological difference is consistent with the individualism vs. structuralism explanation in that liberals may in fact view genes as a structural, uncontrollable reason for violent behavior while conservatives construe violent behavior as an individual choice and remain less receptive to information about genetic predispositions.

Interestingly, the fact that the genetic treatment affects judgements about responsibility for at least liberal respondents does not imply that these respondents adopt a deterministic view of genes and violent behavior. Indeed, respondents across the ideological spectrum evinced a broad skepticism of our genetics expert's finding when the expert suggested that the vignette subject did have a genetic predisposition toward violence. Most respondents who disagreed with the expert in the genetic treatment condition told us they did so because they realized that even when scientific evidence for a link between genes and a particular behavior existed, individuals with such a gene would not necessarily display that behavior. These responses, along with responses to our earlier item about whether or not individual actions are a product of biology, complex environmental factors, or some combination thereof suggest that respondents are generally aware that human behavior is the product of a complex combination of factors. This may help explain why the genetic treatment did not translate into policy views about sentencing, violence, three strikes laws, or public programs for any ideological subgroup. Genetic predispositions may push respondents to view individuals as less responsible for their actions, but if respondents believe genes are only a small part of what contributes to violent behavior they are unlikely to change their policy views.

Our results also indicate that race plays a role in shaping how respondents think about several of the outcomes we asked about, particularly teaching and projected future violence. Respondents in our sample were significantly more likely to suggest hiring black vignette subjects as teachers relative to white and Hispanic vignette subjects, and seemed undeterred in cases where black vignette subjects had a genetic predisposition toward violence. In direct contrast to previous work on perceptions (among whites) of violent behavior (among blacks), our results actually suggest that respondents are less likely to believe that black vignette subjects will engage in future violence after the incident we describe to them relative to white vignette subjects. Both effects are moderated by respondent ideology; we find that liberals (and, to a lesser extent, moderates) are more sensitive to this treatment than are conservatives. With the exception of these two outcomes, our results provide no evidence for a possible link between race and sensitivity to the genetic treatment. We do not observe significant interactions between the genetic treatment condition and the two non-white race treatments outside of the responsibility, teaching, and violence outcomes.

The strongest evidence of interactions in our study comes in cases where respondents are making assessments about the individual: what is his level of responsibility? Should he be hired as a teacher? Will he commit violent acts in the future? These results have important implications for how people judge individuals they know to have genetic predispositions toward violence. The impacts on group policy are less clear, and warrant future research about the linkages between assessments of individuals and recommendations for group-based policymaking.

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Appendices

A Power

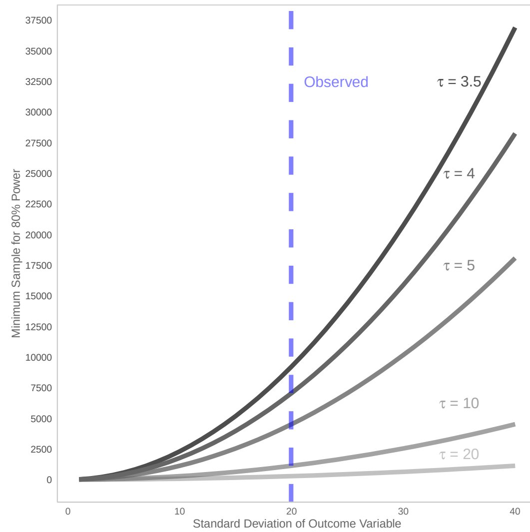
The central challenge of power analysis for any researcher is the need to make assumptions about treatment effect sizes and variances that have not yet been observed (Bansak (Forthcoming), Gelman and Carlin (2014)). This means that even studies that make use of state-of-the-art "best practices" approaches to calculating power still rely on a series of decisions made by the researcher. In this section, we discuss power using a series of "best practices" approaches under a variety of assumptions in order to give readers an accurate sense of power in a complex experiment.

Multiple Experiments. We start with the simplest approach to thinking about power in this experiment for two reasons. First, it is the most intuitive way to think about power in a setting with categorical treatments with more than one level. Second, it does not rely on any of the data collected during the experiment - researchers have suggested that the possibility of doing this may lead to biased power calculations (Hoenig and Heisey, 2001). Our interest in this study lies in whether or not providing respondents with the information that a propensity toward violent behavior is genetic (or not) affects their views of an individual who behaved violently and policies that might affect him. However, we are interested in whether or not this affect appears across groups of people who (1) have one of three political ideologies before treatment and (2) receive one of three randomly assigned race treatments. If we conceptualize these as nine distinct "cells" of respondents, we can think of our study as nine separate experiments for which we need to recruit nine groups of respondents. If we do this, we can calculate the minimum sample size required to calculate the effect of the genetic treatment for one cell of respondents and multiply by nine.

The implicit assumption in this type of power calculation is that respondents in all nine unique combinations of ideology and race treatment should experience the same treatment effect (if any). This is a simplifying assumption. In fact, we believe that there *should* be observable differences between groups - that is what observing a significant interaction effect indicates. In the case that treatment effects are unequal, we would want larger sample sizes in the cells where treatment effects were likely to be small (even if they were nonzero in the population). One conservative approach to calculating power or minimum required sample size would be to assume small effects for all groups in hopes of over-estimating our total required sample size. For example, let's consider the responsibility outcome, where respondents tell us how responsible the vignette subject is for his actions on a scale from 1 (no responsibility) to 100 (full responsibility). Let's assume that a treatment effect with a magnitude of five units on that scale, or 10% (the effect we observe on the genetic treatment in a model with triple interactions is slightly larger at 10.6%). Hypothesizing about variance is much harder in this context, but any assumptions we make about the variance of our effect will ultimately stem from what we think the variance of our outcome variable might be. We assumed the standard deviation in our outcome measure for responsibility would be twice the size of our treatment effect at 20. Under these assumptions, the minimum number of participants we would need to observe an effect with 80% power is 126. Looking for this treatment in nine separate groups of respondents, then, would require 1,134 respondents. We illustrate this calculation under a variety of different assumptions about treatment effect sizes and standard deviations for a hypothetical outcome variable in Figure 11. At a standard deviation of 20 in the outcome variable, we would be able to observe effect sizes of approximately 7% or higher. All of these calculations assume a two-tailed test.

Minimum Detectable Effects. Another approach to calculating power asks researchers to calculate a Minimum Detectable Effect ("MDE") at a given power level and sample size. For a two-tailed test, the minimum detectable effect size is given as: $\sigma \cdot Z_{1-(0.05*0.05)} + \sigma * Z_{0.8}$. Here, σ refers to the estimated standard error for a coefficient. Assuming 80% power and a significance level, α, of 0.05, the MDE is functionally 2.8 times the standard error of the estimated effect. To establish a hard case for our study, we can calculate a minimum detectable effect for the largest standard error in our model with triple-interactions. This value is $\sigma = 4.84$, the standard error for our coefficient on the triple interaction between the genetic treatment, the black race treatment, and conservative ideology (see Appendix Table 5 for full regression results). Our minimum detectable effect at this sample size is 13.56. Note that this is necessarily the largest MDE in our model. For the standard error on the interaction between the Hispanic treatment and conservative

Figure 11: Minimum Sample Necessary for Nine Separate Experiments Approach



ideology (3.35), for instance, the MDE would be 9.38. Our observed effect is 7.94, which would be the MDE at approximately 66% power. It is important to note that the MDEs calculated at 80% power are *feasible* effect sizes for our study. An effect size of 7.94 is observed with less than 80% power *if we assume* that 9.38 is the true effect. Our 95% confidence interval for this effect is (1.40, 14.48), which includes the MDE.

Type S and M Errors. One concern about the MDE approach is that it conveys too little specific information. The MDE, after all, is a uniform inflation factor for the standard errors of a regression. An alternative to this approach might be to explicitly account for the possibility of Type S (sign) and Type M (magnitude) errors. Gelman and Carlin (2014) base their calculations for Type S and Type M errors on an effect estimated from a hypothetical replication study. That is, Gelman and Carlin (2014) define a random variable, d^{rep}, which represents the estimate of a treatment effect that could be obtained if we drew a replication sample from a population with true effect size D using the same procedure we used to draw our real sample (and with the same standard deviation). They use the distribution of d^{rep} and our observed test statistic d to establish:

- Power: the probability that an estimated effect in a replication study would be sufficiently large to reject the null hypothesis of no effect at a given significance level.

- The Type S Error Rate: The probability that the estimated effect in a replication study has the wrong sign (if it is significantly different from 0)
- The Type M Error Rate: This is the exaggeration ratio, or the expectation of |estimate/effect size|

For our observed triple interaction effect between the genetic treatment, the black race treatment, and conservative ideology (magnitude: 11.0; see Appendix Table 3 for regression results), for instance, Gelman and Carlin (2014) 's `retrodesign()` function yields a power of 66%, a Type S probability of $1.07x10^{-5}$, and an exaggeration rate of 1.23. The implication of this result is that this triple interaction effect, one with one of the largest standard errors in the model, has an extremely low probability of sign errors and an exaggeration rate that is relatively close to 1. While power is not 80% for the triple interaction, 66% power still allows us to reject the null correctly the vast majority of the time.

In summary, we use a variety of approaches to show that this study has sufficient power to address the interaction effects that are central to our hypothesis. While true effects in some subgroups may indeed be too small to detect with our sample size, relatively large effects in others are reliable with the sample we have used. Those differences are interesting in themselves: our hypotheses in this study proposed that partisans should respond very differently to genetic information. While it's difficult to predict the precise magnitudes of these heterogeneous effects ahead of time, we provide sufficient evidence to show that differences among these groups exist.

B Appendix: Regression Results

B.1 Notes on Select Covariates

The complete list of respondent level covariates collected in this study appears in Section D. To preserve power, we re-coded several of the covariates for modeling purposes. We use a binary version of respondent religious affiliation in our models. Respondents who answered agnostic, atheist, or no religious affiliation were coded as non-religious and other respondents were coded as religious.

Respondent's race was operationalized as a binary factor as well. White respondents were coded as white and respondents listing any other race or multiple races were coded as non-white. The genetic attribution questions were coded numerically at 0, 1, 2, or 3. 0 corresponds to respondents who answered that a person's actions and behavior were a function of "almost exclusively their upbringing and environment." Respondents at the opposite end of the spectrum were coded as 3. Income is also coded numerically in our sample using $35,000 and $200,000 at the endpoints and the midpoints in all other categories. Education is similarly coded numerically using years. In Tables 3 - 5, we pool across respondents from MTurk and DLABSS. Table 6 shows our results with a fixed effect identifying survey platform. Including this fixed effect does not change our substantive or statistical conclusions in this paper.

Table 3: Effects of the Genetic and Race Treatments, Including Respondent-Level Controls

	Dependent variable:						
	Responsibility	Sentence	Violence	Three Strikes	Programs	Violence Prevention	Teaching
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Genetic	−5.836*** (1.407)	0.462 (0.584)	2.054 (1.879)	−0.510 (2.395)	−0.741 (1.797)	−0.797 (1.689)	2.111 (2.163
Black	−1.773 (1.405)	0.557 (0.583)	−3.770** (1.876)	−1.835 (2.391)	−0.228 (1.794)	0.028 (1.686)	5.863*** (2.1
Hispanic	−1.255 (1.389)	1.550*** (0.577)	0.097 (1.855)	0.932 (2.364)	−0.793 (1.774)	−0.088 (1.667)	2.790 (2.135
Family & Friends	0.359** (0.175)	−0.386*** (0.073)	−0.012 (0.234)	−1.775*** (0.298)	1.103*** (0.224)	1.035*** (0.210)	0.942*** (0.2
Own Experience	−0.795*** (0.200)	0.567*** (0.083)	−0.030 (0.267)	0.769** (0.340)	−0.463* (0.255)	−0.693*** (0.240)	−0.273 (0.30
Religious	−1.826** (0.905)	1.342*** (0.376)	−0.207 (1.209)	6.287*** (1.540)	2.348** (1.156)	0.245 (1.086)	0.575 (1.391
Male	−1.908** (0.833)	−1.099*** (0.346)	−0.299 (1.113)	−6.526*** (1.418)	−6.825*** (1.064)	−6.799*** (1.000)	3.853*** (1.2
Other Gender	−26.787*** (6.018)	−1.033 (2.499)	−12.663 (8.038)	−17.843* (10.242)	5.687 (7.684)	−1.315 (7.223)	7.283 (9.250
Respondent: White	−0.155 (1.024)	−0.941** (0.425)	−1.284 (1.368)	−3.096* (1.743)	1.575 (1.308)	1.347 (1.229)	−0.215 (1.57
Respondent: Hispanic	−0.468 (1.568)	0.048 (0.651)	3.737* (2.094)	−0.672 (2.669)	2.637 (2.002)	1.264 (1.882)	3.491 (2.410
Age	0.070** (0.030)	−0.011 (0.013)	0.039 (0.041)	0.137*** (0.052)	0.003 (0.039)	0.018 (0.037)	0.184*** (0.0
Married	1.103 (0.879)	0.359 (0.365)	1.595 (1.174)	1.878 (1.496)	−0.642 (1.122)	0.891 (1.055)	−1.576 (1.35
Children	−0.217 (0.208)	0.426*** (0.086)	0.456 (0.278)	0.423 (0.354)	−0.176 (0.265)	−0.493** (0.249)	0.212 (0.319
Genetic Determinism	−6.757*** (0.653)	1.318*** (0.271)	−0.254 (0.873)	1.628 (1.112)	−0.766 (0.834)	−1.531* (0.784)	0.409 (1.004
Income	0.00001 (0.00001)	0.00000 (0.00000)	0.00001 (0.00002)	0.00003 (0.00002)	−0.00003** (0.00001)	−0.00003* (0.00001)	0.00001 (0.000
Education (Years)	−0.084 (0.171)	0.044 (0.071)	−0.137 (0.229)	−0.957*** (0.292)	0.169 (0.219)	0.369* (0.206)	0.009 (0.264
Moderate	2.826*** (0.999)	0.872** (0.415)	1.161 (1.335)	9.700*** (1.701)	−8.237*** (1.276)	−8.089*** (1.200)	−3.994*** (1.
Conservative	5.489*** (1.090)	2.331*** (0.453)	5.159*** (1.456)	19.229*** (1.855)	−19.446*** (1.392)	−16.614*** (1.308)	−10.528*** (1.
Genetic:Black	2.805 (1.998)	−1.299 (0.830)	−0.895 (2.669)	0.314 (3.401)	0.968 (2.552)	1.380 (2.399)	−0.735 (3.07
Genetic:Hispanic	1.036 (1.974)	−0.842 (0.820)	−1.865 (2.637)	−3.563 (3.360)	0.515 (2.521)	1.397 (2.370)	−2.132 (3.03
Constant	90.540*** (3.196)	6.253*** (1.327)	60.242*** (4.269)	60.319*** (5.440)	79.958*** (4.081)	81.025*** (3.836)	46.981*** (4.9
Observations	2,162	2,162	2,162	2,162	2,162	2,162	2,162
R^2	0.123	0.101	0.022	0.129	0.141	0.133	0.043

Note: *p<

Table 4: Interaction of Ideology, Race, and Genetic Treatment Conditions without Respondent-Level Controls

	Dependent variable:						
	Responsibility	Sentence	Violence	Three Strikes	Programs	Violence Prevention	Teachin
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Moderate	−3.107 (2.498)	0.364 (1.034)	2.137 (3.204)	10.098** (4.170)	−5.538* (3.120)	−8.610*** (2.940)	−3.677 (3
Conservative	0.991 (2.450)	1.688* (1.014)	2.794 (3.143)	21.069*** (4.091)	−22.013*** (3.060)	−16.652*** (2.884)	−0.637 (3
Genetic	−10.568*** (2.147)	0.880 (0.889)	2.218 (2.754)	0.170 (3.585)	1.432 (2.682)	0.941 (2.527)	3.494 (3.
Black	−3.033 (2.144)	−0.290 (0.887)	−6.193** (2.750)	−4.619 (3.580)	1.271 (2.678)	1.316 (2.523)	10.628*** (
Hispanic	−4.348** (2.207)	0.924 (0.913)	−1.970 (2.831)	−0.871 (3.685)	−0.038 (2.756)	1.236 (2.597)	3.991 (3.
Moderate:Genetic	7.818** (3.550)	−0.162 (1.469)	−0.780 (4.553)	1.643 (5.927)	−8.213* (4.434)	−1.357 (4.178)	0.829 (5.
Conservative:Genetic	8.695** (3.522)	−0.791 (1.458)	−0.813 (4.518)	−3.736 (5.882)	3.351 (4.400)	−2.339 (4.146)	−7.755 (5
Moderate:Black	4.124 (3.531)	1.856 (1.461)	0.491 (4.529)	3.200 (5.895)	−2.743 (4.410)	−1.717 (4.155)	−3.729 (5
Conservative:Black	2.654 (3.508)	1.685 (1.452)	8.610* (4.501)	8.199 (5.858)	−0.170 (4.383)	−0.184 (4.129)	−14.884***
Moderate:Hispanic	4.869 (3.510)	1.653 (1.453)	1.515 (4.503)	4.183 (5.861)	−2.994 (4.384)	−1.769 (4.131)	0.803 (5.
Conservative:Hispanic	6.871** (3.468)	0.800 (1.435)	5.028 (4.448)	1.641 (5.790)	0.698 (4.331)	−2.633 (4.081)	−7.038 (5
Genetic:Black	3.443 (3.075)	−1.452 (1.272)	0.591 (3.944)	−1.209 (5.134)	−1.884 (3.841)	−0.459 (3.619)	−4.697 (4
Genetic:Hispanic	4.313 (3.065)	−0.792 (1.268)	0.444 (3.931)	−2.359 (5.117)	−2.958 (3.828)	−2.984 (3.607)	−1.073 (4
Moderate:Genetic:Black	−2.260 (5.023)	−1.238 (2.079)	−1.680 (6.443)	0.050 (8.387)	7.673 (6.274)	4.353 (5.912)	4.465 (7.
Conservative:Genetic:Black	−1.405 (4.982)	1.302 (2.062)	−3.403 (6.391)	2.687 (8.319)	−1.180 (6.223)	−1.065 (5.864)	13.713* (7
Moderate:Genetic:Hispanic	−3.815 (4.945)	−0.412 (2.046)	−2.590 (6.344)	−6.331 (8.257)	9.627 (6.177)	5.084 (5.820)	−1.553 (7
Conservative:Genetic:Hispanic	−10.203** (4.989)	1.207 (2.065)	−3.611 (6.400)	3.246 (8.331)	3.077 (6.232)	10.287* (5.872)	0.823 (7.
Constant	86.450*** (1.498)	7.959*** (0.620)	60.696*** (1.921)	48.392*** (2.501)	81.778*** (1.871)	84.819*** (1.763)	57.667*** (
Observations	2,182	2,182	2,182	2,182	2,182	2,182	2,182
R^2	0.045	0.027	0.018	0.088	0.106	0.093	0.029

Note: *

Table 5: Effects of the Genetic and Race Treatments, Including Interactions with Ideology and Respondent-Level Controls

	Dependent variable:							
	Responsibility	Sentence	Violence	Three Strikes	Programs	Violence Prevention	Teaching	Expert Agreement
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Moderate	−2.632	−0.202	1.627	6.162	−5.122*	−7.907***	−4.100	−0.475
	(2.423)	(1.008)	(3.244)	(4.133)	(3.098)	(2.914)	(3.727)	(3.267)
Conservative	−0.048	1.215	1.845	15.770***	−21.614***	−16.020***	−1.976	1.643
	(2.407)	(1.001)	(3.223)	(4.107)	(3.078)	(2.895)	(3.703)	(3.247)
Genetic	−10.191***	0.445	2.134	−1.675	0.449	0.059	3.816	−20.051***
	(2.072)	(0.862)	(2.773)	(3.534)	(2.649)	(2.492)	(3.187)	(2.794)
Black	−3.294	−0.603	−6.285**	−5.442	0.742	0.827	11.102***	−0.262
	(2.065)	(0.859)	(2.765)	(3.524)	(2.641)	(2.484)	(3.177)	(2.785)
Hispanic	−4.811**	0.869	−2.007	−1.013	−0.671	0.550	4.308	−1.310
	(2.119)	(0.881)	(2.837)	(3.615)	(2.710)	(2.549)	(3.260)	(2.858)
Family & Friends	0.338*	−0.388***	−0.013	−1.796***	1.135***	1.050***	0.946***	−0.134
	(0.176)	(0.073)	(0.235)	(0.300)	(0.225)	(0.211)	(0.270)	(0.237)
Own Experience	−0.756***	0.573***	−0.048	0.780**	−0.472*	−0.701***	−0.278	0.371
	(0.200)	(0.083)	(0.268)	(0.341)	(0.256)	(0.241)	(0.308)	(0.270)
Religious	−1.776**	1.331***	−0.258	6.302***	2.304**	0.183	0.654	0.379
	(0.905)	(0.376)	(1.211)	(1.543)	(1.157)	(1.088)	(1.392)	(1.220)
Male	−1.959**	−1.088***	−0.298	−6.475***	−6.841***	−6.786***	3.847***	−1.370
	(0.834)	(0.347)	(1.116)	(1.422)	(1.066)	(1.002)	(1.282)	(1.124)
Other Gender	−26.783***	−0.999	−12.623	−17.519*	5.060	−0.869	7.052	−0.435
	(6.016)	(2.502)	(8.054)	(10.264)	(7.693)	(7.236)	(9.255)	(8.114)
Respondent: White	−0.088	−0.974**	−1.430	−3.137*	1.533	1.322	0.003	0.789
	(1.026)	(0.427)	(1.373)	(1.750)	(1.312)	(1.234)	(1.578)	(1.383)
Respondent: Hispanic	−0.525	0.030	3.870*	−0.682	2.559	1.214	3.271	0.886
	(1.569)	(0.653)	(2.101)	(2.678)	(2.007)	(1.888)	(2.414)	(2.117)
Age	0.077**	−0.013	0.038	0.137***	0.001	0.019	0.180***	−0.041
	(0.031)	(0.013)	(0.041)	(0.052)	(0.039)	(0.037)	(0.047)	(0.041)
Married	1.200	0.353	1.525	1.796	−0.582	0.980	−1.593	−0.369
	(0.879)	(0.366)	(1.177)	(1.499)	(1.124)	(1.057)	(1.352)	(1.185)
Children	−0.227	0.422***	0.466*	0.425	−0.180	−0.476*	0.210	0.380
	(0.208)	(0.086)	(0.278)	(0.355)	(0.266)	(0.250)	(0.320)	(0.280)
Genetic Determinism	−6.741***	1.323***	−0.302	1.563	−0.654	−1.533*	0.377	4.861***
	(0.653)	(0.272)	(0.875)	(1.115)	(0.835)	(0.786)	(1.005)	(0.881)
Income	0.00001	0.00000	0.00001	0.00003	−0.00003**	−0.00003*	0.00001	−0.00001
	(0.00001)	(0.00000)	(0.00002)	(0.00002)	(0.00001)	(0.00001)	(0.00002)	(0.00002)
Education (Years)	−0.097	0.043	−0.143	−0.977***	0.187	0.387*	0.004	−0.153
	(0.172)	(0.071)	(0.230)	(0.293)	(0.219)	(0.206)	(0.264)	(0.231)
Moderate:Genetic	7.853**	0.096	−0.888	4.428	−8.316*	−1.164	1.521	−1.717
	(3.431)	(1.427)	(4.594)	(5.854)	(4.388)	(4.127)	(5.279)	(4.628)
Conservative:Genetic	8.340**	−0.031	0.471	−0.063	3.706	−2.013	−7.582	−9.530**
	(3.401)	(1.415)	(4.553)	(5.802)	(4.349)	(4.090)	(5.232)	(4.587)
Moderate:Black	3.432	2.101	0.560	4.447	−3.217	−2.203	−3.248	0.638
	(3.403)	(1.416)	(4.556)	(5.806)	(4.352)	(4.093)	(5.236)	(4.590)
Conservative:Black	2.233	2.190	8.750*	9.094	−0.649	−0.698	−15.980***	2.710
	(3.397)	(1.413)	(4.548)	(5.796)	(4.344)	(4.086)	(5.226)	(4.581)
Moderate:Hispanic	5.032	1.717	1.695	4.760	−2.214	−0.624	0.625	−0.712
	(3.378)	(1.405)	(4.523)	(5.764)	(4.320)	(4.063)	(5.197)	(4.556)
Conservative:Hispanic	7.941**	0.789	5.480	2.478	1.563	−1.541	−6.365	2.294
	(3.335)	(1.387)	(4.464)	(5.689)	(4.264)	(4.011)	(5.130)	(4.497)
Genetic:Black	3.679	−1.014	0.826	0.908	−0.646	0.827	−5.587	−5.768
	(2.967)	(1.234)	(3.973)	(5.063)	(3.794)	(3.569)	(4.565)	(4.002)
Genetic:Hispanic	5.516*	−1.003	0.347	−1.046	−2.409	−2.000	−1.859	−0.909
	(2.946)	(1.225)	(3.943)	(5.025)	(3.766)	(3.543)	(4.531)	(3.973)
Moderate:Genetic:Black	−2.087	−1.522	−1.716	−2.410	7.686	4.068	3.792	2.111
	(4.841)	(2.014)	(6.481)	(8.259)	(6.190)	(5.822)	(7.448)	(6.529)
Conservative:Genetic:Black	−1.525	0.398	−4.679	−0.360	−1.429	−1.850	14.021*	3.676
	(4.843)	(2.014)	(6.483)	(8.262)	(6.192)	(5.824)	(7.450)	(6.531)
Moderate:Genetic:Hispanic	−5.545	−0.027	−2.718	−7.921	9.305	3.810	−2.432	−1.453
	(4.766)	(1.982)	(6.381)	(8.131)	(6.094)	(5.732)	(7.332)	(6.428)
Conservative:Genetic:Hispanic	−11.003**	0.635	−5.051	−1.605	2.214	9.225	1.085	−2.579
	(4.809)	(2.000)	(6.438)	(8.204)	(6.149)	(5.784)	(7.398)	(6.485)
Constant	93.349***	6.920***	61.359***	62.567***	79.382***	80.531***	44.781***	71.417***
	(3.326)	(1.384)	(4.453)	(5.675)	(4.253)	(4.000)	(5.117)	(4.486)
Observations	2,162	2,162	2,162	2,162	2,162	2,162	2,162	2,162
R^2	0.130	0.105	0.025	0.131	0.145	0.136	0.048	0.216

Note: *p<0.1; **p<0.05; ***p<0.01

Table 6: Effects of the Genetic and Race Treatments, Including Interactions with Ideology and Respondent-Level Controls

	Dependent variable:							
	Responsibility	Sentence	Violence	Three Strikes	Programs	Violence Prevention	Teaching	Expert Agreement
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Moderate	−2.605	−0.164	1.774	6.370	−5.256*	−8.005***	−4.440	−0.362
	(2.423)	(1.006)	(3.237)	(4.123)	(3.093)	(2.911)	(3.694)	(3.264)
Conservative	−0.030	1.240	1.943	15.908***	−21.703***	−16.086***	−2.202	1.719
	(2.408)	(1.000)	(3.216)	(4.097)	(3.073)	(2.892)	(3.670)	(3.243)
Genetic	−10.142***	0.514	2.401	−1.299	0.207	−0.118	3.201	−19.846***
	(2.073)	(0.861)	(2.769)	(3.527)	(2.645)	(2.490)	(3.160)	(2.792)
Black	−3.248	−0.538	−6.033**	−5.088	0.514	0.660	10.523***	−0.068
	(2.066)	(0.858)	(2.760)	(3.516)	(2.637)	(2.482)	(3.150)	(2.783)
Hispanic	−4.751**	0.952	−1.684	−0.558	−0.964	0.336	3.564	−1.061
	(2.121)	(0.881)	(2.833)	(3.609)	(2.707)	(2.548)	(3.233)	(2.857)
Family & Friends	0.356**	−0.363***	0.083	−1.662***	1.048***	0.986***	0.726***	−0.060
	(0.177)	(0.074)	(0.237)	(0.301)	(0.226)	(0.213)	(0.270)	(0.239)
Own Experience	−0.773***	0.550***	−0.139	0.652*	−0.389	−0.640***	−0.069	0.301
	(0.201)	(0.084)	(0.269)	(0.342)	(0.257)	(0.242)	(0.307)	(0.271)
Religious	−1.844**	1.238***	−0.621	5.791***	2.633**	0.424	1.490	0.100
	(0.909)	(0.378)	(1.214)	(1.547)	(1.160)	(1.092)	(1.386)	(1.224)
Male	−1.972**	−1.106***	−0.366	−6.571***	−6.779***	−6.740***	4.005***	−1.423
	(0.834)	(0.346)	(1.114)	(1.419)	(1.064)	(1.002)	(1.271)	(1.123)
Other Gender	−26.585***	−0.726	−11.559	−16.021	4.095	−1.575	4.601	0.385
	(6.022)	(2.501)	(8.045)	(10.247)	(7.686)	(7.235)	(9.180)	(8.112)
Respondent: White	−0.082	−0.966**	−1.397	−3.091*	1.503	1.301	−0.072	0.814
	(1.026)	(0.426)	(1.370)	(1.745)	(1.309)	(1.232)	(1.564)	(1.382)
Respondent: Hispanic	−0.519	0.039	3.905*	−0.633	2.528	1.191	3.192	0.912
	(1.570)	(0.652)	(2.097)	(2.671)	(2.003)	(1.886)	(2.393)	(2.114)
Age	0.083***	−0.005	0.069	0.180***	−0.026	−0.002	0.110**	−0.018
	(0.031)	(0.013)	(0.042)	(0.054)	(0.040)	(0.038)	(0.048)	(0.042)
Married	1.192	0.342	1.483	1.736	−0.543	1.008	−1.494	−0.402
	(0.879)	(0.365)	(1.174)	(1.496)	(1.122)	(1.056)	(1.340)	(1.184)
Children	−0.238	0.407***	0.410	0.345	−0.128	−0.438*	0.341	0.337
	(0.208)	(0.087)	(0.278)	(0.355)	(0.266)	(0.250)	(0.318)	(0.281)
Genetic Determinism	−6.766***	1.288***	−0.439	1.370	−0.530	−1.442*	0.692	4.756***
	(0.654)	(0.272)	(0.874)	(1.113)	(0.835)	(0.786)	(0.997)	(0.881)
Income	0.00001	0.00000	0.00001	0.00003*	−0.00004**	−0.00003**	−0.00000	−0.00001
	(0.00001)	(0.00000)	(0.00002)	(0.00002)	(0.00001)	(0.00001)	(0.00002)	(0.00002)
Education (Years)	−0.081	0.064	−0.059	−0.859***	0.110	0.331	−0.190	−0.088
	(0.173)	(0.072)	(0.231)	(0.294)	(0.220)	(0.208)	(0.263)	(0.233)
DLABSS	−1.008	−1.389***	−5.416***	−7.625***	4.912***	3.594**	12.479***	−4.171**
	(1.296)	(0.538)	(1.732)	(2.206)	(1.654)	(1.557)	(1.976)	(1.746)
Moderate:Genetic	7.772**	−0.014	−1.319	3.822	−7.926*	−0.878	2.513	−2.048
	(3.433)	(1.426)	(4.587)	(5.842)	(4.382)	(4.125)	(5.234)	(4.625)
Conservative:Genetic	8.317**	−0.064	0.345	−0.240	3.820	−1.930	−7.293	−9.626**
	(3.401)	(1.413)	(4.544)	(5.787)	(4.341)	(4.086)	(5.185)	(4.582)
Moderate:Black	3.435	2.106	0.576	4.469	−3.232	−2.213	−3.285	0.650
	(3.404)	(1.414)	(4.547)	(5.792)	(4.344)	(4.089)	(5.189)	(4.585)
Conservative:Black	2.208	2.155	8.614*	8.902	−0.525	−0.607	−15.665***	2.604
	(3.398)	(1.411)	(4.539)	(5.781)	(4.336)	(4.082)	(5.179)	(4.577)
Moderate:Hispanic	4.986	1.655	1.452	4.418	−1.994	−0.463	1.184	−0.899
	(3.379)	(1.404)	(4.514)	(5.750)	(4.313)	(4.060)	(5.151)	(4.552)
Conservative:Hispanic	7.941**	0.790	5.480	2.478	1.563	−1.541	−6.365	2.294
	(3.335)	(1.385)	(4.455)	(5.675)	(4.256)	(4.007)	(5.084)	(4.492)
Genetic:Black	3.644	−1.061	0.640	0.646	−0.477	0.950	−5.158	−5.911
	(2.968)	(1.233)	(3.965)	(5.050)	(3.788)	(3.566)	(4.525)	(3.998)
Genetic:Hispanic	5.420*	−1.135	−0.169	−1.773	−1.941	−1.657	−0.669	−1.306
	(2.948)	(1.225)	(3.939)	(5.017)	(3.763)	(3.542)	(4.495)	(3.972)
Moderate:Genetic:Black	−2.023	−1.432	−1.368	−1.920	7.370	3.837	2.989	2.380
	(4.842)	(2.011)	(6.469)	(8.239)	(6.180)	(5.817)	(7.382)	(6.523)
Conservative:Genetic:Black	−1.522	0.401	−4.666	−0.341	−1.441	−1.859	13.990*	3.687
	(4.843)	(2.012)	(6.470)	(8.240)	(6.181)	(5.818)	(7.383)	(6.524)
Moderate:Genetic:Hispanic	−5.348	0.245	−1.656	−6.425	8.341	3.105	−4.881	−0.635
	(4.773)	(1.983)	(6.377)	(8.122)	(6.092)	(5.735)	(7.276)	(6.430)
Conservative:Genetic:Hispanic	−10.983**	0.663	−4.941	−1.452	2.115	9.153	0.834	−2.495
	(4.809)	(1.998)	(6.425)	(8.183)	(6.138)	(5.778)	(7.331)	(6.478)
Constant	92.966***	6.392***	59.301***	59.670***	81.248***	81.897***	49.522***	69.832***
	(3.363)	(1.397)	(4.492)	(5.722)	(4.292)	(4.040)	(5.126)	(4.530)
Observations	2,162	2,162	2,162	2,162	2,162	2,162	2,162	2,162
R^2	0.131	0.108	0.030	0.136	0.148	0.138	0.066	0.218

Note: *p<0.1; **p<0.05; ***p<0.01

C Appendix: Balance

Race and genetic treatments are fully randomized in this study. Accordingly, while controlling for various respondent-level covariates should yield slightly more precise estimates of the average treatment effects, it should not significantly change these estimates. Full regression tables in Section B demonstrate that this is the case in our study. While we are not aware of a single, omnibus test for balance across multiple treatment conditions, we discuss several approaches to calculating balance below.

One simple approach to evaluating balance across treatment conditions is to model treatment assignment as a function of the various respondent-level covariates we use in our analysis. We can think of unique combinations of the race and genetics treatment as "bins" in a multinomial process, where respondents participating in the experiment can be assigned to any of the six bins with equal probability. If there are no substantial imbalances along covariates, then no covariate should be a statistically significant predictor of assignment to a particular treatment bin. This appears to be the case in our data. Table 7 shows the results of a multinomial logistic regression. Each cell represents a z-score for the coefficient on a particular respondent-level covariate for a two tailed hypothesis test comparing the corresponding coefficient to 0 at the 95% level - that is, each cell shows the value of the coefficients on covariates from a multinomial logistic regression of treatment categories on covariates divided by their corresponding standard errors. Values greater than 1.96 or less than -1.96 would suggest imbalance by indicating that taking values of a particular covariate was a significant predictor of being assigned to a particular treatment. The z-scores in our data are all very close to zero, which suggests that there is no relationship between treatment assignment and respondent-level covariates.

Another approach to thinking about balance is explicit comparison of the distributions of continuous covariates across treatment conditions. We do this using Kolmogorov-Smirnov tests. Specifically, for the continuous covariates we adjusted for in our analysis, we perform Kolmogorov-Smirnov tests comparing the distribution of each covariate across each of the 15 possible different pairs of treatments in our study. In each test, the null hypothesis holds that the observed covariates in a given set of treatments are drawn from the same continuous distribution of that covariate as

Table 7: Covariate Balance Across Treatment Assignments

	Genetic.Hispanic	Genetic.White	Not Genetic.Black	Not Genetic.Hispanic	Not Genetic.White
Moderate	0.00	-0.00	0.00	0.00	-0.00
Conservative	-0.00	-0.00	-0.00	0.00	0.00
Family and Friends	0.00	-0.00	0.00	-0.00	-0.00
Own Experience	0.00	-0.00	0.00	-0.00	-0.00
Religious	-0.00	-0.00	-0.00	0.00	0.00
Male	-0.00	-0.00	-0.00	0.00	0.00
Other Gender	0.00	0.00	0.00	-0.00	0.00
Respondent: White	-0.00	0.00	-0.00	0.00	0.00
Respondent: Hispanic	0.00	-0.00	-0.00	-0.00	-0.00
Age	-0.00	-0.00	-0.00	0.00	0.00
Married	-0.00	0.00	0.00	-0.00	0.00
Children	0.00	-0.00	-0.00	0.00	-0.00
Genetic Determinism	0.00	0.00	-0.00	-0.00	-0.00
Income	0.35	-0.08	-0.03	0.26	0.34
Education (Years)	0.00	-0.00	0.00	0.00	-0.00

another set of treatments. So, for instance, if we want to compare the distributions of respondent ages across treatment categories, we might compare the distribution of ages for respondents who were in the White/Non-Genetic treatment pair to the distribution of ages for respondents who were in the White/Genetic treatment pair. Failing to reject the null in that case would lead us to conclude that respondents in the White/Non-Genetic treatment condition come from the same age distribution as respondents in the White/Genetic conditions. If we repeat this exercise for every unique combination of treatments we can be reasonably confident that the distribution of age or any other continuous covariate is the same across treatment conditions. We provide the results for these tests below for the relevant covariates.

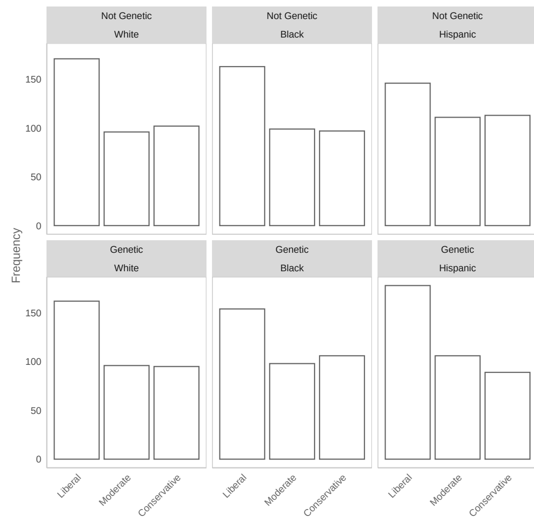
C.1 Information on Specific Covariates

Ideology. Respondents in our sample skew liberal. The distribution of respondent ideology across treatment conditions looks similar to the overall distribution of our respondents, which allays concerns about ideological concentration within any treatment category. Figure 12 summarizes the distribution of respondent ideology across treatment conditions.

Respondent-Level Demographics.

Gender. Overall, our sample was 53.5% female. The proportions of men and women who responded in each treatment condition are relatively close to this. Our sample skewed female; the proportion of female respondents is higher than the proportion of male respondents in all but one treatment category. The proportion female in each treatment condition ranges from 0.48 to 0.58.

Figure 12: Distributions of Respondent Ideology Across Treatment Conditions



Race. The vast majority of respondents to this survey (79%) are white. This is true across treatment categories. The proportions of white respondents across treatment categories range from 76% to 81%. Approximately 7% of our respondents were Hispanic or Latino. This holds across treatment conditions, where the proportion of Hispanic or Latino respondents ranges from 6.4% to 9.6%.

Age. The average age of respondents to this survey experiment was 41, with a standard deviation of 14 years. This is true across treatment categories. Average age of respondents by treatment category ranges from 40.9 to 42.4 with standard deviations of 13.9 to 14.6. Our KS tests suggests that there are no pairs of treatments for which the distributions of respondent ages differ significantly at the 5% level. p-values range from 0.27 to 0.98.

Income. The median respondent in our study had a household income of $50,000-$74,999. The modal respondent had an annual household income of under $35,000. The latter is true across treatment categories with the exception of respondents evaluating the white vignette subject without a genetic predisposition toward violence, where the model respondent earned $50,000-$74,999. Average values in the numeric coding of this variable fell in the $50,000-$74,999 for all treatment categories. KS tests across treatment categories do not identify any pairs of treatments for which the distribution of income among respondents differ significantly at the 5% level. p-values range from 0.31 to 1.00.

Education. The median survey respondent in this study has an undergraduate degree. This is also the modal level of education across respondents in our study. This is true across treatment assignments. KS test results lead us to fail to reject the null that the distributions of years of education among respondents are the same for any two pairs of treatments in the study at the 5% level. p-values range from 0.72 to 1.00.

Marriage and Children. 57% of the respondents to this survey are married or living with a domestic partner. This proportion ranges from 55% - 60% across treatment categories. The average number of children respondents reported living with in this survey is 0.92, with a median of 0. This varies little across treatment assignments. The median number of children across treatment categories remains 0, with averages ranging from 0.88 to 1.00.

Religion. There is some variation in the distribution of respondent religious affiliations across treatment conditions. The mode in each category with the exception of the Hispanic subject and genetic treatment condition is agnostic or atheist. The modal respondent in the excepted category is Protestant. We use a binary form of our religion covariate in our regressions. The distribution of this form of the religion covariate is relatively constant across treatment categories. The modal respondent across categories is religious.

Genetic Attribution and Mitigating Experiences.

Mitigating Experiences. The distributions of mitigating experiences respondents reported among friends and family are highly comparable across treatment conditions. The mean number of experiences on the list (see Section D) reported across treatment conditions ranges from 3.7 to 4.1. The p-values corresponding to the KS tests for mitigating experiences among family and friends range from 0.12 to 1.00. We cannot reject the null hypothesis that realizations of this covariate come from the same distribution for any two pairs of treatments. The distributions of mitigating experiences respondents reported for themselves are also very similar across treatment conditions. The mean number of experiences on the list (see Section D) reported across treatment conditions is 2.0 to 2.4. Formally, our KS tests identify statistically significant differences in the distributions of this covariate for 3 pairs of treatment conditions (Hispanic/Genetic vs. Hispanic/Non-Genetic, White/Genetic vs. Hispanic/Non-Genetic, Black/Genetic vs. Hispanic/Non-Genetic) at the 5% level (with p-values of 0.02, 0.04, and 0.04, respectively). Formal tests do not indicate that respondents in any other combinations of treatments differ along this covariate.

Genetic Attribution To gauge respondents' baseline levels of genetic attribution, we asked them the extent to which people's actions and behavior were determined by genes. The modal respondent believed that actions and behavior were due to "some genetic factors or traits inherited from their parents, but mostly from their upbringing and environment." That is the case across individual treatment combinations as well.

D Appendix: Survey Instrument

Preamble

The first few questions in this survey focus on a particular person and situation. Please read the description of the situation on the next screen, and answer the questions according to your views. There are no correct or incorrect answers. Please choose the answers that are closest to what you think.

Intervention Text

[Connor/Jamal/Miguel] is a 26-year-old man. He has a job, is not married, and currently lives alone. Back when [Connor/Jamal/Miguel] was in high school, he repeatedly got into physical fights with his classmates. Recently [Connor/Jamal/Miguel] had a fight with a friend in which he injured his friend badly enough that onlookers called the police. [Connor/Jamal/Miguel] was charged with assault and served time in jail. [Connor/Jamal/Miguel] was examined by medical experts while he was in jail. A genetics expert said that [Connor/Jamal/Miguel]'s tendency to be aggressive has a very strong genetic component/ [Connor/Jamal/Miguel]'s tendency to be aggressive is not due to genetic factors].

Outcome Questions The following questions are presented to respondents in random order:

- On a scale of 1 (no responsibility) to 100 (full responsibility), how much personal responsibility does [Connor/Jamal/Miguel] have for his tendency to be aggressive?
- In [Connor/Jamal/Miguel]'s state, criminal sentences for assault range from 1 month to 30 months in jail. In your opinion, how long should [Connor/Jamal/Miguel]'s sentence have been, given that this was his first conviction?
- On a scale of 1 (extremely unlikely) to 100 (extremely

likely), how likely do you think [Connor/Jamal/Miguel] is to act violently toward someone else after this incident?

- On a scale of 0 (strongly oppose) to 100 (strongly support), how much would you support "three strikes laws" in your state? (Three strikes laws make life in prison the minimum sentence for someone who commits a violent felony and already has two prior convictions for violent felonies)

- On a scale of 1 (strongly oppose) to 100 (strongly support), how much do you support publicly funded programs to help people like [Connor/Jamal/Miguel]? These programs might include things like job training, rehabilitation, talk therapy, or medication, but they are not limited to those options.

- On a scale of 1 (strongly oppose) to 100 (strongly support), how much do you support publicly funded programs that prevent violent behavior? Examples of these programs include: youth counseling, after school sports or other activities, or anger management therapy, but they are not limited to those options.

- Many years after this incident, [Connor/Jamal/Miguel] gets certified as a teacher and applies for a teaching position in his local school district. His earlier violent incident is the only crime in his record, but he still has to inform the school. Do you agree or disagree that his local school should hire [Connor/Jamal/Miguel] as a teacher if he is otherwise qualified?

- To what extent do you agree with the genetics expert's analysis that [Connor/Jamal/Miguel]'s behavior [is not due to genetic factors/is due to genetic factors]

Expertise Follow-Up

- Which of the following did the expert say about [Connor/Jamal/Miguel]'s tendency to be aggressive?
  - It was due to genetic factors
  - It was not due to genetic factors

- Did you use the expert's information to answer questions about [Connor/Jamal/Miguel] and policies that might affect him?
  - Yes
  - No

- (Displayed if Agreement with Expert $<$ 51) Which of the following represents the most important reason that you disagreed with the genetics expert in this case?
  - Something about genetic science
  - Something about the expert
  - Something about the prison system
  - Something else (please describe): free text window

- (Displayed if "Something about the expert" is selected) Which of the following comes closest to your views about genetics experts?
  - Genetics experts are biased
  - Genetics experts do not know more about genes than regular people do
  - Something else (please describe): free text window

- (Displayed if "Something about the expert" is selected) Do your views of the genetics expert in this case also apply to experts in most other fields?
  - Yes
  - No

- (Displayed if "Something about genetic science" is selected) Which of the following comes closest to your views about genetic science?
  - Even if scientists make a true connection between genes and behaviors, it does not mean that a person with specific genes will always display those behaviors
  - Scientists do not know enough about why people commit crimes

- The science behind genetics is not sound
- Something else (please describe): free text window

- (Displayed if "Something about the prison system" is selected) Which of the following comes closest to your views about the prison system?
  - Genetics testing in prison is likely to be mishandled in a way that helps prisoners
  - Prisons do not have the resources to do accurate genetic testing
  - Genetics testing in prison is likely to be mishandled in a way that hurts prisoners
  - Prisons do not employ the most qualified genetics experts
  - Something else (please describe): free text window

- (Displayed if Agreement with Expert $\geq$ 50) Which of the following represent reasons that you agreed with the genetics expert in this case? (Select all that apply)
  - It is possible to do accurate genetics testing even in prison
  - Genetics experts are unbiased and honest
  - Genetics experts know more about genes than regular people do
  - The science behind genetics is sound.
  - Something else (please describe): free text window

Transition Text

Now we would like to ask you some questions about your background and your views on human traits. Again, there are no right or wrong answers. Please choose the answer categories that best represent you and your beliefs.

Politics

- When thinking about politics and government, do you consider yourself to be:
  - Very Liberal
  - Liberal
  - Moderate
  - Conservative
  - Very Conservative

- Do you think of yourself as a Republican, Democrat, Independent, or something else
  - Republican
  - Democrat
  - Independent
  - Something Else

- If Independent, next screen says: Do you think of yourself as closer to the Republican Party, closer to the Democratic Party, or strictly Independent?
  - Republican
  - Democrat
  - Strictly Independent

Genetic Attribution

- A person's actions and behavior are products of:
  - Almost exclusively genetic factors inherited from their parents
  - Mostly genetic factors or traits inherited from their parents, but some from their upbringing and environment
  - Some genetic factors or traits inherited from their parents, but mostly from their upbringing and environment
  - Almost exclusively their upbringing and environment

Mitigating Contact and Experience

- Have any of your family members or close friends (select the number of possibilities that apply):
  1. Been diagnosed with a genetic condition that affects his or her daily life

2. Been diagnosed with a learning disability or had some other difficulty in learning
3. Been convicted of a crime
4. Developed an addiction to drugs or alcohol
5. Become dangerously overweight
6. Identified as gay, lesbian, bisexual, or transgender
7. Been diagnosed with a mental illness
8. Been identified as exceptionally gifted or talented in school
9. Been identified as exceptionally gifted or talented at a sport or other athletic activity
10. Been identified as exceptionally gifted or talented at art or music

- Have you yourself (select the number of possibilities that apply):

1. Been diagnosed with a genetic condition that affects his or her daily life
2. Been diagnosed with a learning disability or had some other difficulty in learning
3. Been convicted of a crime
4. Developed an addiction to drugs or alcohol
5. Become dangerously overweight
6. Identified as gay, lesbian, bisexual, or transgender
7. Been diagnosed with a mental illness
8. Been identified as exceptionally gifted or talented in school
9. Been identified as exceptionally gifted or talented at a sport or other athletic activity

Demographics

- Which of the following best describes your religious affiliation?
  - Protestant
  - Catholic
  - Other Christian denomination
  - Jewish
  - Muslim
  - Other Affiliation Please Describe
  - No affiliation
  - Agnostic or atheist
- If answer above is Protestant: Are you Evangelical, or born again?
  - Yes
  - No
- If answer above is any religion except for No affiliation or Agnostic/Atheist: How important is religion in your daily life?
  - Extremely important
  - Very Important
  - Somewhat important
  - Not at all important
- What is your gender?
  - Male
  - Female
  - Other
- What is your race (you may select more than one category)?
  - White/Caucasian
  - Black/African American
  - Asian/Asian American
  - Native American
  - Pacific Islander
  - Other
- Are you Hispanic or Latino?
  - Yes

- No

- What is your age in years?
- What is your annual household income?
  - Under $35,000
  - $35,000-$49,999
  - $50,000-$74,999
  - $75,000-$99,999
  - $100,000-$149,999
  - $150,000-$199,999
  - Over $200,000
- Are you currently married or living with a domestic partner?
  - Yes
  - No
- How many children currently live with you (including stepchildren)?
- What is your highest level of education?
  - Less than high school degree
  - High school degree
  - Associate's degree or some college
  - B.A. or B.S., or equivalent
  - More than college