

Motivated Innumeracy: Estimating the Size of the Gun Owner Population and its Consequences for Opposition to Gun Restrictions

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Abstract: Past research suggests people substantially overestimate the size of minority populations. Labeled innumeracy, inflated estimates of minority populations can have a negative impact on inter-group relations and influence policy attitudes toward minority groups. Our research examines people's estimates of the gun owner population in the United States. We discover that people vastly overestimate gun ownership and similarly misjudge its future growth. Estimations of size are influenced by several determinants including gun ownership and affective orientations toward gun owners. Gun owners, compared to non-gun owners, reported higher estimations of the gun owner population. In addition, positive feelings toward gun owners were associated with increased estimates of gun ownership. Affective orientations toward minority populations are in fact a key predictor neglected by prior innumeracy studies. Finally, estimations of the gun owner population, and judgments about its future growth, were both significant determinants of gun policy preferences.

Keywords: gun owner, population innumeracy, affective feelings, attitudes, gun policy

It is a challenge for people to accurately estimate the proportions of major demographic and minority groups in the United States (Nadeau, Niemi and Levine 1993). Labeled innumeracy (Paulos 1988), people consistently and systematically overestimate the populations of African Americans and Jews (Nadeau, Niemi, and Levine 1993; Sigelman and Niemi 2001), Hispanics and Whites (Alba, Rumbaut, and Marotz 2005), immigrants (Citrin and Sides 2008; Herda 2010) and gays and lesbians (Haider-Markel and Joslyn 2018; Martinez, Wald and Craig 2008).

Why does it matter if people's perceptions do not match reality? Research demonstrates that distorted perceptions can influence policy preferences and choices. For example, perceptions about the state of the economy can be more important than actual government measures in affecting vote choices (Hetherington 1996). Similarly people that overestimated the numbers of poor African Americans in the U.S. were more likely to oppose welfare programs (Gilens 1999). In addition people's estimates of the relative sizes of minority populations affected their attitudes toward minority groups (Alba, Rumbaut, and Maotz 2005). In short, innumeracy matters.

This article extends the innumeracy literature to gun owners, a minority distinguished in several ways from groups considered by previous studies. First, comparatively little is known about gun owners. Academic studies largely examine guns and violence, or the guns and crime connection (Duggan 2001; Lott 2013; Siegel, Ross and King 2013; Stroebe 2016). A much smaller number of studies examine the characteristics of gun owners (e.g. Kalesan et al. 2016). Still fewer explore the political behavior and attitudes of gun owners (Haider-Markel and Joslyn 2017), while a subset examine attitudes about guns and gun control (e.g. Filindra and Kaplan 2016). Therefore, while guns are common in popular media, such as television, video games, and movies, actual gun owners are less visible in daily life, which raises the possibility of different dynamics motivating people's estimates about the size of the gun owner population. Further our

investigation is especially important as Congress and state legislatures consider an increasing array of legislation involving gun ownership (Reich and Barth 2017).

Second, unlike race or ethnicity gun ownership is difficult to identify. It is not generally visible. People asked to judge the size of the gun owner population thus confront high uncertainty. They are then more likely to rely on political predispositions, notably ideology, party identification, and their own gun experiences (Haider-Markel and Joslyn 2018; Herda 2010; Nadeau and Niemi 1995; Wong 2007).

Finally, among minority populations examined, gun owners represent a larger proportion of the population. Although no definitive government source tracks gun ownership, opinion surveys indicate that roughly a third to forty percent of American households presently have a gun and approximately a quarter of Americans personally own a gun (Ingraham 2016; Pew Research Center 2013; Smith and Son 2015). In addition, recent decades witnessed a significant decline in gun ownership. According to General Social Surveys, the percentage of households with guns declined by approximately 16% since 1980, and the percentage of personal ownership dropped nearly 5% (Smith and Son 2015).

Our project addresses three questions. First, what percentage of Americans does the public estimate as gun owners? Related, do gun and non-gun owners perceive the size of the gun owner population similarly? Second, do feelings toward gun owners influence perceptions of the gun owner population? Finally, do perceptions about the size of gun owner population affect attitudes toward gun policy?

Our evidence indicates estimates of the gun owner population are highly exaggerated and gun owners, relative to non-gun owners, report higher estimates of the gun owner population. Additionally, positive feelings toward gun owners produce higher assessments of the gun owner population than negative feelings. The analyses also show that gun ownership estimates

influence gun control policy attitudes, as do respondents' expectations about whether the gun owning population will increase or decrease in the future. Importantly, although gun ownership estimates and expectations about the growth of the gun owner population are noticeably inaccurate, they are nevertheless important predictors of opposition to gun control.

Estimating the Size of Groups

Estimates about the size of minority groups are consistently inaccurate, and often substantially so. Nadeau, Niemi, and Levine (1993) discovered that over half of survey respondents believed African Americans represented 30 percent of the population or more, and estimates of the Jewish population were excessive as well. Similarly, significant overestimation of the foreign-born populations prevailed across each of the 21 countries Citrin and Sides (2008) examined. Americans were exceptional over estimators, believing an average 28 percent of the U.S. population is foreign born compared to the reality of 12 percent. In addition, Alba, Rumbaut and Marotz (2005) reported that two thirds of General Social Survey respondents perceived the Asian American population to be a least 10 percent, considerably overestimating the actual 4 percent figure. Finally, Martinez, Wald and Craig (2008, 757) reported the mean estimated percentage of gays and lesbians in United States as 17 percent, and roughly a quarter of respondents believed gays and lesbians represented 25 percent or more of the population. Both figures far exceed those of the actual gay population.

H1: On average, people will overestimate the size of the gun owner population in the United States.

Researchers proposed three categories of variables related to perceptions of group size. First, cognitive variables such as education that develop abilities relevant for weighing alternatives, selecting among them, and applying factual understanding to confront existing

problems (McClosky and Brill 1983). Education is in fact strongly associated with political knowledge and interest (Campbell et al. 1960; Delli Carpini and Ketter 1996; Zaller 1992), both of which are important predictors of estimates of minority populations (Alba, Rumbaut and Marotz 2005; Haider-Markel and Joslyn 2018; Martinez, Wald and Craig 2008; Nadeau, Niemi, and Levin 1993).

Second, contextual effects. Research suggests when forming estimates of minority populations, people draw information from their immediate environment. For example, Sigelman and Niemi (2001) found that for White and African American respondents greater exposure to African Americans produced inflated estimates of the African American population. Likewise overestimations of minority populations were higher among respondents living in states and localities with greater concentrations of minorities (Nadeau, Niemi and Levine 1993). Personal experiences were also important. Martinez, Wald and Craig (2008) examined respondents who reported knowing a gay person and found they estimated the gay population significantly greater than those who did not know a gay person.

To the extent that people draw conclusions about populations from smaller samples of their personal observations and daily social interactions, minority groups may be particularly susceptible to innumeracy. Alba, Rumbaut and Marotz (2005) in fact demonstrated significant overestimations among minorities when judging the size of their own groups. Blacks and Hispanics reported their own populations as nearly three times higher than the actual figures. We posit this tendency among minority groups to overestimate should apply to gun owners as well. For example, gun owners are more likely than non-gun owners to attend gun shows, read trade magazines, purchase memberships in gun clubs, receive advertising from gun interests such as the National Rifle Association (Kohn 2004; Parker et al. 2017). Thus gun owners frequently interact,

and are exposed too, other gun owners (Carlson 2015; Cook and Goss 2014; Kohn 2004).

Among non-gun owners, such exposure and experiences are less likely.

H2: Gun owners, compared to non- gun owners will estimate higher percentages of gun ownership in the United States.

Third, perceived threat. People who feel threatened by an expanding minority often overestimate its numbers (Alba, Rumbaut, Marotz 2005; Allport 1954; Nadeau, Niemi, Levine 1993; Herda 2010). Nadeau, Niemi and Levine (1993) demonstrated that among respondents who felt Hispanics growing numbers would threaten the place of English as the country's common language, and who lived in greater concentrations of Hispanics, estimated the Hispanic population significantly higher than those not so threatened. Similarly, Herda (2010) found perceived threat of immigrants increased innumeracy, producing excessive estimates of immigrant population across 21 European countries. Martinez, Wald and Craig's (2008) analyses however produced mixed results. The authors utilized Evangelicals and those possessing traditional values as groups threatened by gay and lesbian populations. Statistical associations between these threat measures and overestimations of gay populations were not reliable.

We introduce a fourth category to the conventional set of predictors – affect toward the minority group. Distinct from emotions of threat that are triggered by perceived competition with minority populations over resources, or potential loss of cultural dominance, affective orientations are evaluative dispositions (Abelson, et al. 1982). Theoretically, affective orientations connect to perceptions by way of a powerful psychological drive for cognitive consistency (Heider 1958; Festinger 1957). People strive to maintain affective and perceptual consistency (Crandall et.al 2007). Favorable feelings toward gun owners, for example, should anchor estimates of frequency and produce higher estimations of the gun owner population than less favorable feelings. In other words, unfavorable or favorable feelings cause perceptions to align with them. Liking a group

but perceiving that group as unpopular or low in number exposes the discrepancy. Indeed perceiving a liked group as abundant may function to enhance individual self-esteem and perceived social standing in a manner similar to social identity (Conover 1988). Thus when the affective orientation aligns with perceptions of group frequency, consistency is preserved. People prefer that "...sentiments and perceptions arrange themselves in such a way that simple harmonious configurations result." (Heider 1958, p.25 as quoted by Crandall et al. 2007).¹

H3: There is a positive association between affective orientation toward gun owners and the estimated percentage of gun owners in the population.

Data and Methodology

Our analysis depends on data from an online national survey of American adults. We commissioned Clear Voice Research to conduct the survey from June 18 to June 28, 2016. For several years, Clear Voice Research has maintained an online panel exclusively for research purposes. Clear Voice Research recruited participants by emailing invitations to 58,481 empaneled members. Extensive member profile surveys prior to recruitment increased targeting when Clear Voice Research sent invitations. One thousand six hundred and thirty nine accepted the invitation and 1,290 completed the entire survey, which provided a response rate of 2.2%. Rivers and Bailey (2009) show that similar online samples produce reasonably accurate inferences generalized to the adult population.

The demographic characteristics of the sample closely resemble the population as represented in several well-known surveys. (see Appendix). Approximately 75% of the sample identified as white, 12% as Black, 5% Latino, 4% Asian, and about 2% as multi-racial. Nearly

¹ We do not hypothesize negative affective states to be associated with overestimating the minority group populations. The perceived threat hypothesis proposes this relationship (Herda 2010; Martinez, Wald and Craig 2008). Rather, we hypothesize that *favorable affect* is associated with greater innumeracy, overestimating the size of gun owner population..

58% of respondents reported completing some college and 53% were women. Independents accounted for 36% of the sample, 37% were Democrats, 27% Republican.

The survey included a variety of policy, election specific, psychological and political questions including a number on gun ownership and regulation. The specific question to assess gun owner population appeared toward the end of survey, “Just your best guess, what percentage of Americans today would you say own firearms?” The question wording is identical to Gallup’s for estimating the gay and lesbian population and quite similar to others used in innumeracy research (Alba, Rumbaut, and Marotz 2005; Haider-Markel and Joslyn 2018; Martinez, Wald, and Craig 2008).

[Insert Figure 1 about here]

Unlike the minority groups examined by other innumeracy research, the estimated gun owner percentage displayed in Figure 1 is nearly normal – though the mean (52%) is slightly larger than the median and mode (50%). Distributions of right skew typically characterize estimates of minority populations. This is even true for the perceived distribution of the white majority (Alba, Rumbaut and Marotz 2005, 906). Recall the actual percentage of gun owners is roughly 25 percent, and households with guns about 33 to 40 percent. Fifty was the most common percentage reported (n = 154), followed closely by 60 percent (n = 143), 40 percent (n = 108), 75 percent (n = 92), and 30 percent (n = 70). If we consider 15 to 35 percent range as a generous measure of accuracy, then over 75 percent of respondents overestimated and a small minority of 2.3 percent underestimated. Nearly a fifth estimated the gun owner population as 70 percent or higher.

Recall the analysis is organized around the proposition that estimates of the gun owner percentage is a function of three measures; cognitive factors, context effects, perceived threat, and a fourth yet to be examined affective orientation toward gun owners. In the model, education

and political knowledge represent cognitive factors. A four-point scale ranked educational attainment: (1) high school or less, (2) some college, (3) college graduate, (4) post-graduate. In addition, six factual questions about politics were added together to form a political knowledge scale. The political office held by Joe Biden, the institution responsible for determining if a law is constitutional, how much of a majority is required for Senate and House to override presidential veto, which party currently has most members in House of Representatives, which party is more conservative at the national level, and Barack Obama's faith. We expected education and political knowledge to produce more accurate estimates of the gun owner population.

Two variables represented context effects. First we considered state level concentrations of gun owners. There is considerable variation in this measure, with a low in Delaware at 5.2 percent to 61.7 percent in Alaska (Kalesan et al. 2016). To the extent that people use environmental cues and experiences as benchmarks to assess group percentages within a larger population, states with higher concentrations of gun owners should produce greater individual level estimates of gun owners. Second, greater levels of personal contact with gun owners should lead to higher estimates of gun owners in the public. Those people who do not own a gun yet report living in a household with a gun are likely exposed to the gun owner and attendant gun culture (Utter and True 2000). Respondents were asked, "Do you or does someone else keep a gun or rifle in your home? Yes (26.5 percent), yes, but the gun does not belong to me (7.5 percent) and No (66 percent). We constructed two dichotomous variables from this question. One variable for gun owners and the other for people that live in households with guns, but do not personally own a gun. With this two variable formulation, non-gun owners serve as the baseline to compare gun owners and people living in households with guns but do not personally own guns. We labeled this latter measure personal contact.

The survey did not include explicit measures of threat perceptions. We did consider groups that are likely to perceive gun owners as political threats. For example, Martinez, Wald and Craig (2008) used various groups likely to perceive homosexuality as a threat, including religious denominations. Similarly, Herda (2010) employed political conservatism as a threat variable to predict perceptions of immigrant populations.

In an electoral context groups may feel threatened by gun owners, notably liberals and Democrats. Gun culture comprises a host of values aligned with conservative ideology and the Republican Party, including individualism, self-sufficiency and limited government (Celinska 2007; Joslyn and Haider-Markel 2017; Kohn 2005). Since 1972, gun owners, compared to non-gun owners, consistently supported Republican presidential candidates and this “gun gap” is increasing (Joslyn et.al. 2017). Liberals and Democrats generally possess negative views of gun rights initiatives and gun culture specifically, and are more likely to support greater restrictions on gun possession and access (Kahan and Braman 2003). To the extent that Liberals and Democrats feel threatened by gun owners, we expect overstated estimates of the gun owner population.

Feeling thermometer from 0 to 100 measured affective orientations toward gun owners. Specifically, respondents were asked, “We’d like to get your feelings toward some of our organizations and groups who are in the news these days. We’d like you to rate groups using something we call the feeling thermometer. Ratings from 0 to 49 degrees means that you don’t feel favorable toward the group and that you don’t care too much for that group. Rating from 51 to 100 mean that you feel favorable and warm toward the group. You would rate the group at 50 degree mark if you don’t feel particularly warm or cold toward the group.” The mean response was 54 degrees, with a standard deviation of 31. To compare, the mean feelings toward the Tea Party were 33, Veterans 80, Muslims 39, Police Officers 62 and Christian Fundamentalists 46.

In addition to measures of theoretical interest, we included a number of control variables. These include income, sex, and race. We do not have concrete expectations for the performance of these measures. However previous innumeracy studies suggest that because women and members of minority and low income groups exhibit lower levels of political knowledge, they are more likely to overestimate group size (Alba, Rumbaut and Marotz 2005; Martinez, Wald and Craig 2008; Nadeau, Niemi, and Levine 1993).

Results

We employed Ordinary Least Squares (OLS) regression as it is well suited for interval data and convenient for interpretation of estimated coefficients (Schroeder, Sjoquist, and Stephan 1986). We scaled independent variables from zero to one for comparability. The results presented in Table 1 confirm that estimates about the size of gun owner population derive from factors consistently identified by previous research, and in the case of cognitive factors and context effects, the patterns make substantial theoretical sense. Further, after taking into account these main categories of predictors, affective orientations toward gun owners is statistically significant and substantively important.

[Insert Table 1 about here]

The most educated ($b = -5.1, p < .01$) and knowledgeable ($b = -8.6, p < .00$) respondents estimate the population of gun owners as considerably less than the least educated and knowledgeable. State residence influences population estimates as well. The highest estimates of gun owners come from respondents living in states with higher concentrations of gun ownership ($b = 13.5, p < .00$). Similarly, living in a household with a gun, compared to households without a gun, produces higher estimates of the gun owner population ($b = 5.5, p < .01$). The final contact variable, gun owners, generates similarly inflated judgments. Gun owners, perhaps the group

most exposed to other gun owners and the broader gun culture, estimate gun owners' proportion of the population considerably higher than non-gun owners ($b = 5.6, p < .00$). This result confirms hypotheses 2. The three different measures of contact – percent of state residents that own a gun, living in house with a gun that is not yours and personal gun ownership – suggest people do in fact utilize environmental and experiential cues to judge the frequency of gun owners in the population.

Our results do not support the perceived threat expectations, though better measures of threat may perform differently (Nadeau, Niemi and Levine 1993). Neither ideological ($b = 1.6, p < .525$) nor the partisan measures for Democrats ($b = -1.4, p < .328$) and Republicans ($b = -.9, p < .526$) are statistically significant. Overall, the regression results suggest women, African Americans and lower income people tend to report higher estimates of the gun owner population than men, whites, and those with greater income. The impact of income is considerable ($b = -10.9, p < .00$), ranking just behind state population of gun owners in relative impact.

Finally, favorable feelings toward gun owners produces significantly higher estimates of the gun owner population than unfavorable feelings ($b = 8.0, p < .00$). It does appear that people maintain consistency between affect toward a group and perceptions of frequency of that group.

Although the model identifies gun ownership and affect toward gun owners as important determinants, it is plausible the two measures interact. Ownership implies social-psychological commitment to guns, associated beliefs and values, and a connection to the larger gun culture (Kohn 2004). In addition ownership of a firearm represents an important political identity, reliably predicting presidential vote choice and various political attitudes (Joslyn et al. 2017). Gun owners should then be more likely than non-gun owners to possess a strong consistency drive that aligns their feelings toward fellow gun owners with estimates of the gun owner share of the population.

[Insert Figure 2 about here]

We inserted an interaction term of affect toward gun owners and gun ownership into the full model.² The interaction returned a significant and positively signed coefficient ($b = 10.2, p < .03$). Ownership of a firearm therefore modifies the relationship between affect toward gun owners and estimates of the percentage of gun owners. Figure 2 shows the gap between gun and non-gun owners is most evident at the highest levels of favorable feelings. By contrast confidence intervals overlap at the lower affect levels. Thus gun owners that feel very favorably toward other gun owners perceive about a 10 percent larger gun owner population than do non-gun owners possessing equally favorable feelings: Ownership appears to strengthen the consistency motive that links feelings and perceptions of frequency.

The Consequences for Attitudes toward Gun Restrictions

To this point, the analyses identified the determinants of estimates of the gun owner population, adding group affect to the list of cognitive, environmental, and threat factors. The question now is do these perceptions of group size influence related political attitudes. Alba, Rumbaut and Marotz (2005) show that white respondents were more likely to support restrictions on immigration if they perceived minority groups as relatively close in number to their own group. Martinez, Wald and Craig (2008) offer modest bivariate associations between the estimated size of the gay population and support for laws that protect gays and lesbians and the salience of gay issues. More recently, within a multivariate framework, Haider-Markel and Joslyn (2018) uncovered robust positive relationship between estimated size of the gay population and supportive policies of the gay community.

² The estimates for full interaction equation is as follows: $y = 50.8*(\text{constant}) - 5.09*(\text{edu}) - 8.6*(\text{polknow}) + 13.7*(\% \text{ gun ownership state}) - 1.4(\text{gun owners}) + 5.8*(\text{personal contact}) - 1.4(\text{dem}) - .9(\text{rep}) + 1.4(\text{ideo}) + 6.0*(\text{feelings toward gun owners}) + 2.1*(\text{female}) + 4.8*(\text{blacks}) + 2.2(\text{age}) - 10.7*(\text{income}) + 10.2*(\text{gun owners} \times \text{feelings toward gun owners})$. The separate slope estimates for feelings toward gun owners: Among gun owners it was $b = 15.6 (4.4)*$ and among non-gun owners it was $b = 6.7(2.5)*$

It appears population estimates influence related attitudes, and generally extreme overestimations of group size produce the strongest support for favorable group policies. In our survey, we posed a question about access to guns, “How strongly would you favor or oppose new laws that would restrict access to gun ownership? Strongly favor (29 percent), favor (27 percent), oppose (21 percent), and strongly oppose (23 percent).”³ Further, we asked respondents whether they expected the gun owner population to change in the future. Specifically, “do you expect that percentage (the percentage respondents’ identified as gun owners) to increase or decrease in the future?” Seventy-one percent expected the percentage of gun owners to increase, 7 percent decrease and approximately 22 percent said stay the same. The variable was coded 1 = increase, 0 – otherwise and labeled increase gun ownership.

We therefore utilized three measures typically absent in the gun regulation literature – population estimates of gun ownership, gun ownership, and expectations of growth in gun ownership – to predict opposition to restricting gun access. The results of an ordered logistic regression appear in Table 2. Positive coefficients indicate an increased likelihood of opposing laws restricting gun access.

[Insert Table 2 about here]

The analyses show that estimates of gun owners’ population influence respondents’ opposition to restrictive gun laws. After controlling for typical demographic and political predictors of gun policy attitudes – education, age, race, gender, ideology and party identification (Smith 1980; Kleck 1996), higher estimates of the gun owner population produce opposition to restrictive gun access laws ($b = .01, p < .00$). The likelihood of respondents selecting the

³ This is a broad and fairly typical question regarding gun restrictions. It also tends to elicit fairly strong responses, separating gun control and gun rights people. Other limiting guns policy questions do produce more agreement, such as laws that prevent mentally ill from purchasing guns and requiring background checks for gun shows. Thus our results speak to a general question on gun restrictions not one concerned with specific restriction policies.

strongest opposition category – the most intense gun rights position, holding other variables at mean and mode values, is 0.12 among those who perceive the gun owners population at 25 percent and 0.21 among those that perceive gun owners at 75 percent. This is a reasonably strong effect considering the difference in probability between Democrats and Republicans reporting strong opposition is also 0.09 and between gun owners and non-gun owners is 0.20. Further, respondents perceiving the gun owner population as increasing in the future are more likely to oppose restrictions on guns ($b = .36, p < .00$). The differences in probability of strong opposition to gun regulations between those perceiving a growing gun owner population and a static population is about 0.05, a significant though modest effect. However, the most substantial effect is ideological--the probability that liberals strongly oppose restrictive gun laws is quite small 0.04 but for conservatives 0.40.

Figure 3 offers a convenient comparison of the predictors' average marginal effect. The vertical line at zero on the horizontal axis represents a null finding. We calculated the effects for the probability of strongly opposing restrictions on gun access. The visual depiction makes clear the substantial influence of ideology but also the noteworthy effects of gun ownership and the separate influence of the state gun owner population.

[Insert Figure 3 about here]

In sum, conventional partisan and ideological leanings strongly influence opposition to restrictive gun laws. However gun possession and perceptions of the size of the gun owner population are also important predictors. These gun specific measures are clearly influential but absent in the literature on gun policy attitudes. Greater size estimates of the gun owner population intensify opposition to restrictive gun access laws. Considering the mean value of perceptions was 52 percent, and 25 percent of the sample estimated 68 plus percent of gun owners in the population, the typical perception was not inconsequential for gun rights attitudes. The

strongest support for a gun rights perspective evidently comes from those who estimated the least accurate percentages of gun owners – substantial overestimating the population. Even less connected to reality were respondents’ perceptions that the gun owner population is increasing (Ingraham 2016; Pew Research Center 2013). Yet this inaccurate perception also produced strong opposition to gun restrictions.

Discussion and Conclusions

Research on population innumeracy has long noted that people tend to overestimate the size of minority groups within the overall population. Our paper sought to contribute to this literature by providing additional theoretical considerations and by examining population estimates of a previously overlooked minority group — gun owners. From our analyses we draw several conclusions for future research and implications for policymakers.

First, Americans vastly overestimate the gun owner population. The extent of the inaccuracy is underscored by the fact that nearly 48 percent believed that gun owners comprise a majority or more of the U.S. population. Most existing data, primarily based on survey responses, suggest the personal gun owner population is approximately 25 percent. Moreover, 71 percent of respondents expected gun ownership to *increase* in the future, even though for 30 years all signs point to a declining or stable gun owner population (Ingraham 2016; Pew Research Center 2013; Joslyn and Haider-Markel 2018).

Similar to prior research on perceptions of minority populations, political knowledge and education levels were important predictors of perceptions of the gun owner population. The more political knowledge and education, the lower the estimates of the gun owner population – in this instance, a more accurate perception. In addition, consistent with prior research (Alba, Rumbaut, and Marotz 2005; Overby and Barth 2002; Wong 2007), perceptions of group size varied with

environmental cues. The more people encounter gun owners and gun culture, the greater the percentage of gun owners estimated in the population. Personal contact with gun owners, living in a state with many gun owners, and possessing a firearm each contributed to higher estimates of the gun owner population.

However, evidence confirming the threat hypothesis proposed by other innumeracy researchers did not emerge. Rather, we concluded that if liberals and Democrats feel threatened by gun owners, it is not revealed in their judgments about the size of the gun owner population. Neither party identification nor ideological disposition were significant predictors. As eluded to earlier, it may well be that these threat measures are deficient. It might also be the case that gun owners are not typically viewed as political threats except if guns are identified as a cause of violence, such as mass shootings, or if electoral competition explicitly mobilizes gun rights in opposition to gun control groups. That said, the evidence is mixed supporting the threat hypothesis. Our results may then simply support the findings of existing studies (see Martinez, Wald, and Craig 2008).

Importantly, we introduced affective orientation toward minority groups as a theoretical contribution. The strong association demonstrated between feelings toward gun owners and perceptions about the size of the gun owner population suggests that people are motivated to maintain a consistency between affect and perceptions of population size. Heider (1958) observed long ago that consistency between affect and perceptions is a preferred cognitive state. Our results seem to support Heider's contention and also show that the drive for consistency is notably stronger among those that possessed a firearm.

In addition, our results showed that perceptions have consequences for policy attitudes. Estimates of the gun owner population, and expectations for that population to increase, independent of notable political characteristics, strongly influenced attitudes about restrictive gun

laws. Given the significant impact (perceived or otherwise) that gun owners have on gun policy (Reich and Barth 2017), public opinion (Goss 2010), and constituency representation (Richards 2017), this connection is not a trivial one.

However this perception-policy connection does beg the question, what if Americans correctly assessed the percentage of the gun owner population? Would that accurate information translate into greater support for restrictive gun laws? We cannot answer this question definitely, though recent work by Lawrence and Sides (2014) indicates correcting information about minority populations – and other distributions in the United States – did not affect attitudes toward relevant public policies. In other words, making respondents aware of the actual percentages does not change their subsequent policy attitudes. However, Kuklinski et al. (2000) found that correcting respondents of their misperceptions did in fact alter relevant policy attitudes.

Clearly, we need to know much more about the connection between accurate population information and policy attitudes. The impact of correct information on attitudes may be most efficacious if people are motivated to respond accurately (Prior and Lupia 2008) and least valuable when matters touch on issues involving deeply rooted predispositions such as ideology or racial identity. Nevertheless, our analyses does reveal that respondent's perceptions that closely matched opinion survey estimates (those that were approximately accurate) of the gun owner population were more favorable to restrictive gun ownership laws. Overall, fifty five percent of respondents strongly favored or favored laws that restricted access to gun ownership. But among respondents that correctly estimated gun ownership between 20 to 30 percent, favorability increased 16 percentage points to 71 percent. On its face, this suggests that more accurate information about gun ownership could enhance gun control support. Conversely, gun

rights supporters appear to have a significant incentive to misinform or inflate the size of the gun owner population.

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Appendix

Panel participants are told they will be invited to participate in online research surveys in exchange for various incentives. Their initial registration form collects basic fields including: name, email address, postal address, gender, date of birth, and language. After completing this form a double opt-in/confirmation email is sent to the email address. Only double opt-in/confirmed accounts are invited to participate in surveys. Following opt-in, panelists are asked to complete their profile so that they collect as many data points as possible, which increases their targeting abilities when they send the member survey invitations. Based on client specifications a sample is pulled in quota group formats. Simple randomization is used to give a representative sample of new and old members within the quota groups. Participants are invited via email to participate in the survey

Table A.1 displays the demographics of this sample compared to the American Community Survey 2014 Census estimates, MTurk samples (adapted from (Berinsky et al. 2012) and the Annenberg National Election Study (Johnston et al. 2008). Amazon’s Mechanical Turk is an online marketplace where people hire laborers for a variety of tasks. Since the mid-2000’s researchers have been offering people money to participate in online survey experiments through Amazon’s Mechanical Turk. Recently, scholars have spent considerable effort trying to determine the quality of the samples that are usually obtained through this service (Mullinix et al. 2015). The following table shows that this sample is more representative of the US population on key variables than samples obtained through Amazon’s Mechanical Turk.

Table A.1: Survey Demographics

Demographics	June CV 2016 Survey	ACS 2014 Estimates	MTurk	NAES 2008
Female	53.14%	50.8%	60.1%	56.62%
Age (mean years)	50.86	37.4 (median)	20.3	50.05
Education (% completing some college)	57.71%	58.9%	-	62.86%
White	75.29%	73.8%	83.5%	79.12%
Black	12.39%	12.6%	4.4%	9.67%
Asian	4.26%	5.0%	-	2.53%
Latino (a)	5.03%	16.9%	-	6.3%
Multi-Racial	1.78%	2.9%	-	2.37%
Party Identification				
Democrat	36.95%	-	40.8%	36.67%
Independent	36.33%	-	34.1%	20.82%
Republican	26.72%	-	16.9%	30.61%
<i>N</i>	1,291	-	484-551	19,234

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Table 1. OLS Regression of Estimates of the Gun Owner Population

<u><i>Independent Variables</i></u>	Estimate	SE	p-value
Cognitive Factors			
Education	-5.1	2.5	.010
Political Knowledge	-8.6	3.7	.000
Contact			
Gun Owning Population in State	13.5	2.8	.000
Personal Contact	5.5	2.1	.011
Gun Owner	5.6	1.4	.000
Threat			
Democrat	-1.4	1.4	.328
Republican	-0.9	1.5	.526
Ideology	1.6	2.6	.525
Affective Orientation	8.0	2.1	.000
Controls			
Female	2.1	1.1	.062
Black	4.7	1.7	.007
Age	2.2	1.9	.257
Income	-10.9	2.6	.000
Constant	49.9	3.0	.000
R squared .167			
Number of Cases 1,016			

Notes: Dependent variable is responses to question “Just your best guess, what percentage of Americans today would you say own firearms?” Data are from a June 2016 survey that was conducted by Clear Voice Research for the authors and includes a national sample of American adults. All independent variables are coded from 0 to 1 for comparability.

Table 2. Ordered Logit of Opposition to Restrictive Gun Access Laws

<i>Independent Variables</i>	Estimate	SE	p-value
Education	-.00	.07	.89
Gun Owner	1.22	.14	.00
Estimate of Gun Owner Population	.01	.00	.00
Democrat	-.82	.15	.00
Republican	.21	.16	.20
Ideology	.43	.04	.00
Female	-.06	.12	.61
Black	-.49	.19	.00
Age	-.05	.04	.23
Income	-.11	.04	.01
Increase Gun Ownership	.36	.13	.00
/cut 1	.70	.36	
/cut 2	2.29	.39	
/cut 3	3.70	.40	
Chi-Square 431.09			.000
Number of Cases 964			

Notes: Dependent variable is responses to question “How strongly would you favor or oppose new laws that would restrict access to gun ownership? (strongly favor = 1; strongly oppose = 4)” Data are from a June 2016 survey that was conducted by Clear Voice Research for the authors and includes a national sample of American adults. Table 1 included 52 more respondents than Table 2. The differences are a result of the number of responses to a different dependent variable and an additional independent variable.

Figure 1. Distribution of Estimations of Gun Owner Population in U.S.

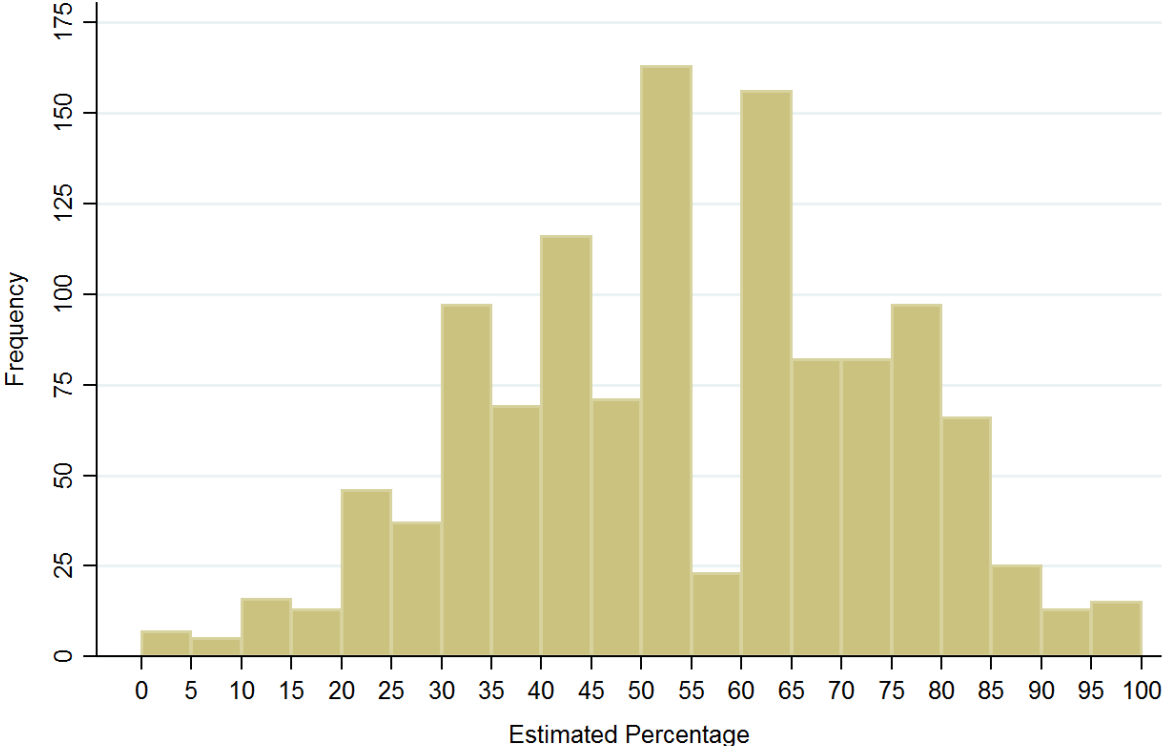


Figure 2. The Impact of Feelings toward Gun Owners on Estimates of Size of Gun Owner Population

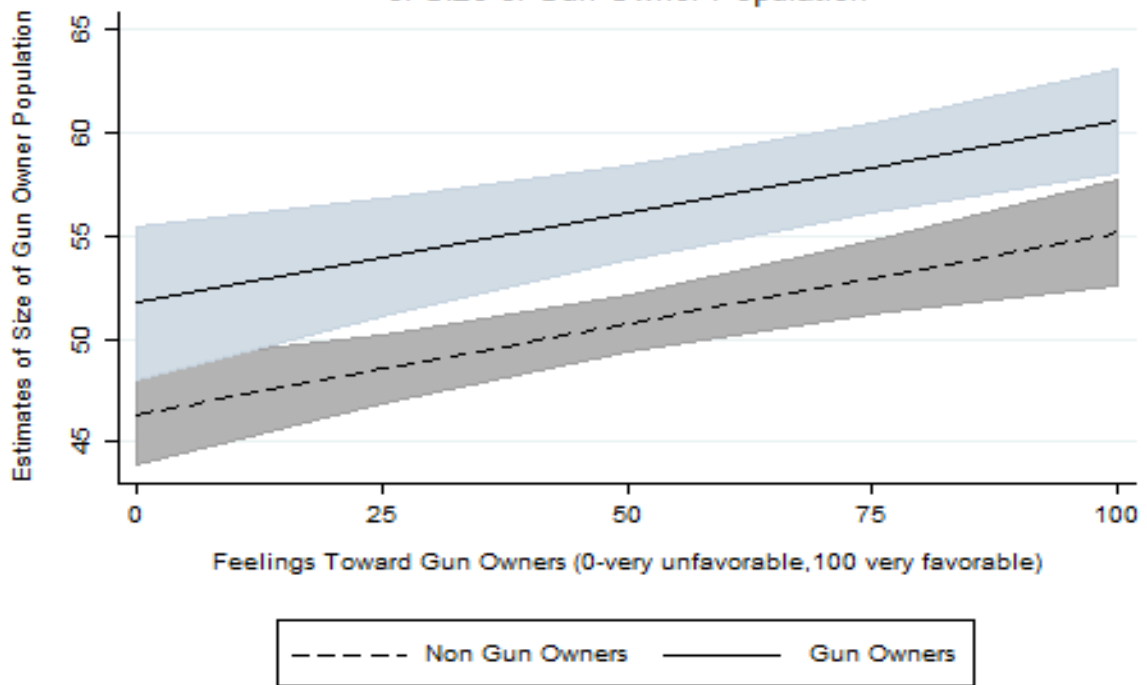


Figure 3. Average Marginal Effects with 95% CIs

