

Exhibit A

A Response to Critics of the 2021 National Firearms Survey

(working paper draft)

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I had the honor of being the subject of a long *New York Times* article and podcast that attempted to cast aspersions on the National Firearms Survey I conducted in 2021. As I explained in a response published in the *Wall Street Journal*, the *Times* article was politically motivated and written in bad faith, voicing criticisms that were uninformed and unconvincing.

However, the attention that the *Times* drew to my survey is welcomed. It is an important scholarly contribution that merits wider publicity and engagement. Due to the lawfare waged against me by two AG's offices over the last two years, which included multiple subpoenas, some of which continue to be litigated, I had to pause work on the survey and have yet to submit a comprehensive paper reporting its results to a journal. I look forward to doing so, and by the time it is published it will have benefitted from one of the most thorough vettings that any piece of survey research has ever received.

The first serious attempt by scholars to engage the survey results that I am aware of is a direct response by Azrael et al., "A Critique of Findings on Gun Ownership, Use, and Imagined Use from the 2021 National Firearms Survey: Response to William English," which is forthcoming in the *SMU Law Review*. The authors, distinguished academics, many of whose careers have been dedicated to advancing pro-gun-control arguments, do a considerable service by articulating the most powerful critiques they can muster against the survey's findings. Upon

examination, however, their critiques are mild and largely unpersuasive. Moreover, the most plausible criticisms they articulate are immaterial to the survey's main findings. While the concerns they express deserve thoughtful, detailed, and dispassionate rebuttals, which I provide below, the alarm that this survey has caused among gun control advocates raises interesting questions of its own.

In this piece, I respond in detail to the particular criticisms voiced by Azrael et al. I also briefly note and address other concerns that have been raised in less academic contexts, particularly those voiced by paid experts in support of anti-Second Amendment litigation. Finally, in conclusion, I consider why such a simple and straightforward survey has inspired such extraordinary efforts to disparage its results.

I. Survey Estimates of Firearms Ownership

Azrael et al. begin their critical examination of my survey results with the observation that "the initial sample was not strictly representative of the American adult public." Of course, for any survey to be *strictly* representative of the American adult public, one would have to survey every American adult. The point of surveys is that by sampling a subset of a population we can still derive highly informative insights about the characteristics of the overall population. By conventional standards of survey research, the sample obtained for my survey is both large and highly representative, particularly across demographics of sex, race, and age. Azrael et al. note that higher income individuals (those making over \$150,000) were relatively underrepresented, constituting 8.1% of the sample, while they are 20.2% of the population. However, this is not unique to my survey. The so-called "missing rich" problem¹ is a well-

¹ Lustig, Nora. The "missing Rich" in Household Surveys: Causes and Correction Approaches. Vol. 520. ECINEQ, Society for the Study of Economic Inequality, 2020.

established challenge in survey research, and refers to fact that it is generally harder to reach those with higher income² and to get them to spend time answering surveys.³

Azrael et al. acknowledge that this challenge is customarily addressed by employing survey weights to arrive at overall population level estimates, and that I indeed employ weights in my papers. Moreover, given the size of my sample, what little weighting is required is grounded in highly informative subsamples. For context, in the “Comprehensive National Survey on Firearms Ownership and Use” that Cook and Ludwig conducted in 1994, which was the authoritative source for firearms ownership estimates for decades, their entire sample of gun owners who make over \$75,000 only consisted of 197 individuals.⁴ In contrast, my data contains 1,493 individuals who make over \$150,000. Thus, in weighting these responses to balance the representativeness of the overall sample, I am drawing on a significant and highly informative subpopulation sample.

Although employing weights is a straightforward exercise when estimating the proportion of Americans who indicate that they own a firearm, if I were to use weights systematically to estimate responses within the subset of those who indicate that they own firearms, I could be potentially be criticized because we do not have an independent, authoritative source akin to the Census Bureau that can provide the “true” baseline demographic composition of firearms owners. However, as I note in my paper, what we can do as a next best approximation is employ a two-step procedure in which I first use the gun owner demographics observed in my sample as the basis to then weight within group responses. Again, as mentioned in my original paper, I do run this analysis as a robustness check, and it yields results that are statistically indistinguishably, many of which I explicitly note.

² Burkhauser, R. V., S. Feng and J. Larrimore (2010), "Improving Imputations of Top Incomes in the Public-Use Current Population Survey by Using Both Cell-Means and Variances," *Economic Letters* 108 (1), pp. 69-72.

³ Korinek, A., Mistiaen, J.A. & Ravallion, M. Survey nonresponse and the distribution of income. *J Econ Inequal* 4, 33–55 (2006). <https://doi.org/10.1007/s10888-005-1089-4>

⁴ Cook, P. and Jens Ludwig. *Guns In America: Results of a Comprehensive National Survey on Firearms Ownership and Use.* The Police Foundation. 1996. P.34 <https://www.policinginstitute.org/wp-content/uploads/2015/06/Cook-et-al.-1996-Guns-in-America.pdf>

For example, on page 20, I report that “82.7% of gun owners report owning a handgun (95% CI 82.0% - 83.3%), 68.8% reported owning a rifle (95% CI 68.1% - 69.6%), and 58.4% report owning a shotgun (95% CI 57.6% - 59.2%);” and then I go on to note that using survey weights based on in-survey demographics of firearms ownership yields the following nearly identical results: “Handgun, 83.7% (82.9% -84.4%), Rifle, 68.6% (67.7% - 69.6%), Shotgun 58.6% (57.6% - 59.6%).” I also note the weighted results for other major findings, including 11+ magazine ownership (47.4% vs 48.0%) and ownership of AR-15 and similarly styled rifles (30.2% in both specifications). In all cases, the results between the two estimates are statistically indistinguishable, and while I am happy to report every alternative specification in a paper revision, it is clear that this will make no material difference to the results.

- a. Speculations regarding individuals answering based on household and external validity.

Although my survey at no point asks about or mentions “households,” Azrael et al. speculate that respondents might be answering based on their household rather than individually. On the face of it, this seems unlikely. No questions in the survey, including ownership or defensive gun use questions, about household ownership or use. Rather, all questions are all addressed to the individual answering the survey (“you”) asking, for example:

“Do you own any of the following?...”

“...Have you ever defended yourself or your property with a firearm...”

“...Have you ever owned an AR-15 or similarly styled rifle?...”

“[Answer option]: Yes, I own rifles such as an AR-15...”

Nonetheless, Azrael et al. worry that some individuals, particularly women cohabiting with a male gun owner, may answer based on what their partner owns rather than what the female respondent personally owns, even though that is not what the questions ask. However, given that there is a large literature that examines both individual and household firearms ownership rates, this should be a relatively straightforward claim to assess. Is my finding that

31.9% of U.S. adults own a firearm in line with other major surveys that ask about individual ownership, or does it line up with surveys that document household ownership?

As I note in my paper, my result lines up with Gallup polling in 2020 and 2021, which found that 32% and 31% of adults *personally* own a firearm. In reviewing comparable survey results, Azrael et al. claim that my survey “generates the highest point estimate of individual ownership overall,” but in fact the 2020 Gallup estimate exceeded mine, and in 2022 Gallup documented an even higher individual ownership rate of 33%.⁵ Meanwhile, the latest Pew Survey conducted in 2023, finds that 32% of Americans personally own a firearm - a point estimate that is again higher than my survey.⁶ Thus, the most reputable ongoing professional survey projects that measure individual ownership rates align precisely with my estimates.

Household firearms ownership rates are, by contrast, much higher, again suggesting that this is not what my survey is measuring. Between 2020-2023, Gallup documented household firearms ownership rates between 42-45%.⁷ The most recent Pew survey puts household ownership at 42% and the survey in 2021 places it at 41%.⁸

Azrael et al. cite as contrary evidence a survey done by Miller, Zhang, and Azrael in 2021 that found an individual rate of ownership of 28.8% (approximately 3% less than mine) and a household ownership rate of 39.2% (more than 7% higher than the individual rate I document). Clearly my rate is much closer to their individual rate, and my rate is grounded in a sample nearly three times the size of theirs. Moreover, their survey results were gathered from an Ipsos (formerly GfK) KnowledgePanel, a previous version of which had yielded contradictory responses from supposed gun owners in another survey project conducted by many of the same authors (Azrael, Miller, and Hemenway).⁹ In that study, respondents were told that the survey was sponsored by Northeastern University, and a large number of the respondents “reported that they had acquired one or more guns during the past five years even though they had previously

⁵ <https://news.gallup.com/poll/1645/guns.aspx>

⁶ <https://www.pewresearch.org/politics/2023/08/16/for-most-u-s-gun-owners-protection-is-the-main-reason-they-own-a-gun/>

⁷ <https://news.gallup.com/poll/1645/guns.aspx>

⁸ <https://www.pewresearch.org/short-reads/2021/08/04/wide-differences-on-most-gun-policies-between-gun-owners-and-non-owners-but-also-some-agreement/>

⁹ Azrael, Deborah, et al. "The stock and flow of US firearms: results from the 2015 National Firearms Survey." *RSF: The Russell Sage Foundation Journal of the Social Sciences* 3.5 (2017): 38-57. <https://muse.jhu.edu/pub/207/article/677232/pdf>

indicated that their most recent firearm acquisition (among the guns they currently owned) took place more than five years ago.”¹⁰ In estimating the number of firearms that acquired in the last five years, the authors end up excluding “the 23 percent of respondents who reported acquiring at least one gun in the past five years yet also indicated their last acquisition was more than five years ago,” which has the net effect of reducing their estimate by 15 million firearms. While the discrepancy presents a difficult challenge for making analytic inferences, it also raises questions about the quality of responses from gun owners in the Ipsos/GfK KnowledgePanel, which has been the basis for much of the survey research conducted by many of Azrael et al.’s co-authors.

Around the same time as that survey, the polling firm Zogby Analytics asked respondents on an independent survey, “If a national pollster asked you if you owned a firearm, would you determine to tell him or her the truth or would you feel it was none of their business?” 34.9% of self-reported “current” gun owners and 38.3% of self-reported “former” gun owners responded with “Feel it was none of their business.”¹¹ This result speaks to a longstanding methodological concern in firearms survey research, namely that if there is any bias it is likely to be in the direction of gun owners underreporting firearms ownership.

Azrael et al. point to the University of Chicago affiliated General Social Survey (GSS) as an authoritative source that finds lower rates of individual firearms ownership than either their survey or mine (“In 2021, 35.2% of respondents lived in a home with a gun, while just 24.5% indicated that they personally owned a gun.”). They neglect to mention that GSS has historically had its respondents report much lower firearms ownership rates than other surveys. One concern with the GSS is that it has generally involved interviewers going to a respondent’s house to administer the survey in person. When asked the awkwardly phrased gun ownership question, “Do you happen to have in your home (or garage) any guns or revolvers?” there are reasons to expect that respondents may not answer truthfully, including worries about revealing this sensitive information to researchers who are aware of exactly where the respondents live and the fact that the survey is publicly associated with a university, which respondents may feel has an agenda hostile to their interests. While the 2020 survey was conducted online because of covid, recruitment involved sending invitations to a respondent’s physical residence, raising similar

¹⁰ Ibid. p.47

¹¹ <https://www.hoplophobia.info/wp-content/uploads/2017/11/Zogby-Analytics-Survey-2015.pdf>

concerns regarding privacy and sensitive information that respondents would be sharing with university researchers.

In his 2019 article "Gun-shy: Refusal to answer questions about firearm ownership," Robert Urbatsch analyzing responses to the GSS's firearm ownership question and found that there has been an increase in recent years in the percentage of respondents who refuse to answer this question, whereas other questions have not seen a comparable increase in non-responses. Moreover, while this characterizes respondents across all political identifications, it is especially pronounced among Republicans, which is a subgroup more likely to own guns.¹² This analysis does not address an additional potential source of bias, namely gun owning respondents who simply answer "no" to the ownership question out of a desire to avoid scrutiny, stigmatization, or being targeted for theft.

A recent (2024) paper by Bond et al published in *Social Psychiatry and Psychiatric Epidemiology* uses sophisticated statistical methods to estimate the number of respondents who are likely to have falsely denied firearm ownership in an online survey. Out of a representative sample of 3,500, with 3,485 answering the firearms ownership question, 34.6% of survey respondents (1,206) reported that they owned a firearm. Again, this is an ownership rate close to, but in excess of, the rate documented by my survey. However, based on models that characterize the types of people who are most likely to own firearms, the authors estimate that another 29.7% of respondents (1,036) who claimed that they did not own a firearm likely did (with "likely" meaning that the model predicts that they have a greater than 50% probability of being a firearm owner). Raising the threshold to only count those with greater than 75% probability of being a firearm owner as true owners still results in an estimate of 6.3% (220) respondents who are highly likely to own firearms but say they didn't.

The authors are able to characterize the types of people who appear to be systematically denying firearms ownership when in fact they are likely to be owners. Remarkably, the two largest groups that account for this phenomenon were composed overwhelmingly of women. The first group, which accounted for 43.6% of those thought to be falsely denying firearms ownership, was 90.5% female. The next largest group, which accounted for 39.0% of those

¹² Urbatsch, Robert. "Gun-shy: Refusal to answer questions about firearm ownership." *The Social Science Journal* 56.2 (2019): 189-195.

thought to be falsely denying firearms ownership, was 94.5% female. As for what might explain this, Bond et al speculate that a number of factors may be at play, including that members of these groups might be “suspicious of the intentions of the survey, opting to withhold their status as firearm owners to avoid sensitive information being obtained by bad actors (p.721).”

Recall that main empirical argument Azrael et al. advance for doubting the firearms ownership rate numbers documented by my survey, despite their alignment with rates measured by Pew and Gallup, was that my survey found a “relatively high estimate for female respondents” (approximately 5% higher than Pew and Gallup). This was the basis on which Azrael et al. speculated that respondents may have misinterpreted my questions to be asking about household ownership. However, in light of the findings of Bond et al., it seems more likely that my survey is the more accurate one, and that other surveys have been designed and fielded in ways that make some gun owners, particularly female ones, reluctant to admit to ownership.

Precisely because such a large literature has suggested that gun owners under report ownership, my survey was designed, as I explain on page six of my main working paper, “so as to not suggest animus towards gun owners or ignorance of firearms-related terminology.” My respondents were also assured of anonymity, and there was no language linking the survey to university affiliation. Finally, when asking questions that could be perceived as being sensitive, my survey explained the rationale for asking the question. Without an explanation of why the surveyor was asking such questions, respondents might understandably “Feel it was none of their business.”

As I explain in greater depth below, the survey also included design elements to guard against any respondents who did not read questions carefully (attention check questions) or who might try to inflate survey results by entering implausibly high numbers (allowing the number entered to be unconstrained and discarding distributional outliers). All of these design choices were aimed at ensuring that the survey would provide the most accurate estimates possible of the true state of affairs. External reviewers selected by the National Institute of Justice who provided comments on the survey before it was fielded still worried that some gun owners might be reluctant to answer ownership questions. Indeed, I find some evidence for this, as eight respondents who indicated having owned an AR-15 or similarly styled “assault weapon” refused

to indicate how many they owned and instead manually entered “None of your business,” “Not your business,” “prefer not to answer,” and similar refusals.

In sum, concerns expressed by Azrael et al. that my survey may have overestimated firearms ownership rates, driven by the wording of questions or the misunderstandings of (particularly female) respondents, who may have answered based on household rather than personal ownership, are not persuasive. My results align with other prominent, professional surveys; and the overarching methodological worry in this literature is that surveys have systematically under-measured the true prevalence of firearms ownership, particularly amongst women. My survey took transparent measures to mitigate the design flaws of prior surveys, and, for this reason, provides estimates that are likely more accurate than many of the surveys that Azrael et al. would selectively like to privilege.

b. Ownership of AR-15 and similarly styled rifles.

As Azrael et al note, my survey asked respondents, “Some have argued that few gun owners actually want or use guns that are commonly classified as "assault weapons." Have you ever owned an AR-15 or similarly styled rifle? You can include any rifles of this style that have been modified or moved to be compliant with local law. Answering this will help us establish how popular these types of firearms are.” 30.2% of gun owners answered in the affirmative. Combined with answers regarding how many such rifles they had owned, the survey estimates that 44 million such rifles have been owned by American gun owners.

As I explicitly note in my paper, “this estimate is based on a question that asks whether someone has ever owned such a rifle, so this estimate should be interpreted as an upper bound on current ownership given that some rifles may have been resold (p.33).” Azrael et al. seem to view this as a weakness, pointing out that this does not answer the question of how many people currently own such rifles, but that is arguably not the question that is most relevant to legal and public policy debates regarding whether such arms are popular and commonly used. The survey establishes that about a third of gun owners report having owned such weapons. Moreover, given that a number of states have changed the legal status of these weapons in recent years, the

frequency with which Americans move, and the legal jeopardy involved in owning such arms in restrictive jurisdictions, it would not be surprising if such legal considerations have forced a modest number of gun owners to sell their rifles.

Azrael et al. speculate that the estimate of 44 million assault weapons having been owned by 30% of gun owning Americans is high because three other estimates imply lower current ownership numbers (WaPo, NSSF, and Azrael-Ipsos survey). Azrael et al. cite a Washington Post-Ipsos poll of gun owners that found that 20% of reported owning “AR-15-style rifles, including any semi-automatic weapon built on a common AR-platform.” This survey implied that 16 million Americans own an AR-15, but did not ask how many AR-15’s they owned. This survey was based on a much smaller sample than mine, and in the methods section it notes that the survey has a relatively large margin of error: “The margin of sampling error for the sample of AR-15-style rifle owners, including the design effect is plus or minus 5.5 percentage points.”¹³ My survey finds a rate only about 5% higher than the upper bound of the Ipsos survey.

However, Azrael et al. do not appear to be aware that the question asked by the Washington Post-Ipsos poll is a much narrower question than the one asked by my survey. This is admittedly likely to not be obvious to those who are not familiar with firearms. My survey asked about “assault weapons” at large, specifying not only AR-15s but also “similarly styled rifles.” The list of similarly styled rifles that are commonly classified as “assault weapons” is extensive and would include, for example: AK-47 designs, FN FALs, M1 carbines, M1A’s, HK 91/93/94s, SKSs, Kel Tec rifles, Thompsons, and even Ruger 10/22s in certain configurations. In contrast, the Washington Post-Ipsos survey specifically asks only about “AR-15 style rifles” and semi-autos “built on a common AR-15 platform,” which would exclude all of the styles of rifle listed in the previous sentence. It’s important to emphasize that these rifles are likewise banned under most assault weapons bans (see for example the Maryland,¹⁴ Illinois,¹⁵ and California¹⁶ definitions), and therefore it is essential to measure their popularity as well, not only the

¹³ <https://www.washingtonpost.com/tablet/2023/03/26/sept-30-oct-11-2022-washington-post-ipsos-poll-ar-15-owners/>

¹⁴

<https://mdsp.maryland.gov/Organization/Pages/CriminalInvestigationBureau/LicensingDivision/Firearms/FirearmSearch.aspx>

¹⁵ <https://isp.illinois.gov/StaticFiles/docs/Home/AssaultWeapons/PICA%20Emergency%20Rule%20Register.pdf>

¹⁶ <https://oag.ca.gov/firearms/regs/genchar2>

popularity of the AR-15, which is but one instance of the many types of firearms banned by these laws.

A similar problem confronts Azrael et al.'s use of the National Shooting Sports Foundation's estimate as an upper bound for the number of such rifles that could be in private hands. The NSSF estimate only reports Modern Sporting Rifles (AR and AK platform rifles¹⁷) manufactured between 1990 and 2020, finding that 24.4 million have gone into the US domestic market during this period. Given that firearms that state laws classify as "assault weapons" have been sold in the US for over a century, 24.4 million must be understood as a lower limit, not an upper limit. Just to take one example, over six million M1 carbines were produced by 1945,¹⁸ a large number of which ended up in US civilian hands¹⁹ through the Civilian Marksmanship Program.²⁰ The NSSF data also does not include over two million privately made firearms that the ATF estimates have entered circulation, largely through kits that enabled individuals to make AR-15's using unfinished lower receivers.²¹ Using 1990 as a starting date, and focusing on AR and AK platform rifles, will significantly underestimate the number of firearms owned that are now classified as assault weapons by various states.

Finally, Azrael et al cite a study co-authored by Azrael and Miller (with Berrigan, 2023) in which they used a survey company to estimate that 23 million "military-style rifles" were in civilian hands in 2019. However, upon examination, the design of this survey suffered from a glaring problem: respondents who indicated owning rifles were forced to put them in mutually exclusive categories, and these categories included both "semi-automatic military-style rifles" and "semi-automatic hunting rifles." Given that these categories do not actually correspond to firearm models, and that a wide range of AR and similarly styled rifles can be and are used for hunting, there is no reason to believe that a large number of "semi-automatic hunting rifles" would not qualify as "assault weapons" as defined by most state bans. Strikingly, in addition to

¹⁷ <https://www.nssf.org/articles/commonly-owned-nssf-announces-over-24-million-msrs-in-circulation/>

¹⁸ <https://www.rjmilitaria.com/the-m1-carbine-a-brief-history/>

¹⁹ <https://www.wearethemighty.com/mighty-history/u-s-government-sold-nearly-a-quarter-million-illegal-rifles-to-citizens/>

²⁰ <https://www.gao.gov/products/gao-19-555r#:~:text=Since%201996%2C%20the%20Army%20has%20transferred%20more%20than%20700%2C000%20surplus,45%20caliber%20handguns>

²¹ <https://www.atf.gov/firearms/docs/rulemaking/ria-final-rule-2021r-05f-definition-frame-or-receiver-and-identification>

the 23 million “military-style rifles” in civilian hands, Berrigan et al., 2023 also found 22 million “Semi automatic hunting rifles” in civilian hands. Taken together, this means that this 2019 survey found that Americans owned 45 million semi-automatic rifles. Given that a small minority of semi-automatic rifles on the market today are not characterized as “assault weapons” by the standards of states like California, this survey ironically provides evidence largely consistent with my survey’s findings.

To be clear, my survey addresses the question of how many gun owners have owned AR-15 and similarly styled rifles commonly referred to as “assault weapons,” and how many they have owned. Because it’s possible that some respondents have sold or otherwise gotten rid of guns they owned, the survey does not provide an exact estimate of the total number currently owned. However, it does establish that these guns are popular among gun owners, having been owned by almost a third of them.

II. Defensive Gun Use Estimates

My survey finds that Americans use guns defensively about 1.67 million times a year: about 300,000 times a shot is fired, about 852,000 times the gun is only brandished, and about 518,000 times neither happens (e.g. someone said they had a gun and that made an aggressor flee).

Azrael et al contest these findings for three reasons. First, they inexplicably think that using a firearm to defend against an animal should not count as an instance of defensive gun use. Second, they point to other estimates of defensive gun use that are much lower, while neglecting to mention significant methodological flaws with those estimates. Third, they suggest that gun owners are not qualified to answer such questions and to make accurate determinations regarding whether they used a firearm in self-defense.

Azrael et al.’s assertion that we should not include animal threats in assessing the defensive value of firearms is perplexing on its face, and they do not provide any argument in support of this stance. They simply note “most surveys of this sort ask respondents to limit their response to DGUs against people.”

If a survey intends to evaluate how often firearms are used to defend against criminals, then this restriction would be appropriate. If a survey intends to evaluate how often firearms are used in self-defense, then this restriction would obviously not be appropriate. My survey aims to evaluate the latter, and any policy evaluation of the utility of firearms would be gravely defective if it did not count instances in which individuals defended themselves from animal threats.

Such threats are indeed real. Conover (2019) finds that “Over 47,000 people annually in the United States sought medical attention after being attacked or bitten by wildlife, and approximately 8 people died annually.”²² (This does not include over 68,000 people who sought medical assistance for zoonotic diseases, some 243 of which prove fatal on an annual basis.) Domestic animals also pose genuine threats. From 2011-2021 an average of 43 people were killed each year by dogs.²³ In some years these fatalities exceeded the number of people killed in public mass shootings!²⁴ Although my survey was not designed to characterize defensive gun use against animal threats in detail, it does document such incidents among the small number of optional free response entries that respondents provided in characterizing situations in which 11+ magazines would have been valuable for a defensive situation they experienced.

There is simply no reason to exclude defensive gun use against animal threats in evaluating the overall defensive value of firearms and providing a comprehensive calculation of defensive gun use. One might speculate that Azrael et al. desire to exclude these defensive gun uses because they would prefer lower DGU estimates. In any case, they offer no argument for this exclusion beyond the pedantic deferral to the way that some other surveys have approached the question.

As for Azrael et al.’s preferred DGU estimates, they cite the National Crime Victimization Survey (NCVS) as “the largest and in some ways highest quality survey on this subject,” noting that it finds DGU rates 20 times lower than my estimates. However, this survey suffers from severe methodological problems. As a RAND summary of DGU literature explains, “In the NCVS, questions about defensive or self-protective actions are asked only of those who

²² Conover, Michael R. (2019) "Numbers of Human Fatalities, Injuries, and Illnesses in the United States Due to Wildlife," *Human–Wildlife Interactions*: Vol. 13: Iss. 2, Article 12.
DOI: <https://doi.org/10.26077/r59n-bv76>

²³ <https://www.cdc.gov/mmwr/volumes/72/wr/mm7236a6.htm>

²⁴ <https://www.motherjones.com/politics/2012/12/mass-shootings-mother-jones-full-data/>

first reported that they had been the victims of certain personal contact crimes—even if those crimes had not been completed.”²⁵ It’s of course unclear why those who successfully used a firearm to deter a crime would consider themselves to be victims of a crime. Thus, the survey suffers from the logical problem that only individuals who were unsuccessful in using a gun to prevent a crime being perpetrated against them are the ones who are likely to be counted.

A second issue is that “respondents in several other categories [not included in the list of major contact crimes] are not given the opportunity to report defensive action.” Finally, “the NCVS does not ask directly about gun use. Rather, it simply asks the respondents to indicate what, if anything, they did in response to the crime.” Many respondents may not interpret this as an invitation to report the defensive use of a firearm. Moreover, given that this survey is conducted by the Justice Department using promotional materials labeled as government forms and that using a gun in self-defense can create legal jeopardy, respondents may reasonably judge that mentioning the defensive use of a gun can only work to their detriment, and thus exclude any mention of such incidents out of rational self-interest.

In again defending the NCVS as an authoritative source for estimating DGU’s in the final pages of their paper, Azrael et al. arguably misrepresent how the survey works, claiming: “If the respondent reports being robbed, threatened, assaulted, burglarized, or otherwise victimized while present at the scene, there are follow up questions about whether and how they responded. One option is that they used a gun in self-defense.” This “option” is not in fact an option presented to respondents, as the survey is conducted as an in-person (or phone) interview. There is not a battery of choices for respondents to choose from, among which “gun” is listed. Rather, the interviewer simply asks the open-ended question “What did you do?” If the respondent volunteers that they used a firearm in self-defense, there are places on the form for the interviewer to record firearm related answers, but these are not options presented to respondents.²⁶

Azrael et al. argue that the only alternative to the approach taken by the NCVS is to require those who indicate a DGU to “provide some detail regarding the sequence of events.” In fact, my survey did ask respondents to answer detailed questions regarding each defensive

²⁵ <https://www.rand.org/research/gun-policy/analysis/essays/defensive-gun-use.html>

²⁶ https://bjs.ojp.gov/content/pub/pdf/ncvs22_cir.pdf

incident with regard to where it took place, the number of assailants, whether shots were fired and, if so, how many, and the type of firearm used. Azrael et al. seem to assume that respondents cannot be trusted to understand and answer questions about defensive gun use, but rather they must prove such answers through some longer narrative reporting process. Naturally, the more extensive this process, the more of a barrier one erects to reporting such incidents.

Azrael et al. proceed to express vague concerns that respondents cannot be trusted to remember if they have ever used a firearm in self-defense. They suggest that for rare events there is a far greater opportunity for false positives and cite in support of this claim Hemenway's 1997 article "The Myth of Millions of Annual Self-defense Gun Uses: A Case Study of Survey Overestimates of Rare Events." However, my survey was explicitly designed to not be vulnerable to the critique that Hemenway articulates in that paper.

In brief, Hemenway's entire argument in that paper is predicated on there being a limited time horizon for which a respondent is asked to recall a rare event. His argument regarding recall bias only makes sense in such a context. The gist of his argument is that if someone is asked whether they defended themselves with a firearm in the last year, the relatively rare event of a DGU may be vivid in someone's memory (indeed rare, dramatic events often are), but the precise timing of the event is likely to be harder to recall. Particularly if an event happened close to a year ago - say 13 months ago - a respondent is likely to recollect it as an event from the past year, even though it is technically beyond the one-year threshold. This is understandably a problem if researchers want to extrapolate out to population wide estimates, as more rare events will be reported as having occurred within a twelve-month period than actually did, leading to inflated estimates of the frequency of these rare events.

This critique is plausible and it is the reason that my survey did not ask about DGU's within a restricted window of time, but rather asked if a respondent had ever used a firearm to defend themselves. This does not create a mechanism for inappropriate inflation if a respondent misremembers the precise date that a DGU occurred. It simply assumes that using a firearm in self-defense is a memorable life event (and to the degree it isn't, that would only lead to underreporting of DGU's). Amazingly, Azrael et al. later criticize my survey on page 16 of their SSRN draft for *not* adopting the method (of a limited time period) explicitly criticized by Hemenway.

The paragraph by Azrael et al. that follows the Hemenway citation is the most poorly reasoned in the entire article. It is worth reproducing in full:

All attempts to validate published estimates that there are millions of DGUs each year have led to absurd conclusions. If the descriptions of the respondents were accurate, gun owners would be saving from homicide more than 20 times the number of people who are actually murdered each year; they would be shooting more assailants than the number of gunshot wounds seen in all medical care institutions (and the morgue), and would be protecting themselves against more than 100% of the burglaries of gun owning homes in which there was someone awake during any part of the event.

These obtuse inferences would depend on the following logical implications: a) every time a gun is used defensively it prevents an imminent homicide, b) if someone fires a gun in self-defense the assailant is shot, c) burglaries exhaust the scenarios that give rise to defensive gun use. Just to illustrate the infirmity of what many regard as Hemenway's most persuasive argument on this topic, consider how many gunshot victims we might reasonably expect to see in emergency rooms and morgues based on my survey results and actual knowledge of how armed confrontations play out in the real world.

My survey estimates that Americans discharge a firearm in about 300,000 DGU's a year. Hemenway mistakenly concludes that the number of people shot should be close to this amount. In fact, however, we should only expect that an aggressor was hit in a small fraction of those cases. This is for two reasons: a) numerous studies have shown that when police fire their guns they miss in the vast majority of cases (the NYPD only hit 15% of their targets one year that a study was done).²⁷ b) unlike police officers whose job is to apprehend or neutralize dangerous criminals, victims of crime generally need only scare off their attacker to end a confrontation. Indeed, in support of this expectation my survey finds that, among those who do fire their gun, the modal number of shots fired is one. Finally, police should presumably be highly trained professionals, while the average gun owner is not.

²⁷ Donner, Christopher M., and Nicole Popovich. "Hitting (or missing) the mark: An examination of police shooting accuracy in officer-involved shooting incidents." *Policing: an international journal* (2018). <https://www.emerald.com/insight/content/doi/10.1108/PIJPSM-05-2018-0060/full/html> See also, <https://www.ajc.com/blog/get-schooled/gunfights-trained-officers-have-percent-hit-rate-yet-want-arm-teachers/mDBlhDtV6Na4wJVpeu58cM/>

Given the skill difference and the defensive/deterrent nature of DGU's it would be entirely reasonable to expect that ordinary people connect with their target an order of magnitude less, which would put the number of gunshots caused by DGU's in the range of 3,000-6,000 assuming a 1-2% hit to shots fired ratio (of course fatalities would be much lower, and criminals with less serious wounds could be expected to try to avoid hospital admissions if possible). Given that prominent gun control advocacy organizations claim that 76,725²⁸ people survive gun injuries each year in the U.S. (although some peg it at about half that²⁹) and that there are a non-negligible number of justified homicides (although poorly tracked³⁰), these DGU estimates are easily consistent with the larger picture of firearms injuries and deaths.

Returning to the issue of whether to limit DGU reports to a limited window of time, which Hemenway had previously criticized, but Azrael et al. now seem to think is the only proper methodology, their paper raises questions about how to average the DGU responses of those from different age cohorts. They are concerned that the "life years" of the elderly are relatively underrepresented, in the sense that everyone in the survey is reporting any DGU that happened when they were young, while only the smaller subset of older respondents can report DGU's that happened when they were old. Azrael et al. are also concerned that there could be cohort effects, such that older groups had a different experience when they were young compared to today's younger groups.

These are thoughtful reflections that would need to be taken into account if one wanted to calculate the DGU's for the most recent survey year with the greatest accuracy. However, these considerations are not material if one aims to provide an average estimate of the annual DGU's represented in survey responses over the lifetimes of those in the survey. Put another way, the raw responses in the survey represent 50 million total DGU's in the larger U.S. population among those who were adults in 2021. It's a secondary issue how one believes these experiences ought to be allotted on an annual basis over the life years represented in the survey (i.e. how they were accumulated year by year). The average amount works out to 1.67 million per year, but this

²⁸ <https://brady-2-stage.s3.amazonaws.com/5YearGunDeathsInjuriesStats-Jan-2021.pdf>

²⁹ <https://www.gunviolencearchive.org>

³⁰ <https://scholarship.law.ufl.edu/cgi/viewcontent.cgi?article=1431&context=jlpp>

of course need not be uniform across all years. However, given how averages work, if they were greater in some years, they would be less in others.

If we want to assess the utility of firearms for self-defense in the U.S. context, examining DGU's on a lifetime basis is the superior approach. This is the case, both because of the possible inflation problem with specifying a limited time period for reporting DGU's, as Hemenway pointed out, but also because we want to assess this utility over an extended time, and not only a particular year in which crime may be waxing or waning.

Finally, whether the considerations articulated by Azrael et al. would make a difference for generating more accurate point estimates of DGU's in the most recent year is entirely an empirical question. It deserves further investigation, but preliminary analysis suggests it actually may not because cohort effects cancel out age effects. Azrael et al. argue that my sample both oversamples older cohorts and over represents "younger" life years. However, these effects largely balance each other out, as it appears that 80-year-olds passed through their "most active DGU years" during a time when crime was extremely low, and therefore they accumulated fewer DGU's. Thus, the average of the old and the young taken together approximates the average of the middle aged.

Incidentally, Azrael et al. also falsely assert that "18–20-year-olds in his sample reported more than half (54%) of the total number of lifetime DGUs reported by all age groups combined." This is wildly inaccurate. The breakdown of total DGUs reported by age cohort is as follows:

Age	Respondents	Total DGUs	DGUs per Respondent
18-20	671	590	0.88
21-25	971	878	0.90
26-30	1,119	902	0.81

31-35	1,988	1,379	0.69
36-40	2,173	1,560	0.72
41-45	1,524	1,077	0.71
46-50	1,163	766	0.66
51-55	1,123	529	0.47
56-60	1,264	618	0.49
61-65	1,310	525	0.40
66-70	1,236	398	0.32
71-75	672	220	0.33
76-80	259	78	0.30
Over 80	96	14	0.15
Total	15,569	9,534	

III. Magazines that Hold More than 10 Rounds

Azrael et al. spend a few brief paragraphs at the end of their paper attempting to dismiss the utility of magazines that hold more than 10 rounds for self-defense. Despite 48% of gun owners indicating that they own such magazines, and 62.4% citing home defense as a reason for owning them, Azrael et al. judge that this does not make a credible case for their self-defense utility. This is apparently because in an optional free response section where gun owners could

describe actual scenarios that they have experienced for which such magazines would have been particularly useful, the 31 out of 550 responses reported there did not describe cases in which a firearm owner explicitly fired more than 10 rounds at a criminal assailant. Plenty of cases do describe multiple, violent criminal assailants, but absent narrative descriptions in which respondents reported successfully firing more than 10 rounds at them, Azrael et al. find no reason to think that having the capacity to do so would be useful. I leave it for the judicious reader to consider whether being able to fire more than 10 rounds without reloading would or would not be useful in defending against multiple violent assailants.

V. Other Criticisms of the Survey Findings.

Given the thoroughness of Azrael et al.'s critique and their reputation as distinguished scholars who have strong policy preferences in tension with the findings of this survey, it is worth calling attention to what their review does not find problematic.

When a member of their team reached out to me this past April inquiring about my survey, he wondered in particular whether screening questions were used beyond the firearms ownership question and the collection of demographic data. I was happy to be able to immediately send him the public link to the survey data, and to assure him that there were no selection gimmicks. Apparently, Gary Kleck also raised a question in some venue regarding whether my survey sample was representative or whether it was a self-selected, convenience sample. As explained at length at the outset of this piece, the sampling of the survey, which was done by an independent professional survey firm, was indeed highly representative across Census demographics. Weighting was employed to correct for minor imbalances, but the magnitude and effects were minimal. By all measures, the sample was large and representative of the U.S. adult population. Arguably, the major innovation of this survey was that it asked updated questions regarding the ownership and use of firearms that had been neglected by the literature and it did so with a large enough sample so as to provide statistically informative insights across all 50 states.

I have already noted above that the ownership rates documented by the survey align with the results of multiple recent surveys conducted by Pew and Gallup. Another prominent independent survey that aligns with my results regarding the total number of firearms owned is the latest wave of the Small Arms Survey. Conducted in 2017, it estimated that Americans owned 393 million firearms.³¹ My work conducted four years later, after the largest gun buying spree on record during which some 23 million people bought guns,³² found 415 million.

While the *New York Times* sought to portray the wording of some questions in my survey as leading, as explained above there was a strong rationale for this wording, as it provided an intelligible explanation to respondents as to why sensitive questions were being asked and avoided language that could alienate respondents in a context where the overriding methodological concern in the literature is under reporting by firearms owners.

Moreover, the survey was designed so that respondents submitting suspiciously large answers could be detected and controlled for. Responses to ownership questions were unconstrained, so if a respondent desired to skew results by entering an implausibly large number, they could submit that number. However, by examining distributions of responses, I could characterize and detect implausible outliers, which allowed me to exclude those suspect responses through a transparent methodology. This applied to only a fraction of a percent of responses (approximately 0.2-0.3%), but was invaluable for ensuring the integrity of the overall ownership estimates.

Louis Klarevas, a researcher at a teacher's college who was paid by the state of Illinois for his critique of the survey, criticized this approach, arguing that this makes "assault weapons" and 11+ magazines appear to be more widely owned. He doesn't seem aware of the fact that if these answers were included, this would also massively inflate the estimate of the total number in circulation, making them appear even more common!

Klarevas admits that he realizes that some of these responses must be exaggerated and cannot possibly be true. However, he provides no principled methodology for dealing with the handful of such responses. In fact, discarding outliers that fall well beyond the normal

³¹ <https://www.smallarmssurvey.org/sites/default/files/resources/SAS-BP-Civilian-Firearms-Numbers.pdf>

³² <https://web.archive.org/web/20230314122248/http://smallarmsanalytics.com/v1/pr/2021-01-05.pdf>

distribution of responses due to suspicion of them being untrue, is a common, sound, and appropriate methodological approach.³³

Klarevas own analysis of the outlier issue is particularly sloppy and mistaken. He acknowledges that out of the approximately 2,200 respondents who provide data regard the number of AR-15 and similarly styled “assault weapons” that they own, only 14 indicating owning more than 100. Klarevas further admits that it would be proper to exclude two respondents who respectively indicated owning “1 million and 69,420” such rifles, as he judges that those answers cannot be true. However, among the other respondents, he inexplicably does not suggest excluding someone who entered 100,000 (Klarevas’s analysis suggests that perhaps he missed this response?). The other 11 respondents indicate owning: 159, 200, 455, 200, 108, 243, 150, 246, 124, 1,000, 433.

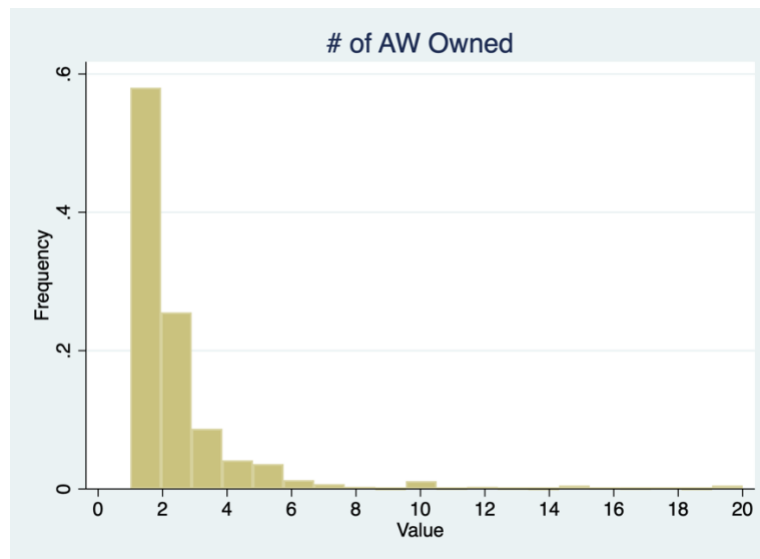
In place of the respondent who entered 100,000, Klarevas also apparently included someone who entered “100+” as a non-numerical response. In a footnote, Klarevas notes that 147 respondents entered non-numerical narrative responses, which were not included in my analysis. Most of these responses were commentaries on the question, such as “None of your business,” “As many as I want!,” “Not enough,” “Not needed to know what I own I agreed to say I do own a gun,” model numbers of particular guns owned “AK-47,” “Had an M-1 Carbine, .30 cal.,” “XM8,” “AR-15,” or non-specific “Numerous,” “30+,” “Enough.” By hand coding these responses, Klarevas estimates that that they indicate an additional 172 rifles. However, this apparently involves him interpreting the two answers of “100+” and “30+” to constitute most of this count, and it appears that he also erroneously counted some pistol and shotgun models that were listed. There are only three respondents that provide an answer with an unambiguous numerical interpretation (namely “one”), but given the heterogeneity and ambiguity of narrative responses they were understandably not included in my analysis.

Klarevas’s sensational claim that respondents who entered suspiciously high ownership numbers “account for ownership of 37.1% of all AR-15-style rifles” is driven, in particular, by his inclusion of the extreme outlier who indicated owning 1,000 such rifles. Again, if one believes that the handful of extremely high numbers entered by a dozen or so respondents are

³³ Barnett, Vic. "Principles and methods for handling outliers in data sets." *Statistical Methods and the Improvement of Data Quality*. Academic Press, 1983. 131-166.

indeed true and representative, then this would also mean that the number of such rifles in circulation is much higher and that these rifles are even more common!

Given the distribution documented in the rest of the sample, however, it seems clear that these responses are not representative. I reproduce below a histogram of responses, which shows a very clear distribution with a tail that tapers off at around the 10-rifle mark. Again, thoughtful readers can make their own conclusions. If one believes that a handful respondents out of ~2,200 who purported to have own hundreds or thousands of AR-15 and similarly styled “assault weapons” are representative, then this suggests a far greater number in circulation. Conversely, if one believes that the statistical distribution below that is documented among the other 99.7% of respondents is more likely to be representative, then my approach is the correct one and Klarevas’s conjectures are clearly mistaken. The same critique and conclusion also apply to Klarevas’s identical criticism of magazine ownership numbers, for which again the 0.2% of implausibly high responses are excluded.



Klarevas also criticizes the survey results for finding that there are gun owners currently located in jurisdictions that ban or restrict the ownership of “assault weapons” and 11+ magazines who report having owned such items. Since the questions explicitly asked respondents to include weapons and magazines that they have owned in the past and which they

may have moved to a different state in order to be compliant with local restrictions, there is nothing inconsistent with finding that such items have been commonly owned, even by those who are currently in restrictive jurisdictions.

Klarevas apparently misunderstands an interesting finding that I highlight regarding of the ownership of such items in highly restrictive jurisdictions like DC. On the one hand I find that a relatively small percentage of DC residents own firearms. However, amongst the small percentage who are gun owners, they indicate having owning “assault weapons” and 11+ magazines at relatively high rates. My interpretation of this result is that if someone in DC wants to be gun owner, the barriers to doing so are relatively high, and thus only the most motivated “gun enthusiasts” are likely to be gun owners within the District. Moreover, DC is a highly transient place, with Census data suggests that about 70% of adult residents in DC are not originally from the area.³⁴ It should be no surprise that gun owners who move into the area report having owned such items in the past or having storing them in other states. Incidentally, Klarevas falsely asserts that “neighboring Maryland also restricts LCM possession” – in fact Maryland does not restrict the possession of such magazines.³⁵

Klarevas also bizarrely claims that my survey weighting scheme was not disclosed, when in fact I clearly describe the procedure in my working paper and provide the Census Based Weighted Proportions in Appendix B of the working paper. All that weighting involves is running the Stata command “ipfweight” with the demographic variables and Census based weights that I list. I suspect that Klarevas simply doesn’t understand how weighting techniques work.

Finally, among the more ridiculous claims that Klarevas advances is his assertion that the survey was somehow “unethical” because respondents were informed at the outset that they would be asked questions “about outdoor recreational activities and what can be done to encourage them, along with questions concerning public policies that affect these activities” and because survey funding wasn’t specified at the working paper stage.

Given that the *Times* already devoted so much attention to the funding topic, that objection is moot at this point, but it is important to emphasize that funding is typically disclosed

³⁴ <https://www.dcpolicycenter.org/publications/which-areas-have-the-highest-share-of-d-c-born-residents/>

³⁵ <https://www.marylandshallissue.org/jmain/counselor-s-corner/315-md-mags>

at the journal submission stage in academic contexts. Moreover, although psychology researchers frequently use deception in survey experiments, and there is nothing unethical in doing so, my survey did not use deception as it in fact asked about “outdoor recreational activities and what can be done to encourage them.” The very first question of the survey was explicitly about how best to encourage outdoor recreational opportunities; and, as my survey responses make clear, the majority of gun owners indicate that recreational target shooting is a purpose for which they own firearms. Moreover, given that shooting is an outdoor recreational activity, the survey also truthfully foreshadowed that some questions would be related to “public policies that affect these activities.”

This overview was phrased so as to be ideologically neutral, which is an important methodological consideration. Had the intro to the survey advertised it as something that would be of interest to firearms owners or enthusiasts, this would have generated a methodological concern that there could be some selection/response bias, as those without such interests might not proceed to take the survey. The neutral and broad survey description I employed is clearly the methodically superior to approach in a context where we want to make sure that respondents are not self-selecting into a survey based on narrow topical interests.

VI. Why Has this Survey Provoked Such a Response?

The National Firearms Survey I fielded in 2021 is a remarkably simple and straightforward social science research project. Americans from a large representative sample were asked a series of questions about their ownership and use of firearms by an independent, professional survey firm. The company provided me with the data, and I summarized the responses.

My results align almost perfectly with other major national surveys like Pew and Gallup, and I have a strong claim to external validity with regard to the 2017 Small Arms Survey and publicly reported sales estimates since 2017. Even my DGU estimates of 1.67 million per year, which Azrael et al vigorously dispute, align squarely with prior findings in this hotly contested literature. As noted in a 2013 National Academies report, commissioned by the Centers for

Disease Control and Prevention during the Obama administration, “Almost all national survey estimates indicate that defensive gun uses by victims are at least as common as offensive uses by criminals, with estimates of annual uses ranging from about 500,000 to more than 3 million.”³⁶

The main contribution of this survey to the scholarly literature is that it asks basic questions about the ownership of AR-15 and similarly styled “assault weapons” and 11+ magazines that have been curiously under studied by many other major survey projects, and it does so with a sample that is so large that it provides statistically informative insights across all 50 states.

Azrael et al. have done a considerable service by articulating the best scholarly objections they can develop of this survey. As I have argued above, these criticisms are relatively mild and unpersuasive. However, even if one were to be persuaded of these criticisms, the effect they have on the overall picture that emerges from my survey and multiple other sources regarding the popularity of AR-15 and similarly styled semi-automatic rifles and 11+ magazines and the reasons that people cite for owning them is minor and not material to the major public policy and legal debates that I’m aware of.

This only deepens the question, then, of why ideological advocates in concert with the *NYT* and a number of AG’s offices have waged such an aggressive campaign against me and this research. One worry, which is exemplified by the expert report submitted by Klarevas in Illinois, is that advocates are being forced to take increasingly untenable positions, denying that some of the most popular firearms in America are widely owned and sought after for lawful purposes, including self-defense. Having to retreat to increasingly extreme ground can lead advocates to view the most basic facts as enemies.

Ultimately, the survey results are what they are. To the degree that people have problems with the results of this survey, their problem is not with me but with what a large proportion of gun owners in America say and do.

³⁶ <https://nap.nationalacademies.org/read/18319/chapter/3#15>