Do Armed Civilians Stop Active Shooters More Effectively Than Uniformed Police?*

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Abstract

The FBI tracks active shooting cases—where individuals attempt to kill people in public places, excluding those tied to robberies or gang violence. This study is the first to systematically compare how uniformed police and civilians with concealed handgun permits perform in stopping these attacks. We find that civilians with permits reduce the number of victims killed, the number wounded, and the total number of casualties more than responding police officers do. They also stop the attacks more frequently and face a lower risk of being killed or injured than police. We also provide evidence that these numbers significantly underestimate the advantages of civilians over officers in stopping these attacks. We find that officers who intervened during the attacks were more likely to be killed or injured than those who apprehended the attackers later. We explore the implications of two possible identification problems. There is some evidence that Constitutional Carry laws reduce deaths and injuries from active shooting attacks.

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"A deputy in uniform has an extremely difficult job in stopping these attacks. These terrorists have huge strategic advantages in determining the time and place of attacks. They can wait for a deputy to leave the area or pick an undefended location. Even when police or deputies are in the right place at the right time, those in uniform who can be readily identified as guards may as well be holding up neon signs saying, 'Shoot me first.' My deputies know that we cannot be everywhere."[1]

-- Sheriff Kurt Hoffman of Sarasota County, Florida.

1. Introduction

Since 2000, the FBI has tracked active shooting cases, defined as an event where one or more individuals attempt to kill people in a public place, excluding shootings tied to robberies, gang violence, or other crimes. An active shooting could be as simple as a single shot fired at a lone human target, even if the shooter misses, to a mass shooting with many casualties.

Yet, while this data has been collected by the FBI, there have been no studies by the FBI nor academics that systematically examined these data or police performance in stopping these attacks. In this paper, we compare police with the alternative: civilians who have permitted concealed handguns. Comparisons can be made in the rate that armed citizens stop attacks, whether they increase or decrease the number of casualties, whether they accidentally shoot bystanders, and whether the individuals attempting to stop the attack were wounded or killed by the criminal. A key strength of our research is to examine these factors when police and armed citizens face similar violent situations.

A literature has emerged on mass public shootings, which are similar to active shootings but limits attacks to where four or more people have been murdered (see, e.g., Blau et al., 2016, Duwe et al., 2002, Duwe, 2020, Kleck, 2016, 2020, Kovandzic et al., 2002, Gius, 2018, Lott and Landes, 2001, Lott, 2010). These studies have concentrated on attacks in places that allow people to carry permitted concealed handguns or other gun control laws. There have been no studies on the much broader set of active shooting cases and none that focus on the effectiveness of police in stopping either active shooting or mass public shooting attacks.

Most armed civilians won't receive the same level of training as police. As a result, they may make mistakes and accidentally shoot bystanders or interfere with law enforcement, and they won't necessarily stop every active shooter situation. It is possible that, on average, police might perform better in confronting active shooters.

[1] John R. Lott, Jr. and Thomas Massie, "Another Mass Shooting in a 'Gun-Free Zone'," Wall Street Journal, August 28, 2025.

But the right comparison isn't against perfection. As noted in the above quote by Sheriff Hoffman, police officers often face tactical disadvantages because they usually arrive after the shooter has opened fire and their uniforms make them easy targets. It is simple economics in that attackers face lower costs of avoiding those in uniforms or in knowing who to shoot first. Attackers who spot a uniformed officer can simply wait until the officer leaves, choose a different venue, or strike the officer first — knowing that the officer is definitely armed.

These tactical disadvantages explain why air marshals don't wear uniforms on airplanes. Ideally, we would compare outcomes between uniformed and plainclothes or off-duty officers, but the sample of non-uniformed cases is too small—only two such incidents exist. When attackers can easily identify who might stop them, they are more likely to shoot that person first.

Civilians, by contrast, can intervene anywhere they are allowed to carry concealed weapons before an attacker notices them. They also outnumber on-duty police officers by a wide margin. In 2024, 21.5 million Americans—about 8.2% of adults—held concealed handgun permits (Lott et al., 2024). In addition, 29 states allowed Constitutional Carry, which requires no permit at all. Surveys show that 7.2% of likely voters carry all the time, and another 8.4% carry some of the time.[2] On the other hand, there are roughly 671,000 full-time sworn law enforcement officers in 2020.[3] If only a third are on duty at any given time, that leaves less than 240,000 officers to protect a population of 340 million—less than 0.1% of the population.

Even though police may have more training and experience, uniformed officers face greater risks and challenges. They are less likely to be near an attack when it occurs, and when they are, they are more likely to be targeted and killed. This paper is the first to compare outcomes in active shooter events based on whether armed civilians or police intervened.

2. Data

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[2] McLaughlin & Associates, "National – Crime Prevention Research Center, General Election Voters," August 22, 2023.

[3] Sean E. Goodison, Local Police Departments Personnel, 2020, Bureau of Justice Statistics, November 2020 (https://bjs.ojp.gov/sites/g/files/xyckuh236/files/media/document/lpdp20.pdf). Connor Brooks, Primary State Law Enforcement Agencies: Personnel, 2020, Bureau of Justice Statistics, January 2024 (https://bjs.ojp.gov/document/psleap20.pdf). Connor Brooks, Federal Law Enforcement Officers, 2020 – Statistical Tables, Bureau of Justice Statistics, September 2022 (https://bjs.ojp.gov/document/fleo20st.pdf).

The FBI collects data on "active shooter" incidents; that is a situation where one or more individuals actively engage in killing or attempting to kill people in a public area.[4] The FBI excludes gang and drug-related violence as well as other criminal acts such as a robbery, to focus on cases where an attacker's sole goal is to murder people in a public place such as mall, school, or outdoors. Since law enforcement agencies do not collect such data in crime reports, the FBI worked with the Advanced Law Enforcement Rapid Response Training Center at Texas State University to collect these cases from news reports. Research done at the Office of Justice Programs and Office of Legal Policy, U.S. Department of Justice points out that while the FBI generally does a good job of identifying active shooting cases and catches all the cases where law enforcement stopped attacks, the research found that the FBI missed some news reports on cases where civilians stopped attacks and misidentified others (Lott, 2021a).[5]

We rely on the work done at the U.S. Department of Justice to fill in these missing cases for civilians who stopped attacks, but the Crime Prevention Research Center (CPRC) has filled in the missing data for many more of these cases from 2014 through 2024. The FBI claims that there were 350 active shooting cases over those years, but our data show that there were 562 – the difference almost completely involving additional active shooting incidents stopped by civilians. The CPRC used Nexis searches and defensive gun use cases from the Heritage Foundation, Defensive Gun Use Tracker, Gun Violence Archive, the American Rifleman, and Reddit that met the FBI's definition of an active shooting.[6]

They checked all those sources to see if they had cases that confirmed to the FBI's definition of active shootings, but only a small fraction of these cases met that definition.[7] For example, over the five years from 2019 to 2023, the Heritage Foundation identified 3,872 defensive gun uses. The Gun Violence Archive, in a list that doesn't

[4] "Active Shooter Incidents in the United States in 2023," Federal Bureau of Investigation, U.S. Department of Justice, Washington, D.C., 2024, p. 1 (https://www.fbi.gov/file-repository/2023-active-shooter-report-062124.pdf/view). See also https://www.fbi.gov/how-we-can-help-you/active-shooter-safety-resources

[5] See also Lott (2015) for a discussion on pre-2014 data by the FBI and Texas State University.

[6] The keywords in Nexis and Google news searches included "murder" or "murdered" or "murders" or "wounded" and "gunfire," "shot," "shots," or "active shooting."
https://twitter.com/DailyDGU
- https://www.dailysignal.com/author/amy-swearer/
- https://datavisualizations.heritage.org/firearms/defensive-gun-uses-in-the-us/
- https://www.gunviolencearchive.org/
- https://www.americanrifleman.org/armed-citizen
- http://www.gooddiggin.com/-ramblings--smiles/stories-from-june-of-law-abiding-citizens-who-chose-not-to-become-just-another-victim
- https://www.reddit.com/r/dgu/

[7] So that people can check, the cases along with links to the news stories are available here (https://crimeresearch.org/2024/07/updated-cases-where-armed-citizens-have-stopped-active-shooter-incidents/).

contain all the same cases over the nine years from 2015 to 2014, has 14,514 defensive gun uses. As with the Texas State University data, all these cases were based on news reports. News reports are increasingly being used in academic research, see e.g., Kleck (2020) and Viscusi and Blasinsky (2022). Our data set is as close to a complete collection of active shooter incidents as we can make it.

ChatGPT evaluated whether the CPRC's identified cases met the FBI's definition of active shootings.[8] Except for three cases marked as "borderline," all were clearly included under the FBI's criteria.[9] The borderline cases initially raised questions because the FBI often excludes incidents stemming from domestic or dispute-driven motives. However, in each of those cases, multiple uninvolved individuals were endangered in a populated area—conditions that match the FBI's written definition of an active shooter. ChatGPT therefore determined that all CPRC-documented cases qualify as active shooter incidents. As a robustness check, we reran the estimates excluding the three borderline cases, but this adjustment produced no discernible change in the results.

The FBI and additional data we collected indicate that, if police officers are the first responders to an attack in progress, there are several possible outcomes. The most common is that the perpetrator is killed or apprehended by police at the site or commits suicide after the police arrive. Other possible outcomes are that the shooter commits suicide before law enforcement arrive, the shooter is apprehended after the attack at a different location, the shooter remains at large, or armed or unarmed citizens or armed or unarmed security guards kill or subdue the attacker. Armed citizens are credited with stopping the attack if the shooter is killed or otherwise subdued by the armed citizen. Armed security guards are characterized as police because they have uniforms and openly carry firearms, which make them easily identified by potential shooters.[10]

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[8] Ibid

[9] The three "borderline" cases were: South Fulton, Georgia (April 2022) – a dispute-driven shootout at a community rally; Phenix City, Alabama (April 2022) – a targeted business dispute where others were endangered; and Colonial Heights, Tennessee (February 2019) – a domestic motive at a dentist office where staff/patients were in danger.

[10] We had to make a number of decisions in categorizing these cases. For example, the following case was credited to the police for making the arrest in another location, even though the shooter was deterred by an armed citizen. On October 23, 2017, at 11:23 a.m., Alan Ashmore, 61, armed with a shotgun and a handgun, allegedly began firing into several homes and a vehicle in Clearlake Oaks, California, killing two people, including his father, and wounding one. The shooter then shot and wounded a responding law enforcement officer before fleeing in his vehicle. The shooter drove to a nearby gas station and exchanged gunfire with the vendor, who possessed a valid firearms permit. He then fled the scene in his vehicle and drove to another gas station where he fired more shots. Ashmore was eventually caught by a police roadblock.
https://abcnews.go.com/US/california-shooting-spree-suspect-talked-killing-father-times/story?id=50705618

Neither law enforcement nor armed citizens are counted as stopping the attack if (1) the shooter commits suicide before they arrive, (2) leaves the scene before they arrive, or (3) is neutralized by unarmed citizens or unarmed security guards. If the shooter flees, he is either apprehended at another site or remains at large. These cases comprise the omitted class for comparison purposes.

There were no cases where both armed civilians and law enforcement were at the scene stopping attack at the same time. When armed civilians stop an attack, the police usually arrived well after the attack had ended. There is one case that comes very close to police being on the scene at the same time as civilians who were trying to stop an attack. On November 23, 2018, a civilian with a concealed handgun permit at a mall in Hoover, Alabama was attempting to aid a wounded civilian when he was shot by police, who happened to be in another part of the mall, after the attacker had fled.

Examples in the FBI active shooting data where the police responded but did not stop the attack include the following:

> On May 3, 2023, between 11:59 a.m. and 12:08 p.m., a male shooter, 24, armed with a handgun, began shooting people inside Northside Family Medicine and Urgent Care in Atlanta, Georgia. One person (patient) was killed; four people (two employees) were wounded. The shooter was apprehended by law enforcement at another location.
>
> On June 5, 2014, at 3:25 p.m., 26-year-old Aaron Rey Ybarra began shooting inside Otto Miller Hall at Seattle Pacific University in Seattle, Washington. As he reloaded his shotgun, a student pepper-sprayed and tackled him. The student, along with others, restrained Ybarra until police arrived. Ybarra killed one person and wounded three.
>
> On January 20, 2017, at 7:36 a.m., 17-year-old Ely Ray Serna began shooting inside West Liberty-Salem High School in West Liberty, Ohio. After assembling his shotgun in a bathroom, Serna shot a student who walked in and fired at a responding teacher. He also shot through classroom door windows. Eventually, Serna returned to the bathroom, where school staff confronted and subdued him. Law enforcement then took him into custody. He wounded two students but killed no one.

A complete list of cases where civilians have stopped active shooting attacks as well as links to the underlying news stories is available at the Crime Prevention Research Center.[11] For example

[11] Staff, "Updated: Cases where armed citizens have stopped active shooter incidents," Crime Prevention Research Center, https://crimeresearch.org/2024/07/updated-cases-where-armed-citizens-have-stopped-

> Around closing time at a suburban Indianapolis mall, a heavily armed gunman fired 24 times on a food court within 15 seconds. Several people were shot, three of them fatally. Almost as soon as the gunman began firing, a 22-year-old shopper with a concealed carry permit was able to shoot and kill him, stopping further bloodshed. No charges were filed against the armed citizen. Police say the good Samaritan had no police training or military background. Despite this, he was able to save countless lives.

> At the Gold Nugget nightclub in Panama City was closing, the suspect walked outside. After being locked out of the business and enraged over lost property, he got a firearm from his car and began firing into the club occupied by multiple patrons and staff. A patron who is a concealed weapon license holder intervened and fired multiple rounds, striking the suspect at least once. Officers said the patron's actions were determined to be in self-defense and the self-defense of others.

Researchers are increasingly relying on newspaper articles to create data sets, such as those compiled by the Gun Violence Archive, to study gun control. But these studies consistently overlook a key question: Do news articles reflect reality? The media's tendency to focus on dramatic incidents ties directly to the old journalism adage, "If it bleeds, it leads." For example, the media disproportionately cover defensive gun uses when the attacker is killed or wounded versus cases when a gun is simply brandished (Lott, 2021b).

Despite the well-known bias in news coverage, academic studies ignore how selective reporting distorts our understanding of gun violence. We address this issue of potential selection bias by comparing how the media covers civilian and police interventions in active shooter incidents. We start by assuming that when legally armed civilians and police face similarly violent situations—such as the same number of victims killed during an active shooting—the media will report both types of cases. To test that assumption, we analyze potential systematic biases in how the media covers the cases where civilians versus police stop active shootings.

The data set is an unbalanced panel dataset covering cities in nearly all states for the years 2014-2024. The lack of balance is the result of 284 cities having only one observation. We include state and year dummy variables to control for unobserved heterogeneity and robust standard errors to control for any heteroskedasticity. Section 5 provides several alternatives to address the unbalanced nature of this panel.

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active-shooter-incidents/ An Excel file that documents where attacks have occurred in places where permit holders are allowed to carry is available here https://crimeresearch.org/wp-content/uploads/2024/07/Cases-where-armed-citizens-have-stopped-active-shooter-incidents_2023-with-FBI-data-and-gun-free-zone-info_updated.xlsx

The dataset contains information on both police and armed citizen responses to active shooter events. The continuous and policy variables are summarized in Table 1. Binary and categorical variables are summarized in Table 2. We do not include the perpetrator in the number of victims killed, the number wounded, or the total number of casualties.

Table 1: Continuous variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Year	562	2020.15	2.73	2014	2024
Killed	562	1.63	4.18	0	58
Wounded	562	3.62	21.06	0	489
Casualties	562	5.24	24.06	0	547
Police officers killed	363	0.07	0.39	0	5
Police officers wounded	363	0.29	0.98	0	9
Constitutional carry law	562	0.29	0.45	0	1
Pct pop with right-to-carry permits	562	8.56	5.48	0	32.49
Population in 100,000 units	562	122.32	109.97	0.0005	394.38

Note: Vermont has had a constitutional carry law since it became a state, implying zero concealed carry permits.

Table 2: Binary and categorical variables

Variable	Frequency	Percent
Active shooting incident stopped by police	167	29.72
Active shooting incident stopped by armed citizen	199	35.41
Neither	196	34,88
Armed citizen outcome		
(Percentages based on armed citizens responding first, N=199)		
Mass shooting averted	58	32.22
Suspect fired first	115	63.89
Suspect with gun, armed citizen fired first	7	3.89
Shot wrong person	1	0.50
Killed wrong person	0	0.00

Interfered with police	0	0.00
Had gun taken away	0	0.00
Armed citizen injured	49	24.62
Armed citizen killed	2	1.01
Police outcome		
Percentages based on police responding first, N=167		
Suspect killed at the scene	133	79.64
Suspect apprehended later at another location	115	68.86
Suspect committed suicide after police arrive	34	20.36
Other	81	48.50
At least one police officer killed	19	11.38
At least one police officer wounded	51	30.54
Police officer killed by friendly fire	2	1.20
Police killed wrong person (civilian)	1	0.60
Police wounded wrong person (civilian)	2	1.20

Assuming our count is complete, armed citizens have stopped more active shooter incidents than the police have. Also, armed citizens do not appear to interfere with the police or blunder so badly as to get their weapon taken away by the shooter or kill the wrong person. In a later section we test the hypothesis that innocent bystanders are equally likely to be shot by an armed citizen as by a police officer. Finally, armed citizens have stopped 58 active shooter events which, according to the police, were likely to have escalated into mass public shootings.

3. Methodology

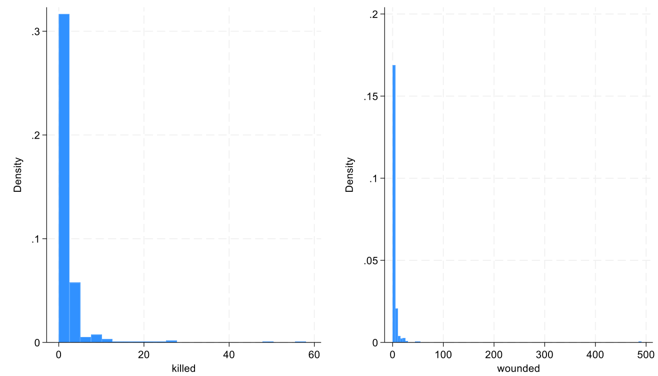
The identification strategy is straightforward. We have data on individual active shooter incidents. We exploit the exogenous variation of these inherently unpredictable active shooter events. Most individuals (85 percent) who legally carry a concealed weapon do so routinely.[12] Any encounter between the armed citizen and the active shooter is random with respect to both the shooter and the armed citizen. Thus, the probability that an armed citizen stops an active shooter is independent of the outcome of the event. Similarly, the police stand ready to respond to any active shooter event, which is randomly determined by the shooter, making the probability that they stop such a shooter independent of the outcome. As a result, there is no simultaneity between the dependent variable, for example the number of casualties, and the independent variables such as a dummy variable for an armed citizen stopping the shooting or a dummy variable indicating that the first responders were police officers.

All of the dependent variables in this study are limited one way or another by the granular nature of the individual observations. There are several choices that can be made concerning how to analyze such data. If the dependent variable is binary and we are willing to assume a normal approximation, then we can test that the difference between two probabilities is equal to zero using Stata's *prtest* command. If we are unwilling to make the normality assumption or want to use control variables, then we have to choose between probit and logit, with the attendant tradeoffs. Since the choice between probit and logit is somewhat arbitrary (Cameron and Trevidi 2010, pp. 459-479), we report the simple difference between two probabilities and consign the corresponding probit and logit results to the robustness section.

If the dependent variable consists of count data with a skewed distribution, like the number of victims killed in an active shooter event, then we use a negative binomial regression model, a generalization of the Poisson model which collapses to a standard Poisson if the mean and variance are approximately equal. (Cameron and Trividi 1998, pp. 59-85; Cameron and Trevidi 2010, pp. 567-581.) Figure 1 shows the histograms for the number killed and the number wounded in active shooter attacks.

[12] McLaughlin & Associates, "National – Crime Prevention Research Center, General Election Voters," August 22, 2023.

Figure 1: Histograms for victims killed and wounded



Obviously, both dependent variables are highly skewed with the majority of values close to or equal to zero with a small number of relatively large outliers. The mean number of victims killed is 1.63 while the variance is 17.5. The corresponding values for the mean and variance for number wounded are 3.6 and 21.1. These variances indicate very large, possibly significant, overdispersion leading us to choose the negative binomial model when possible. Casualties, being the sum of these two variables, will also have a skewed distribution.

The dataset is a highly unbalanced panel of states and years with many states represented with a single incident. We include state and year dummies to control for unobserved heterogeneity. We use robust standard errors to correct for heteroskedasticity. Clustered standard errors are not possible because many states have only one observation.

3.1 Potential unobserved confounders

With respect to potential omitted variable bias, it is necessary to ensure that the armed citizens face risks similar to those of police officers when confronting active shooter incidents. To make this comparison, we control for key factors such as the lethality of the shooter and the type of venue (school, business, open area, etc.). We suspect that more detailed planning and greater lethality in attacks correlate with factors such as the number of shooters, the variety and quantity of weapons, the attacker's age, and whether the attacker used explosives, body armor, or additional weapons like knives. Prior research (Lott, 2016, pp. 120–121) found that the deadliest mass public shootings often involved attackers carrying multiple types of firearms. By holding constant the attack's lethality, and the venue type, we aim to isolate and compare the actual risk each group of first responders face during these high-stakes encounters.

There are two other possible endogeneity problems, namely possible unmeasured cofounders and selection bias in what news stories the media reports. With respect to unmeasured confounders, armed citizens might choose not to engage the active shooter. There are a number of possible reasons for this behavior. For example, the first response for armed citizens who are accompanied by small children or others, is to get their wards to safety. Also, some armed citizens might not feel confident enough in their shooting skills to take on the shooter, others might feel outgunned or simply freeze. The result is that these cases are stopped by police. We do not know how many police cases could have been stopped by armed citizens who chose not to respond. Since we control for the lethality of the shooter with variables such as the number of guns, the type of gun, and the use of body armor, we expect that the cases that include non-responsive armed citizens are randomly associated with the number of killed and wounded and do not bias the estimates.

In addition, while such behavior is unobservable, we have considerable evidence that armed citizens do in fact respond by engaging potentially serious shooters, for example the 58 cases that were determined by police to be potential mass public shootings prevented by the actions of armed citizens. In the robustness section, we compare that group of armed civilians to the 38 mass public shootings stopped by police. In section 4.2, we use the control function method to address the potential unobserved confounder problem.

3.2 Selection bias

With respect to selection bias by the news media, if there is selective reporting it could have serious implications for any study of the relative success of armed citizens and police officers responding to active shooter incidents. For example, if the news stories covered all the cases where civilians were involved in stopping attacks but systematically ignored police cases where few people were murdered or wounded, it would make it appear as if there were more casualties involving attacks stopped by police.

However, the opposite appears to be the case. News outlets tend to provide far more detail when police stop attacks than when civilians do. Of the 199 cases where permit holders stopped active shootings, 81 (40.7%) cases didn't mention the firearm used by the attacker. By contrast, of the 167 cases that police stopped, the type of weapon used by the attacker was omitted in only 12 (7.2%) of the cases. Not surprisingly, the cases that were missing this information had fewer casualties, with 1.9 fewer murders and 3.6 fewer victims wounded.

There is a similar gap for news stories failing to mention the age of the attacker, with discussions of the attacks involving police much more likely to mention the attacker's age. Of the 199 cases where permit holders stopped active shootings, 41 (20%) of the cases didn't mention the age of the attacker. By contrast, of the 167 cases that police stopped, the age of the attacker was mentioned in every case. As might be expected, the cases that were missing this information had 1.8 fewer murders.

The simple regressions reported in Table 3 illustrate how murders, though not woundings, drive news coverage.

Table 3: Does Media Coverage Vary with the Number Killed?

Variables	(1) Killed	(2) Wounded	(3) Casualties
No information on weapon used	-1.135**	-0.540	-1.675
	(-2.24)	(-0.21)	(-0.56)
Constant	0.939	0.424	1.364
	(0.63)	(0.06)	(0.16)
Observations	562	562	562
R-squared	0.141	0.107	0.112

Notes: linear regression; dependent variables are number of victims killed, wounded, and total casualties, t-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1; state and year dummies included in all regressions.

If armed civilians arrive at the scene faster and limit the number of victims, the media may give them less coverage than police. Still, we must ask whether the media finds civilian interventions inherently less newsworthy—even after controlling for the number of victims killed or wounded and other factors.

To explore this, we ran a probit regression using as the dependent variable a dummy variable taking the unit value when a media report omits the type of weapon used, and zero when it includes it. In our first model, we included several explanatory variables: whether an armed citizen or the police stopped the attack (with attacks stopped by neither as the reference group), the number of fatalities, the number of injuries, and fixed effects for states and years to account for variations in media coverage by location and time.

In our second estimate, we added venue indicators to determine whether certain locations—like schools—receive more detailed media coverage. We also included the number of attackers to test whether coordinated assaults garner greater attention. We performed a Chi-square test on the null hypothesis that media coverage of police and armed citizen interventions is equally likely, controlling for the other variables. Table 4a presents our results.

Table 4a: Does media coverage of the weapon used by the attacker vary between armed citizens and police? VARIABLES	(1) Weapon	(2) Weapon

	Omitted	Omitted
Armed citizen	0.190***	0.223***
	(5.79)	(5.88)
Police	-0.071	-0.049
	(-1.21)	(-0.70)
Killed	-0.087***	-0.094***
	(-3.42)	(-3.28)
Wounded	-0.007	-0.003
	(-1.02)	(-0.41)
Commerce		0.075
		(0.63)
Open Space		0.073
		(0.63)
Residential area		0.035
		(0.24)
School		0.182
		(1.23)
Number of shooters		0.010
		(0.26)
Observations	499	381
Chi2 test armed citizen = police	32.95	22.13
P-value	0.000	0.000

Notes: probit regression; dependent variable is a dummy variable taking 1 if the weapon type is missing, zero if not missing; coefficients are average marginal effects; robust z-statistics in parentheses*** p<0.01, ** p<0.05, * p<0.1; chi-square tests the null hypothesis that the coefficients on armed citizen and police are equal. As a group the state and year fixed effects are statistically significant.

The coefficient on the armed citizen dummy variable is positive and highly significant. The chi-square test is also highly significant indicating that armed citizens get significantly more missing values than the police even if we control for the number killed, wounded, venue, and number of shooters, as well as state and year fixed effects. The results show that when a civilian stops an active shooting attack, news stories are approximately 20 percent more likely to omit the type of firearm used than when police stop the attacks. This pattern holds even after controlling for other factors. The number of victims killed is the only other variable that significantly influences whether reporters mention the weapons used. Each additional death reduces the probability of omitting the weapon by 9 percent.

We used the same approach for the missing information on the age of the attacker, but since the attacker's age is never missing when the police stopped a shooter, the coefficient for police stops is perfectly predicted and missing from the probit regressions, so we have also provided OLS estimates. The results shown in Table 4b are consistent with those shown for missing information on the weapons used in the attack.

Table 4b: Does media coverage of the age of the attacker vary between armed citizens and police?

VARIABLES	(1) OLS	(2) Probit	(3) OLS	(4) Probit
Armed citizen	0.144***	0.124**	0.109***	0.096*
	(4.06)	(2.54)	(2.94)	(1.80)
Police	-0.047**		-0.049***	
	(-2.53)		(-2.69)	
Killed	-0.006**	-0.145***	-0.005**	-0.166***
	(-2.21)	(-3.77)	(-2.14)	(-4.09)
Wounded	0.001***	0.002	0.001***	0.005
	(2.98)	(0.29)	(2.60)	(0.46)
Commerce			-0.051	-0.027
			(-0.29)	(-0.16)
Government			-0.069	
			(-0.39)	
House of Worship			-0.076	
			(-0.44)	
Open Space			-0.038	-0.090
			(-0.22)	(-0.54)
Residential area			-0.044	0.012
			(-0.24)	(0.05)
School			-0.058	
			(-0.33)	
Health services			-0.090	
			(-0.51)	
Number of shooters			0.039	0.033
			(0.66)	(0.70)
Constant	0.055		0.014	
	(0.48)		(0.07)	
Observations	562	312	539	260
R-squared	0.169		0.163	
Chi2 test armed citizen = police	37.82	6.471	23.94	3.247
P-value	0.000	0.0110	0.000	0.0715

Note: robust t- or z-statistics in parentheses; probit coefficients are average marginal effects; *** p<0.01, ** p<0.05, * p<0.1.

These results indicate that news stories are significantly more likely to include the shooter's age when police intervene, and more likely to omit it when armed civilians do, even when the attacks are otherwise similar. The chi-square test is significant indicating that armed citizens get significantly more missing values than the police if we control for the number killed, wounded, venue, and number of shooters, as well as state and year fixed effects.

These disparities raise a serious concern: when reports of civilian interventions lack detail, the media might also skip covering them altogether. If an armed citizen stops an attack without any casualties, news outlets might be less likely to report the incident. If so, the truncated dataset overstates the likelihood of death or injury during civilian interventions, thus biasing the coefficient on armed citizens upward. As a result, the data understate the effectiveness of armed citizens compared to police officers in active shooter scenarios. The Appendix expands on this point with a Monte Carlo demonstration and simulation test.

4. Results

4.1 Victims killed, wounded, and total casualties

We estimate four models for each of the categories (killed, wounded, and total casualties). Model (1) is a simple negative binomial regression of the number of victims killed on the two variables of interest: was the incident stopped by police or by one or more armed citizens? Model (2) includes two control variables: a dummy variable indicating passage of a constitutional carry law, where a permit is no longer required to carry, and a continuous variable indicating the proportion of the adult population with concealed carry permits. These variables act as proxies for how likely it is that an armed citizen will be present during an attack. In states with constitutional carry laws the percent of the adult population with permits might not provide a very accurate measure of how many people are carrying.

Model (3) adds seven additional control variables: the number of shooters, the shooter’s age and age-squared, the number of guns the shooter was armed with, whether the shooter used a rifle or shotgun, and if the shooter used multiple weapon types. We use these variables to control for the intentional lethality of the shooter. Finally, in Model (4) we add variables controlling for the use of other weapons (explosives or knives), body armor and the type of venue (commerce, government, health services (e.g., hospital, doctor or dentist office), churches or other houses of worship, outdoors in open space, and schools). The omitted category for weapons is handguns and the omitted class for venue is residential neighborhood.

All models include the state population as an exposure variable as well as state and year fixed effects. A chi-square test of the equality of the coefficients on armed citizens and police is reported in the bottom two rows. Results for the number of victims killed are presented in Table 5.

Table 5: Victims killed in Attacks Stopped by Armed Civilians or Police

Variables	(1) Killed	(2) Killed	(3) Killed	(4) Killed
Armed citizen	-1.775***	-1.727***	-1.241***	-1.071***
	(-7.00)	(-7.32)	(-4.99)	(-4.97)
Police	0.616***	0.625***	0.469**	0.503***
	(3.25)	(3.46)	(2.57)	(2.82)
Constitutional carry law		-0.661**	-0.570*	-0.413
		(-1.99)	(-1.71)	(-1.48)
Pct pop with right-to-carry permits		0.015	0.024	0.026
		(0.38)	(0.52)	(0.62)
Number of shooters			0.077	-0.112
			(0.27)	(-0.34)
Age of shooter			-0.086***	-0.054*
			(-2.90)	(-1.92)
Age squared			0.001***	0.001*
			(2.91)	(1.77)
Number of guns			0.217**	0.239**
			(2.18)	(2.51)
Rifle			0.815***	0.588***
			(2.95)	(2.61)
Shotgun			-0.538	-0.338
			(-1.13)	(-0.76)
Multiple weapon types			0.557*	0.270
			(1.70)	(0.92)
Explosives				0.401
				(0.49)
Knife				0.572
				(0.96)
Body armor				0.762
				(1.28)
Commerce				0.547
				(1.49)
Government				0.244
				(0.49)
Health services				0.266

				(0.54)
House of Worship				1.571**
				(2.19)
Open Space				-0.425
				(-1.09)
School				0.463
				(1.03)
Observations	562	562	476	476
Chi2 test armed citizen = police	85.50	85.70	44.78	49.20
P-value	0.000	0.000	0.000	0.000

Notes: negative binomial; coefficients are average marginal effects; robust z-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1; chi-square tests the null hypothesis that the coefficients on armed citizen and police are equal; all models include state population as an exposure variable. As a group the state and year fixed effects are statistically significant.

Table 5 shows that armed citizens reduce the number of deaths in active shooter incidents significantly more than the police do. In fact, armed citizens reduce the number of victims killed by 1.07 to 1.78 while the police increase the number killed by 0.5 to 0.6 in comparison to the omitted class (shooters who fled, were stopped by unarmed citizens, or stopped of their own accord). This does not mean that calling the police results in more deaths. In the absence of an armed civilian on the scene, there is no other choice; otherwise, the death toll would be higher. If the police were already at the location and not in uniform, the number of casualties would likely be lower than that associated with armed citizens. The Chi-square test of the equality of the armed citizen and police is significantly different from zero for all four models.

To gauge the magnitude of the difference in the number of people murdered in attacks stopped by civilians versus police, we compared the results across models. In our most complete model (column four), the difference equals 0.97 times the mean number of people murdered in the sample (1.63). In column two, the difference is 1.4 times the average number murdered.

States with a constitutional carry law experience fewer victims killed in active shooter incidents (0.4 to 0.6), significantly different from zero at the 10 percent level in two out of three models, presumably because the probability of a shooter encountering an armed citizen in a public place is higher. Shooters using rifles kill significantly more people than shooters using handguns or shotguns. Also, shooters with more than one weapon kill significantly more people. The effect of age is U-shaped with the youngest and oldest shooters killing more victims. Houses of Worship suffered 1.6 more victims killed on average in each incident.

The results for the number of victims wounded in these incidents are shown in Table 6.

Table 6: Number wounded in Attacks Stopped by Armed Civilians or Police

Variables	(1) Wounded	(2) Wounded	(3) Wounded	(4) Wounded
Armed citizen	-	-	-	-
	5.164***	5.182***	2.859***	2.731***
	(-7.43)	(-7.47)	(-5.37)	(-5.28)
Police	0.712	0.717	0.327	0.393
	(1.09)	(1.11)	(0.68)	(0.76)
Constitutional carry law		-1.565	-1.119	-1.029
		(-1.56)	(-1.43)	(-1.37)
Pct pop with right-to-carry permits		0.037	0.238	0.182
		(0.16)	(1.36)	(0.99)
Number of shooters			0.335	-0.681
			(0.31)	(-0.48)
Age of shooter			-.216***	-0.188**
			(-3.10)	(-2.47)
Age squared			0.002***	0.002**
			(2.72)	(2.24)
Number of guns			0.973***	0.949**
			(2.60)	(2.57)
Rifle			3.003***	2.846***
			(4.03)	(3.90)
Shotgun			-0.519	-0.626
			(-0.41)	(-0.50)
Multiple weapon types			0.768	0.458
			(0.82)	(0.51)
Explosives				3.174
				(0.92)
Knife				-0.360
				(-0.15)
Body armor				0.396
				(0.22)
Commerce				1.073
				(1.02)
Government				0.613
				(0.47)
Health services				-0.697
				(-0.45)
House of Worship				1.754

				(0.91)
Open Space				0.405
				(0.38)
School				1.023
				(0.88)
Observations	562	562	476	476
Chi2 test armed citizen = police	52.14	53.21	28.92	25
P-value	0.000	0.000	0.000	0.000

Notes: negative binomial; coefficients are average marginal effects; robust z-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1; chi-square tests the null hypothesis that the coefficients on armed citizen and police are equal; all models include state population as an exposure variable. As a group the state and year fixed effects are statistically significant.

Armed citizens reduce the number of victims wounded in active shooter incidents by 2.7-5.2 while the police have no significant effect. The difference between police and armed citizen response is highly significant. The effect of Constitutional Carry laws is negative, but not significant at the 10 percent level. The results for the age of the attacker and the use of multiple guns and whether a rifle is used are very similar to the results in Table 5. In our most complete model (4), the magnitude of the number of victims wounded in attacks stopped by armed citizens compared to its mean (3.6) is 0.86, about the same as the corresponding value for the number killed in Table 5.

The results for the total number of victims killed and injured in active shooter incidents are shown in Table 7.

Table 7: Total Casualties in Attacks Stopped by Armed Civilians or Police

Variables	(1) Casualties	(2) Casualties	(3) Casualties	(4) Casualties
Armed citizen	-8.777***	-8.794***	-5.573***	-5.158***
	(-9.07)	(-9.19)	(-7.01)	(-7.11)
Police	1.943**	1.984**	1.096	1.283*
	(2.14)	(2.20)	(1.53)	(1.73)
Constitutional carry law		-2.793**	-2.241*	-1.933*
		(-1.96)	(-1.92)	(-1.84)
Pct pop with right-to-carry permits		0.005	0.265	0.218
		(0.02)	(1.41)	(1.11)
Number of shooters			0.575	-0.974
			(0.34)	(-0.47)
Age of shooter			-0.376***	-0.293***
			(-3.55)	(-2.67)
Age squared			0.004***	0.003**
			(3.26)	(2.41)

Number of guns			1.642***	1.641***
			(3.27)	(3.28)
Rifle			5.004***	4.497***
			(4.09)	(4.06)
Shotgun			-1.336	-1.155
			(-0.72)	(-0.66)
Multiple weapon types			1.603	0.851
			(1.12)	(0.66)
Explosives				4.568
				(0.84)
Knife				0.867
				(0.26)
Body armor				2.018
				(0.76)
Commerce				2.293
				(1.50)
Government				1.237
				(0.65)
Health services				-0.192
				(-0.10)
House of Worship				4.900
				(1.59)
Open Space				-0.229
				(-0.15)
School				1.935
				(1.13)
Observations	562	562	476	476
Chi2 test armed citizen = police	84.58	85.27	51.72	51.96
P-value	0.000	0.000	0.000	0.000

Notes: negative binomial; coefficients are average marginal effects; robust z-statistics in parentheses*** p<0.01, ** p<0.05, * p<0.1; chi-square tests the null hypothesis that the coefficients on armed citizen and police are equal; all models include state population as an exposure variable. As a group the state and year fixed effects are statistically significant.

As might be expected, the results for the total number of casualties show that armed citizens reduce the number of casualties significantly more than the police do. Armed citizens reduce the number of casualties by 5.6-8.8 while police response results in a small increase that is significantly different from zero at the .10 level in three out of four models. In this case, the difference between civilians and police stopping these attacks is slightly larger compared to the mean number of causalities, with the difference in column four equal to 1.2 times the mean (5.24). Constitutional carry states have significantly ($p<.10$) fewer victims killed and wounded in active shooter events than other states presumably because more armed citizens are available to intervene quickly.

Overall, the results are very similar for all three injury categories. The number of victims killed, wounded, or the total number of casualties is significantly reduced if armed citizens stop the attack compared to the situation where the police stop the attack.

4.2 An alternative identification strategy

We hypothesize that armed citizens stop active shooter incidents with fewer casualties than police because they have a tactical advantage. Uniformed police usually arrive after the shooting has started or are targeted first because they're easily identifiable. Armed civilians are more likely already at or near the scene, wear plain clothes, and carry concealed weapons, allowing them to return fire quickly before the shooter identifies the threat.

While we control for factors relating to the lethality of the shooter—and compare mass public shootings stopped by armed citizens with those stopped by police in the robustness section—it is possible that armed civilians somehow avoid the most dangerous attackers, leaving police to confront the riskiest situations and resulting in higher casualty counts. This is an unmeasured confounder, an omitted variable that is negatively correlated with armed citizen response and positively correlated with the outcome. To test it properly, we need an instrumental variable—one that is independent of casualty numbers but closely predicts whether an armed civilian intervenes.

We focus on gun-free zones, which exist in every state and include venues like schools, government buildings, and some private businesses. These areas legally prohibit civilians from carrying guns, making civilian intervention less likely. There is considerable evidence that serious active shooters often target gun-free zones, knowing armed civilians are unlikely to be there. The diaries and manifestos of mass shooters reveal that many of them explicitly choose these locations because they expect their victims to be defenseless.[13]

[13] The 2012 Batman movie theater shooter scouted seven theaters within 20 minutes of his apartment that were showing the new Batman movie that night—and chose the only one that banned guns. In 2015, Charleston Church shooter Dylann Roof told a friend he initially planned to target a school but "couldn't get into the school because of the security," so he "just settled for the church." Similarly, the Nashville Covenant School shooter had originally considered the Green Hills Mall as her primary target but rejected it because it had "too much security" and allowed people to carry permitted concealed handguns—unlike the school she ultimately attacked. Staff, "Friend of Dylann Roof says suspect planned attack on College of Charleston," Fox News, November 28, 2015 (https://www.foxnews.com/us/friend-of-dylann-roof-says-

We instrument the active shooter variable using a dummy variable indicating the venue has been designated as a gun-free zone. To be an effective instrument, there are three requirements. The first, relevance, requires that the instrument affects the treatment. In this case, the existence of the gun-free zone is correlated (negatively) with the presence of an armed citizen. This is to be expected since armed citizens presumably respect the prohibition and do not carry firearms in that location.

Secondly, there is an exclusion requirement. That is, the instrument, gun-free zones, only affects the outcome through its effect on the treatment. The gun-free zones were created before the attack, so there is no causal relationship running from the outcomes of later attacks to the gun-free zone variable. For example, a gun-free zone created in 2002 could remain crime free for 20 years, then suffer an active shooter attack. The resulting casualties are caused by the active shooter and actions of the first responders, not the gun-free zone.

Finally, independence requires that the instrument be uncorrelated with the error term associated with the outcome. Gun-free zones are determined before any active shooter event occurring in them. As a result, there can be no systematic correlation between the error term associated with the outcome and the existence of the gun-free zones.

We identified 278 incidents for which the venue's gun-free status could be confirmed. States adopted Right-to-Carry laws to replace complete concealed carry bans or restrictive May Issue laws, but they initially included long lists of gun-free zones (Lott, 2010). Over time, states tend to reduce the number of these zones. None of the right-to-carry or constitutional carry states have added more legally designated gun-free zones over time, so the majority of the gun-free zones in place during the 2014–2024 study period had already existed well before the incidents occurred. Because the gun-free zones were determined before any active shooter incident, their presence is independent of the outcome of that incident. Gun-free zones may attract shooters, but the designation must have been made before the actual attack, making it independent of the outcome.

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suspect-planned-attack-on-college-of-charleston). John R. Lott, Jr., "Colorado shooter singled out Cinemark theater because it banned guns?" Fox News, September 10, 2012 (https://www.foxnews.com/opinion/did-colorado-shooter-single-out-cinemark-theater-because-it-banned-guns). Lydia Fielder and Tony Garcia, "Nashville school shooter purchased 7 guns, planned attack on multiple locations, police say," WSMV, March 27, 2023 (https://www.wsmv.com/2023/03/28/nashville-school-shooter-purchased-7-guns-planned-attack-multiple-locations-police-say/). For a longer list of cases, see Staff, "UPDATED: How mass killers pick out venues where their victims are sitting ducks," Crime Prevention Research Center, March 28, 2023 (https://crimeresearch.org/2023/03/vince-vaughn-explains-the-obvious-how-mass-killers-pick-out-venues-where-their-victims-are-sitting-ducks/).

The presence of armed civilians capable of stopping an attack depends not only on whether there is a gun-free zone, but also whether a state allows citizens to carry concealed firearms without a permit, and the percentage of adults holding concealed handgun permits. However, potential shooters may hesitate to attack if they perceive a higher chance of encountering armed citizens, thus deterring attacks altogether. Active shootings could be positively or negatively related to the presence of a constitutional carry law or the number of concealed carry permits. In any case, the existence of a gun-free zone is independent of the outcome of any given attack.

We use the control function method, which offers a practical way to obtain consistent instrumental variable estimates in nonlinear models with endogenous regressors. Because probit, negative binomial and Poisson functions are nonlinear, the conventional two-stage least squares method is not applicable. In our application, the control function methodology estimates a probit model predicting the probability of an armed citizen response using the gun-free-zone dummy variable and other exogenous variables. It uses a Poisson model to estimate the outcome as a function of the armed citizen variable as well as the other exogenous variables, including the police variable. It includes the residual from the probit model to control for any endogeneity of the armed citizen variable. We implement the procedure using the Stata 18 ivpoisson procedure with the probit option.

The control function approach provides a unifying framework for IV estimation in nonlinear models, is straightforward to implement in practice, while retaining the full structure of the probit likelihood. The GMM version of the procedure requires no adjustment to the standard errors because there is only one stage (Windmeijer and Santos Silva. 1997; Wooldridge 2010, sec 14.5). In addition, the statistical significance of the control function residual provides a built-in test of endogeneity for the instrumented regressor (Rivers and Vuong 1988; Wooldridge 2015). The results are shown in Table 8.

Table 8: GMM control function estimation

Variables	(1) Killed	(2) Wounded	(3) Casualties
Armed citizen	-5.300**	-6.862**	-11.395**
	(-2.25)	(-2.05)	(-2.34)
Police	0.050	-0.922	-0.794
	(0.10)	(-1.41)	(-0.83)
Constitutional carry law	-0.127	-0.626**	-0.799**
	(-0.83)	(-2.39)	(-2.35)

Pct pop with right-to-carry permits	0.016	-0.015	-0.003
	(0.75)	(-0.61)	(-0.09)
Number of guns	0.128	0.788***	0.942**
	(0.77)	(2.63)	(2.45)
Rifle	0.359	1.574***	2.112***
	(1.02)	(2.97)	(2.82)
Population in 100,000 units	0.001	0.002	0.003
	(1.01)	(1.23)	(1.47)
Observations	258	258	258
Chi2 test armed citizen = police	7.927	4.498	6.798
P-value	0.005	0.034	0.009

Note: dependent variable is outcome; control function GMM estimation, stacked probit and Poisson models; armed citizen is instrumented by the gun-free-zone dummy variable; z-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1; ; coefficients are average marginal effects; state dummies are dropped due to collinearity with gun-free-zone dummy.

The estimated coefficients for armed citizens are numerically large and significantly different from zero; larger than the results reported in Tables 5-7. The corresponding coefficients for police are small and not significantly different from zero. The null hypothesis that the outcomes for armed citizens and police are equal is rejected with p-values less than .05 for all three outcomes. Relative to police responses, armed citizens are estimated to reduce the number of deaths by 5.3 and the number of casualties by 11.4. To measure how much greater the number of people murdered in attacks stopped by the police rather than armed citizens, we compared the results across models. The first estimate shows that the difference between the coefficient on armed citizens and that for the police is 3.28 times the sample's mean number of victims killed. In column two, the difference between armed citizen and police is 1.64 times the sample mean for number wounded. In column three, it is 2.02 times the sample mean for total casualties.

The t-statistic for the gun-free-zone variable is significant (p=.016) for the probit model predicting the armed citizen response, indicating a strong instrument. The z-statistic on the generalized residual is a test for endogeneity of the instrumented variable. The test is significant for all of the models at the .05 level, indicating that there is significant endogeneity in the instrumented variable. However, the control function model is estimated on a subset of the data and cannot be estimated with state fixed effects due to collinearity. Nevertheless, both the ordinary negative binomial model reported in Tables 5-7 which is estimated on the entire dataset and includes state dummies and the instrumented Poisson model show similar results.

Overall, both methods find that armed citizens reduce the number of victims killed, the number wounded, and the total number of casualties relative to a police response.

4.3 Is it more dangerous for armed citizens or police?

In this section we look at the probability of the first responder being killed if the person responding is an armed citizen compared to the same risk for a police officer. The dependent variable is a dummy variable indicating that there were one or more deaths among the first responders. In this case we can use the simple difference between two means to see if the probabilities are equal. The results are shown in Table 9.

Table 9: Difference between two probabilities that armed civilians or police are killed or wounded in stopping active shooter events

Killed	Cases	Deaths	Probability
Armed citizen	199	2	0.010
Police	167	27	0.162
Difference			-0.152
Z-score			-5.35
P-value			0.000
Wounded	Cases	Injuries	Probability
Armed citizen	199	49	0.246
Police	167	101	0.605
Difference			-0.359
Z-score			-6.95
P-value			0.000

Note: assumes a normal distribution.

According to the simple difference between two probabilities analysis, the police are significantly more likely to be killed or wounded in an active shooter event than an armed citizen. For example, the probability of an armed citizen being killed while attempting to stop an active shooter is one percent. The corresponding probabilities for police officers responding to an active shooter incident is 16.2 percent. The results for non-fatal injuries
are similar. The corresponding probit regression results are presented in Table 10.

Table 10: Probabilities that armed citizens or police are killed or injured

Variables	(1) Fatality	(2) Injury
Stop by police	0.147***	0.249***
	(3.10)	(5.21)
Stop by armed citizen		0.241***
		(5.08)
Observations	207	497
Chi2 test armed citizen = police	9.638	0.0356

P-value	0.002	0.850

Notes: probit; z-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1; for fatalities, the armed citizen dummy predicted the outcome perfectly; the chi-square tests the null hypothesis that the coefficient for armed citizens equals that for police.

These results corroborate some of the simple analysis above. With respect to the number of police killed while stopping an active shooter event, an armed citizen has a zero probability of being killed compared to the police officer's 14.7 percent. This difference is highly significant. However, the probabilities with respect to a first responder being injured is almost exactly the same for both armed citizens and police officers. Overall, it is safer for first responders if they are already on the premises, respond quickly with a concealed weapon, and are not wearing a uniform.

With respect to unfortunate mishaps, Table 2 shows that armed citizens have shot the wrong person once while police officers have shot the wrong person four times, including friendly fire. Table 11 shows the result of a simple analysis of the difference between the two probabilities of shooting the wrong person.

Table 11: Probability of shooting the wrong person

	Cases	Shootings	Probability
Armed citizen	199	1	0.005
Police	167	4	0.024
Difference			-0.019
Z-score			-1.55
P-value			0.12

Note: assumes normal distribution; includes cases where officers were killed by friendly fire.

Although the probability that the police will shoot the wrong person is four times higher than that of armed citizens, both probabilities are small and the difference between them is not significantly different from zero, presumably because both events are extremely rare. This result is confirmed by probit analysis using control variables in the robustness section.

4.4 Comparing the risk to police of stopping active shooters at the scene of their attacks to cases where they caught these attackers later.

As noted earlier, we do not credit law enforcement with stopping an attack if officers apprehend the attacker later or at a different location. But this distinction raises an important question: What risks do officers face when confronting an attacker during the crime versus confronting the same criminal later—when police have the advantage of time, planning, and location?

We looked at the 167 cases where law enforcement stopped attacks in progress and compared them to the 115 cases where officers arrested the attackers later. The difference in officer fatalities between these two scenarios is striking: 25 officers died when confronting attackers during the crime, while only two officers were killed when making arrests after the fact.

This comparison is especially powerful because it involves similar types of violent offenders. In fact, those who manage to escape and are caught later may be even more dangerous, do more planning, or are more cunning or experienced, suggesting they could pose a greater threat to officer safety. Yet the data show that officers face far more risk when they respond to an attack that the shooter initiates than when they make arrests under conditions which the police control. See Table 12. These results are confirmed by probit analysis in the robustness section.

Table 12: Comparing the rates that police are killed when the active shooter initiates the attack versus when the police catch the attacker at a later time

	Cases	Deaths	Probability
Police arrest later	115	2	0.017
Police stop attack in progress	167	25	0.150
Difference			-0.132
Z-score			-3.71***
P-value			0.000
	Cases	Injuries	
Police arrest later	115	8	0.070
Police stop attack in progress	167	93	0.560
Difference			-0.487
Z-score			-8.39***
P-value			0.000

Note: assumes normal distribution.

Finally, we asked whether police who arrested attackers later faced fewer injuries or deaths because S.W.A.T. teams helped capture them. Since S.W.A.T. officers receive specialized training to handle violent situations, they might reduce the risk of officers being shot. However, our analysis found that the presence of S.W.A.T. officers had no statistically significant impact on the likelihood of officer deaths or injuries.

All results, programs, and data are available at <link>.

5. Robustness tests

We re-estimated our models in several ways to test their robustness. None of the robustness checks negated our earlier findings. All results, code, and data are in the online supplemental materials.

When a dependent variable contains too many zeros, a standard negative binomial model may produce biased and inconsistent estimates and overstate standard errors. In such cases, a zero-inflated negative binomial (ZINB) or zero-inflated Poisson model is preferable (Greene 1994; Lambert 1992). Since 50.49% of our observations for the number of victims killed were zero, we ran ZINB models and found results consistent with those reported above. Armed citizens significantly reduced the probability of victim death or injury compared to police intervention.

We also found that the log of the dispersion parameter was significantly greater than zero, indicating severe overdispersion across all regressions in Tables 5-7. This supported our choice of the negative binomial model over the Poisson. However, since Poisson models can be more efficient when overdispersion is mild, we also estimated Poisson and zero-inflated Poisson models for all three outcome variables—deaths, injuries, and total casualties (Cameron and Trivedi 1998, pp. 59–85). In every model, civilians who stopped active shooter events significantly reduced casualties compared to police responses. We used population as an exposure variable in our regressions, assigning it a coefficient of one. When we removed that variable, the results remained unchanged across all three casualty measures.

We examined whether police involvement in higher victim counts resulted from a few extreme mass shootings. In our dataset, the maximum number of victims killed, wounded, and total casualties in events stopped by armed citizens were 26, 20, and 46, respectively. For police-stopped cases, the maxima were 49, 53, and 102. We re-estimated the models using only cases within the armed citizen maxima. The results remained consistent: active shooter incidents stopped by armed citizens resulted in significantly fewer deaths and injuries than those stopped by police.

We re-estimated the regressions Tables 5-7, using city-fixed effects instead of state-fixed effects. While 52% of observations included multiple entries per city, this approach significantly reduced the effective sample size. Still, it allowed us to account for potential differences across police departments at the city level. The results remained unchanged.

- For Table 5 (killings): All results were consistent.

- For Table 6 (woundings): Columns 1 and 2 remained stable; columns 3 and 4 did not converge due to the smaller sample.
- For Table 7 (casualties): Columns 1, 2, and 3 were unaffected; column 4 did not converge.

Panel data have important advantages, but those benefits are reduced when the panel is unbalanced. Our dataset is very unbalanced, given that 284 cities have only one observation, so it is impossible to correct for unobserved heterogeneity with fixed effects for those observations. To address this concern, we conducted several robustness tests. First, we ran a pooled OLS model without state or year dummies across all three outcomes—victims killed, wounded, and total casualties—and found no change. Next, we estimated a pure cross-sectional model by aggregating across years for each city. Again, the results remained the same.

We built a balanced panel of state-year data using 50 states over 10 years. For each state-year, we calculated totals for victims killed, wounded, and total casualties; we also summed the number of police and armed citizen stops and averaged the remaining variables, manually generating a dummy for constitutional carry. We set missing values to zero in years with no active shooter incidents. This balanced panel allowed us to correct for unobserved heterogeneity and estimate standard errors clustered at the state level. The results were the same. The average marginal effect of armed citizens was smaller than that of police for all outcomes and significantly smaller in the majority of cases.

We re-estimated the models reported in Tables 5-8 removing the "borderline" cases from the ChatGPT analysis. We also verified the results reported in Tables 10-12 using probit regressions.

Finally, we compared the likelihood of first responders being killed in mass public shootings (defined as incidents where four or more people were killed, excluding the shooter). Armed citizens likely stopped 58 such attacks, with 2 of them killed (3.4%). Police stopped 41 mass public shootings and suffered 13 fatalities (31.7%). This difference in fatality rates was statistically significant (p=.000). Armed citizens also reduced the number of wounded and total casualties significantly relative to police in likely or actual mass shootings.

6. Discussion

The evidence supports the role of armed citizens in stopping active shooter attacks. Unlike uniformed police, armed civilians are already present when an attack begins and do not stand out as immediate threats to potential shooters. In contrast, police face serious disadvantages. They are rarely present when an attack begins, and if a would-be attacker spots a nearby officer, he's likely to delay the assault, choose a different location, or target the officer first. The results remain the same using an instrumental variable to control for possible endogeneity caused by armed citizens failing to respond to potentially serious active shooter events.

After controlling for the number of casualties. the locations of attacks, and fixed effects, we found that the media devotes more coverage to cases stopped by police than those stopped by civilians. Reports of civilian interventions often omit key details and are presumably more likely to not be reported at all. The evidence we provide on the underreporting of civilian cases implies that our results are biased against showing the benefits of armed civilians. This form of endogeneity would be more of an issue if the effect was in the opposite direction and biased the results in favor of armed civilians.

Off-duty, undercover, or plainclothes officers would presumably benefit from the same tactical edge as armed civilians. Unfortunately, with only two recorded cases involving non-uniformed officers confronting shooters, we don't yet have enough data to compare their effectiveness directly.

Our research shows that armed civilians reduce the number of killed, wounded, and total casualties by more than uniformed police officers do. This outcome doesn't reflect poorly on law enforcement—it highlights the tactical disadvantages uniformed officers face. Uniforms make them easy targets, and their delayed arrival gives attackers more time to cause harm. These results lend support to a larger conclusion: allowing armed civilians in public areas increases safety, while gun-free zones make the public more vulnerable. That finding aligns with other research showing that the vast majority of mass public shootings occur in areas where civilians cannot legally carry firearms (Lott, 2010; Crime Prevention Research Center, 2025). Our results also provide some evidence that Constitutional Carry laws reduce the number of attacks.

Critics argue that civilians lack the training police receive and may make things worse by intervening. But our results directly contradict that concern. Armed civilians don't interfere with police or shoot bystanders—and they consistently prevent more deaths and injuries than uniformed police officers during active shooter events. They are also less likely to be killed stopping such events than are the responding police officers.

All results, programs, and data are available in the online supplemental materials <link>.

References

Blau, B.M., Gorry, H.G., and Wade, C. 2016. Guns, Laws, and Public Shootings in the United States, *Applied Economics* 48: 1-15.

Cameron, A. C. and Trivedi, P.K. 1998. *Regression Analysis of Count Data*. Cambridge: Cambridge University Press.

______ 2010. *Microeconometrics Using Stata*. Revised Edition. College Station, TX: Stata Press.

Crime Prevention Research Center. 2025. Updated Detailed Information on Mass Public Shootings from 1998 to 2024. Crime Prevention Research Center, January 2 (https://crimeresearch.org/2025/01/updated-information-on-mass-public-shootings-from-1998-to-2024/).

Duwe, G. 2019. Patterns and Prevalence of Lethal Mass Violence, *Criminology and Public Policy* 19: 17-35.

Duwe, G., Kovandzic, T., and Moody, C.E. 2002. The Impact of Right-to-Carry Concealed Firearm Laws on Mass Public Shootings, *Homicide Studies* 6: 274-296.

Gius, M. 2017. The Effects of State and Federal Gun Control Laws on School Shootings, *Applied Economics Letters* 25: 317-320.

Greene, W. H. 1994. Accounting for Excess Zeros and Sample Selection in Poisson and Negative Binomial Regression Models. NYU Working Paper No. EC-94-10.

Kleck, G. 2016. Large-Capacity Magazines and the Casualty Counts in Mass Shootings: The Plausibility of Linkages, *Justice Research and Policy* 17: 28-47

Kleck, G. 2020. Do Mass Shooters Favor Using High-Capacity Magazines, Florida State University, working paper, March 10.

Kovandzic, T., Duwe, G., and Moody, C.E. 2002. The Impact of Right-to-Carry Concealed Firearms Laws on Mass Public Shootings. *Homicide Studies* 6: 271-296.

Lambert, D. 1992. Zero-Inflated Poisson Regression, with an application to defects in manufacturing. *Technometrics* 34: 1–14.

Lott, J.R. and Landes, W.M. 2001. Multiple Victim Public Shootings. University of Chicago

Working Paper https://papers.ssrn.com/sol3/papers.cfm?abstract_id=272929.

Lott, J.R. 2010. *More Guns, Less Crime: Understanding Crime and Gun Control Laws*, University of Chicago Press, third edition.

Lott, J.R. 2015. The FBI's Misinterpretation of the Change in Mass Public Shootings, *Academy of Criminal Justice Sciences Today* 40: 18-29.

Lott, J.R. 2016. The War on Guns, Regnery Publisher: Washington, D.C.

Lott, J.R. 2021a. Corrections to the FBI's Reports on Active Shooting Incidents,Office of Legal Policy, U.S. Department of Justice https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3857331#.

Lott, J.R. 2021b. There Are Far More Defensive Gun Uses Than Murders. Here's Why You Rarely Hear of Them. *Real Clear Investigations*, September 22.

Lott, J.R., Moody, C.E., and Wang, R.J. 2024. Concealed Carry Permit Holders Across the United States: 2024. Social Science Research Network, November. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5040077.

Rivers, D., and Vuong, Q. H. 1988. Limited information estimators and exogeneity tests for simultaneous probit models. *Journal of Econometrics* 39: 347–366.

Stock, J. H., and Yogo, M. 2005. Testing for weak instruments in linear IV regression. In D. W. K. Andrews and J. H. Stock Eds.), *Identification and inference for econometric models: Essays in honor of Thomas Rothenberg* pp. 80–108). Cambridge University Press.

Viscusi, W.K. and Blasinsky, K.J. 2022. Leveraging public support for gun laws to reduce mass shootings. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4425499

Windmeijer, F., and J. M. C. Santos Silva. 1997. Endogeneity in count data models: An application to demand for health care. *Journal of Applied Econometrics* 12: 281–294. https://doi.org/10.1002/(SICI)1099-1255(199705)12:33.0.CO;2-1.

Wooldridge, J. M. 2010. *Econometric Analysis of Cross Section and Panel Data*. 2nd ed. Cambridge, MA: MIT Press.

Wooldridge, J.M. 2015. Control function methods in applied econometrics. *Journal of*

Human Resources, 50: 420–445.

Appendix: Simulation of media bias

Our hypothesis is that media ignore cases where there is an active shooter who is stopped by one or more armed citizens, but the number of victims killed or injured is small. This is exactly the type of outcome we prefer, namely a potentially dangerous situation that results in few casualties. In the media, this relatively good news is no news.

Further, we hypothesize that the coefficient on the armed citizen dummy variable will be substantially biased upward by the omission of these relatively uninteresting cases. In this appendix we report a simulation test of this hypothesis.

Suppose the counterfactual that all armed citizen cases are reported along with all cases involving the police.

We created a dependent variable derived from two sources: 300 observations from armed citizen cases and 300 from police-involved cases. In each case we generated a simulated variable that is inspired by the actual observations in the dataset.

In our dataset, the mean of the number of victims killed in armed citizen cases is 0.4, with a variance of 3.6. The mean of the number of victims killed in police-involved cases is 2.3 with a variance of 24.

It was difficult to generate exactly the same distributions, so we settled on a distribution of armed citizen cases that had a lower mean and lower variance than the distribution of police cases. See Appendix Table 1.

Appendix Table 1: Summary of complete sample

Variable	Obs	Mean	Std. dev.	Min	Max
y armed cit.	300	1.606667	2.665013	0	17
x police	300	2.716667	4.367299	0	31

We then did a negative binomial regression of a dependent variable consisting of N=1..., 300 armed-citizen cases and N=301…, 600 police cases on two dummy variables, one for armed citizens and one for police. Since the amount of bias is the point of the exercise, we omitted the intercept to get estimates of coefficients for armed citizens and police.

The results are in Appendix table 2.

Appendix Table 2: Negative binomial regression on complete dataset

Negative binomial regression   Number of obs =   600

Dispersion: mean Wald chi2(2) = 129.94

Log likelihood = -1120.637 Prob > chi2 = 0.0000

z	Coefficient	Std. err.	z	P>|z|	[95% conf. interval]	
ac	.4741616	.1005976	4.71	0.000	.276994	.6713293
police	.9994056	.0962922	10.38	0.000	.8106765	1.188135
/lnalpha	.8811009	.0874527			.7096967	1.052505
alpha	2.413555	.211072			2.033374	2.864819

LR test of alpha=0: chibar2(01) = 1259.37 Prob >= chibar2 = 0.000

We then dropped the half of the armed citizen cases with the smallest number of victims killed (mostly zeros). This had the effect of increasing the mean number of victims killed in those cases.

The new means and standard errors of the two types of data are shown in Appendix Table 3.

Appendix Table3: truncated data

Variable	Obs	Mean	Std. dev.	Min	Max
armed cit. y	150	3.213333	3.009129	0	17
police x	300	2.716667	4.367299	0	31

Obviously, the mean for the armed citizens is higher for the truncated sample, 3.23 compared to .474 for the entire sample.

We then did a regression on the truncated sample. The results are in Table 4.

Appendix Table 4: Negative binomial regression on truncated dataset

Negative binomial regression Number of obs = 450

```
Dispersion: mean                                  Wald chi2(2)  = 289.25

Log likelihood = -989.4034                        Prob > chi2   = 0.0000

-----------------------------------------------------------------------------

           z | Coefficient  Std. err.      z    P>|z|     [95% conf. interval]

-------------+---------------------------------------------------------------

          ac |   1.167309   .1067445    10.94   0.000     .9580934    1.376524

      police |   .9994056   .0767258    13.03   0.000     .8490258    1.149785

-------------+---------------------------------------------------------------

    /lnalpha |   .3350114   .0941621                      .1504571    .5195657

-------------+---------------------------------------------------------------

       alpha |   1.397956   .1316345                      1.162365    1.681297

-----------------------------------------------------------------------------

LR test of alpha=0: chibar2(01) = 853.64          Prob >= chibar2 = 0.000
```

The estimated coefficient for armed citizens has more than doubled, from 0.474 using all the data to 1.17 using the truncated sample with the smaller values of the dependent variable removed.

This demonstration shows that ignoring the lower half of the distribution of active shooter cases stopped by armed citizens increases the coefficient on the armed citizen dummy (and shrinks the difference between the coefficients on the ac dummy and the coefficient on the police dummy.

The coefficient estimate on the police dummy is exactly the same for both samples.

However, this is just one example, and it could be non-representative. For this reason, we also simulated the exercise 1000 times to generate a sampling distribution of the two sets of coefficients and enabling us to compute the implied selection bias. The results of that experiment are shown in Table 5.

Table 5: Means of the estimated coefficients on the armed citizen dummy for the full sample and the truncated sample, Monte Carlo sampling distributions.

```
. summarize b_ac b_ac_trunc


    Variable |        Obs        Mean    Std. dev.       Min        Max
```

```
-------------+-----------------------------------------------------
      b_ac |      1,000    .4753848    .0966592   .1655144   .7639163
 b_ac_trunc |      1,000    1.166052    .0946104   .8586616   1.427116
```

The mean of the coefficient estimates for the effect of an armed citizen stopping an active shooter for the complete sample is .475, the mean for the truncated sample is 1.166. The coefficient is biased upward by ignoring active shooter cases stopped by armed citizens. We test the significance of this bias in Table 6.

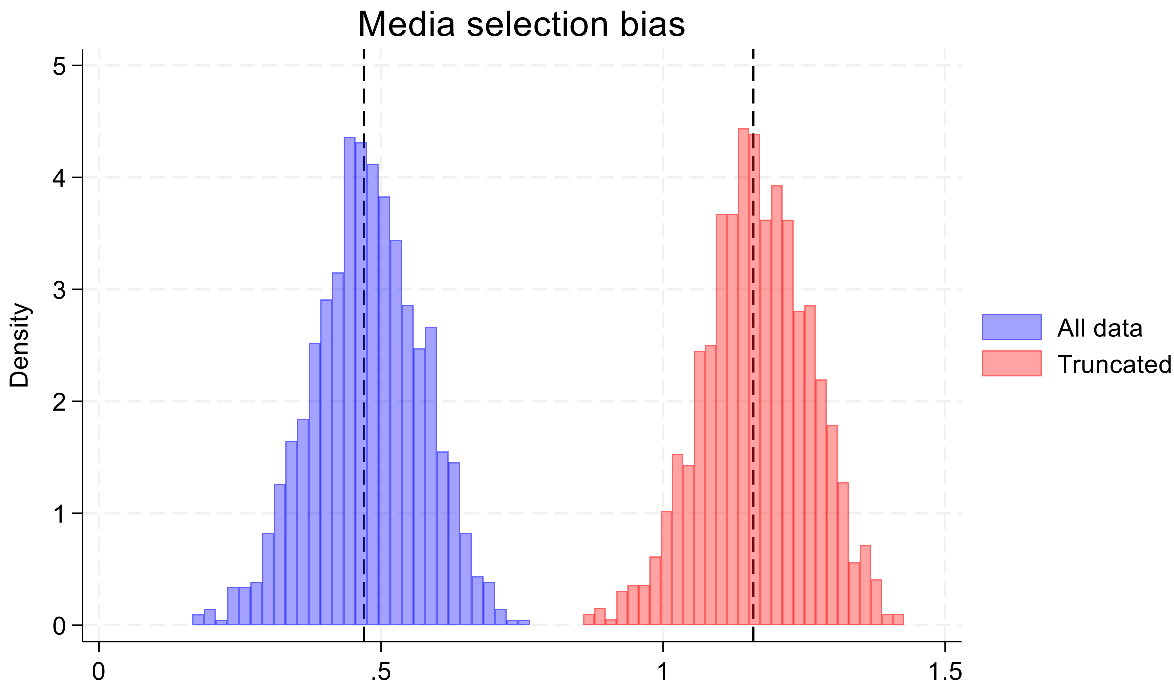
Table 6: Testing if the bias in the coefficient on the armed citizen dummy is significantly different from zero.

```
. gen diff_ac = b_ac_trunc - b_ac

. gen diff_police = b_police_trunc - b_police

. ttest diff_ac=0

One-sample t test

------------------------------------------------------------------------------
Variable |     Obs       Mean    Std. err.   Std. dev.   [95% conf. interval]
---------+--------------------------------------------------------------------
 diff_ac |   1,000    .6906676    .0001943    .0061455    .6902863    .691049
------------------------------------------------------------------------------
    mean = mean(diff_ac)                                 t =  3.6e+03
H0: mean = 0                                Degrees of freedom =      999
    Ha: mean < 0               Ha: mean != 0               Ha: mean > 0
 Pr(T < t) = 1.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 0.0000
```

The bias is positive (.691) and highly significant.

The Monte Carlo sampling distributions for the coefficient on the armed citizen dummy variable are shown in Appendix Figure 1.

Appendix Figure 1



The coefficient estimates on the police dummy are unaffected.

```
. summarize b_police b_police_trunc

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
    b_police |      1,000    .9438897    .0952657   .6151856   1.195941
b_police_t~c |      1,000    .9438897    .0952657   .6151856   1.195941
```