STATE FIREARM RELINQUISHMENT LAWS AND THEIR EFFECTS ON SUICIDE, HOMICIDE, AND INTIMATE PARTNER HOMICIDE

By

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ABSTRACT

While federal law prohibits firearm possession by individuals who have been convicted of a disqualifying offense and those who are subject to certain domestic violence restraining orders (DVROs), it does not explicitly require prohibited persons to surrender firearms they already own. Some states have adopted relinquishment laws to enforce firearm possession restrictions among prohibited persons following a disqualifying status or conviction. Research on these laws includes a legal analysis that detailed state DVRO relinquishment laws and longitudinal regression analyses that have estimated protective effects of these provisions on intimate partner homicide (IPH). The present study sought to build on this work in two ways: (1) by assessing DVRO and conviction-based relinquishment statutes, including legislative changes over time; and (2) quantitatively analyzing the effects of relinquishment provisions on suicide, homicide, and IPH using negative binomial regression models and augmented synthetic controls. Legal research revealed that many states still lack statutory elements that are expected to increase the likelihood of firearm surrender, such as requiring the court to order relinquishment, strict standards for providing proof of firearm transfer or some form of compliance verification, and provisions that authorize law enforcement to recover unrelinquished firearms. Results from the two quantitative approaches did not collectively provide strong evidence that relinquishment laws reduce firearm-specific and overall violent death. The study did find support for firearm policies more broadly—and purchaser licensing and extreme risk protection order laws in particular—as potential tools to reduce firearm violence. Future research that examines the implementation of relinquishment laws among multiple jurisdictions is needed to better understand potential barriers that may limit the effectiveness of relinquishment policies.

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INTRODUCTION

Firearm violence is a persistent public health and safety issue in the United States. According to the Centers for Disease Control and Prevention (CDC), 20,958 people died from firearm homicide and 26,328 people died from firearm suicide in 2021 CDC, 2022). The rate of firearm injury deaths in 2021—approximately 14.7 per 100,000—was the largest recorded rate in 28 years (CDC, 2022). Although the U.S. lacks a robust firearm injury surveillance infrastructure to track non-fatal injuries (Durkin et al., 2020), recent national estimates suggest that over 120,000 non-fatal firearm injuries occur each year (Kaufman et al., 2021).

In addition to intentional self-harm and interpersonal community violence, firearms play a ubiquitous role in intimate partner homicide. Between 1980 and 2017, more intimate partner homicides were committed with firearms than with all other types of weapons combined (Cooper & Smith, 2011; Fridel & Fox, 2019; Petrosky et al., 2017). In 2020, a firearm was used in 60.2% of intimate partner homicides recorded in the Federal Bureau of Investigation's Supplementary Homicide Reports (Fox, 2022).

Coupled with the vast human toll imposed by firearm violence, the healthcare and broader societal costs associated with firearm injury are staggering. Estimates from studies assessing the direct medical costs of initial firearm-related hospitalizations range from $622 million to $1.5 billion annually (Peek-Asa et al., 2017; Salemi et al., 2015; Spitzer et al., 2017). A more complete estimation of the economic impact of firearm violence that combines lost productivity costs with hospitalization and treatment costs raises the annual figure to anywhere from $17.2 billion (Corso et al., 2007; Lee et al., 2014) to $48 billion (Fowler et al., 2015).

Despite the inherent lethality of firearms, as well as the substantial epidemiological burden of firearm-related injury, few restrictions exist at the federal level to regulate purchase

and possession. Prior to the Bipartisan Safer Communities Act of 2022, a pair of provisions to the 1968 Gun Control Act in the mid-1990s represented two of the most notable firearm access restrictions enacted by the federal government in the past 30 years. As part of the Violent Crime Control and Law Enforcement Act in 1994, respondents subject to a final restraining order involving an intimate partner became prohibited from purchasing or possessing a firearm (18 U.S.C. § 922(g)(8)). The same purchase and possession restrictions apply to anyone who has been convicted of a misdemeanor crime of domestic violence (18 U.S.C. § 922(g)(9)). However, neither provision, nor any other federal statute, explicitly requires that newly prohibited persons relinquish firearms they already own.

Many states have enacted legislation to dispossess those who become prohibited from possessing firearms for the duration of a disqualifying condition (e.g., a domestic violence restraining order (DVRO)) or following a prohibiting conviction (e.g., a misdemeanor crime of domestic violence (MCDV) or felony). Specific components of state relinquishment laws, such as prohibitive conditions, timing, discretion given to the court, and the role of law enforcement, vary by state. For example, Hawaii law requires that any person prohibited from owning a firearm surrender their firearm(s) within 48 hours of disqualification and specifically authorizes chiefs of police to seize firearms which have not been relinquished within 48 hours (Haw. Rev. Stat. Ann. § 134-7.3(b)). Connecticut similarly requires that newly prohibited individuals surrender their firearm(s) within two days of a disqualifying event; however, unlike Hawaii, law enforcement officials are not specifically authorized to seize unrelinquished firearms (Conn. Gen. Stat. § 29-36k). The heterogeneity of relinquishment laws extends beyond law enforcement responsibilities; some states require relinquishment regardless of circumstance, others authorize the court to order relinquishment only if certain conditions are met (e.g., possession/use of

weapon during commission of violence), and still others have requirements that are specific to either full or ex parte orders (i.e., temporary orders that do not provide notice to the respondent) (Zeoli, Frattaroli, et al., 2019).

To date, four studies have analyzed the impact of relinquishment laws on mortality rates at the state level (Díez et al., 2017; Wallace et al., 2021; Wallin et al., 2021; Zeoli et al., 2018). Two studies noted that DVRO laws with provisions stating that the court may or shall order relinquishment were significantly associated with decreased intimate partner homicide (IPH) (Díez et al., 2017; Zeoli et al., 2018), in addition to a third study which found that significant reductions in IPH were limited to the white population (Wallin et al., 2021). In their analysis of laws enacted between 2010 and 2018, Wallace et al. (2021) found that relinquishment laws related to MCDV convictions were associated with significant reductions in homicides of pregnant or postpartum women.

Although disqualifications that result in firearm relinquishment are primarily domestic violence-related (i.e., DVROs or MCDVs), the protective effects of relinquishment laws may extend beyond IPH. An analysis of data from the North Carolina National Violent Death Reporting System estimated that IPV was a precipitating factor in 4.5% of single suicide events, the majority of which (over 80%) involved decedents who recently committed IPV (Kafka, Moracco, Taheri, et al., 2022). Studies have also found that it is relatively common for IPH offenders (Zeoli, Kwiatkowski, et al., 2021) and male IPV offenders (Hilton & Eke, 2016) to have violent criminal histories involving non-IPV offenses. Further, given that research has identified past violent convictions as a risk factor for future reoffending (Wintemute et al., 1998), it is possible that laws requiring domestic abusers or people with other disqualifying violent convictions to relinquish their firearms may decrease overall measures of firearm violence. From

a practical standpoint, firearms are the most commonly used weapon in suicides and homicides (Davis et al., 2023), in addition to being the most lethal method of suicide (Conner et al., 2019) and contributing to the lethality of interpersonal violent situations (Braga et al., 2021). Policies that restrict access to firearms—an established risk factor for violent death at the individual level (Studdert et al., 2020, 2022)—may therefore generate mortality reductions that are detectable at the state population level. Indeed, a recent RAND report found that, despite disagreement about the effects of several policies, firearm policy researchers were generally optimistic about the potential for surrender laws to reduce multiple forms of firearm violence (Smart et al., 2021). However, no study has examined the impact of relinquishment provisions on outcomes other than IPH and pregnancy-associated homicide.

To address the dearth of research examining relinquishment policies, I assessed the heterogeneity of firearm relinquishment laws that have been enacted across states and analyzed their associations with multiple measures of violence. Two aims were addressed sequentially, with the descriptive findings of Aim 1 informing specific provisions that were analyzed as part of Aim 2.

Research Aims

Aim 1: Survey state relinquishment laws to provide an up-to-date summary and assessment of current laws and potential gaps. Zeoli and colleagues (2019) previously analyzed state DVRO relinquishment laws through 2016. In addition to reassessing these provisions and their changes over time, this study builds on the work of Zeoli et al. (2019) in two ways: (1) by assessing policy changes in DVRO legislation that occurred after 2016; and (2) examining relinquishment provisions associated with other prohibitions, such as felonies, MCDVs, and misdemeanor crimes of violence.

Aim 2: Examine the effects of firearm relinquishment laws on measures of suicide, homicide, and IPH through quantitative policy analyses. Findings from Aim 1 informed the classification of relinquishment laws and thus, how specific provisions were analyzed beyond a simple measure indicating the presence or absence of a relinquishment law in a state year.

Research Design

I conducted legal research to determine when and in which states relinquishment laws were enacted. Specific characteristics of state laws pertaining to classes of prohibited persons, the period in which firearms are required to be surrendered, to whom firearms can be surrendered, and, among other things, the discretion granted to the court were synthesized. The characteristics of specific state relinquishment provisions guided the quantitative analyses in Aim 2.

I use a quasi-experimental research design and 31 years of panel data (1991-2021) to analyze the effects of state relinquishment provisions on overall measures of each outcome and outcomes stratified by firearm involvement. Suicide and homicide data were obtained from CDC WONDER and IPH data were obtained from a multiply imputed Supplementary Homicide Reports dataset. Negative binomial regressions with two-way fixed effects and standard errors clustered at the state level were used to assess associations between relinquishment provisions and each outcome. Augmented synthetic control methods with fixed effects were used as a secondary analytic technique to estimate the impact of state-specific relinquishment policy changes on each outcome.

LITERATURE REVIEW

The following review of firearm policy and other relevant literature is composed of four sections. First, the role of firearms is discussed in the context of suicide, homicide, and IPH. Second, an overview of federal firearm restrictions is provided, followed by a brief discussion of the limitations of federal law. The third section outlines state firearm laws and research on their associations with suicide, homicide, and IPH. The literature review concludes with an overview of firearm relinquishment laws, research examining their impact on pregnancy-associated and intimate partner homicide, and limitations that necessitate further study.

The Role of Firearms in Suicide, Homicide, and Intimate Partner Homicide

In 2021, the most recent year in which national firearm mortality data are available, there were 48,830 firearm-related deaths in the U.S. (CDC, 2022). The overwhelming majority of homicides (81%) and the majority of suicides (55%) were committed with a firearm (Davis et al., 2023). The prevalence of firearms in intimate partner homicides is similarly staggering, as 51.5% of female IPH victims and 74.8% of male IPH victims were killed with a firearm between 2010 and 2017 (Fridel & Fox, 2019). The availability and lethality of firearms are important factors that account for their high prevalence in suicides and homicides. As described by Stroebe (2013), although firearms are secondary to intent in a causal hierarchy of factors contributing to suicide and homicide, they are one of the most effective means by which to commit fatal acts. The following sections demonstrate the role of firearms in suicide, homicide, and IPH.

Suicide

Findings from studies that have examined the effect of handgun ownership at the individual level underscore the relationship between firearm access and suicide. A 1999 study found that suicide risk was elevated among recent handgun purchasers in California and

remained significantly above that of the general population for at least six years (Wintemute et al., 1999). A similar risk associated with handgun access was observed in a more recent case-control study. Using data from a cohort of over 26 million California residents who were followed for up to 12.2 years, researchers found that first-time handgun owners had significantly higher rates of suicide and firearm suicide but not suicide involving other methods or other forms of mortality (Studdert et al., 2020). Household firearm access has also been identified in other studies as a risk factor for firearm suicide (Wiebe, 2003) as well as suicide committed within one's home (Kellermann et al., 1992). Among women, household firearm access was found to be significantly associated with increased risk of suicide in the home independent of other relevant factors such as depression and living alone (Bailey et al., 1997).

Consistent with the findings of studies examining individual-level risk, ecological analyses have identified indicators of firearm availability as risk factors for suicide. One study found that greater firearm prevalence, measured as the proportion of suicides involving firearms, is associated with increased firearm and overall suicide rates at the state and regional level (Miller et al., 2002a). Using survey-based measures to estimate firearm ownership, researchers have also noted that higher rates of firearm ownership are associated with higher rates of overall suicide at the state level (Miller, Lippmann, et al., 2007). Notably, the increases in suicide cannot be accounted for simply by measures of suicidal behavior, such as attempts. Using survey measures assessing household ownership and attempts of suicide in the prior 12 months, researchers found that greater firearm prevalence within states was significantly associated with increased suicide risk independent of suicide attempt rates (Miller et al., 2013).

Coupled with the widespread availability of firearms within the U.S., their lethality relative to other methods of suicide pose a particular challenge to suicide prevention. Although

precise estimates of suicide case fatality rates vary, attempts involving firearms are consistently found to be the most lethal. Estimates of firearm suicide case fatality rates using state, region, or national data range from 82.5% to 96.5% (Conner et al., 2019; Miller et al., 2004; Shenassa et al., 2003; Spicer & Miller, 2000). Most recently, a national population-based study found that approximately 90% of all firearm suicide attempts from 2007 to 2014 were fatal, followed by 56.4% of attempts involving submersion or drowning (Conner et al., 2019).

Homicide

Perhaps for many of the same reasons that firearms are used in suicide (e.g., availability, lethality), they are also the most commonly used weapon to commit homicide (Kegler et al., 2022). Two reviews of research analyzing the association between firearm accessibility and violent death concluded that firearm access is a risk factor for both suicide and homicide victimization (Anglemyer et al., 2014; Stroebe, 2013).

Although less research has been conducted on the association of firearm ownership or availability with homicide rates at the state level, a similar relationship as the one described above has been observed. Two studies by Miller, Azrael, and Hemenway used differing measures of state firearm prevalence but identified a similar association between firearms and homicide levels. First, controlling for factors such as unemployment rate, poverty, and nonlethal violent crime rates (among other variables) between 1988 and 1997, a commonly used proxy for household firearm ownership (the proportion of suicides involving firearms) was associated with increases in homicide for all age groups over 5 (Miller et al., 2002b). In a similar study which controlled for additional factors between 2001 and 2003, such as aggravated assault rate and robbery rates, the researchers found that a survey-based measure of firearm ownership was significantly associated with greater homicide victimization rates among men, women, and

children (Miller, Hemenway, et al., 2007). Notably, there was no association between firearm ownership and non-firearm homicide rates. In a third study using the same proxy measure mentioned above and a longer study period (1981-2010), firearm ownership was significantly associated with increased firearm homicide rates but not homicide rates involving other weapons (Siegel et al., 2013).

Firearm access has also been identified as a risk factor for homicide victimization at the individual level. In an analysis of three large counties in three states, researchers found that having a gun in the home significantly increased the risk of homicide victimization in one's home after controlling for a set of potential confounders (Kellermann et al., 1993). A national case-control study using 1993 mortality data and interviews of decedents' next of kin found that having a gun in the home was a risk factor for gun-related homicide but not homicide by other means (Wiebe, 2003). Similarly, a study by Studdert and colleagues (2022) that followed participants from 2004 to 2016 noted that the risk of being killed in a homicide was twice as high among cohabitants of handgun owners than among those whose cohabitants did not own handguns.

Just as case fatality rates for suicide attempts involving firearms are higher than those involving other methods, violent encounters involving firearms have been found to be more lethal than those in which firearms are absent. A recent review of firearm lethality research lethality found "strong support for gun instrumentality effects," (p. 148) and ultimately concluded that firearms enhance the lethality of violent situations (Braga et al., 2021). Examining the role of firearms as they relate to the outcomes of specific crime events, Cook found that the risk of homicides in assaults (2018) and robberies (1987) involving guns exceeded the risk in similar violent incidents in which the perpetrator used a knife. A firearm

instrumentality effect was also observed by Weaver and colleagues (2004) who noted a similar excess in fatality risk of firearm assaults compared to those involving a knife and an even greater disparity when firearm assaults were compared to unarmed assaults. A study that used data from the National Incident-Based Reporting System (NIBRS) and controlled for situational and interpersonal characteristics found that all firearm types (e.g., handguns, shotguns, rifles) were significant predictors of lethality in violent encounters relative to those in which no weapon was involved (Libby & Corzine, 2007). Lastly, although much remains to be known about the use of firearms in self-defense, an analysis of National Crime Victimization Survey (NCVS) data revealed that self-defensive gun use was not associated with reduced risk of injury among victims of personal contact crimes (Hemenway & Solnick, 2015). One study concluded that civilian gun use in self-defense is undercounted by NCVS data (Kleck & Gertz, 1995), which might suggest a discounting of the value of protection offered by firearms. However, the projections made by Kleck and Gertz (1995) using alternative survey data appear to substantially overestimate the incidence of defensive gun use (see Webster et al. (2016)).

Intimate Partner Homicide

Firearms can be wielded by abusive partners to threaten, invoke fear, or otherwise coerce victims (Sorenson & Schut, 2018). In addition to non-fatal forms of violence, they are used to commit a majority of intimate partner homicides (Fridel & Fox, 2019). Several studies have identified firearm access as an individual-level predictor of IPH, as well as measures of ownership/availability as risk factors for IPH at the state level.

Research by Bailey and colleagues (1997) underscores the risk of violent death for women posed by firearms in the home. Their case-control study found that having one or more firearms in the home was a risk factor for homicide and intimate partner homicide independent

of relevant factors such as illicit drug use among household members, past domestic violence, and prior arrest(s) of the victim or another member of the home (Bailey et al., 1997). Kellerman and colleagues (1993) also concluded that home firearm ownership increased the risk of intimate partner homicide after controlling for similar factors as those in the study by Bailey et al. (1997). In perhaps the most influential study on risk factors for IPH, researchers used an 11-city case-control study design to examine the associations of individual, relationship, and contextual characteristics with IPH. Independent of several relevant risk factors, including incident-level variables, an abuser's access to a gun was associated with a five-fold increase in IPH victimization risk (Campbell et al., 2003).

Ecological analyses have used a modified version of the previously mentioned proxy for firearm ownership that incorporates the prevalence of federally licensed firearms dealers to assess how broader indicators of firearm availability influence rates of IPH. Whereas the correlation between the commonly used proxy measure for firearm ownership and survey-based measures is 0.8, the correlation of the modified proxy developed by Siegel and colleagues (2014) that incorporates per capita state hunting license data is 0.95. Using the modified proxy, researchers found that state firearm ownership was associated with increased firearm IPH and overall IPH rates for men and women (Kivisto et al., 2019). At the county level, an analysis across 16 states indicated a positive and significant association between the rate of federally licensed firearms dealers per 100,000 residents and intimate partner homicides in urban counties (Stansfield & Semenza, 2019). A similar relationship was noted at the city level in a subsequent study sampling 286 large cities between 2010-2019 (Stansfield et al., 2021). Taken together, results from the studies discussed above suggest that individual-level access to firearms, as well as broader measures of firearm availability within communities, increase the risk of IPH.

Conclusion

Firearms are used to commit a majority of suicides and homicides, including intimate partner homicides, in the U.S. Although many people report owning a firearm for protection (Azrael et al., 2017), research suggests that firearm access increases the risk of violent death. Rather than conferring a protective effect, indicators of individual- and ecological-level firearm access have been established as risk factors for fatal self-harm and interpersonal violence outcomes.

Federal Regulation of Firearm Access

The following section provides an overview of major firearm policy changes at the federal level as well as gaps that have gone unaddressed. Specific attention is given to legislation prohibiting firearm access among certain classes of persons. Despite these regulations, no enforcement mechanism exists to ensure that prohibited persons relinquish their firearm(s) upon becoming disqualified from possessing a firearm.

In 1938, the Federal Firearms Act prohibited firearm purchases by convicted felons, fugitives, individuals under felony indictment, and those who were otherwise "not qualified to own the firearm in question in their state or locality" (Zimring, 1975, p. 151). The Gun Control Act (GCA) of 1968 expanded the prohibited persons list to include minors (defined as under 18 years of age for long guns and 21 years of age for handguns), individuals who had been adjudicated as not guilty by reason of insanity or previously committed to a mental institution, and drug users (Zimring, 1975). Although the expanded prohibited persons list was intended to limit firearm access for certain classes, the only prohibition with an associated verification component was the age requirement, as dealers were required to verify a buyer's age but not the absence of any other prohibition (Zimring, 1975).

The Brady Handgun Violence Prevention Act (1993) amended the GCA and addressed a major loophole in the law—the lack of a verification component to prevent prohibited persons from purchasing firearms. Specifically, the Brady Act included permanent and interim provisions that regulated firearm purchases from federal firearms licensees (FFLs). In addition to an interim provision that imposed a five-day waiting period for handgun purchases in some states (Luca et al., 2017), the law also established the National Instant Criminal Background Check System (NICS) which took effect in 1998. As of January 1, 2022, over 411 million background checks had been conducted through NICS (Federal Bureau of Investigation, 2022).

Following the enactment of Brady, the Violent Crime Control and Law Enforcement Act was signed into law in September 1994. The law included a revision to the GCA that restricted firearm access for some perpetrators of domestic violence. Pursuant to 18 U.S.C. § 922(g)(8), a person subject to a final DVRO became prohibited from purchasing or possessing firearms. Despite expanding the classes of prohibited persons to include DVRO respondents, three important gaps remain. First, like other federal firearm restrictions, the law did not explicitly require respondents to relinquish their firearm(s) upon becoming disqualified, nor did it require verification that they did not possess firearms. Second, the law did not restrict firearm access for respondents subject to emergency or "ex parte" protective orders despite such orders being granted in instances in which the judge finds it necessary to issue immediate protection to a petitioner (Zeoli, Frattaroli, et al., 2019). Third, the federal definition of an "intimate partner" does not include current or former dating partners who do not have a child together or those who have not lived together. Data suggests that such domestic violence offenders are as dangerous as those who fit the federal definition of an intimate partner. Among intimate partner homicides in 2020 for which the victim-offender relationship was known, 52.9% were committed by a dating

partner (including those coded in the Supplementary Homicide Reports dataset as being in a homosexual relationship) compared to 47.1% by a spouse (including common-law and former spouses) (Fox, 2022). More IPHs are committed by dating partners than spouses, yet victims of abuse by the former are unable to receive the protections offered by DVROs to the latter unless they have cohabitated with their abuser or have a child together.

A similarly focused firearm restriction related to domestic violence offenders, often referred to as the Lautenberg Amendment, was enacted by Congress in 1996 and signed into law as part of the Omnibus Consolidated Appropriations Act of 1997. Pursuant to 18 U.S.C. § 922(g)(9), it became a federal crime for a person who has been convicted of a MCDV to purchase or possess a firearm. Additionally, like the prohibition associated with DVROs, the federal definition of an intimate partner limits the firearm restriction to convicted abusers who are or were married to the victim, cohabitated with the victim, or share a child with the victim. The failure of federal laws to prohibit abusive dating partners from accessing firearms as part of a conviction or restraining order is often called the "boyfriend loophole." The loophole has remained a major gap in the federal firearm policy framework since the mid-1990s although it was partially closed in 2022.[1]

Conclusion

Although federal law prohibits the purchase or possession of firearms by certain classes of individuals, in practice, such regulations only enforce the former without verifying compliance of the latter. Notwithstanding that background check requirements do not cover

[1] As part of the Bipartisan Safer Communities Act, individuals who are convicted of a violent offense against a current or recent dating partner are prohibited from purchasing or possessing firearms for five years. Notwithstanding the revision of 18 U.S.C § 921(a)(33)(A)(ii) to include current or former dating partners under the definition of *misdemeanor crime of domestic violence*, the limitations of restraining orders involving dating partners and emergency or ex parte orders remain.

private sales, the NICS system works to prevent firearm purchases by prohibited persons. In 2021, over 150,000 transactions were denied through NICS (Federal Bureau of Investigation, 2022). Conversely, it is unclear how many prohibited possessors surrendered their firearms following a disqualifying status or conviction. There is no statute that requires verification or compels individuals to relinquish their firearm(s) upon a possession disqualification. Therefore, preexisting firearm access among high-risk people who have become prohibited from acquiring or possessing firearms remains an important concern despite significant changes in firearms regulation since the 1938 Federal Firearms Act.

Firearm Regulation at the State Level

While firearm regulation at the federal level remained largely unchanged between the late 1990s and 2022, states enacted more restrictive policies to address the limitations of federal statutes. The following discussion of these policies and their associated research support is necessary to situate firearm relinquishment laws within the broader policy landscape and consider the potential impact such provisions may have on firearm-related mortality.

Expanding Classes of Prohibited Persons

Many states have addressed two of the main gaps in federal law described above by (1) enacting firearm access prohibitions for respondents subject to ex parte DVROs; and (2) broadening the definition of "intimate partners" to include dating partners who have not cohabitated and do not have a child together. As a result, abusive dating partners and those who are subject to an ex parte DVRO are, in some states, prohibited from purchasing or possessing a firearm. There is moderate evidence that state firearm restrictions for DVRO respondents are associated with reductions in firearm IPH and overall IPH (Smart et al., 2023; Vigdor & Mercy, 2006; Zeoli et al., 2018; Zeoli & Webster, 2010). Zeoli and colleagues (2018) found that state

DVRO restrictions that include ex parte orders and those that cover dating partners were independently associated with a 13% reduction in IPH rates when compared to states that did not have DVRO firearm restrictions. Beyond domestic violence-related restrictions, they also noted that firearm prohibitions for violent misdemeanor convictions were associated with a 23% decrease in overall IPH (Zeoli et al., 2018).

Vigdor and Mercy (2006) found significant effects associated with restraining order prohibitions only when they included firearm purchase restrictions. Notably, states that restricted firearm possession but did not also prohibit purchase did not have significantly different IPH rates than those lacking restraining order firearm laws altogether, whereas states that included purchase restrictions had IPH rates that were 10% lower (Vigdor & Mercy, 2006). The authors posited that the lack of a protective effect associated with possession restrictions may be due to the challenge of enforcing such laws, which further illustrates the importance of relinquishment provisions.

No studies have examined the relationship between state domestic violence-related firearm restrictions and overall homicide rates. The limited research that has analyzed the association between domestic violence-related firearm restrictions and suicide is uncertain (Smart et al., 2023).

Background Checks

A second area in which states have extended the requirements outlined in federal law pertains to background checks for firearm purchases. As previously noted, federal law prohibits licensed dealers from completing firearm transfers before a background check is processed (or before three business days have passed following the initiation of the background check, in which case the transfer may proceed without a completed check) (18 U.S.C. § 922(t)). Absent a

comprehensive background check (CBC) law, buyers can purchase firearms from private sellers, at gun shows, and online without undergoing a background check. According to Giffords Law Center, 21 states now require background checks for at least some sales from unlicensed sellers, with 16 states requiring them for all firearm sales (Giffords Law Center, n.d.). Although there is little evidence to suggest that expanding point-of-sale background check requirements to include private firearm sales reduces suicide (Castillo-Carniglia et al., 2019; Kagawa et al., 2018; McCourt et al., 2020), dealer background checks may reduce firearm homicide (Smart et al., 2023).

Purchaser Licensing

Purchaser licensing laws, also known as permit-to-purchase (PTP) laws, are a similar but more restrictive set of policies than CBC laws. Whereas a CBC law requires that a background check be conducted by a licensed dealer or by law enforcement at the point of sale, a PTP law requires that a person apply for a permit to purchase a firearm directly through state or local law enforcement. In addition to undergoing a background check which may be more thorough than that initiated by a licensed dealer, some states mandate fingerprinting and safety training to obtain a valid permit (Crifasi et al., 2015). Results from recent policy analyses suggest that PTP laws may reduce firearm suicides (Crifasi et al., 2015; McCourt et al., 2020) and total suicides (Luca et al., 2017), in addition to having protective effects on firearm homicide (Crifasi et al., 2018; Hasegawa et al., 2019; McCourt et al., 2020; Webster et al., 2014). PTP laws were not found to be significantly associated with IPH rates in two studies (Díez et al., 2017; Zeoli et al., 2018).

Waiting Periods

In addition to expanding purchase requirements, states have also implemented temporal restrictions on firearm purchases. Waiting period laws mandate a delay between the purchase and acquisition of a firearm from a licensed dealer. The transfer delay is intended to provide law enforcement with additional time to conduct background checks and investigate suspected straw purchases, as well as prevent impulsive acts of firearm violence by those seeking to purchase a firearm (Smart et al., 2023). Although few studies have examined waiting periods, there is growing evidence that such purchase delay policies may reduce firearm suicides (Edwards et al., 2018; Luca et al., 2017; Oliphant, 2022a; Smart et al., 2023). Research also suggests that waiting periods may reduce firearm homicides by as much as 17% (Luca et al., 2017). One study found mixed results related to the effect of waiting periods on IPH; policies mandating a two- to seven-day delay were associated with significant reductions in IPH, while delays longer than seven days were linked to higher incidences of IPH (Roberts, 2009).

Extreme Risk Protection Orders

Lastly, many states have enacted extreme risk protection order (ERPO) laws in recent years. ERPOs are targeted, risk-based tools to restrict firearm access among people who have been determined by a judge to pose a threat to themselves or others. Although they are often sought as a means of protection against individuals who already possess a firearm, ERPOs can also be used to prevent a dangerous person from purchasing a firearm (Zeoli, Paruk, et al., 2021). Law enforcement or other authorized petitioners initiate ERPO petitions which are typically followed by one or more hearings in which temporary and final protection orders may be issued by a civil court judge. If the court finds that the petitioner has met the necessary standard of

proof, a final ERPO is issued that prohibits the respondent from purchasing or possessing a firearm for up to a year and requires the surrender of any firearm(s) they already possess.

Given their relative recency in comparison to other firearm policies, few studies have examined the impact of ERPOs on suicide and interpersonal violence. Researchers note that similar risk-based firearm removal laws in Connecticut and Indiana may have prevented suicides among those subject to the removal laws (Swanson et al., 2017, 2019). Additionally, a recent case series suggests that ERPOs may be an effective tool to prevent mass shootings (Wintemute et al., 2019). However, more rigorous analyses are needed to better estimate the effects of ERPOs (Zeoli, Paruk, et al., 2021).

Conclusion

In many ways, the concept of states as "laboratories of democracy" applies to the patchwork of firearm policies that have been enacted to address gaps in federal law. Legislation at the state level provide opportunities to test the effects of social policies, including those that limit access to firearms. The preceding sections demonstrate that various firearm access restrictions are associated with reductions in firearm-related fatalities and overall mortality rates of self-harm and interpersonal violence. However, apart from ERPOs, the policies discussed above act exclusively as firearm *purchase* restrictions.

Firearm Relinquishment Laws

Although purchase restrictions can prevent prohibited persons from acquiring firearms, they fail to address preexisting firearm access. Absent more stringent laws at the state level to mandate relinquishment, many newly prohibited individuals likely retain possession of their firearms despite being subject to a DVRO or having been convicted of violent offenses. Many states have enacted laws to require relinquishment in certain circumstances; however, the types

of prohibitions that are supplemented by a relinquishment requirement, as well as the elements within the relinquishment provision, can vary by state.

In Nevada, the court *may* order a DVRO respondent to relinquish their firearm(s) after considering the following factors: the respondent's history of domestic violence, use or threatened use of a firearm to threaten injury against the petitioner or a minor, and use of firearm in the commission of a crime (Nev. Rev. Stat. Ann. § 33.031). Notably, the provision applies only to full DVROs and cannot be used to dispossess respondents of ex parte DVROs. Unlike in Nevada, courts in neighboring California are mandated to order the surrender of firearms as part of full and ex parte orders regardless of a respondent's history (Cal. Fam. Code § 6389).

California's relinquishment policy extends beyond DVROs. As of 2018, California law requires all individuals convicted of felonies, MCDVs, and other prohibitive crimes to relinquish their firearms (Cal. Penal Code § 29810). The law also explicitly describes the procedure that must be followed, including obligations of the court to inform the defendant and the date by which their firearm(s) must be transferred or sold. It is hypothesized that statutes such as the one in California, which provide greater detail about the process and requirements of all parties involved, increase the likelihood that relinquishment will occur (Zeoli, Frattaroli, et al., 2019).

Other provisions that may strengthen a relinquishment policy are those that require proof of relinquishment and authorize law enforcement to seize firearms that have not been appropriately transferred or sold. In Hawaii, any person who becomes prohibited from owning a firearm must surrender their firearm(s) within 48 hours of disqualification. Hawaii law specifically authorizes chiefs of police to seize firearms which have not been relinquished within the allotted 48-hour period (Haw. Rev. Stat. Ann. § 134-7.3(b)). In addition to authorizing law enforcement to recover unrelinquished firearms and implementing time limits for

relinquishment, requiring verification of compliance is an additional process-related element that varies by state and is expected to impact the likelihood of firearm relinquishment (Zeoli, Frattaroli, et al., 2019).

Firearm Relinquishment Literature

One study has analyzed state firearm relinquishment laws enacted between 1989 and 2016 (Zeoli, Frattaroli, et al., 2019). Zeoli and colleagues (2019) offer a careful assessment of relinquishment laws and propose a continuum intended to indicate the relative strength of provisions and the likelihood that they will result in dispossession. For each of the 28 states that enacted dispossession laws, the researchers classify the instructions that are provided to courts (e.g., shall or may require the surrender of firearms), to which types of DVROs the instructions apply (i.e., full and/or ex parte orders), applicable criteria (e.g., an indication of whether the court's dispossession instructions are conditioned by particular circumstances, such as firearm-related threats made by the respondent), and other relevant information (e.g., exemptions, instructions for seizing firearms). The study demonstrates clear variability in relinquishment provisions across states.

To date, only four studies have analyzed the impact of relinquishment provisions on measures of homicide. Three studies used negative binomial models and at least 25 years of data to estimate the effects of domestic violence-related relinquishment laws on intimate partner homicides (Díez et al., 2017; Wallin et al., 2021; Zeoli et al., 2018). A fourth study examined pregnancy-associated homicides over a nine-year study period (Wallace et al., 2021).

Díez and colleagues (2017) used data from 1991 to 2015 to analyze the association between domestic violence-related firearm restrictions at the state level and rates of firearm and overall intimate partner homicide. The researchers found that state laws that prohibited firearm

possession among DVRO respondents and required them to relinquish their firearms were significantly associated with reductions in firearm and overall IPH. Relative to states that lacked both laws, states that prohibited possession and required relinquishment among DVRO respondents had firearm IPH rates that were 15% lower and overall IPH rates that were 10.8% lower (Díez et al., 2017). Notably, state DVRO prohibitions that were not accompanied by a relinquishment provision were not significantly associated with rates of IPH. Their findings suggest that relinquishment provisions may be a critical statutory element to effectively restrict DVRO respondents' firearm access and prevent IPH.

Zeoli and colleagues (2018) used a longer study period (1981-2013) to assess the association of several state firearm restriction laws with IPH in 45 states. Among other restrictions, the researchers examined the impact of various DVRO laws (e.g., those that expanded coverage to include dating partners and ex parte orders; those that included relinquishment provisions) on IPH and firearm IPH. While state DVRO laws were associated with reductions in IPH as hypothesized, additional analyses illustrated the importance of specific provisions. Most relevant to the present study, DVRO laws that included a relinquishment provision were associated with a 12% reduction in IPH and a 16% reduction in firearm IPH (Zeoli et al., 2018). Similar to the Díez et al. (2017) study, states with DVRO laws that lacked a relinquishment provision were not associated with significantly lower IPH or firearm IPH rates when compared to states that did not have any DVRO restrictions.

The study conducted by Wallin and colleagues (2021)—a re-analysis of Zeoli et al. (2018)—investigated whether firearm restrictions differentially impact IPH rates of white and Black victims. Whereas DVRO relinquishment provisions were associated with significant decreases in IPH (-11%) and firearm IPH (-16%) among white victims, no effect was observed

for IPH or firearm IPH rates of Black victims. The authors posited that differences in firearm ownership and the likelihood of petitioning for a DVRO between white and Black Americans might contribute to the differential effects of relinquishment provisions.

Lastly, Wallace and colleagues (2021) estimated the impact of MCDV- and DVRO-related firearm relinquishment laws on pregnancy-associated homicide rates (i.e., homicides of pregnant women and women who were pregnant within the past year). State MCDV laws that included relinquishment provisions were associated with significantly lower rates of pregnancy-associated homicide. Estimates for the effect of DVRO-related relinquishment provisions on pregnancy-associated homicides were in the expected direction but only approached statistical significance. MCDV and DVRO laws that restricted firearm possession but did not mandate relinquishment were not associated with decreased pregnancy-associated homicide rates.

Gaps

The findings discussed above suggest that relinquishment provisions may be effective policies for states to enact to reduce IPH. Still, given that few studies have analyzed such laws, more research is needed to better understand their impact and the specific provisions that may be driving observed effects. There are several gaps in the extant research that future work can address. First, the analyses are limited to relinquishment laws that are related to domestic violence-specific prohibitions. Further, only one study examined the association of MCDV-related relinquishment provisions with rates of IPH. Beyond MCDVs and DVROs, state relinquishment laws can also apply to other prohibitive convictions, such as those for violent misdemeanors and felonies. It is necessary to assess how these laws may impact rates of suicide and homicide.

Second, and related to the first limitation, the studied outcomes are limited to IPH or pregnancy-associated homicide. Given that firearm access has been established as a risk factor for suicide and homicide (Anglemyer et al., 2014; Stroebe, 2013), it is possible that laws requiring dispossession by prohibited persons may reduce other forms of mortality. A recognition of the potential suicide risk is evident in North Carolina's relinquishment statute. North Carolina courts are required to order respondents of ex parte and full DVROs to surrender their firearms if any of four conditions are met, one of which being suicidal threats by the respondent (N.C. Gen. Stat. § 50B-3.1(a)).

Third, the analyses of the impact of DVRO relinquishment provisions on IPH end in 2013 and 2015. The synthesis of state firearm relinquishment provisions related to DVROs ends in February 2016 (Zeoli, Frattaroli, et al., 2019). Updated analyses that evaluate both the potential gaps in state policy as well as associations of specific relinquishment provisions with various rates of mortality are needed to further the understanding of these policies.

Finally, the three studies that analyzed rates of IPH used negative binomial models and generalized estimating equations to estimate the effects of relinquishment laws. The present study supplements regression analyses with augmented synthetic controls to model single-state policy changes.

Conclusion

Firearm access has been established as a risk factor for suicide, homicide, and IPH at the individual and ecological level. Federal firearm policy has slowly evolved to reflect these risks in the form of laws that restrict firearm access among prohibited persons who may be at high risk of perpetrating violence. Yet, there is no formal dispossession requirement or process to ensure that individuals who become disqualified from possessing firearms relinquish their weapons. Over

the years, states have addressed gaps in federal firearm policy by mandating that courts order relinquishment in certain situations (e.g., protection orders, domestic violence-related convictions). Although research examining the impacts of such laws is limited, the results suggest that relinquishment policies reduce rates of IPH (Díez et al., 2017; Wallin et al., 2021; Zeoli et al., 2018) and pregnancy-associated homicide (Wallace et al., 2021). It is unclear what effect relinquishment laws may have on the rates of overall and firearm-specific suicide and homicide. The proposed study seeks to advance the understanding of relinquishment laws as potential policy tools to prevent violence. Specifically, the study will incorporate more outcomes, an innovative statistical method, and analyses of more relinquishment provisions to address limitations of the existing evidence related to relinquishment laws.

THEORETICAL FRAMEWORKS

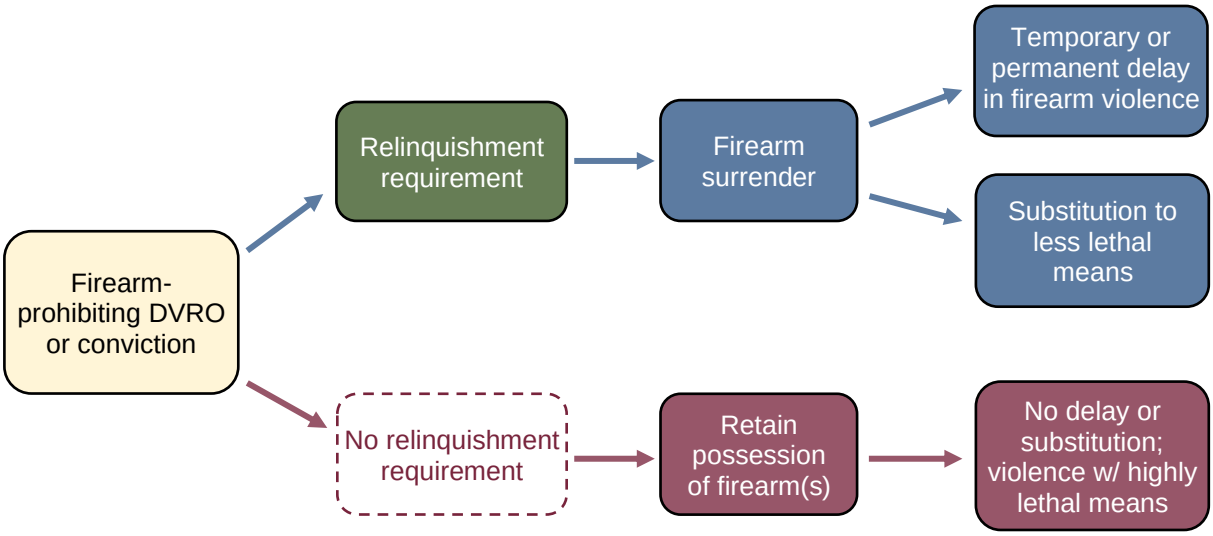
Theory of Change

Firearm relinquishment is intended to act as a form of means restriction to reduce a person's capacity to commit fatal violence. Means restriction is a capacity and opportunity reduction strategy centered around limiting access to firearms, weapons, or other lethal means. Often discussed in the context of suicide prevention, means restriction changes the circumstances of violence by "precluding potentially fatal actions or forcing the use of a less lethal method" (Yip et al., 2012, p. 2394). As described by Yip et al. (2012), appropriate targets of means restriction interventions are methods that are common and highly lethal. Firearm suicide attempts have a higher case fatality rate than any other method and are among the most commonly used methods of suicide (Miller et al., 2004; Shenassa et al., 2003; Spicer & Miller, 2000). Similarly, firearms enhance the lethality of violent situations (Braga et al., 2021) and are the most commonly used weapon in homicides (Kegler et al., 2022) and intimate partner homicides (Cooper & Smith, 2011; Fridel & Fox, 2019; Petrosky et al., 2017). Therefore, restricting firearm access may reduce overall mortality by preventing potential attempts and forcing those whose attempts are not prevented to substitute less lethal means.

The potential mortality reduction effect of relinquishment laws is illustrated by an example involving a respondent or defendant who becomes prohibited from possessing firearms (Figure 1). Following relinquishment after a disqualifying conviction or DVRO, an abuser who would have otherwise used a firearm to perpetrate IPH is theoretically less capable—in the sense that they no longer possess the most lethal and commonly used weapon to commit homicide—of perpetrating IPH. At a minimum, if relinquishment does not prevent an IPH attempt altogether, it forces the abuser to substitute less lethal means or attempt to access a firearm through the illicit

market. Either scenario, though still presenting significant threats to victim safety, requires substantially more effort on the part of the abuser to perpetrate IPH. It is plausible that this effort, owing to the capacity reduction effect of dispossession, reduces the likelihood that an IPH will occur.

Figure 1. A model of potential means restriction effects generated by relinquishment laws.



Relinquishment laws may also contribute to a reduction in overall homicide in a few ways. First, reductions in IPH may simply be reflected in firearm-specific and overall homicide rates. Second, relinquishment laws may lead to fewer non-IPHs. Researchers have noted that a history of intimate partner violence (IPV) can be common among perpetrators of homicide-suicide (i.e., homicides that are immediately followed by the perpetrator's suicide) who did not commit IPH (Logan et al., 2008). Requiring that perpetrators of IPV surrender their firearms upon becoming a prohibited possessor may therefore prevent non-intimate partner homicides. Among the 55.8% of male homicide-suicide perpetrators who had prior IPV conflicts (as identified in NVDRS data from 17 states), 92% used a firearm in the homicide-suicide (Logan et al., 2008). Lastly, although not necessarily distinct from the pathways in which IPHs and non-

IPHs may decrease, firearm relinquishment laws are expected to remove an established risk factor of violent death (Bailey et al., 1997; Kellermann et al., 1993; Studdert et al., 2022; Wiebe, 2003) from many households.

The potential for relinquishment laws, primarily those that apply to disqualifications related to domestic violence, to reduce suicide may be less clear. However, the role of firearms in homicide-suicides, the prevalence of IPV as a precipitating factor in suicides, and the risks associated with firearm access suggest that the effects of such policies to dispossess prohibited persons may extend beyond interpersonal violence outcomes.

Although homicide-suicides represent a small minority of homicides (Barber et al., 2008; Smucker et al., 2018), they comprise a much larger proportion of IPH incidents. In North Carolina, nearly 25% of IPH incidents recorded in the National Violent Death Reporting System from 2003-2014 were followed by a suicide (Smucker et al., 2018). Pilot NVDRS data from a separate study of several states from 2001-2002 indicated that IPH perpetrators committed suicide in 31.9% of cases (Barber et al., 2008). IPH-suicide incidence is even greater when cases are limited to violence committed by males with firearms. Research suggests that male perpetrators of firearm IPH commit suicide in 59% to 70% of cases (Barber et al., 2008; Walsh & Hemenway, 2005). In contrast, Barber and colleagues (2008) found that less than 20% of male-perpetrated IPH incidents involving a weapon other than a firearm were followed by suicide. The possibility of preventing suicide by limiting access to firearms is similarly evident in femicide cases. An 11-city analysis of mortality data from 1994-2000 found that a firearm was used in 61.2% of femicide-suicides compared to 28.3% of femicides that were not followed by suicide (Koziol-McLain et al., 2006). Given that many femicides and IPHs committed with

firearms are followed by suicide, preventing interpersonal firearm violence might similarly reduce IPH-suicide and overall suicide rates.

Lastly, as was briefly mentioned in relation to homicide, firearm relinquishment is expected to decrease the risk of firearm and overall suicide among dispossessed individuals and their cohabitants. Researchers estimated that IPV served as a precipitating factor in roughly 6% of suicides in North Carolina (Kafka, Moracco, Taheri, et al., 2022). Nearly 75% of suicide decedents for whom IPV involvement was identified as a precipitating factor were males who perpetrated IPV (Kafka, Moracco, Taheri, et al., 2022). Regardless of the effect of relinquishment on interpersonal violence, the theorized protective effect of firearm dispossession is consistent with research that has identified individual and household firearm access as a key risk factor for suicide (Bailey et al., 1997; Kellermann et al., 1992; Studdert et al., 2020; Wiebe, 2003; Wintemute et al., 1999).

Relinquishment laws are theorized to act as a form of means restriction, thereby making potential acts of violence less likely to occur and less lethal if they do occur. Criminology and public health frameworks related to capacity and opportunity reduction are useful for understanding how firearm relinquishment laws may reduce suicide and homicide. The following sections illustrate the theoretical support for means restriction policies and the overlap that exists between criminology and public health in violence prevention.

Criminological Theory

Routine activity theory, a core criminological framework that explores the circumstances of crime events, was first proposed to explain changes in crime rates following World War II. Cohen and Felson (1979) theorized that three elements must converge for a crime to occur: a motivated offender, a suitable target, and a lack of capable guardianship to prevent the crime.

The theory focuses on how social activity patterns influence the convergence of requisite crime elements in time and space, which subsequently affects the risk of and opportunity for crime (Cohen & Felson, 1979).

A stipulation within routine activity theory that a motivated offender not only harbors criminal inclinations but also "the ability to carry out those inclinations" (Cohen & Felson, 1979, p. 590) implies that an individual's capacity to commit a crime is a deterministic element. Indeed, in noting that an increase in crime rates could not be driven solely by rates of criminal inclination, Felson and Cohen stated that "the tools, skills, and weapons available to the offenders" are factors that must be considered (Felson & Cohen, 1980, p. 397). Although the focus of routine activity theory is intentionally on factors related to target suitability and guardianship (i.e., not individual characteristics of potential offenders), the framework makes clear that weapons "may enable offenders to carry out their own work more effectively" (Cohen & Felson, 1979, p. 591). As discussed in the literature review, firearm access has been established as an important risk factor for fatal self-inflicted and interpersonal violence (Anglemyer et al., 2014; Stroebe, 2013). Thus, it is important to limit access to firearms among potential offenders to prevent the convergence of requisite crime elements or, in the case of suicide, the convergence of a suicidal individual with the capacity to commit suicide in an environment lacking capable guardianship.

Although originally conceptualized to explain trends in direct-contact predatory violations, wherein one person takes, damages, or otherwise harms another person or their property, the routine activity theory framework can also be applied to self-harm. Felson (1987) wrote that the theory's reasoning "can be extended to all four types of lawbreaking"—one of which being individualistic acts—as each "requires that certain elements converge in space and

time" (p. 912). While suicide is not a criminal offense, it was described by Felson as an *individualistic offense* to which the framework could be applied (Felson, 1987). Within the context of routine activity theory, a suicidal individual represents both the "offender" and "target" (Branas et al., 2004). Whereas efforts to prevent homicide must effectively address an offender's capacity or motivation to perpetrate violence, target suitability, or guardianship, suicide prevention must address capacity, suicidality, or guardianship. Routine activity theory posits that effectively limiting any one of the aforementioned factors is sufficient to prevent the event from occurring. The elements pertaining to capacity, motivation, and guardianship are modifiable for both self-harm and interpersonal violence; however, target suitability does not apply to suicide in the same manner that it does to homicide.

Policy interventions such as firearm relinquishment laws are intended to address an important characteristic of the *offender* by limiting the capacity for violence among people who have become disqualified from possessing a firearm. The potential effectiveness of restricting firearm access to prevent future criminal offenses is evident even at the individual level. For example, prospective firearm buyers with felony convictions who were denied handgun purchase after a background check had a 20-30% lower risk of subsequent criminal activity relative to buyers whose prior felony arrests did not result in conviction (and thus did not prevent their firearm purchase) (Wright, Wintemute, & Rivara, 1999). Although other avenues to obtain firearms without a background check are exploited by criminals (Vittes et al., 2013), the findings from Wright and colleagues (1999) suggest that restricting firearm access among people with disqualifying convictions or statuses may be sufficient to prevent future offenses.

At the population level, the effectiveness of limiting access to means that facilitate suicide has been well-documented (Florentine & Crane, 2010; Hawton, 2007). One of the most

notable examples of a population-level intervention impacting suicide trends is the conversion of ovens in Great Britain from toxic coal to non-toxic natural gas (Clarke, 1995). The intervention was the culmination of efforts to find cheaper forms of gas; however, transitioning to non-toxic gas generated a positive externality—a sustained decrease in the country's overall suicide rate and little displacement to other methods (Clarke & Mayhew, 1988). Despite accounting for 40% of suicides in England in Wales in 1963, gas suicides comprised 0.2% of all suicides in 1980 (Clarke & Mayhew, 1988). Other interventions have similarly resulted in population-level reductions in method-specific or overall suicide. For example, legislative actions that banned toxic pesticides, which are one of the most common methods of suicide in Asia, appear to have had a profound impact on suicide in Sri Lanka (Gunnell et al., 2007). The country experienced a drastic increase in suicide from 1950 to 1995 before import controls and bans on toxic pesticides were implemented. Between 1995 and 2005, a nearly 50% reduction in suicide in Sri Lanka was driven by reductions in methods categorized as self-poisoning and "other" (Gunnell et al., 2007). Similarly, the decrease in automobile emissions of carbon monoxide following the introduction of the catalytic converter was associated with reductions in motor vehicle-related carbon monoxide suicide in the U.S. (Mott et al., 2002)

Given the lethality of firearms, as well as their prevalence in suicides and homicides, requiring the surrender of firearms among prohibited possessors may have a measurable impact on rates of intentional self-harm and interpersonal assaultive death. Efforts to restrict access to the methods, or "means," by which lethal violence is often committed are fundamental in public health frameworks to prevent violence and injury.

Public Health Theory

In addition to public health broadly, the subfield of injury prevention focuses on preventing adverse outcomes by addressing factors beyond individual-level behavior changes. The social ecological model, a derivation of Bronfenbrenner's (1979) ecological systems theory, illustrates four levels of risk and protective factors—individual, relationship, community, and societal—that present opportunities for intervention. In 2002, the framework was applied to violence prevention in the World Health Organization's World Report on Violence and Health (Krug et al., 2002). In the context of firearm violence prevention, Durkin et al. (2020) and Allchin et al. (2019) outline how risk can be reduced at each level of the social ecological model through legislation, community interventions, and education. Societal-level interventions, such as extreme risk protection order laws, firearm purchase waiting periods, universal background checks, and other firearm policies, are important prevention components that also support strategies at other levels to modify risk (Allchin et al., 2019). For example, the temporal barrier to immediate firearm access created by a state's firearm purchase waiting period may complement other prevention strategies by reducing the immediate risk of suicide for non-gun owners experiencing an acute crisis. Specifically, the universal approach of delaying firearm transfers to prospective buyers supplements targeted efforts at the relationship level, such as healthcare workers providing lethal means counseling to high-risk patients. In general, societal-level interventions that are not dependent on identification (e.g., waiting periods) may provide critical intervention at a time when a person is not accessible via individual-, relationship-, or community-level interventions.

A related framework that can be used to identify prevention opportunities in various phases of an event is the Haddon Matrix, a core paradigm of injury prevention. Similar to the

converging elements of a crime event in routine activity theory, circumstances that influence an adverse outcome (i.e., injury) are the primary focus of the Haddon Matrix. The matrix consists of three rows representing the temporal phases of an injury event—pre-event, event, post-event—and four columns that correspond to the host (i.e., actor), vector or agent (e.g., firearm or other mechanism of injury), physical environment, and social environment (e.g., social norms, policies). Conceptually, the matrix can be used to identify opportunities for "preventing potentially injurious events (the pre-event phase), minimizing the likelihood that injury will occur when the event is taking place, and reducing the unnecessary consequences of injury (the post-event phase)" (Williams, 1999, pp. 15–16). The framework was originally applied to motor vehicle crashes before becoming a more common public health tool to address other forms of injury (Grossman, 2000; Runyan, 2003). An example of the Haddon Matrix (adapted from Runyan's (2003) school firearm violence prevention model) applied to child firearm injury prevention is provided below in Table 1.

Table 1. An application of the Haddon Matrix to the prevention of firearm-related mortality in children.

	Host (child)	**Vector/Agent** (firearm)	**Physical Environment**	**Social Environment**
Pre-event	Gun safety education	Firearm safety mechanisms	Storage of firearm and ammunition Adult supervision	Child access prevention laws
Event		Trigger pull weight Magazine capacity		Regulation of firearm features and magazine capacity
Post-event				Emergency services staffing and funding

An important aspect of Haddon's approach evident in the matrix is a recognition that modifying behavior is only one aspect of injury prevention. As described by Williams (1999, p. 16): "Haddon went on to argue that focusing on human error as the cause of most injuries had resulted in undue emphasis on changing behavior, rather than on using more effective measures to reduce injuries and their consequences." Like motor vehicle crashes, there are opportunities to address modifiable risk factors of the host, vector, and environment in each phase of a firearm violence event. For example, possible pre-event interventions or policies to prevent unintentional firearm injuries among children include educating children about firearms, safety design features and childproof locks for firearms, and child access prevention (CAP) laws that criminalize unsafe firearm storage. While each intervention targets a different element of the event (i.e., host, vector, environment), the overarching objective is the same: prevent access to lethal means by children who may unintentionally injure themselves or others.

Within the social ecological model and Haddon framework, a relinquishment law represents an intervention at the societal level that is intended to prevent interaction between the host (potential victim of suicide or homicide) and vector (firearm) in the pre-event phase. A similar aim of separation is evident in Haddon's 10 general strategies for injury prevention. Namely, one of the basic strategies is "to separate, in time or space, the hazard and that which is to be protected" (Haddon Jr, 1980, p. 418). The focus on limiting one of the requisite sources of firearm-related hazard—access—is therefore a key element of injury prevention.

It can be argued that relinquishment laws are reactive (i.e., initiated after a person has become disqualified from possessing a firearm) and therefore should not be considered a pre-event approach. However, the events being studied are fatal forms of firearm violence. Although a person must first become prohibited from accessing firearms as a result of a violent act,

restraining order, or other prohibitive status or conviction, the intervention still represents primary prevention (i.e., pre-event) of firearm suicide and homicide. A more precise characterization of relinquishment laws is that they are a form of means restriction for newly prohibited persons who may be at an elevated risk of firearm violence.

Conclusion

Firearm relinquishment policies are supported by public health and criminological theory. Specifically, the focus on limiting an individual's capacity to commit violence through a societal-level intervention is grounded in injury prevention and routine activity theory. Although it may be difficult to modify target suitability, guardianship, pre-event behavioral characteristics of a host, and other environmental characteristics, interventions that target the capability of a potential offender or suicidal individual by way of access to an important vector may be an effective strategy to prevent lethal violence. This evaluation will assess the population-level effects of an opportunity-reduction policy targeting the vector that is most often used to commit lethal violence.

METHODS

This study is divided into two parts. First, I surveyed state statutes to identify which states have enacted relinquishment laws and the years in which they took effect. Several characteristics related to the continuum proposed by Zeoli and colleagues (2019) were recorded for each law and subsequently analyzed to describe state relinquishment policies and associated policy gaps. The synthesis of relinquishment provisions informed the second aim of the study. In Aim 2, I examined the effects of relinquishment provisions on firearm, non-firearm, and overall measures of suicide, homicide, and IPH through quantitative policy analyses. Negative binomial regression models and augmented synthetic controls were used to estimate policy effects.

Aim 1

The study period for the 50-state survey of firearm relinquishment policies is 1980-2022. For the purpose of this study, a relinquishment policy is defined as any state law that (1) explicitly authorizes or requires the court to order prohibited possessors to surrender all firearms; or (2) explicitly requires prohibited persons to surrender all firearms following a disqualifying status or conviction. State laws that prohibit the acquisition or possession of firearms by classes of prohibited persons but do not specifically require that they surrender their firearms are not considered relinquishment statutes.

Relinquishment statutes that apply to at least one of the following statuses or convictions were recorded: civil DVROs, MCDVs, misdemeanor crimes of violence (MCV), and felony convictions. Given that MCDVs represent a more specific classification of the victim-offender relationship within the broader category of violent misdemeanors, all provisions that apply to MCVs were coded as also applying to MCDVs. A MCV is defined here as a misdemeanor conviction for an assault/battery offense. Therefore, relinquishment provisions that are classified

as applying to MCVs are those that, at a minimum, apply to assault/battery misdemeanors. Provisions that apply to assault/battery misdemeanors only if a weapon was involved in the offense or possessed by the defendant are not considered MCV relinquishment provisions for the purpose of this study.

Data Collection

Legal research was conducted to identify firearm relinquishment policy changes in each state over the 43-year study period. State-specific searches were performed using Nexis Uni, an academic research tool that functions as a repository for state and federal cases and statutes. Nexis Uni is similar to Westlaw and LexisNexis, both of which have been used in other firearm policy analyses to identify state policy changes (Vigdor & Mercy, 2006; Webster et al., 2020; Zeoli, Frattaroli, et al., 2019). The following keyword search query was used to generate a list of statutes related to relinquishment:

"firearm" OR "weapon" AND "relinquish" OR "surrender" OR "transfer"

Results were subsequently filtered using the following designations within Nexis Uni: "Codes" (a subcategory of "Statutes and Legislation") and the respective state being searched (a subcategory within "Jurisdiction").

Statute histories, consisting of previously enacted session laws, were reviewed to verify that a statute met the inclusion criteria described above. Session laws that included relevant changes to relinquishment policy (e.g., modifications to the timing element of relinquishment; additional compliance requirements) were saved to state-specific folders and reviewed further to identify relevant statutory elements.

Analysis

The following features of a state's relinquishment policy were recorded during the review process of each session law:

- Citations associated with the relinquishment policy (e.g., Ariz. Rev. Stat. § 13-3602(G)(4))
- Associated session laws (e.g., 1998 Ariz. ALS 294)
- Enacted and effective dates
- The corresponding firearm-prohibiting offense or protection order (e.g., DVRO, MCDV, MCV, felony)
- Whether the court shall or may require the surrender of firearms
- Necessary conditions that must be met for the provision to apply
- To whom firearms can be surrendered
- Compliance requirements
- Responsibilities assigned to law enforcement (e.g., authorization to seize unrelinquished firearms, instructions for storing firearms)
- Timing of relinquishment
- Exemptions noted within the text of the law

Full descriptions of the characteristics that were recorded for relinquishment policy changes are presented in Table A1 (Appendix A). Characteristics of DVRO-related relinquishment provisions were noted separately for each type of injunction (i.e., full and ex parte). Several of the aforementioned characteristics are borrowed directly from or otherwise motivated by the analysis of DVRO relinquishment provisions by Zeoli and colleagues (2019) that documented the status of each state's DVRO relinquishment policy as of early 2016. The present study sought to build on their work by providing an updated assessment of DVRO relinquishment provisions, including a documentation of relinquishment policy changes within each state over time, as well as an assessment of relinquishment policies associated with felonies, MCVs, and MCDVs.

Effective dates were obtained from the respective session laws or through state legislature websites. For five session laws in which no effective date could be determined, it was assumed that the state's current timeline (e.g., "existing state law sets the effective date of bills passed

during the regular session as July 1") applied at the time the law was enacted. Published work, state government websites, and data made accessible by non-profit organizations were cross-referenced to confirm classifications of statutory elements when necessary. Namely, the information presented in Díez et al. (2017), Zeoli et al. (2019), Wallin et al. (2021), and Smart et al. (2023), as well as classifications by Giffords Law Center, the State Firearm Laws database, and Everytown for Gun Safety, were reviewed if an aspect of a session law was unclear.

Aim 2

The study period for suicide and homicide outcomes covers 31 years (1991-2021).[2] Analyses assessing IPH outcomes are limited to 30 years (1991-2020) due to the limited availability of IPH data.

Sample

The analyses of the association of relinquishment laws with suicide and homicide outcomes include all 50 U.S. states. Consistent with a prior study of relinquishment laws and IPH (Zeoli et al., 2018), Florida, Kansas, Kentucky, Montana, and Nebraska were excluded in IPH analyses due to inconsistent reporting of homicide data to the Federal Bureau of Investigation (FBI). Alabama was also excluded given reporting inconsistencies in recent years. Specifically, despite reporting a yearly average of 36 IPH victims from 1990-2020, three years of IPH counts are uncharacteristically low (e.g., fewer than five total IPH incidents across three years).

[2] While augmented synthetic control analyses assessing the estimated effects of relinquishment policy changes on homicide cover the full study period, regression analyses are limited to 1991-2020 due to the lack of robbery rate data for 2021.

Data and Measures

Dependent Variables. Six primary outcomes were assessed in regression and augmented synthetic control analyses: suicide and firearm suicide; homicide and firearm homicide; IPH and firearm IPH. Non-firearm measures of each outcome were assessed as secondary outcomes to better understand the potential effects of relinquishment laws and provide validity checks. Significant negative associations for these outcomes would indicate uncontrolled confounding since there is no theoretical pathway linking relinquishment laws to reductions in non-firearm mortality. Beyond serving as negative controls, non-firearm outcomes were also used to assess whether substitution to other methods occurred (i.e., if relinquishment provisions were associated with decreased firearm mortality but increased non-firearm mortality).

Data for suicide and homicide were obtained from the CDC' Wide-ranging Online Data for Epidemiologic Research (WONDER) database. WONDER is a commonly used resource for public health research that provides county-level mortality data for all 50 states and the District of Columbia (CDC, 2022). The study involved two different request forms in WONDER and thus, different editions of International Classification of Disease (ICD) codes to identify mortality causes. Pre-1999 mortality data were obtained via queries in the Compressed Mortality database using ninth edition ICD codes (ICD-9), whereas data for 1999-2021 were accessed through the Underlying Cause of Death database using tenth edition ICD codes (ICD-10). The respective codes for firearm and overall measures of suicide and homicide are provided in Table 2. Given the uniquely tragic loss of life that occurred on September 11, 2001, ICD-10 code U01.1 (terrorism involving destruction of aircraft) was excluded from the total homicide counts. The terrorist attacks resulted in nearly 3,000 U01.1 fatalities in 2001—the only year in which

national U01.1 deaths were not suppressed due to confidentiality reasons (i.e., counts representing fewer than 10 fatalities).

Table 2. ICD-9 and ICD-10 codes for the primary suicide and homicide outcome variables.

Outcome	**ICD-9 codes** (pre-1999)	**ICD-10 codes** (1999-2021)
Suicide	E950-E959	X60-X84, Y87.0
Firearm Suicide	E955.0-E955.4	X72-X74
Homicide	E960-E969	U01.0, U01.2-U01.9 U02, X85-Y09, Y87.1
Firearm Homicide	E965.0-E965.4	U01.4, X93-X95

Although the WONDER database provides data on underlying causes of mortality by intent and mechanism, it does not provide victim-offender relationships for interpersonal violent deaths. Instead, relational homicide data for IPH counts were accessed from a modified version of the FBI's Supplementary Homicide Reports (SHR). SHR data are provided each year as part of the FBI's Uniform Crime Reporting (UCR) Program.[3] Data from state and local law enforcement related to the circumstances, relationships, and other incident-level characteristics of homicide victims and offenders are included in the SHR. Although SHR data are used in criminological research, the limitations of the dataset have been well-documented. Specifically, researchers have noted two main limitations related to the completeness of data: non-reporting among agencies or states and incident-level missing data (e.g., offender characteristics, circumstances of homicides) (Fox, 2004; Pizarro & Zeoli, 2013). The voluntary nature of reporting by law enforcement agencies leads to inconsistent coverage and underestimated

[3] 2020 is the last year that SHR data are available through the UCR Program. In 2021, the FBI transitioned from the UCR Program to the National Incident-Based Reporting System (NIBRS). The proposed study is not affected by this change given the study period.

homicide totals. Data usability is further compromised by missing information related to offenders and circumstances of uncleared homicides.

A modified version of the SHR dataset compiled by criminologist James Fox was used for IPH analyses. The dataset attempts to address the limitations described above by imputing incident and individual characteristics and weighting estimates to match FBI state homicide totals. Fox (2004) uses known characteristics of solved homicides to impute data for unsolved homicides after matching on variables such as state, year, and demographic characteristics of victims. A recent iteration of the multiply imputed SHR dataset was obtained for the years 1991-2020 and was used for IPH outcome measures (Fox, 2022). Intimate partner homicides were classified as homicides involving individuals aged 14 and older in current or former marital relationships, common law relationships, and dating partners. Sensitivity analyses were conducted using unweighted and unimputed SHR data.

Independent Variables. Categorical measures of state relinquishment policies were developed based on the legal research findings in Aim 1. Three sets of categorical measures were used to assess the differential impact of DVRO relinquishment policies relative to policies that only restrict firearm purchase or possession (Table 3).[4] Two measures were used to examine relinquishment laws pertaining to MCDV and felony convictions (Table 4). Subcategories were coded as being active if the requisite policy characteristics were in effect for at least six months of the year. DVRO relinquishment variables were assessed independently in separate models.

The first DVRO relinquishment measure indicated the presence of any relinquishment provision, regardless of whether it applied to ex parte orders or the degree of discretion granted

[4] The column labeled States indicates the number of states that fit each classification for one or more years during the 1991-2021 period. Current DVRO relinquishment classifications can be found in Table 5. Appendix C has information on conviction-related relinquishment.

to the court in ordering relinquishment. A second variable examined the impact of full and ex parte relinquishment orders relative to firearm restriction policies that did not include relinquishment provisions. The final measure assessed three types of relinquishment provision characteristics: *may order* directives, *shall order* directives for full orders only, and *shall order* directives that apply to full and ex parte orders.[5] Each set of categorical measures also included a category that indicated state years in which no DVRO firearm restrictions or relinquishment provisions were in effect. State years with firearm relinquishment provisions but no state restrictions prohibiting firearm purchase or possession were coded as not having DVRO firearm restrictions.[6]

Table 3. Operationalizations of DVRO relinquishment variables used in regression analyses.

Variable	Measurement		States	State years
Any relinquishment law	Ref.	DVRO purchase/possession restrictions only	18	226
	1	No DVRO firearm restrictions	50	818
	2	Any relinquishment law	29	506
Order type (full, ex parte)	Ref.	DVRO purchase/possession restrictions only	18	226
	1	No DVRO firearm restrictions	50	818
	2	Relinquishment law (full orders)	21	237
	3	Relinquishment law (full and ex parte orders)	15	269
Court discretion (may/shall order)	Ref.	DVRO purchase/possession restrictions only	18	226
	1	No DVRO firearm restrictions	50	818
	2	*May order* relinquishment law	11	171
	3	*Shall order* relinquishment law (full orders)	18	160
	4	*Shall order* relinquishment law (full, ex parte)	9	175

[5] Given that no state had a *shall order* policy for ex parte orders but *may order* for full orders, the *may order* subcategory is all encompassing (i.e., it includes states that had a *may order* directive for full orders only or both full and ex parte orders).

[6] The following states were affected: Pennsylvania (5 years), North Dakota (23 years), South Dakota (31 years). Each state year had *may order* relinquishment directives but no base law restricting firearm purchase or possession.

Analyses of conviction-based relinquishment policies were limited to felony and MCDV convictions due to the small number of states that include MCVs more broadly in their relinquishment statutes. The MCDV relinquishment variable measures the differential impact of relinquishment relative to firearm restriction policies for MCDVs that did not include relinquishment (Table 4). As most states have longstanding laws that prohibit firearm purchase or possession among people who have been convicted of any felony (or specific felonies), a dichotomous measure was used for felony relinquishment. States in which a felony conviction was a qualifying offense that would result in a relinquishment order were compared to states with no such relinquishment laws.

Table 4. Operationalizations of relinquishment variables pertaining to MCDV and felony convictions.

Variable	Measurement		States	State years
MCDV relinquishment	Ref.	MCDV purchase/possession restrictions only	26	335
	1	No MCDV firearm restrictions	48	1091
	2	MCDV relinquishment law	17	124
Felony relinquishment	Ref.	No relinquishment law for felony convictions	49	1446
	1	Felony conviction relinquishment law	7	104

All independent variables were lagged by one year in regression analyses to more appropriately represent expectedly gradual policy implementation, as well as to limit bias that could arise if changes in the outcome(s) are correlated with the timing of the relinquishment policy change (see Zeoli & Webster, 2010). Operationalizations of the independent variables as policy interventions in the augmented synthetic control analyses are described below.

Control Variables. A full list of control variable descriptions and data sources are provided in Table B1 (see Appendix B). The following set of core covariates indexed by state and year were used in all analyses: population density, percentage of the population identifying as Black, unemployment rate, educational attainment (measured as the percentage of the population age 25 and older with a high school degree or equivalent), ethanol consumption per capita, poverty rate, and a proxy measure for firearm ownership that used the proportion of suicides involving firearms and the number of hunting licenses per 100 residents age 15 and older (Siegel et al., 2014). These variables were chosen due to their theoretical relevance to the study outcomes, demonstrated in part by their regular inclusion in firearm policy studies (Crifasi et al., 2015; McCourt et al., 2020; Miller et al., 2002a; Zeoli et al., 2018), as well as their empirical associations with suicide and interpersonal mortality. Per capita alcohol consumption (Kerr et al., 2011; Norström, 2011; Parker, 1995), unemployment (Campbell et al., 2003; Kposowa, 2001; Schleimer et al., 2022), poverty (Kerr et al., 2017; Miller et al., 2002b), lower educational attainment (Jones-Webb & Wall, 2008; Phillips & Hempstead, 2017), and firearm ownership (Kivisto et al., 2019; Miller et al., 2002a, 2002b) have been positively associated with suicide and homicide outcomes at the individual and/or ecological levels. Population density was included to control for urban/rural differences among states. The percentage of the population identifying as Black was included as a covariate due to the disproportionate burden of firearm mortality borne by Black Americans (Kalesan et al., 2014; Kegler et al., 2022). Two covariates initially included in all outcome models—percentage married and per capita personal income—were highly collinear with other variables as indicated by mean variance inflation factor (VIF) values that were consistently between 5.5 and 6.5. In comparison, the mean VIF was consistently

below 2.1 across all models when percentage married, per capita personal income, and fixed effects variables were excluded.

Several outcome-specific measures were also included based on their theoretical relevance to their respective outcomes and inclusion in similar studies investigating suicide, homicide, or IPH. Homicide analyses controlled for three criminal justice variables that are expected to influence homicide levels: robbery rate, incarceration rate, and the number of law enforcement officers per 100,000 residents. Given high firearm mortality rates among adolescents and young adults (Davis et al., 2023), the percentage of the population aged 15-24 years was also included in homicide analyses. Suicide analyses included the overdose death rate to account for recent increases in drug-related deaths driven by synthetic opioids (Hedegaard et al., 2021). Lastly, IPH analyses included the number of law enforcement officers per 100,000 residents (Zeoli & Webster, 2010), as well as the nonintimate partner homicide rate among those 18 years and older to control for broader interpersonal violence trends (Zeoli et al., 2018).

The study also included dichotomous variables that indicated the presence or absence of various state firearm restrictions to control for other policies that may influence firearm-related mortality (Table B2 in Appendix B). Policy data were obtained from prior work (Webster et al., 2020; Zeoli et al., 2018) as well as through legal research conducted using Nexis Uni and other legal resources outlined in Aim 1. The following state firearm policy variables were included in regression analyses: firearm purchase or possession restrictions for full DVROs, MCDV convictions, and violent misdemeanors; purchaser licensing laws (also referred to as permit-to-purchase), point of sale comprehensive background check laws, and extreme risk protection order (ERPO) laws. Given that the variables that indicate restrictions for DVROs and MCDV convictions are subsumed within their respective relinquishment measures, each measure was

included only in models assessing the other type of relinquishment. In other words, the DVRO firearm restrictions variable was included only in models assessing conviction-based relinquishment, whereas the MCDV firearm restrictions variable appears in DVRO relinquishment models.[7] Waiting periods were included in suicide and homicide analyses given their associations with these outcomes in recent research (Smart et al., 2023). Lastly, a trichotomous measure of concealed carry permitting laws (0=no or may issue, 1=shall issue, 2=permitless carry) was included in regression models assessing homicide. All policy variables, including those capturing relinquishment provisions, were lagged by one year to account for the time it takes to implement a new policy.

Analysis

Two methodological approaches were used to estimate the relationship between relinquishment provisions and each of the outcome measures. The purpose of the dual-method approach was to better estimate relinquishment policies' effects within and across states, as well as to avoid relying on a single method to estimate policy effects. Regression models estimated the average effect of specific provisions across all treated states, whereas augmented synthetic controls were used to evaluate the impact of policy changes within individual states. Given the potential heterogeneous effect of relinquishment provisions by state, it was necessary to analyze the effects of state-specific policy changes. Augmented synthetic control estimates were then pooled in meta-analyses to generate an average treatment effect.

Negative binomial regression. I used negative binomial regression models with state and year fixed effects and standard errors clustered at the state level to estimate the association of

[7] Given the overlap between restrictions for violent misdemeanors (MCVs) and MCDVs, the two measures were combined to produce more parsimonious models involving suicide and homicide outcomes. The variables were kept separate in analyses of IPH due to the connection of domestic violence-related restrictions to the outcome, as well as findings from a previous study (Zeoli et al., 2018).

relinquishment provisions with each outcome. Goodness-of-fit test statistics comparing preliminary Poisson and negative binomial regressions indicated that regression models using a negative binomial distribution to account for overdispersion would be more appropriate. However, given that alternative methods may not necessarily perform better than Poisson regression—particularly if overdispersion stems from specification errors (Berk & MacDonald, 2008)—main results from supplemental analyses using regressions with a Poisson distribution are provided in Appendix D.

Each regression model included an offset variable to indicate the population at risk of the outcome in each state. As more populous states can generally be expected to have more suicides, homicides, and IPHs than less populous states, exposure variables are needed to transform outcomes into population-based rates. The natural log of each state's population indexed by year was used as the offset variable for suicide and homicide analyses. Consistent with the approach used by Zeoli and colleagues (2018), as well as the estimates presented by Vigdor and Mercy (2006) that less than 0.5% of IPHs involve victims that are 10-14 years old, the natural log of each state's population age 14 and older was used as the offset variable for IPH analyses.

Standard errors were clustered at the state level to address the lack of independence between observations. Regression models included state and year fixed effects to account for unobserved differences between states and potential time-related trends occurring throughout the duration of the study period, respectively. All regression analyses were conducted using Stata/BE version 17.0 (StataCorp, 2021).

Augmented synthetic control estimation. The augmented synthetic control method (ASCM) was used to estimate the associations of state-specific relinquishment policy changes with each outcome. The approach is an extension of the synthetic control method (SCM)

introduced by Abadie and Gardeazabal (2003) and Abadie et al. (2010). Synthetic controls address a methodological challenge of case study analysis; that is, a single untreated unit often does not represent an adequate control for a unit that experienced an intervention or policy change (Abadie et al., 2010). For example, in an assessment of the impact of a state firearm policy change, it is unlikely that 1 of the remaining 49 U.S. states is similar enough on important characteristics to provide a counterfactual estimate of the outcome. SCM pools from a group of untreated donor units to construct a weighted "synthetic" control that closely resembles both the outcome trend and relevant pre-intervention characteristics of the treated unit. Authors of a recent review examining firearm policy studies using SCM urged researchers to use the method to triangulate evidence, arguing that it can make a meaningful contribution to the field (Degli Esposti et al., 2022)

As described by Abadie and colleagues (2011), the chosen weights of donor states and predictor variables in the synthetic control construction process are those that solve a nested optimization problem. First, a vector w^* is identified that minimizes the difference between pre-intervention characteristics of the treated state and its synthetic control. W^* is incorporated in a second equation in which the optimized V^* assigns predictor variable weights to minimize the mean squared prediction error (MSPE) between the outcome of the treated and synthetic control units over the pre-intervention period (Abadie et al., 2011). The MSPE is measured as:

$$\sum_{t=1}^{T_0} \left(Y_{1t} - \sum_{j=2}^{J+1} w_j^*(V) Y_{jt} \right)^2$$

where t=1 represents the first year of the pre-intervention period, T_0 is the number of pre-intervention years, Y_{1t} is the outcome of the treated state at time t, $J + 1$ represents the pool of

donor states, w_j^* is a vector of optimized donor weights, *V* is a matrix of predictor weights, and Y_{jt} is the outcome of donor state *j* in year *t* (Cunningham, 2021).

Following the construction of an adequate synthetic control that closely approximates the treated state's outcome prior to the intervention (as indicated by a small MSPE), the mean difference in the post-intervention outcomes captures the estimated effect of the policy intervention. The estimated effect $\hat{\alpha}$ is obtained by averaging the differences in observed and synthetic estimates in each post-intervention year ($t > t_0$), such that:

$$\hat{\alpha}_{1t} = Y_{1t} - \sum_{j=2}^{J+1} w_j^* Y_{jt}$$

where Y_{1t} is the outcome of the treated state, $J + 1$ represents the donor pool, w_j^* is an optimized vector of donor weights that are positive and sum to 1, and Y_{jt} is the outcome of donor state *j* at time *t* (Abadie et al., 2010).

ASCM is an extension of SCM that uses extrapolation and negative weights to improve pre-intervention fit (Ben-Michael et al., 2021). Recent studies have adopted the augmented approach to analyze policy effects, including a study of the impact of concealed carry law changes on officer-involved shootings (Doucette et al., 2022) and a case study of Seattle's minimum wage increase (Mitre-Becerril & Chalfin, 2021). ASCM uses ridge regression to estimate bias in the original SCM estimate and extrapolation to achieve a better fit when the pre-intervention fit is inadequate (Ben-Michael et al., 2021). Whereas donor weights must be positive in the original SCM approach, ASCM extrapolates to allow negative donor weights to improve the fit between the treated and synthetic units. At the same time, ASCM includes a parameter to limit the degree of extrapolation by penalizing the distance from the non-negative donor weights of the original SCM estimate (Ben-Michael et al., 2021).

Consistent with prior work (Doucette et al., 2022; McCourt et al., 2020; Oliphant, 2022b), the outcome in each ASCM analysis was measured as a three-year moving average of the mortality rate (suicide, homicide, or IPH) per 100,000.[8] As in the regression models, a state's population age 14 and older was used to calculate IPH rates. All numeric covariates used in the negative binomial regression models were included as predictor variables in the respective ASCM analyses. Dichotomous variables cannot be used as predictors in synthetic control analyses; therefore, predictor variables were limited to the numeric covariates included in the regression models assessing suicide, homicide, and IPH. Furthermore, given that the categorical operationalizations used in the regression analyses are incompatible with synthetic control analyses that estimate the effect of individual policy changes, dichotomous measures of policy changes were used. Three policy interventions were assessed: the adoption of any relinquishment policy that applied to (1) DVROs; (2) MCDVs; and (3) felony convictions.[9] The donor pools in the DVRO and MCDV analyses were composed of states that did not have firearm restrictions for DVROs and MCDVs, respectively, during the study period. The donor pool in analyses of relinquishment laws stemming from a felony conviction included states without such relinquishment laws for felony convictions. To ensure that a sufficiently long pre-intervention period existed to construct synthetic controls, and to provide for at least two years of post-intervention analysis for each outcome, only policy changes that occurred after 1998 and before 2019 were assessed. All ASCM analyses were restricted to post-intervention periods of 10 years (or shorter for policy changes that took place within 10 years of the end of the study period).

[8] Three-year moving average rates were used due to the volatility of the data and poorer pre-intervention fits observed in preliminary models when annual mortality rates were used.

[9] It should be noted that all relinquishment laws related to felony and MCDV convictions have shall order directives (apart from Idaho, which passed its may order relinquishment policy for felony convictions before the study period). Therefore, the ASCM analyses for conviction-based relinquishment policies estimated the effects of adopting a *shall order* relinquishment policy.

I conducted a meta-analysis of ASCM-estimated relinquishment policy effects for each outcome to obtain an average treatment effect (Doucette et al., 2022). ASCM models with poor pre-intervention fit,[10] measured here as having a root mean squared prediction error (RMSPE) greater than 0.5 for suicide and homicide models and greater than 0.1 for IPH models, were excluded from meta-analyses. I also excluded models in which the synthetic and treated outcomes diverged drastically in the period immediately preceding the policy change. In these cases, although the mean pre-intervention prediction errors were satisfactory, poor fit leading up to the intervention could bias estimated treatment effects. All ASCM analyses were conducted in R version 4.2.1 (R Core Team, 2022) using the *augsynth* package (Ben-Michael et al., 2021). Jackknife standard errors were used to obtain confidence intervals and determine statistical significance. Fixed effects, which de-mean the outcomes to model mean-centered trends as opposed to changes in crude rates, were specified in the construction of all ASCM models.

[10] There is no standard prediction error threshold to indicate whether the pre-intervention fit of a synthetic control is appropriate. A smaller threshold was used for IPH given that a prediction discrepancy of 0.5 constitutes a much larger error for IPH rates than it does for rates of suicide and homicide.

RESULTS

Aim 1

The keyword search query used to generate a list of relinquishment statutes returned over 6,000 results.[11] Results from the legal research conducted to fulfill Aim 1 are presented below. Findings related to DVRO relinquishment are divided into two subsections—one focused on characteristics of the order itself (e.g., full or ex parte orders, court discretion) and a second that presents findings on process characteristics (e.g., transferring firearms, surrender timing, compliance requirements). Lastly, I present results for conviction-based relinquishment laws.

DVRO Relinquishment Orders

There are important differences in the types of orders for which state relinquishment directives apply (full or ex parte orders), the discretion granted to the court in ordering relinquishment (*shall order* vs. *may order*), and the conditions that must be met to generate a relinquishment order. These characteristics are summarized in Table 5 and their chronological changes described in Appendix C.

Full and Ex Parte Orders. Respondents to full DVROs are prohibited from obtaining or possessing firearms by federal law, as well as by laws enacted in many states. As of 2023, 31 states have laws that require respondents to DVROs to relinquish their firearms (or otherwise permit the court to order relinquishment) for the duration of a full or final order (Table 5). Fewer states (18) have relinquishment provisions for ex parte orders despite the fact that they are granted on a temporary or emergency basis when more immediate protection is warranted. The remaining 13 states limit their relinquishment provisions to full orders, which are granted after notice to a respondent and an opportunity to appear in court.

[11] Most statutes appearing in the search results were unrelated to firearm relinquishment; instead, many were related to regulations of the sale or transfer of firearms or other weapons.

Table 5. Statutory elements of state DVRO relinquishment laws as of 2023.

State	Order to surrender	Surrender to whom	Timing	Compliance	LE
AK	Full: May (conditional)	Law enforcement (LE)	Not specified	None	
AZ	Full: Shall (cond.)	LE	24 hours if not immediately	None	
CA	Full: Shall Ex parte: Shall	LE, licensed dealer, eligible third party	Immediately or within 24 hours	File receipt with court/LE in 48 hrs	*
CO	Full: Shall	LE, licensed dealer, eligible third party	Within 24 hours of service (or 48h if served outside of court)	Affidavit with court in 7 days; compliance hearing 8-12 days	*
CT	Full: Shall Ex parte: Shall	LE, licensed dealer	Immediately or within 24 hours	File sale/transfer form w/LE in 48 h	
DE	Full: May Ex parte: May	LE, licensed dealer	Immediately or within 24 hours	File proof of transfer with court in 48 hours	*
HI	Full: Shall Ex parte: Shall	LE, licensed dealer	Within 48 hours of order service	None	*
IL	Full: Shall (cond.) Ex parte: Shall (cond.)	LE	Not specified	File copy of FA disposition record w/LE in 48 hours	*
IN	Full: May	LE	Not specified	None	
IA	Full: Shall (cond.)	Eligible third party or LE if no eligible party	Date determined by the court	None	
LA	Full: Shall (cond.)	LE	Within 48 hours of issuance	File proof of transfer with court within 5 days	
ME	Full: Shall (cond.) Ex parte: Shall (cond.)	LE, eligible third party	Within 24 hours of service	File third party info. with court, LE w/in 24 hours	*
MD	Full: Shall Ex parte: May (cond.)	LE	Not specified	None	
MA	Full: Shall (cond.) Ex parte: Shall (cond.)	LE (may then transfer to dealer)	Upon service	None	*
MN	Full: Shall (cond.)	LE, licensed dealer, eligible third party	Within 3 business days	File affidavit or proof with court within 2 days	*
NV	Full: May (cond.)	LE, licensed dealer, eligible third party	Within 24 hours of order service	Provide receipt to court, LE in 72 hrs	*

Table 5 (cont.)

State	Order to surrender	Surrender to whom	Timing	Compliance	LE
NH	Full: Shall Ex parte: May	LE	Not specified	None	*
NJ	Full: Shall Ex parte: May	LE (Ex parte: via search and seizure)	Full: immediate	None	*
NM	Full: Shall (cond.)	LE or licensed dealer	Within 48 hours of service	File receipt with court w/in 72 hrs	*
NY	Full: Shall (cond.) Ex parte: Shall (cond.)	LE	Specified in the order	None	*
NC	Full: Shall (cond.) Ex parte: Shall (cond.)	LE	Immediately or within 24 hours	None	
ND	Full: May (cond.) Ex parte: May (cond.)	LE	Time determined by LE	None	*
OR	Full: Shall	LE, licensed dealer, or eligible third party	Within 24 hours of order issuance	Proof of transfer with court and DA w/in 2 days	
PA	Full: Shall Ex parte: May (cond.)	LE, eligible third party; licensed dealer (Full only)	Within 24 hours of order service	Affidavit transfer to LE (+ receipt in 24 h for 3rd party)	
RI	Full: Shall Ex parte: May	LE or licensed dealer	Within 24 hours of order notice	File receipt with court w/in 72 hrs	
SD	Full: May Ex parte: May	LE	Not specified	None	
TN	Full: Shall	Eligible third party or any lawful means	Within 48 hours of order issuance	Return firearm disposs. affidavit	
VT	Full: May Ex parte: May	LE, licensed dealer, or eligible third party	Immediately upon service	Affidavit (third party transferee)	
VA	Full: Shall	LE, licensed dealer, or eligible third party	Within 24 hours of order service	Certify in writing within 48 hours	
WA	Full: Shall (cond.) Full/Ex parte: May	LE	Immediately or within 24 hours	Proof of surrender with court within 5 days of order	*
WI	Full: Shall	LE or approved third party	Within 48 hours	Provide receipt to court within 48 h	

States that do not have firearm relinquishment provisions for civil DVROs: AL, AR, FL, GA, ID, KS, KY, MI, MS, MO, MT, NE, OH, OK, SC, TX, UT, WV, WY.
Abbreviations: LE=law enforcement, FA=firearm, DA=district attorney. NOTE: * indicates that LE is authorized/required to take possession of firearms upon order service or seize firearms in certain circumstances (e.g., after time limit, noncompliance, following warrant issued by court).

The example set by the federal law's scope of prohibited persons is evident in the text of some states' relinquishment statutes. Namely, Colorado, Iowa, and Tennessee, all of which require relinquishment if certain conditions are met in full DVROs, cite 18 U.S.C. § 922(g)(8) in the text of their law outlining when the provision applies. Vermont similarly references federal law in allowing the court to order relinquishment for full orders; however, its government extended the provision to allow judges to grant relinquishment as a form of emergency relief in ex parte orders starting in 2022 (15 V.S.A. § 1104(a)(1)). Arizona law addresses a potential gap in federal policy coverage by allowing the court to prohibit respondents from possessing firearms under ex parte orders, but it does not permit the court to order relinquishment in such cases.

Although most states with ex parte relinquishment laws adopted full and ex parte policies at the same time, seven states implemented relinquishment requirements for ex parte orders sometime after the policy was in effect for full orders. State governments in these states—Connecticut, Illinois, Maryland, Pennsylvania, Rhode Island, Vermont—took an average of 13 years to adopt relinquishment requirements for ex parte orders. Hawaii's ex parte relinquishment policy took effect one year after its policy for full orders. No state has ever repealed its relinquishment policy for full or ex parte orders.

Court Discretion. A second distinguishing feature among relinquishment provisions pertains to court discretion in carrying out the law. Of the 31 states with relinquishment policies for full orders, 24 states have laws that require respondents to relinquish their firearms or state that the court *shall order* relinquishment. Policies permitting greater court discretion are more common for ex parte DVROs, as 10 of the 18 ex parte policies can be characterized as *may order* directives. Whereas firearm dispossession is mandated under "shall order" statutes, judges in states with "may order" policies may decide not to order relinquishment as part of a DVRO. As a

result, they may prohibit a respondent from possessing firearms for the duration of the order—in addition to the federal firearms prohibition for respondents to full DVROs and any applicable state laws—but ultimately decline to order relinquishment. Six states have "may order" relinquishment policies for ex parte orders despite having some form of a "shall order" policy for full orders.

By definition, fewer respondents are ordered to surrender their firearms under a "may order" policy than would be the case if the state instead had a "shall order" directive for full and ex parte orders. Over the course of the study period, six states transitioned from allowing court discretion in ordering relinquishment for full DVROs to requiring relinquishment in all cases or cases in which necessary conditions are met. No "shall order" state has modified its policy to introduce or re-introduce court discretion in the form of a "may order" policy.

In some states, such as Delaware, firearm relinquishment is listed as a potential remedy that may be granted by the court for full and ex parte orders. The court has considerable discretion in granting "appropriate relief," including remedies such as temporary prohibition of firearm possession, awarding temporary custody of children to the petitioner, and monetary compensation (Del. Code Ann. tit. 10, §§ 1043-1045). Other states similarly permit discretion in granting DVRO relief; however, relinquishment is not always included among specified remedies, and it may be unclear which remedies can be ordered ex parte. For example, while Indiana law specifies that "relief necessary to bring about the cessation of the violence or the threat of violence" may include firearm relinquishment, and the law explicitly allows the court to direct a respondent to surrender all firearms after notice and a hearing (i.e., full DVROs), firearm prohibitions are not specified as permissible relief for ex parte orders (Ind. Code Ann. § 34-26-5-9).

Conditional Directives. In 16 states, the court is required or authorized to order relinquishment for full and/or ex parte orders only if certain conditions are satisfied. These stipulations primarily apply to *shall order* directives, although judges in North Dakota *may order* relinquishment in full and ex parte orders if there is probable cause that the respondent is likely to use, display, or threaten to use the firearm or other weapon in further acts of violence (N.D. Cent. Code §§ 14-07.1-02, 14-07.1-03). Maryland and Pennsylvania are the only states with conditional relinquishment directives that apply only to ex parte orders; both states require unconditional relinquishment for full orders but allow judges to decide against ordering relinquishment for ex parte orders even if certain conditions are met.

As noted by Zeoli and colleagues (2019), conditions largely relate to (1) previous acts/elements of abuse or (2) risk of future violence. Examples of the former category include the possession or use of a firearm during the commission of domestic violence (Alaska), conduct involving serious injury or threats/use of a weapon (New York), and a preexisting ineligibility to possess firearms (Washington). In two states, a finding that the respondent has threatened suicide represents a qualifying condition. In Pennsylvania, the court *may order* relinquishment for ex parte respondents who have threatened suicide, whereas judges in North Carolina are required to order relinquishment as part of full and ex parte orders if threats of suicide (among other factors) are noted.

A common example of future violence risk is a court's determination that the respondent represents a credible threat to the physical safety of the petitioner. Detailed accounts of threats to physical safety can be obtained directly from DVRO petitions. For example, under New Mexico law, the court *shall order* relinquishment if the respondent represents a credible threat to the petitioner's physical safety (N.M. Stat. Ann. § 40-13-5). The state's DVRO petition form

requests that the petitioner explain why the respondent represents a credible threat to the petitioner's safety, in addition to soliciting descriptions of domestic abuse, threats which caused fear of injury, firearms owned by the respondent, and whether weapons were used during abuse, among other things. In states with *shall order* policies such as New Mexico, conditional directives may therefore provide strict guidance concerning firearm relinquishment rather than opportunities to exercise broad discretion.

Exemptions. Eight states grant employment-based exemptions (or otherwise allow the court to grant employment-based exemptions) from firearm relinquishment provisions. Hawaii also permits exemptions for good cause shown, which includes considerations of a respondent's employment as well as the protection and safety of the person to whom a restraining order was granted. Exemptions across states primarily apply to law enforcement, active military, or individuals whose firearms were issued by state departments or agencies for the performance of official duties. In California, the court may grant an exemption if a respondent can demonstrate that a firearm is a necessary condition of employment and that the employer is unable to reassign them to a position that does not require firearm possession. Several state laws explicitly limit firearm possession exemptions to periods in which a respondent is working, on duty, or when traveling to or from a place of duty.

DVRO Relinquishment Process

Many state laws outline requirements related to the relinquishment process, including to whom a respondent can or must transfer their firearms, a time limit for relinquishment, and compliance requirements. Process requirements typically apply to both full and ex parte orders in states that have adopted ex parte relinquishment provisions. Current process characteristics in

states with DVRO relinquishment provisions are summarized in columns 3-6 of Table 5 (see Appendix C for chronological changes of state relinquishment policies).

Among the 31 states with relinquishment laws pertaining to DVROs, 29 explicitly allow or require respondents to surrender their firearms to a sheriff, chief of police, or law enforcement, generally. In addition, Iowa requires firearm relinquishment to law enforcement on an interim basis if an eligible third party cannot be identified by the court (Iowa Code § 724.26). Tennessee law states that a respondent must "dispossess himself or herself by any lawful means," but does not provide examples beyond "a third party who is not prohibited from possessing firearms" (Tenn. Code Ann. § 36-3-625). Respondents in Massachusetts must surrender firearms to law enforcement but may subsequently transfer them to a licensed firearms dealer. Thirteen other states allow respondents to sell or transfer their firearms directly to a licensed dealer as a means of relinquishment. Twelve states allow transfers to eligible third parties, the definition of which varies by state but commonly refers to individuals who are not prohibited from possessing firearms.

Most states require respondents to transfer their firearms within one or two days of an order being served. The most common time limits for relinquishment are within 24 hours of order service (13 states), within 48 hours of order service (5 states), immediately or upon order service (3 states), and by a date determined by the court, law enforcement, or otherwise specified in the order (3 states). Minnesota requires firearm transfer within three business days. Six states do not specify a time limit for relinquishment—five of which do not have requirements to ensure compliance.

Eighteen states require respondents to demonstrate that they have surrendered their firearms in accordance with state law. Although requirements vary, state laws generally mandate

that respondents file an affidavit, proof of transfer, receipt of sale, or firearm dispossession form with the court and/or law enforcement. In most states, evidence of compliance must be provided within 24 or 48 hours, although three states allow up to 72 hours, two states allow 5 days, and Colorado allows 7 days. Thirteen states do not require any documentation or attestation by the respondent to verify that they have surrendered all firearms in their possession (although some states permit or require law enforcement to seize unrelinquished firearms).

Many states provide guidelines for how law enforcement may store relinquished firearms, including permissions to charge the respondent a reasonable storage fee. Fewer states grant law enforcement a more functional role in carrying out or enforcing relinquishment provisions. The sixth column of Table 5 indicates whether law enforcement officials are authorized or required to take possession of firearms as part of order service or seize them in certain circumstances. Examples of other instances that may involve firearm seizure include the relinquishment time limit elapsing, a court order stemming from probable cause of noncompliance, or a court finding of an imminent risk of harm. Fifteen states have laws that authorize or direct law enforcement to take possession of firearms upon order service or in other instances detailed above. Massachusetts law states that law enforcement officials "shall immediately take possession of all firearms… in the control, ownership, or possession of said defendant" upon service of a DVRO (Mass. Ann. Laws ch. 209A, § 3B). More commonly, law enforcement may be authorized or required to seize firearms when the respondent has failed to relinquish them. For example, pursuant to Haw. Rev. Stat. Ann. § 134-7.3(b), law enforcement officials in Hawaii *may* seize all firearms and ammunition if the respondent fails to surrender or dispose of them within 48 hours of their disqualification. Likewise, in New Hampshire, the court may issue a search warrant

authorizing law enforcement to seize firearms if it has reason to believe that they have not been relinquished by the respondent (N.H. Rev. Stat. Ann. § 173-B:4, B:5).

Relinquishment Provisions for Qualifying Convictions

Under federal law, individuals convicted of a felony or MCDV are prohibited from purchasing or possessing firearms (18 U.S.C. § 922(g)(1), (g)(9)). As is the case with state DVRO laws, some states require that a newly prohibited person surrender their firearms after qualifying convictions. However, there is far less variation in the discretion granted to the court to order relinquishment and the accompanying requirements associated with conviction-related relinquishment.

Documentation of chronological changes and summaries of state relinquishment laws for qualifying convictions are presented in Table C2 (Appendix C). As expected, there is notable overlap between the states that have MCDV and DVRO relinquishment laws, as well as the key characteristics of those laws. Among the 17 states with relinquishment provisions for MCDV convictions—all of which have *shall order* provisions—16 have *shall order* directives for full DVROs. Nevada is the only state that requires relinquishment for those who are convicted of a felony or MCDV but allows judges to decide whether to order relinquishment for full DVROs. Seven of the eight states with relinquishment provisions for felony convictions have *shall order* directives. Idaho, which allows court-ordered relinquishment but does not require it, is the only state with a relinquishment provision for felony convictions but not MCDV convictions. Relinquishment directives for non-specific MCV convictions involving assault/battery are rare; only three states have such laws that apply to MCVs broadly. Two additional states have relinquishment provisions that apply to some MCVs. In Illinois, firearm relinquishment is required if the Department of State Police revokes a person's Firearm Owner's Identification

Card due to a MCV involving a firearm within the past five years (430 Ill. Comp. Stat. §§ 65/8, 65/9.5). Under Massachusetts law, relinquishment is required upon the revocation of a firearm identification card, which shall occur for misdemeanors punishable by more than two years (Mass. Ann. Laws ch. 140, §§ 129B, 129D, 131(d)(i); ch. 265, § 13A).

With very few exceptions, the transfer options available to a newly prohibited person following a conviction are the same as those specified in the state's DVRO relinquishment law. Of the 17 states with relinquishment requirements for the classes of convictions mentioned above, 15 have time limits for firearm surrender. California has the longest time limit—allowing up to 5 days to dispose or transfer firearms (or 14 days if the prohibited person is in custody during any part of the 5-day period) (Cal. Penal Code § 29810). Pennsylvania previously allowed people with MCDV convictions to relinquish their firearms "within a reasonable amount of time not to exceed 60 days" before limiting its time frame to 24 hours in 2019 (18 Pa. Cons. Stat. § 6105.2). Eleven states require prohibited persons to file an affidavit, receipt, or other documentation with the court or law enforcement to show compliance. Of the nine states that authorize or order law enforcement to take immediate possession of or subsequently seize defendants' firearms in certain circumstances, Maryland is the only state that does not grant similar enforcement responsibilities for DVRO relinquishment.

Summary

There is substantial variation in DVRO relinquishment requirements and processes across states, including the conditions that must be met for a court to order relinquishment, who a respondent may surrender their firearms to and by when, compliance requirements, and law enforcement's role in ensuring relinquishment. Less variation is noted among relinquishment provisions tied to convictions for felonies and qualifying misdemeanors.

Aim 2

The following section includes results from the quantitative aim of the study. First, I present results from negative binomial regression models that assessed the associations of DVRO and conviction-based relinquishment provisions with suicide, homicide, and IPH. All model estimates presented in this section were derived from analyses that controlled for the sociodemographic and firearm policy measures described in the Methods chapter. Complete tables of results for regression models (i.e., those that include the estimates of all control variables alongside the main independent measures) that independently assessed the association of the presence of any relinquishment law (i.e., DVRO, MCDV, felony) with each measure of suicide, homicide, and IPH can be found in Appendix D. Second, I present estimated treatment effects from ASCM models of relinquishment policy adoption and aggregated estimates obtained through meta-analyses using inverse variance weighting.

Negative Binomial Regressions

Results from the models that estimated associations of DVRO relinquishment measures with firearm, non-firearm, and overall suicide rates are presented as incidence rate ratios (IRR) and 95% confidence intervals (95% CI) in Table 6. States with any DVRO relinquishment law had firearm suicide rates that were significantly lower (IRR=0.956, 95% CI: 0.92-1.00) than those with DVRO firearm restrictions for purchase or possession but no corresponding relinquishment provision. Relinquishment provisions that applied to full and ex parte orders were associated with reductions in firearm suicide (IRR=0.930, 95% CI: 0.89-0.97), whereas no association was found for provisions that applied only to full orders (IRR=0.975, 95% CI: 0.94-1.02). The largest estimated reductions were observed in models that examined the court's discretion in ordering relinquishment. *Shall order* directives that applied to full and ex parte

orders were associated with reductions in firearm and overall suicide of 10.6% and 5.7%, respectively. There were significant decreases in non-firearm suicide of similar magnitude as those estimated for firearm suicide, although the decrease in non-firearm suicide tied to *shall order* directives for full and ex parte orders was smaller.

Table 6. Associations of state-level DVRO relinquishment provisions with firearm and overall suicide (1991-2021).

	Firearm Suicide		**Non-firearm Suicide**		**Suicide**	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
Full/ex parte relinquish. law						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	0.976	0.94, 1.01	1.004	0.97, 1.04	0.991	0.96, 1.02
DVRO relinquishment law	**0.956***	**0.92, 1.00**	**0.963***	**0.93, 1.00**	0.976	0.94, 1.01
Order type (full, ex parte)						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	0.983	0.95, 1.02	1.009	0.98, 1.04	0.995	0.97, 1.02
Relinquishment (full only)	0.975	0.94, 1.02	0.975	0.94, 1.01	0.986	0.95, 1.02
Relinquish. (full/ex parte)	**0.930****	**0.89, 0.97**	**0.947****	**0.91, 0.99**	0.962	0.92, 1.00
Court discretion (may, shall)						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	0.989	0.96, 1.02	1.008	0.97, 1.04	0.997	0.96, 1.03
May order relinquishment	1.005	0.95, 1.07	0.989	0.93, 1.05	1.010	0.94, 1.07
Shall order (full only)	0.980	0.93, 1.03	0.967	0.93, 1.00	0.982	0.94, 1.01
Shall order (full/ex parte)	**0.894*****	**0.84, 0.95**	**0.938****	**0.90, 0.98**	**0.943****	**0.90, 0.98**

* $p < .05$; ** $p < .01$; *** $p < .001$

States that lacked firearm purchase or possession restrictions for DVROs had firearm homicide rates that were 7.8%-9.2% higher (with varying significance) than those that had firearm prohibitions for DVRO respondents (Table 7). The lack of firearm restrictions was associated with marginally significant increases in overall homicide of 5.0%-6.1%. *May order* relinquishment directives were associated with significant increases in firearm homicide (IRR=1.156, 95% CI: 1.04-1.28) and overall homicide (IRR=1.100, 95% CI: 1.01-1.20).[12] No

[12] See Discussion and Figure D1 in Appendix D for additional explanation of this unexpected result.

significant associations with non-firearm homicide were observed for any of the DVRO subcategories.

Table 7. Associations of state-level DVRO relinquishment provisions with firearm and overall homicide (1991-2020).

	Firearm Homicide		**Non-firearm Homicide**		**Homicide**	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
Full/ex parte relinquish. law						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	1.078	0.99, 1.17	1.018	0.95, 1.09	1.050	0.98, 1.12
DVRO relinquishment law	1.047	0.94, 1.16	1.010	0.94, 1.08	1.026	0.94, 1.12
Order type (full, ex parte)						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	1.081	1.00, 1.17	1.024	0.96, 1.09	1.052	0.99, 1.12
Relinquishment (full only)	1.053	0.97, 1.15	1.024	0.96, 1.10	1.030	0.96, 1.11
Relinquish. (full/ex parte)	1.037	0.90, 1.20	0.992	0.91, 1.08	1.018	0.91, 1.14
Court discretion (may, shall)						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	**1.092***	**1.02, 1.17**	1.028	0.96, 1.10	1.061	1.00, 1.13
May order relinquishment	**1.156****	**1.04, 1.28**	1.026	0.95, 1.11	**1.100***	**1.01, 1.20**
Shall order (full only)	1.037	0.96, 1.12	1.039	0.96, 1.12	1.025	0.96, 1.10
Shall order (full/ex parte)	0.957	0.82, 1.11	0.962	0.89, 1.04	0.957	0.85, 1.07

* $p < .05$; ** $p < .01$; *** $p < .001$

Results from the models that assessed the association of DVRO relinquishment policies with IPH are presented in Table 8. There were no significant differences in firearm, non-firearm, or overall IPH between states with firearm purchase and possession restrictions and those that also had a DVRO relinquishment law. Likewise, null effects were observed for all subcategories of DVRO relinquishment.

Table 8. Associations of DVRO relinquishment provisions with firearm and overall IPH (1991-2020).

	Firearm IPH		**Non-firearm IPH**		**IPH**	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
Full/ex parte relinquish. law						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	1.047	0.95, 1.16	1.068	0.98, 1.16	1.045	0.97, 1.13
DVRO relinquishment law	1.037	0.97, 1.11	1.023	0.96, 1.09	1.037	0.98, 1.09

Table 8 (cont.)

Order type (full, ex parte)						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	1.046	0.95, 1.15	1.070	0.98, 1.16	1.045	0.97, 1.13
Relinquishment (full only)	1.033	0.96, 1.11	1.031	0.96, 1.10	1.037	0.98, 1.10
Relinquish. (full/ex parte)	1.041	0.92, 1.18	1.016	0.93, 1.11	1.036	0.97, 1.11
Court discretion (may, shall)						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	1.048	0.95, 1.15	1.067	0.99, 1.15	1.046	0.97, 1.12
May order relinquishment	1.056	0.96, 1.16	1.088	1.00, 1.19	1.073	0.99, 1.17
Shall order (full only)	1.030	0.94, 1.13	1.002	0.93, 1.08	1.024	0.96, 1.09
Shall order (full/ex parte)	1.027	0.89, 1.19	0.987	0.90, 1.08	1.017	0.94, 1.10

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 9 presents the results from analyses of relinquishment laws that apply to MCDV and felony convictions. Few associations were found between these laws and the overall and firearm-stratified outcome measures. States with laws that authorized or required the court to order firearm relinquishment following a felony conviction had significantly lower rates of firearm suicide (IRR=0.858, 95% CI: 0.82-0.89) and overall suicide (IRR=0.955, 95% CI: 0.92-0.99) than states without such laws. However, as noted for DVRO relinquishment, relinquishment provisions related to felony convictions were also associated with significant decreases in non-firearm suicide (IRR=0.950, 95% CI: 0.93-0.97).

Relative to states that had firearm restrictions for MCDV convictions, those that did not had significantly lower rates of firearm homicide (IRR=0.913, 95% CI: 0.84-1.00) and overall homicide (IRR=0.937, 95% CI: 0.88-1.00). These results were sensitive to the exclusion of 10 state years in which there were dramatic spikes in firearm violence that coincided with changes in MCDV firearm restrictions.[13] Specifically, South Carolina (2016-2020) and Illinois (2016-2020) were dropped in a sensitivity test due to substantial increases in firearm homicide that

[13] South Carolina (2016-2020) and Illinois (2016-2020) were excluded in the sensitivity test. Firearm homicide rates in South Carolina increased by 50.0% between 2016 and 2020. In Illinois, firearm homicide rates jumped by 72.3% from 2015 to 2020.

occurred around the time when MCDV restrictions changed. Estimates from the sensitivity regression indicated that the absence of firearm restrictions for MCDV convictions was associated with nonsignificant reductions in firearm homicide (IRR=0.930, 95% CI: 0.85-1.01) and overall homicide (IRR=0.950, 95% CI: 0.89-1.01).

Table 9. Associations of state-level MCDV and felony conviction relinquishment provisions with measures of suicide, homicide, and IPH.

	Firearm Suicide		**Non-firearm Suicide**		**Suicide**	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
MCDV relinquishment						
Purchase/poss restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	1.000	0.97, 1.03	0.982	0.96, 1.01	0.997	0.97, 1.02
MCDV relinquishment law	0.963	0.92, 1.00	0.976	0.95, 1.00	0.978	0.95, 1.00
Felony relinquishment						
No relinquishment law	1.000	Ref.	1.000	Ref.	1.000	Ref.
Felony relinquishment law	**0.858*** **	**0.82, 0.89**	**0.950*** **	**0.93, 0.97**	**0.955** **	**0.92, 0.99**
	Firearm Homicide		**Non-firearm Homicide**		**Homicide**	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
MCDV relinquishment						
Purchase/poss restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	**0.913***	**0.84, 1.00**	0.981	0.93, 1.04	**0.937***	**0.88, 1.00**
MCDV relinquishment law	0.947	0.85, 1.06	0.961	0.91, 1.02	0.950	0.87, 1.03
Felony relinquishment						
No relinquishment law	1.000	Ref.	1.000	Ref.	1.000	Ref.
Felony relinquishment law	0.924	0.78, 1.09	**0.927** **	**0.88, 0.97**	0.922	0.83, 1.03
	Firearm IPH		**Non-firearm IPH**		**IPH**	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
MCDV relinquishment						
Purchase/poss restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	0.992	0.91, 1.08	0.973	0.90, 1.05	0.994	0.93, 1.06
MCDV relinquishment law	1.101	1.00, 1.21	1.010	0.90, 1.14	1.047	0.99, 1.11
Felony relinquishment						
No relinquishment law	1.000	Ref.	1.000	Ref.	1.000	Ref.
Felony relinquishment law	1.094	0.91, 1.32	0.890	0.79, 1.01	0.981	0.92, 1.05

* $p < .05$; ** $p < .01$; *** $p < .001$

Sensitivity tests using original SHR data. Sensitivity tests using unweighted and unimputed SHR data were conducted to further assess associations of relinquishment provisions and measures of IPH (see Table D10 in Appendix D). Few substantive differences exist between the relinquishment estimates in the models; however, felony-based relinquishment policies were associated with a significant reduction in firearm IPH (IRR=0.877, 95% CI: 0.78-0.99) when the unweighted and unimputed data were used. Additionally, states with full and ex parte DVRO relinquishment had decreases in firearm IPH that were marginally significant (IRR=0.957, 95% CI: 0.91-1.01). The absence of purchase and possession restrictions for DVROs was associated with significant increases in non-firearm IPH rates that ranged from 13.7% to 15.8%.

Other firearm policy findings. Associations of other firearm policy measures with each firearm outcome are presented alongside the main DVRO relinquishment variable in Table 10. States with PTP licensing laws had significantly lower rates of firearm suicide (IRR=0.961, 95% CI: 0.93-0.99) and overall IPH (IRR=0.906, 95% CI: 0.83-0.99). ERPO laws were associated with significantly reduced suicide rates (IRR=0.959, 95% CI: 0.93-0.99) and reductions in firearm suicide that approached statistical significance (IRR=0.957, 95% CI: 0.91-1.00). Reductions of similar magnitude were also observed in non-firearm suicide rates (IRR=0.971, 95% CI: 0.95-0.99). The estimated effects of ERPO laws on interpersonal violence were limited to firearm homicide (IRR=0.891, 95% CI: 0.81-0.98) and overall homicide (IRR=0.924, 95% CI: 0.86, 1.00); no significant associations were observed with non-firearm homicide. Relative to states that prohibited concealed carry or had *may issue* permitting policies, those with *shall issue* concealed carry laws had significantly higher firearm homicide rates (IRR=1.094, 95% CI: 1.02-1.17) and elevated rates of overall homicide that were marginally significant (IRR=1.055, 95% CI: 1.00-1.12). Lastly, although not included in the table, the proxy measure of state firearm

ownership was associated with significantly higher rates of all firearm-related outcomes, in addition to increased rates of overall homicide and IPH.

Table 10. Associations of the main DVRO relinquishment measure and other firearm policies with firearm suicide, firearm homicide, and firearm IPH.

	Firearm Suicide		**Firearm Homicide**		**Firearm IPH**	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
Full/ex parte relinquishment law						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	0.976	0.94, 1.01	1.078	0.99, 1.17	1.047	0.95, 1.16
DVRO relinquishment law	**0.956***	**0.92, 1.00**	1.047	0.94, 1.16	1.037	0.97, 1.11
Firearm Policies						
Waiting period	1.001	0.97, 1.03	1.019	0.96, 1.08		
Extreme risk protection order	0.957	0.91, 1.00	**0.891***	**0.81, 0.98**	0.948	0.85, 1.06
Point of sale CBC	0.990	0.94, 1.04	0.982	0.88, 1.09	1.009	0.89, 1.15
Permit-to-purchase	**0.961***	**0.93, 0.99**	0.937	0.78, 1.12	0.890	0.76, 1.04
MCDV or MCV restrictions	0.991	0.97, 1.02	1.082	1.00, 1.17		
Concealed carry permitting						
No/May issue			1.000	Ref.		
Shall issue			**1.094***	**1.02, 1.17**		
Permitless			1.109	0.91, 1.35		
MCDV restrictions					1.033	0.93, 1.15
MCV restrictions					1.055	0.90, 1.24

* $p < .05$; ** $p < .01$; *** $p < .001$

Augmented Synthetic Control Method

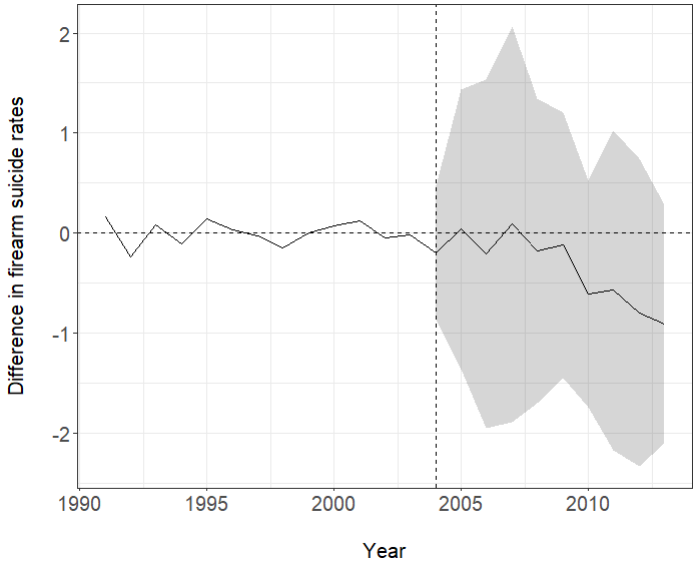
In total, 279 synthetic controls were constructed to estimate the effects of 31 state relinquishment policy changes—12 DVRO, 13 MCDV, 6 felony—on firearm, non-firearm, and overall measures of suicide, homicide, and IPH.[14] ASCM models of 40 state-specific policy changes had pre-intervention prediction errors above this study's acceptable threshold, in addition to 21 models that exhibited large gaps in the observed and synthetic control outcomes

[14] More policy changes occurred than those that were analyzed here by ASCM models. Recall that the analyses were limited to policy changes that occurred after 1998 and prior to 2019 to allow a sufficiently long pre-intervention period and at least two years of post-intervention evaluation.

immediately preceding the relinquishment policy change. The remaining 218 models were deemed to have appropriate pre-intervention fit (i.e., acceptable prediction error values and no extreme prediction discrepancies leading up to the policy change) and were included in meta-analyses. Complete tables of estimates from ASCM models can be found in Appendix E.

DVRO relinquishment. As an example, Figure 2 provides an illustration of the ASCM model used to estimate the state-specific effect of adopting a DVRO relinquishment policy (represented by the vertical line) in North Carolina on firearm suicide. Synthetic North Carolina closely approximated the de-meaned firearm suicide trend of North Carolina prior to its relinquishment policy taking effect (root mean squared prediction error (RMSPE) = 0.148). The policy change resulted in a nonsignificant decrease in the firearm suicide rate (average treatment effect on the treated (ATT) = -0.36 firearm suicide deaths per 100,000; p=0.432).

Figure 2. Gaps in the firearm suicide trends of North Carolina and Synthetic North Carolina.

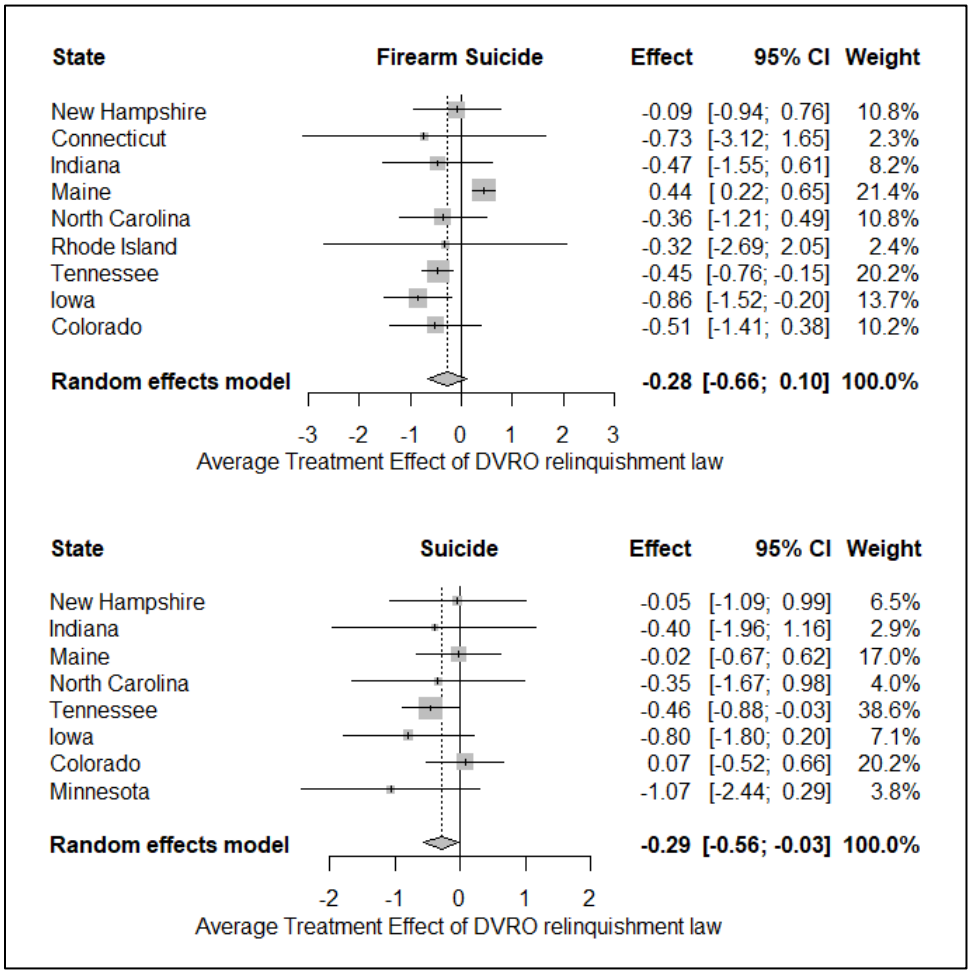


Note: The dashed horizontal line indicates the counterfactual firearm suicide estimates of Synthetic North Carolina. The solid line represents the difference between the firearm suicide trend of North Carolina and Synthetic North Carolina.

State-specific treatment effect estimates for North Carolina and other states with suitable synthetic controls were pooled in meta-analyses to obtain an average effect of DVRO relinquishment on each outcome. The results from meta-analyses assessing firearm suicide and

overall suicide are provided in Figure 3. The adoption of a DVRO relinquishment law resulted in a nonsignificant decrease in firearm suicide (ATT = -0.28, 95% CI: -0.66, 0.10) and a significant reduction in overall suicide (ATT = -0.29, 95% CI: -0.56, -0.03) across included states. No change was observed in non-firearm suicide rates following the adoption of DVRO relinquishment laws (ATT = -0.02, 95% CI: -0.25, 0.20).

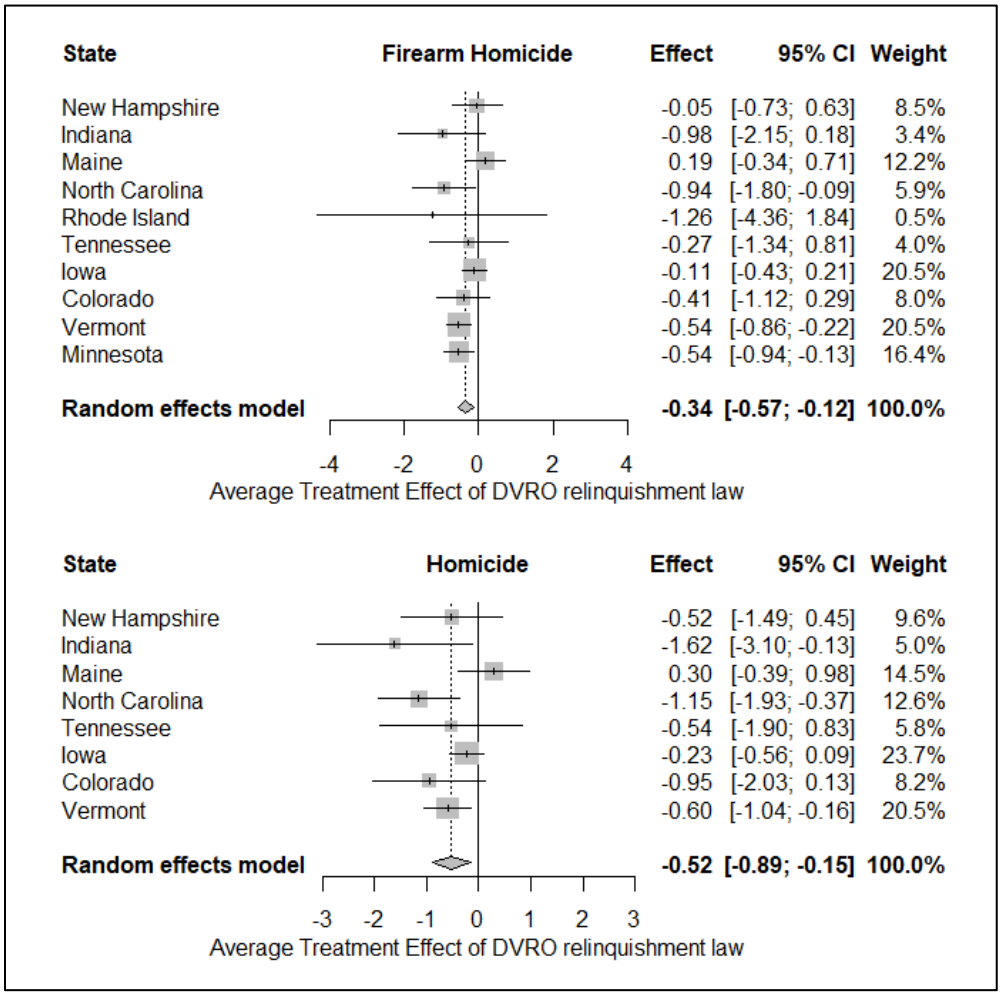
Figure 3. Meta-analyses of DVRO relinquishment effects on firearm and overall suicide using ASCM estimates.



Estimates from ASCM models assessing firearm homicide and overall homicide are presented in Figure 4, in addition to the estimated ATTs across states obtained from meta-analyses. DVRO relinquishment adoption resulted in significant decreases in firearm homicide (ATT = -0.34, 95% CI: -0.57, -0.12) and overall homicide (ATT = -0.52, 95% CI: -0.89, -0.15)

across adopting states. The estimated effects correspond to average reductions of 12.4% and 11.6% in firearm and overall homicide rates, respectively. The meta-analysis of ASCM models analyzing non-firearm homicide, which included all 12 states that adopted a DVRO relinquishment law during the 1999-2018 period, estimated that there was a nonsignificant decrease in rates across states (ATT = -0.08, 95% CI: -0.18, 0.02).

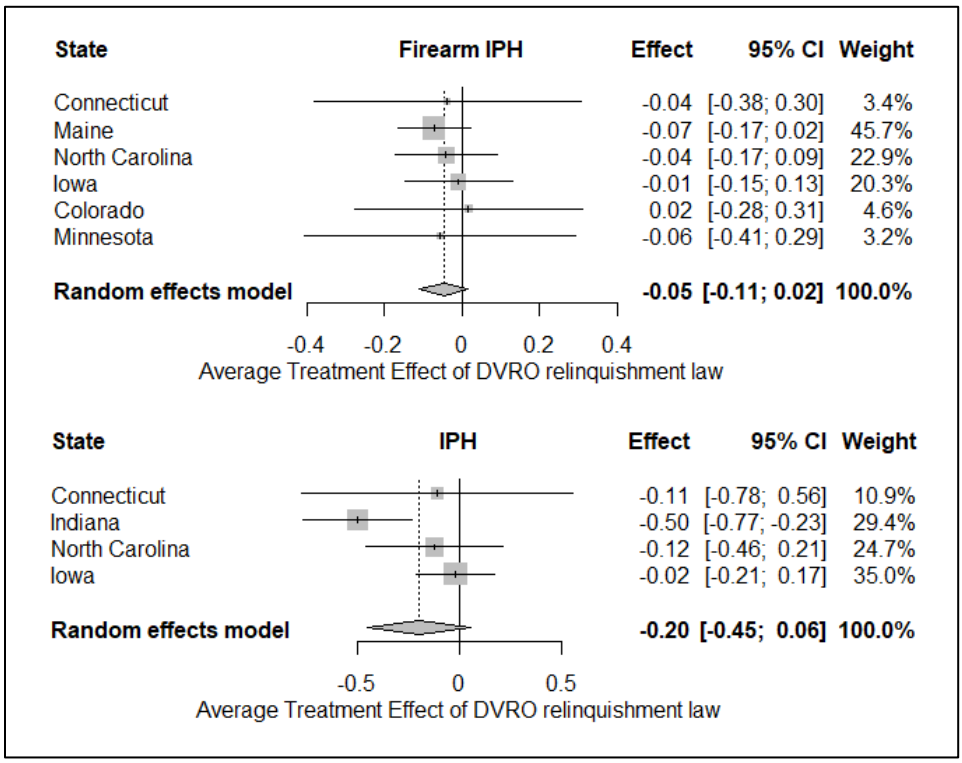
Figure 4. Meta-analyses of DVRO relinquishment effects on firearm and overall homicide using ASCM estimates.



Lastly, the results from analyses of the impacts of DVRO relinquishment laws on IPH are presented in Figure 5. Few ASCM models were included in the meta-analyses of firearm and overall IPH due to poor pre-intervention fits. Estimates suggest that DVRO relinquishment law adoptions resulted in nonsignificant reductions in firearm IPH (ATT = -0.05, 95% CI: -0.11,

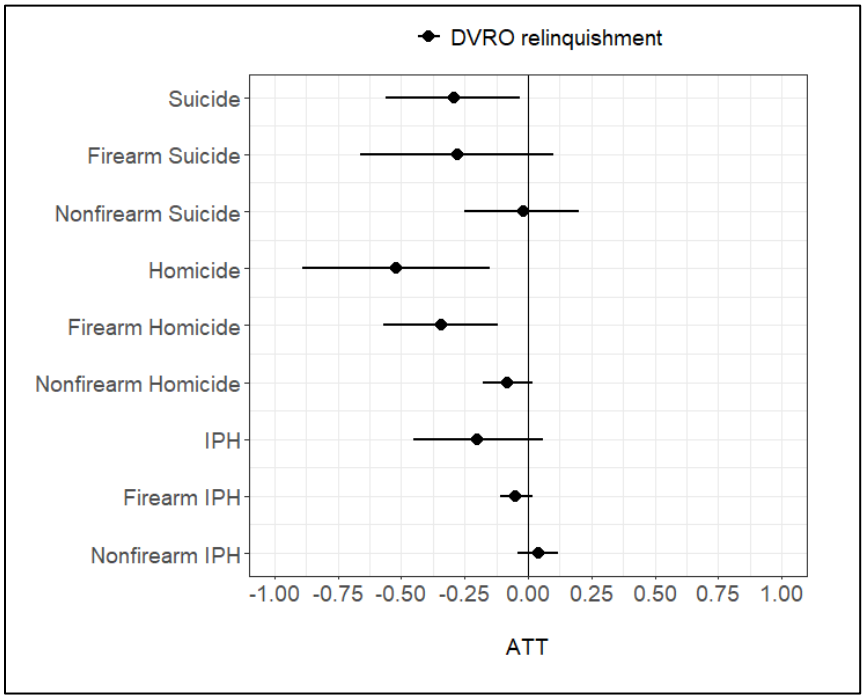
0.02) and overall IPH (ATT = -0.20, 95% CI: -0.45, 0.06), whereas a nonsignificant increase was estimated for rates of non-firearm IPH (ATT = 0.04, 95% CI: -0.04, 0.12).

Figure 5. Meta-analyses of DVRO relinquishment effects on firearm and overall IPH using ASCM estimates.



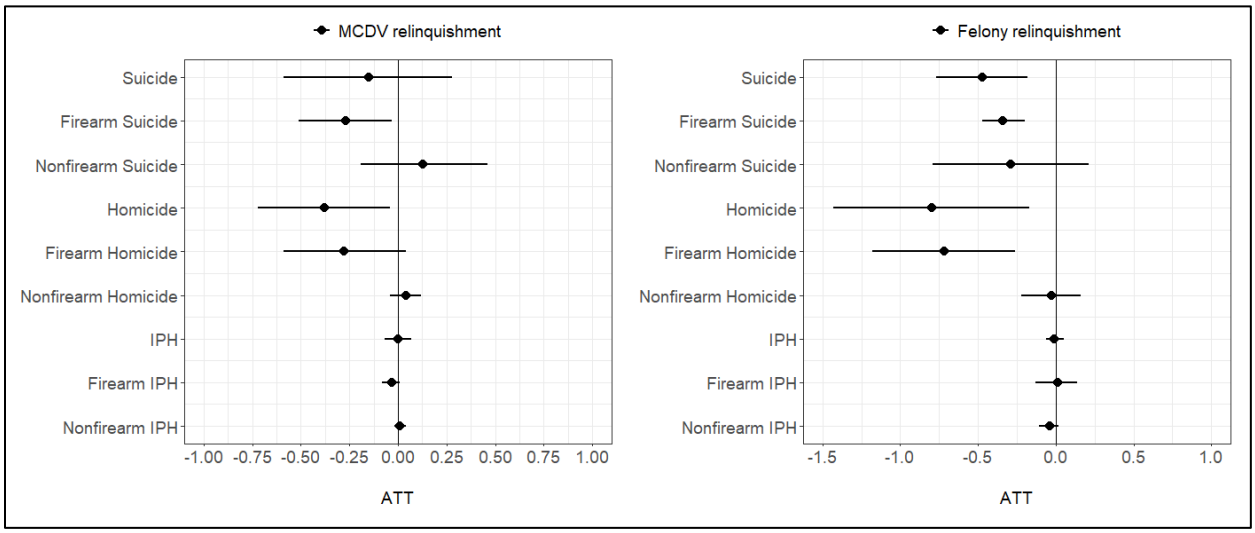
A summary of the aforementioned effects of DVRO relinquishment policy changes on measures of suicide, homicide, and IPH is provided below in Figure 6.

Figure 6. Forest plot of the estimated treatment effects of adopting a DVRO relinquishment law.



Conviction-related relinquishment. The same process—meta-analyses using estimates from ASCM models of state-specific policy changes—was undertaken to assess the impact of relinquishment policies that applied to MCDV and felony convictions. Relinquishment policy adoption related to MCDV convictions resulted in significant reductions in firearm suicide (ATT = -0.27, 95% CI: -0.51, -0.03) and overall homicide (ATT = -0.38, 95% CI: -0.72, -0.04) across states (Figure 7). A marginally significant decrease was noted for firearm homicide (ATT = -0.28, 95% CI: -0.59, 0.04).

Figure 7. Forest plot of the estimated treatment effects of adopting relinquishment laws that applied to MCDV or felony convictions.



Larger effects were observed in the meta-analyses of relinquishment policies that applied to felony convictions in the six states that were analyzed. The pooled estimates from ASCM models suggest that there were significant reductions in firearm suicide (ATT = -0.34, 95% CI: -0.47, -0.20), overall suicide (ATT = -0.47, 95% CI: -0.77, -0.18), firearm homicide (ATT = -0.72, 95% CI: -1.18, -0.26), and overall homicide (ATT = -0.8, 95% CI: -1.43, -0.17) across states with these laws. While the contributions of state-specific estimates were relatively equal in meta-analyses, the estimated effect of Illinois' felony relinquishment law on firearm suicide (ATT = -0.31, 95% CI: -0.47, -0.16) made up 75.3% of the pooled estimate for adopting states (see Figure E4 in Appendix E). Neither type of conviction-based relinquishment policy was found to impact measures of IPH; no ATT estimate exceeded -0.04 in meta-analyses of effects on IPH.

Summary

In regression analyses, various provisions of DVRO relinquishment policies were associated with decreased rates of firearm, non-firearm, and overall suicide compared to DVRO

firearm restriction policies that did not authorize or require relinquishment. While no associations were observed for IPH rates, the absence of any DVRO restrictions was associated with significantly higher rates of firearm homicide. Conversely, *may order* relinquishment directives were associated with significant increases in firearm and overall homicide. Weighted average estimates of state-specific policy changes indicated that relinquishment policy adoptions were generally associated with significant or marginally significant reductions in firearm and overall measures of suicide and homicide.

DISCUSSION

Many states have enacted laws that require certain classes of prohibited persons to surrender their firearms—or otherwise permit the court to order firearm surrender—upon a disqualifying status or conviction. These state laws address a gap in federal law, which prohibits firearm purchase and possession by certain individuals but does not also require that they relinquish firearms they already own. The present study sought to assess relinquishment laws related to DVROs and convictions in two ways: (1) qualitatively in the form of a 50-state survey of current relinquishment provisions and changes over time; and (2) quantitatively by analyzing the differential effect of relinquishment laws on suicide, homicide, and IPH relative to state laws that only restrict firearm purchase or possession. Although some state laws have statutory elements that would be considered strong by the standards proposed in Zeoli and colleagues' (2019) continuum (i.e., provisions that are expected to increase the likelihood of relinquishment), many still have gaps that may severely limit their efficacy. Pooled estimates from the augmented synthetic control models in this study indicated mortality-reducing effects of relinquishment law adoption; however, limitations related to the donor pool and model assumptions hinder the conclusiveness of potential causal attribution. Regression estimates of relinquishment associations were largely null or inclusive of reductions in non-firearm outcomes. Taken together, the results offer limited support that reductions in suicide, homicide, or IPH at the state level can be attributed specifically to relinquishment statutes.

Aim 1

Many firearm owners retain their firearms following a disqualifying status or conviction, in part due to the lack of a legislatively mandated process that could compel relinquishment. A recent study estimated that tens of thousands of people in the U.S. unlawfully possess firearms

following felony convictions (Pear et al., 2021). A growing number of state legislatures have, at least statutorily, implemented legal mechanisms intended to compel firearm surrender for some disqualifying events. By the start of 2023, 31 states had enacted relinquishment laws for DVROs. Fewer states have adopted such laws for conviction disqualifications, as only 17 states had laws that apply to MCDV convictions and only 8 had laws that apply to felony convictions.

In general, relinquishment laws within and across states have become more restrictive over time. The states with the most robust "systems of accountability" (Zeoli et al., 2019, p. 121) have statutes that constrain or compel behaviors of actors (i.e., judges, respondents, law enforcement) at different stages of the relinquishment process. California and Hawaii have two of the strongest DVRO relinquishment laws based on the continuum proposed by Zeoli and colleagues (2019). Both states have an unconditional *shall order* directive, a short time frame in which respondents must surrender their firearms, and an authorization permitting or requiring law enforcement to seize unrelinquished firearms under certain circumstances. As written, these laws ostensibly make firearm surrender more likely to occur overall and among more DVRO respondents. Judges who might otherwise forego ordering relinquishment in some cases due to personal beliefs about domestic violence, firearms, or the court's role in addressing such issues (Frattaroli & Teret, 2006) are instead required under the law to order relinquishment for full and ex parte orders. Coupled with specific time limits and the seizing abilities of law enforcement, compliance requirements theoretically guard against overlooked firearm retention and other forms of noncompliance, such as firearm transfers to ineligible third parties.

Despite relinquishment laws generally becoming more restrictive, most state laws have gaps that could limit how effective they are in generating relinquishment. Previous research has highlighted the lack of detailed instructions in statute texts and unclear enforcement protocols as

barriers to the consistent application and effectiveness of DVRO relinquishment laws (Frattaroli et al., 2021; Frattaroli & Teret, 2006; Kafka, Moracco, Williams, et al., 2022; Zeoli, Frattaroli, et al., 2019). In this regard, the DVRO relinquishment policies of Alaska and Indiana are among the weakest; they have *may order* directives that do not include time limits for firearm surrender, compliance requirements, or an authorization allowing law enforcement to take possession of unrelinquished firearms. There may be few functional differences between these types of laws, which do not require additional hearings or documentation to verify compliance (e.g., affidavit, proof of transfer, receipt of sale) or mechanisms to enforce compliance, and laws that only restrict firearm purchase and possession.

In addition, the discretion permitted by *may order* directives and leveraged within conditional *shall order* directives may profoundly limit how often relinquishment is ordered. Recent research examining implementation fidelity has highlighted the disconnect between statutorily mandated elements of DVRO relinquishment laws and their application in practice (Kafka, Moracco, Williams, et al., 2022). For example, North Carolina has a conditional *shall order* law for full and ex parte orders, meaning that firearm relinquishment must be ordered if any qualifying conditions are present. Kafka and colleagues (2022) noted that the overwhelming majority (93%) of DVRO cases in North Carolina appeared to meet the necessary conditions for firearm relinquishment, yet only 37% of granted orders included a provision requiring firearm surrender. In Arizona, which also has a conditional *shall order* policy for full orders, 31% of DVROs included a relinquishment order despite petitioners requesting firearm removal in half of all cases (Wallin & Durfee, 2020). The findings from North Carolina and Arizona suggest that judges exploit the limited discretionary opportunities that exist by determining that necessary conditions are not present in a DVRO petition or simply ignore conditional *shall order* directives

with impunity. Therefore, the degree to which court discretion is permitted under the law—and exercised outside of it—is a highly important matter.

In contrast to DVRO laws, the degree of court discretion written into conviction-based relinquishment statutes stemming from felony, MCV, or MCDV convictions is minimal. Nearly all conviction-based statutes have unconditional *shall order* directives. Whereas many DVRO relinquishment orders are contingent on the petition demonstrating previous acts/threats of abuse or a future risk of violence, most conviction-based laws do not have these conditions. The main textual limitation of some laws is the absence of strict process-related elements (e.g., compliance requirements, law enforcement seizing ability) that were discussed above in the context of DVRO relinquishment laws. The broader and more significant limitation related to conviction-based relinquishment laws is that they simply have not been enacted in many states. A major difference between convictions and DVROs is that firearm restrictions associated with the latter typically expire after one year. Although a conviction may precede an incarceration sentence, relinquishment laws provide a legal mechanism to disarm a person who would otherwise have unlawful access to firearms following release.

Aim 2

This study addressed a gap in the relinquishment literature by examining associations of relinquishment provisions with outcomes other than IPH. In regression analyses, relinquishment provisions were most consistently associated with reductions in suicide. However, these results should not be misconstrued as providing strong support for such an effect. Significant reductions were also observed in non-firearm suicide, thus undermining the otherwise supportive evidence that the decreases in firearm and overall suicide could be attributed primarily to the relinquishment policies. There is no plausible explanation for why requiring or authorizing the

court to require prohibited persons to relinquish their firearms would result in fewer *non-firearm* suicides. One reason for the inclusive reductions may be that the effects of relinquishment estimated in the models are confounded by other factors, including policies that have protective effects against suicide. Policies such as mental health parity laws (Lang, 2013), which require health insurance plans to cover mental health services to the same extent as physical healthcare, and minimum wage increases (Gertner et al., 2019) have been linked to modest reductions in state suicide rates. To the extent that positive confounding exists due to the introduction of these or other policies coinciding with relinquishment policy adoptions across states, the estimated IRRs would overestimate the impact of relinquishment on suicide. Nonetheless, the results related to non-firearm suicide do not necessarily invalidate the firearm suicide findings. Given that the estimated reductions in firearm suicide exceed those of non-firearm suicide, it is possible that a relinquishment effect, if of an unknown magnitude, still exists.

The unexpected positive association of *may order* DVRO directives with firearm and overall homicide warrants additional discussion. This initial finding suggests that more firearm and overall homicides would occur if a state allowed the court to order relinquishment for some DVRO respondents than if it only allowed the court to prohibit purchase or possession. The pathway by which such a policy would result in homicide increases is unclear. Instead, the positive associations may be better explained by trends in firearm and overall homicide that preceded states' *may order* policy adoptions. Consistent with an approach used by Crifasi et al. (2018) to test the effects of policy leads and lags, sensitivity tests were conducted for each outcome using 1-, 2-, and 3-year lead and lag measures of adoption (see Figure D1 in Appendix D). The results indicated that firearm and overall homicides were increasing in the years leading up to policy adoption before trending downward in the 2- and 3-year lag models. Therefore,

rather than *may order* policy adoption spurring an increase in homicide, it appears that the increase preceded and was subsequently moderated by the adoption of *may order* relinquishment policies.

States that lacked DVRO firearm purchase or possession restrictions had higher rates of firearm homicide than those that had such restrictions. Since these restrictions stem from protection orders related to domestic violence and have been associated with decreased IPH (Vigdor & Mercy, 2006; Zeoli et al., 2018), it was expected that the increase would be driven in part by firearm IPH. Yet, the positive association of the absence of purchase or possession restrictions with firearm IPH was not significant. Most states have adopted firearm purchase and possession restrictions for DVRO respondents since the restrictions became federal law in September 1994. Half of the states that would adopt these restrictions had already done so by the end of 1997. The absence of restrictions in a given state year may be indicative of more permissive firearm policy generally, including an absence of laws that could influence homicide rates but were not accounted for in the models.

The null findings pertaining to IPH are inconsistent with prior relinquishment studies which have found that domestic violence-related relinquishment laws are associated with reductions in IPH (Díez et al., 2017; Zeoli et al., 2018) and pregnancy-associated homicide (Wallace et al., 2021). Although there are differences in the reference categories used in the regression analyses—relinquishment provisions are compared here against firearm restrictions, as opposed to other studies which use the absence of firearm restrictions as the referent—this does not account for the inconsistent results. Adjusting the reference category to comport with the comparisons in other studies (i.e., the effect of relinquishment provisions relative to the absence of purchase or possession restrictions) does not change the MCDV relinquishment

findings and results in estimated IPH reductions for DVRO relinquishment provisions that are small and not significant.

The lack of a clear association between relinquishment laws and reduced IPH would not be surprising if the limited evidence of poor implementation in some states is an indication of broader implementation problems. Still, it is unclear why the regression findings in this study differ from those of other studies. Indeed, there are differences in model specification, control variables (including firearm policies), and the time period of this study compared to the others; however, differences also exist among the studies that found similar effects of relinquishment policies. Whereas other studies assessed the adoption of *any* DVRO relinquishment provision, specific characteristics were tested separately in this study. Few differences were observed across the characteristics in this study, although *shall order* policies that apply to full and ex parte orders were generally more protective based on the sign and magnitude of estimated IRRs. Regression models that used raw SHR data indicated that DVRO relinquishment laws that apply to full and ex parte orders were associated with marginally significant decreases in firearm IPH.

Since victims of intimate partner violence may seek to petition for an ERPO in place of or in addition to a DVRO, the possibility that the estimates of DVRO relinquishment laws were affected by the adoption of ERPOs in several states was considered. Post hoc analyses were conducted using a shortened study period that excluded the years 2018-2020 when most state ERPO laws were adopted. No changes in the estimates of the relinquishment variables were observed in these analyses.

There was suggestive evidence from the pooled ASCM estimates that DVRO relinquishment adoption resulted in slight reductions in firearm and overall IPH across the limited number of states that had adequate synthetic control fits. For example, Indiana's adoption

of a DVRO relinquishment law (in combination with purchase and possession restrictions) resulted in a significant decrease in overall IPH. Nonetheless, there are important limitations of the ASCM results that are discussed more fully below.

In contrast to much of the regression results, pooled estimates from ASCM models indicated that relinquishment policy adoptions resulted in significant reductions in suicide and homicide that did not extend to non-firearm rates. Data on the number of granted DVROs, including the proportion of orders that included a relinquishment requirement, would provide useful context to help determine whether reductions of the estimated magnitudes are plausible. The magnitudes of these reductions are large considering the relatively small subsets of the population that relinquishment laws would be expected to impact, as well as the much smaller and nonsignificant reductions in IPH. The pooled effect of DVRO relinquishment law adoption on firearm IPH was -0.05 (95% CI: -0.11, 0.02), which is a fraction of the effect for firearm homicide (ATT = -0.34, 95% CI: -0.57, -0.12). While it is possible that disarming DVRO respondents could prevent non-intimate partner homicides, the results suggest that the prevention of these types of homicides, rather than IPH, drove the reductions in firearm homicide.

Other explanations for the estimated effects should be considered. Synthetic controls are innovative tools for estimating treatment effects, but validity threats, such as confounding, can still undermine causal inference (Degli Esposti et al., 2020). In the case of DVRO relinquishment adoption, many states enacted relinquishment provisions at the same time as purchase and possession restrictions, thereby entangling the restrictions under a broader "treatment" than relinquishment alone that is ultimately reflected in the ASCM estimates. Some of the same states also extended their restrictions to include dating partners and ex parte orders when they adopted relinquishment laws, in addition to implementing MCDV firearm restrictions. Therefore, the

estimated effects of DVRO or MCDV relinquishment adoption in some states are better characterized as reflecting the impacts of broader domestic violence-focused policy reforms.

A second, related consideration should also inform the interpretation of the ASCM results. A majority of donor states in the DVRO and MCDV relinquishment analyses repealed or rolled back relevant firearm restrictions in the middle or latter half of the study period. In general, the donor pools in the DVRO and MCDV analyses are made up of states with permissive firearm policies.[15] Most policy changes involved repealing permitting requirements for concealed carry, although two states repealed their waiting period for handgun purchases and two states repealed their PTP laws for some or all firearm purchases. PTP repeals have been associated with increases in firearm homicide (Hasegawa et al., 2019; McCourt et al., 2020) and firearm suicide (Crifasi et al., 2015; McCourt et al., 2020). There is moderate evidence that waiting periods reduce firearm suicide (Edwards et al., 2018; Luca et al., 2017; Smart et al., 2023), and Wisconsin's waiting period repeal in particular has been linked to increases in firearm suicide (Dunton et al., 2021; Oliphant, 2022a). Research on concealed carry laws indicates that more permissive policies are associated with increased firearm homicide (Smart et al., 2023). The hypothesized harmful effects of these or other policy changes in the donor states would be reflected in the synthetic control's post-intervention forecast of the counterfactual. In the same manner that a concurrent policy change in a treated state could bias the estimated treatment effect, so too could deregulatory policies that only occur in donor states. ASCM analyses of felony relinquishment laws, which were associated with significant reductions in firearm and

[15] No state in the DVRO donor pool had an ERPO law, PTP law, waiting period, or comprehensive point-of-sale background checks in 2020. Only 1 of the 12 states had a law prohibiting individuals convicted of a MCDV from purchasing or possessing firearms.

overall homicide across adopting states (Figure E5 in Appendix E), were not subject to the same donor pool limitations as those of DVRO and MCDV analyses.

Limitations

There are limitations of the legal research and quantitative analyses presented here that should be noted. First, the descriptive assessment of state relinquishment provisions did not cover ERPO laws. Although their associations with each outcome were assessed in the regression models, a survey of statutes related to ERPOs in each state was beyond the scope of the qualitative portion of the study. In general, while there are differences in the standards of proof, authorized petitioners, and process elements of ERPOs by state, there is more commonality in the base relinquishment requirements for ERPOs than DVROs. For example, all ERPO laws include firearm purchase or possession prohibitions and a requirement to relinquish firearms that applies to ex parte and final orders.

Second, the legal research conducted in Aim 1 did not track the penalties for failing to comply with a relinquishment order. Zeoli and colleagues (2019) recorded whether each state's DVRO relinquishment law included compliance penalties as of 2016, but no study has tracked changes in this statutory element over time or its presence in conviction-based relinquishment laws. Alongside compliance requirements and the seizing abilities of law enforcement when a respondent fails to surrender their firearms, specified penalties may deter noncompliance and increase the likelihood that dispossession will occur (Zeoli, Frattaroli, et al., 2019).

The quantitative portion of this study only assessed two characteristics of DVRO relinquishment orders. The degree of discretion granted to the court to order relinquishment (*may order* or *shall order*) and whether relinquishment provisions cover ex parte orders were included as key elements that may strengthen relinquishment laws. It is also necessary to examine whether

elements related to compliance or enforcement are associated with changes in state-level firearm mortality. These and other elements in the continuum proposed by Zeoli and colleagues (2019) should be included in future analyses that seek to assess the effects of relinquishment laws. Moreover, policy analyses that disaggregate outcome measures by victim race would be informative given that previous work has identified differential impacts among Black and white populations (Wallin et al., 2021).

This study was also limited by the availability of relational homicide data. A modified version of the FBI's SHR dataset was used to address missing and incomplete homicide data in IPH analyses. Six states were excluded from IPH analyses due to reporting inconsistencies, including failing to report any homicides for some years. More complete data from all 50 states would improve both the representativeness within the sample and accuracy of IPH counts.

Like most ecological research (Zeoli, Paruk, et al., 2019), the second aim of the study was limited by a lack of data on policy implementation. This study could not account for the number of DVROs or convictions in each state, or the number of relinquishment orders stemming from those court proceedings. Instead, the current analysis only measures the presence or absence of policy interventions using categorical measures. Aggregated case-level data would help to better assess the effectiveness of these laws given the poor implementation and enforcement that has been observed in some jurisdictions (Kafka, Moracco, Williams, et al., 2022; Webster et al., 2010).

Lastly, there are limitations of the ASCM analyses that warrant additional comment. States that adopted relinquishment policies before 1999 were excluded due to the limited pre-intervention data that would have been available to construct a synthetic control. Likewise, states that adopted their policies after 2018 were excluded due to the short post-intervention window in

which treatment effects would be estimated. It is possible that the estimated average treatment effects across states would be different had all state policy changes in the study period been assessed.

Poor synthetic control fits in some states resulted in additional exclusions. A fundamental assumption of synthetic control methods is that the synthetic outcomes modeled in the post-intervention provide accurate estimates of the counterfactual. As such, care was taken to exclude estimates of poorly fitting synthetic controls from meta-analyses. Approximately one fifth of the 279 synthetic controls were excluded from meta-analyses due to pre-intervention prediction errors above this study's threshold or visually poor fits immediately preceding the policy change. Exclusions affected analyses of each outcome, but IPH models were impacted the most. A less conservative prediction error threshold would have resulted in more states from which to estimate average effects.

As mentioned above, there are limitations associated with the composition of the donor pools and the timing of relinquishment law adoption. In some states, the adoption of a relinquishment law coincided with the adoption of purchase and possession restrictions. This confounding could not be addressed by restricting the donor pool to states that also experienced the confounding event—the adoption of purchase and possession restrictions—as recommended by Degli Esposti and colleagues (2020). Most states that adopted purchase and possession restrictions also adopted a relinquishment law at some point during the study period. Time-confounding events such as these reflect a broader challenge in policy analysis: the identification of a causal effect using observational data.

Policy Implications

Despite the limitations of this study, the findings have important policy implications for firearm violence prevention. The proxy measure for state firearm ownership was consistently associated with increases in firearm-specific measures of all three outcomes, as well as overall measures of homicide and IPH. Individual-level studies have identified access to firearms as a risk factor for suicide (Studdert et al., 2020; Wiebe, 2003) and interpersonal violence outcomes (Campbell et al., 2003; Studdert et al., 2022; Wiebe, 2003). Findings from ecological and individual-level studies point toward the need for prevention efforts to address the widespread availability of firearms. U.S. firearm sales soared during the pandemic (Miller et al., 2022; Schleimer et al., 2021), resulting in current estimates of civilian-owned firearms totaling nearly 350 million (Miller et al., 2022). One policy solution related to firearm acquisition was found to have protective effects for two of the three types of outcomes in this study.

Regression estimates indicated that states with PTP requirements experienced significant reductions in firearm suicide (-4.9%) and overall IPH (-9.4%). PTP laws require prospective buyers to apply for and obtain a permit from a law enforcement agency before purchasing a firearm (Crifasi et al., 2019). The de facto waiting period during the application process may prevent impulsive firearm suicide attempts by delaying firearm acquisition by individuals experiencing transient suicidal ideation. The robust screening processes of PTP laws are also expected to prevent purchases by prohibited persons or those made on their behalf by others (often referred to as straw purchases). Thus, PTP laws make it more difficult for a DVRO respondent or person convicted of a disqualifying offense to bypass a licensed dealer and acquire a firearm through a private sale.

Although PTP laws may be an effective approach to prevent illegal firearm acquisition, they do not address the challenge posed by high-risk individuals who already have access to firearms. As of June 2023, 21 states and the District of Columbia have ERPO laws or have passed laws to establish ERPOs.[16] The findings from this study suggest that allowing the court to temporarily restrict firearm access among individuals who pose a high risk of violence to themselves or others may be an effective policy measure. State ERPO laws were associated with reductions in firearm homicide (-10.9%) and overall homicide (-7.6%), in addition to decreases in each measure of suicide depending on the relinquishment variable being assessed. To my knowledge, this is the first study to assess the association of ERPO laws with firearm mortality at the state-level in a 50-state longitudinal analysis. Evidence from Oregon and California suggest that ERPOs are being granted appropriately when there is imminent risk of harm (Zeoli, Paruk, et al., 2021), including explicit threats of mass shootings by individuals who own firearms (Wintemute et al., 2019).

This study's findings also suggest that the U.S. Supreme Court's decision regarding concealed carry permitting in *New York State Rifle & Pistol Association Inc. v. Bruen* (2022) may result in increases in firearm homicide. The *Bruen* decision invalidated *may issue* concealed carry permitting laws and established a new test for Second Amendment cases which requires firearm regulations to have a historical analogue. In this study, *shall issue* laws were associated with a 9.4% increase in firearm homicide relative to laws that prohibited concealed carry entirely or allowed issuing agencies to deny permits on certain grounds. Although the estimated increases associated with permitless carry policies were not significant, the recent trend in many states of

[16] Michigan and Minnesota adopted ERPO laws that will take effect in 2024.

repealing permitting requirements altogether may further undermine firearm violence prevention efforts.

Lastly, there are important implications for firearm relinquishment policy broadly. The findings from Aim 1 illustrate common gaps in DVRO and conviction-based relinquishment policies, many of which were documented by Zeoli and colleagues (2019) in their assessment of DVRO laws. States might consider strengthening their relinquishment statutes by requiring the court to order relinquishment in all cases, extending relinquishment requirements to ex parte DVROs, requiring proof of compliance, and allowing law enforcement to recover unrelinquished firearms.

Despite the inconsistent results across the two methods that were used to quantitatively assess relinquishment laws, there was evidence to suggest that relinquishment laws, in combination with other firearm restrictions, may contribute to reductions in firearm deaths. ASCM results indicated that a number of states experienced significant reductions in firearm and overall rates of suicide and interpersonal violence following the adoption of relinquishment laws. In particular, the analyses of felony relinquishment laws, which did not suffer the same limitations as those of DVROs and MCDVs, suggest that states experienced significant reductions in firearm and overall homicide following law adoption. Nonetheless, as significant reductions in regression analyses were limited to non-firearm homicide, the evidence of non-inclusive reductions (i.e., protective effects that did not extend to non-firearm outcomes) remains mixed.

The lack of more robust findings, particularly related to IPH, should not be leveraged to make sweeping claims that firearm relinquishment laws are ineffective. The findings from Aim 1 underscored significant gaps in many laws that might limit how often relinquishment is ordered

and whether the orders are likely to result in firearm surrender (Zeoli, Frattaroli, et al., 2019). The limited case-level research on DVROs also indicates that the implementation of relinquishment laws may be wholly inadequate in some jurisdictions, in which case resources to establish additional training and court monitoring programs may be needed (Kafka, Moracco, Williams, et al., 2022). Research that builds on the courtroom observation approach used by Kafka and colleagues (2022) would help to better understand the circumstances of relinquishment order issuance and process-related issues that preclude relinquishment. For example, one study found that the primary reason firearms were not recovered from DVRO respondents in a California county was because the orders were simply not being served (Wintemute et al., 2014). To the extent that a multi-state effort would be feasible, observational data across states with varying directive requirements could elucidate potential barriers to greater implementation fidelity. The identification of implementation challenges could also highlight a path forward for potential remedies, including more statutory guidance, training, or other accountability measures.

Conclusion

The goal of this study was to build on Zeoli and colleagues' (2019) work by descriptively and quantitatively assessing DVRO and conviction-based relinquishment laws. Findings from the statutory assessments revealed that many state laws still lack elements that are expected to increase the likelihood of relinquishment, such as a requirement that the court order relinquishment in all cases, strict standards for providing proof of relinquishment or some form of compliance verification, and provisions that authorize or require law enforcement to recover unrelinquished firearms. The two approaches used to quantitatively assess the laws did not collectively provide strong evidence that relinquishment laws reduce firearm-specific and overall

violent death. ASCM models indicated that relinquishment laws were associated with reductions in suicide and homicide; however, limitations related to the timing of relinquishment law adoption and the sample of donor states precluded more direct attribution of the treatment effects to relinquishment laws. Still, the study found support for firearm policies more broadly—and PTP and ERPO laws in particular—as potential tools to reduce firearm violence. Future research that examines relinquishment order issuance among multiple jurisdictions is needed to better understand the barriers to implementation and possible measures that can be taken to improve relinquishment policies.

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APPENDIX A: AIM 1 METHODS

Table A1. Characteristics of relinquishment policies that were recorded for each session law involving a relevant change to a state's existing policy.

Element	**Description of recorded information**
Citation	The relevant statutes within a state's code pertaining to a given relinquishment provision
Associated session laws	Individual laws passed by state legislatures over time. The additions and deletions of text represented in session laws facilitated the construction of a relinquishment policy chronology
Enacted date	The date in which a state's relinquishment policy was signed into law or otherwise enacted by a legislature overriding a governor's veto
Effective date	The date in which a change to a state's relinquishment policy took effect
Firearm-prohibiting protection order or conviction	Domestic violence restraining order (DVRO: full or ex parte), felony, misdemeanor crime of violence (MCV), misdemeanor crime of domestic violence (MCDV)
Whether the court may or shall require the surrender of firearms	The court's role in ordering firearm relinquishment was assigned one of four classifications based on the requisite conditions and permitted discretion: • **Shall**: the court shall order the respondent to relinquish all firearms (i.e., no conditions; no discretion) • **Shall (conditional)**: the court shall order the respondent to relinquish all firearms if certain criteria are met (conditions; no discretion) • **May**: the court may order firearm relinquishment as relief (no conditions; discretion) • **May (conditional)**: the court may order firearm relinquishment as relief if certain criteria are met (conditions; discretion)

Necessary conditions that must be met for the provision to apply	The criteria specified in a state law that, when met, activates a court's relinquishment order or permission to require relinquishment
	• Examples:
	  ○ Abuse involving a firearm
	  ○ Court prohibition of firearm possession
	  ○ Facts supporting a finding that a respondent owns a firearm

Table A1 (cont.)

To whom firearms can be surrendered	A list of eligible parties to whom a respondent is permitted or required to transfer or sell their firearms
	• Examples:
	  ○ Law enforcement
	  ○ Licensed firearms dealer
	  ○ An individual who is not prohibited from possessing firearms

Timing of relinquishment	The timeframe in which a prohibited possessor must relinquish their firearm(s). This timeframe is expressed in relation to stages of the judicial process, such as upon conviction, upon issuance of an order, upon receiving notice of the order, etc.

Compliance requirements	The evidence a person must provide to the court to verify that they have fulfilled the requirements of a relinquishment order. Compliance requirements may include a time limit.
	• Examples:
	  ○ File affidavit with the court
	  ○ File proof of transfer with the court
	  ○ File receipt of sale with the court

Law enforcement responsibilities	Permissions or requirements assigned to law enforcement regarding firearm relinquishment, including but not limited to authorization or requirement to take possession of firearms upon order service, authorization or requirement to seize unrelinquished firearms, acceptable storage of relinquished firearms, documentation responsibilities (e.g., duty to provide proof of transfer receipt)
Exemptions	Classes of individuals who may be excused from a court's order to relinquish all firearms based on one's employment, good cause shown, or other factors

APPENDIX B: AIM 2 METHODS

Table B1. Descriptions of numeric control variables and associated data sources.

Variable	Description	Data Source(s)	Source Link
Population	Yearly state population	Underlying Cause of Death, 2018-2021, Single Race Request, CDC WONDER Underlying Cause of Death, 1999-2020 Request, CDC WONDER Compressed Mortality, 1979-1998 Request, CDC WONDER	https://wonder.cdc.gov/
Population 14 and older	Yearly state population aged 14 and older		
Population 15-24	Percentage of the state population aged 15-24		
Population density	Yearly state population totals obtained from CDC WONDER divided by land area measurements from the 2010 Census	State Area Measurements and Internal Point Coordinates, U.S. Census Bureau	https://www.census.gov/geographies/reference-files/2010/geo/state-area.html
Percentage of population Black	Percentage of the state population that identifies as Black	Underlying Cause of Death, 1999-2019 Request, CDC WONDER Compressed Mortality, 1979-1998 Request, CDC WONDER	https://wonder.cdc.gov/
Married	Percentage of the state population that is married (5-year estimates used for 2020)	S1201 Marital Status, American Community Survey Obtained in part from a team of firearm policy researchers who have previously published studies using these data	https://data.census.gov/table?q=S1201:+marital+status
Divorced	Percentage of the state population that is divorced (5-year estimates used for 2020)	S1201 Marital Status, American Community Survey Obtained in part from a team of firearm policy researchers who have previously published studies using these data	https://data.census.gov/table?q=S1201:+marital+status
Unemployment rate	Number of unemployed persons divided by labor force (and multiplied by 100)	BLS Data Finder 1.1, Bureau of Labor Statistics	https://beta.bls.gov/dataQuery/find?q=unadjusted+unemployment&q=Unemployment+Rate:%20(U)&st=0&r=100&st=0
Poverty rate	Percentage of the population living below the poverty line	Table 21. Number of Poor and Poverty Rate by State. Current Population Survey, U.S. Census Bureau Table 20. Percent of People in Poverty by State: 2019, 2020, and 2021. Current Population Survey, 2022 Annual Social and Economic (ASEC) Supplement, U.S. Census Bureau	https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-people.html

Table B1 (cont.)

Mean income	Per capita personal income	SAINC1 Personal Income Summary, Bureau of Economic Analysis	https://apps.bea.gov/itable/iTable.cfm?ReqID=70&step=1
Educational attainment	Percentage of the population 25 years and older with high school degree (or equivalent) (5-year estimates used for 2020)	S1501 Educational Attainment and Table 233. Educational Attainment by State, American Community Survey Obtained in part from a team of firearm policy researchers who have previously published studies using these data	https://www2.census.gov/library/publications/2011/compendia/statab/131ed/tables/12s0233.xls https://data.census.gov/cedsci/table?q=S1501%3A%20EDUCATIONAL%20ATTAINMENT&tid=ACSST5Y2020.S1501
Ethanol consumption	Per capita ethanol consumption (in gallons) among statewide population	April 2021 Surveillance Report #117, National Institute on Alcohol Abuse and Alcoholism April 2022 Surveillance Report #119, National Institute on Alcohol Abuse and Alcoholism May 2023 Surveillance Report #120, National Institute on Alcohol Abuse and Alcoholism	https://pubs.niaaa.nih.gov/publications/surveillance.htm
Firearm ownership	A proxy measure of firearm ownership involving the proportion of overall suicides (S) involving firearms (FS) and hunting licenses (see equation below) (0.62 * FS/S) + (0.88 * hunting licenses per 100 residents age 15 and over) - 4.48 Note: hunting licenses in 2023 represent totals in 2021 per WSFR site	Underlying Cause of Death, 2018-2021, Single Race Request, CDC WONDER Underlying Cause of Death, 1999-2020 Request, CDC WONDER Compressed Mortality, 1979-1998 Request, CDC WONDER Hunting Licenses, Holders, and Costs by Apportionment Year. U.S. Fish and Wildlife Services.	https://wonder.cdc.gov/ https://us-east-1.quicksight.aws.amazon.com/sn/accounts/329180516311/dashboards/48b2aa9c-43a9-4ea6-887e-5465bd70140b/sheets/48b2aa9c-43a9-4ea6-887e-5465bd70140b_5ff879d8-a9a3-4166-81e5-987576e74f76
Overdose death rate	Overdose deaths (ICD-10 codes X40–X44, X60–X64, X85, and Y10–Y14) per 100,000	Underlying Cause of Death, 2018-2021, Single Race Request, CDC WONDER Underlying Cause of Death, 1999-2020 Request, CDC WONDER Years 1990-1998 obtained from a team of firearm policy researchers who have previously published studies using these data	https://wonder.cdc.gov/

Table B1 (cont.)

Law enforcement population	Law enforcement officers per 100,000 population	Law Enforcement Employees Breakout. Crime Data Explorer, Federal Bureau of Investigation	https://cde.ucr.cjis.gov/
Robbery rate	Robbery rate per 100,000 population	Rate of Robbery Offenses by Population. Crime Data Explorer, Federal Bureau of Investigation	https://cde.ucr.cjis.gov/
Incarceration rate	The total jurisdiction (incarcerated) population in each state divided by the state population and multiplied by 100,000	Appendix Table 1 (2021) and Appendix Table 2 (2020). Prisoners under the jurisdiction of state or federal correctional authorities, by jurisdiction and race or Hispanic origin. National Prisoner Statistics (NPS) Program. Bureau of Justice Statistics	https://www.bjs.gov/index.cfm?ty=nps
Non-intimate partner homicide rate	The rate of adult non-intimate partner homicides per 100,000 (counts obtained using weighted and imputed SHR data)	Fox, J. (2022). [Multiply-imputed Supplementary Homicide Reports File 1976-2020] [Unpublished raw data]. Northeastern University.	N/A

Table B2. Descriptions of firearm policy variables included in the regression analyses of Aim 2.

Policy	Variable description
Extreme Risk Protection Order (ERPO) laws	Dichotomous measure indicating the presence or absence of a risk protection order law or similar firearm seizure law (CT, IN). ERPO laws allow authorized petitioners (e.g., law enforcement) to petition the court for a civil order that temporarily restricts a person's access to firearms if they are at risk of harming themselves or others.
Purchaser licensing laws (permit-to-purchase)	Dichotomous measure indicating the presence or absence of a law that requires prospective buyers to first apply for and obtain a firearms license before purchasing a handgun or other firearm.
Point of sale comprehensive background checks	Dichotomous measure indicating the presence or absence of a law that requires all purchasers, including those who are buying a firearm from a private seller, to undergo a background check at the point of sale.
Waiting periods	Dichotomous measure indicating the presence or absence of a law that mandates a delay between the purchase and acquisition of handguns or all firearms. Included in this operationalization are state years in which the Brady-imposed waiting period applied (1994-1998) due to alternative systems of conducting background checks not being in place in certain states. This measure does not consider purchase delays related to the application process for a firearms license as constituting a waiting period law.
Concealed carry permitting laws	Trichotomous measure indicating the type of permitting scheme. State years in which concealed carry was illegal and those with a "may issue" law (i.e., licensing authorities may exercise discretion by denying an application even if certain criteria are met) were grouped together as the reference category. "Shall issue" state years (i.e., those in which authorities are required to issue a permit to applicants who meet the necessary criteria) represent a second category. State years in which a permit is not required to carry a concealed weapon (i.e., "permitless states") make up the third category.
DVRO firearm restrictions	Dichotomous measure indicating the presence or absence of a law that restricts firearm purchase and possession by respondents of DVROs or authorizes the court to impose such restrictions.
MCDV firearm restrictions	Dichotomous measure indicating the presence or absence of a law that restricts those convicted of a misdemeanor crime of domestic violence from purchasing or possessing firearms.
Violent misdemeanor (MCV) restrictions	Dichotomous measure indicating the presence or absence of a law that restricts those convicted of a violent misdemeanor (i.e., a conviction for an assault/battery offense as described in the text of the study) from purchasing or possessing firearms. Laws that only apply if the offense involved a firearm and those that do not apply for more than 5 years after the conviction were excluded from this classification.

APPENDIX C: AIM 1 RESULTS

Table C1. Characteristics of state DVRO relinquishment laws and relevant statutory changes over time.

State	Year	Order to surrender	Conditions for order	Surrender to whom	Surrender timing	Compliance	LE seizing ability
AL		None					
AK	1996	Full: May Ex parte: N/A	If respondent possessed/used firearm during commission of DV	Law enforcement	Not specified	None	Not specified
AZ	1997	Full: May Ex parte: N/A	If court finds defendant may inflict bodily injury or death on plaintiff	Law enforcement	Not specified	None	Not specified
	1999	Full: Shall Ex parte: N/A	If court prohibits purchase/possession of firearms, which it may do if respondent is a credible threat to physical safety		Within 24 hours if not immediately		
AR		None					
CA	1995	Full: May Ex parte: May	If the court determines by a preponderance of evidence that the respondent is likely to use/display/threaten use of firearm	Law enforcement (surrender) or licensed dealer (sale)	Within 24 hours (or 48 if not present at the hearing)	File receipt with court showing surrender/sale within 72 hours of order	Not specified
	2000	Full: Shall Ex parte: Shall	Unconditional				
	2005	Full: Shall Ex parte: Shall			Within 24 hours		

(cont. below)

Table C1 (cont.)

State	Year	Order to surrender	Conditions for order	Surrender to whom	Surrender timing	Compliance	LE seizing ability
CA cont.	2007	Full: Shall Ex parte: Shall	Unconditional	Law enforcement upon request (or if no request made by LE, then either surrender to LE or sell to licensed dealer)	Immediately following request by LE serving order (or within 24 hours if no request is made by LE)	File receipt with court showing surrender/sale within 48 hours of receiving order	Not specified
	2013	Full: Shall Ex parte: Shall				File receipt with court and LE showing surrender/sale within 48 hours of receiving order	
	2022	Full: Shall Ex parte: Shall					If court notifies LE of non-compliance
CO	2013	Full: Shall Ex parte: N/A	Unconditional	Law enforcement, licensed dealer, or eligible third party *(cont. below)*	Within 24h of order service in court (or 48 hours if served outside); court may allow up to 72 hours if demonstrated need	File proof of relinquishment with the court within 3 business days of relinquishment	Not specified

Table C1 (cont.)

State	Year	Order to surrender	Conditions for order	Surrender to whom	Surrender timing	Compliance	LE seizing ability
CO cont.	2021	Full: Shall Ex parte: N/A	Unconditional	Law enforcement, licensed dealer, or eligible third party	Within 24 hours of order service in court (or 48 hours if served outside); court may allow addl. 24 hours if demonstrated need	File affidavit with court within 7 days of the order; Compliance hearing 8-12 days after order issuance	Court shall issue search warrant if there is probable cause of failure to relinquish
CT	2002	Full: Shall Ex parte: N/A	Unconditional	Eligible third party or commissioner of public safety	Within 2 business days of disqualify-ing event	Submit 3rd party sale/transfer form to LE within 2 business days; no requirement if surrendering to LE	Not specified
	2017	Full: Shall Ex parte: Shall		Licensed dealer or commissioner of emergency services and public protection	Immediately, but in no event more than 24 hours after notice has been provided		

Table C1 (cont.)

State	Year	Order to surrender	Conditions for order	Surrender to whom	Surrender timing	Compliance	LE seizing ability
DE	1994	Full: May Ex parte: May	Unconditional	Law enforcement	Not specified	None	Not specified
	2008	Full: May Ex parte: May					May be issued an order to seize under certain conditions
	2017	Full: May Ex parte: May	Unconditional	Law enforcement or licensed dealer	Immediately if requested by LE upon order service or within 24 hours if no request is made	File proof of transfer (or statement affirming no possession) with court within 48 hours	
FL		None					
GA		None					
HI	1993	Full: Shall Ex parte: N/A	Unconditional	Law enforcement	Not specified	None	Not specified
	1994	Full: Shall Ex parte: Shall	Ex parte: affidavit shall contain facts supporting a finding that respondent owns or intends to possess a firearm which may be used to threaten, injure, or abuse any person	*(cont. below)*			May take custody of firearms upon service; LE shall apply for warrant to seize if respondent refuses surrender

Table C1 (cont.)

State	Year	Order to surrender	Conditions for order	Surrender to whom	Surrender timing	Compliance	LE seizing ability
HI cont.	2000	Full: Shall Ex parte: Shall	(see above)	Chief of police, licensed dealer, or eligible third party	Not specified	None	May seize firearms after 30 days
	2004	Full: Shall Ex parte: Shall		Chief of police or licensed dealer			
	2018	Full: Shall Ex parte: Shall					May seize firearms after 7 days
	2020	Full: Shall Ex parte: Shall	Unconditional		Within 48 hours of being served with the order		May seize firearms after 48 hours
ID		None					
IL	1996	Full: Shall Ex parte: N/A	If the court is satisfied that there is danger of illegal firearm use following a petition indicating threats or likelihood of firearm use against petitioner	Law enforcement	Not specified	None	Court shall issue a warrant for seizure of firearms if respondent fails to appear
	2010	Full: Shall Ex parte: Shall	Full: *no change from above* Ex parte: same requirements as Full; additionally, harm that relief is intended to prevent must be likely to occur if the respondent were given notice (as with Full orders)	Law enforcement *(cont. below)*	Not specified	None	Court shall issue a warrant for seizure of firearms and FOID card if respondent fails to appear

Table C1 (cont.)

State	Year	Order to surrender	Conditions for order	Surrender to whom	Surrender timing	Compliance	LE seizing ability
IL cont.	2011	Full: Shall Ex parte: Shall					"Court shall issue…" if respondent is not present in court and there is a danger of illegal firearm use
	2012	Full: Shall Ex parte: Shall	If the order restrains respondent from various conduct and finds the respondent to be a credible threat to petitioner or child (Full) and if the if the harm which relinquishment is intended to prevent would be likely to occur if respondent were given prior notice (Ex parte)	Law enforcement	Not specified	None	Court shall issue a warrant for seizure of any firearm and FOID card in the possession of the respondent
	2014	Full: Shall Ex parte: Shall			Firearm disposition record must be completed within 48 hours	Complete firearm disposition form within 48 hours of FOID card revocation	
	2022	Full: Shall Ex parte: Shall				…and provide a copy to the IL State Police	

Table C1 (cont.)

State	Year	Order to surrender	Conditions for order	Surrender to whom	Surrender timing	Compliance	LE seizing ability
IN	2002	Full: May Ex parte: N/A	Unconditional	Law enforcement	Not specified	None	Not specified
IA	2010	Full: Shall Ex parte: N/A	If respondent is found to be in possession of a firearm	Eligible third party (or LE if court is unable to identify a party)	A date determined by the court	None	Not specified
KS		None					
KY		None					
LA	2019	Full: Shall Ex parte: N/A	If firearm prohibition is included in the order	Sheriff (with option to transfer or sell to a third party)	Within 48 hours of order issuance and copy of order sent to sheriff	File proof of transfer with court within 5 days of transfer	Not specified
	2020	Full: Shall Ex parte: N/A				File proof of transfer with court within 10 days of transfer	

Table C1 (cont.)

State	Year	Order to surrender	Conditions for order	Surrender to whom	Surrender timing	Compliance	LE seizing ability
ME	2004	Full: Shall Ex parte: Shall	If the court prohibits defendant from possessing a firearm/dangerous weapon (Full) stemming from abuse involving dangerous weapon or heightened risk of immediate abuse (Ex parte)	Law enforcement or "other individual"	Within 24 hours of order service (or such earlier time as the court specifies in the order)	File info. of person firearms relinquished to (if not LE) with court or local LE within 24 hours of relinquishment	Court may issue search warrant authorizing LE to seize firearms if there is probable cause that defendant did not relinquish firearms
MD	1997	Full: May Ex parte: N/A	Unconditional	Law enforcement	Not specified	None	Not specified
	2010	Full: Shall Ex parte: May	Ex parte: if abuse involved firearm or serious bodily harm (including threats)				
MA	1994	Full: Shall Ex parte: Shall	If the plaintiff demonstrates a substantial likelihood of immediate danger of abuse	Law enforcement	LE shall immediately take possession of all firearms upon service	None	LE shall immediately take possession of all firearms and licenses upon service
	2015	Full: Shall Ex parte: Shall		Law enforcement (but respondent may then transfer firearms to licensed dealer)			
MI		None					

Table C1 (cont.)

State	Year	Order to surrender	Conditions for order	Surrender to whom	Surrender timing	Compliance	LE seizing ability
MN	2015	Full: Shall Ex parte: N/A	If the court finds that respondent is a credible threat to petitioner and restrains respondent from other conduct	LE, licensed dealer, or eligible third party	Within 3 business days	File notarized affidavit/proof of transfer with the court within 2 business days of transfer	LE shall take immediate possession of firearms if preponderance of evidence of imminent risk
MS		None					
MO		None					
MT		None					
NE		None					
NV	2008	Full: May Ex parte: N/A	Must consider (1) history of DV, (2) use/threatened use of firearm against another person or in a crime	LE, person designated by the court, or licensed dealer	Within 24 hours of order service	Provide receipt to the court (72 hrs), info. of transfer to designated person to court and LE, or receipt of sale/transfer to court and LE	LE may be authorized by court to search and seize unrelinquished firearms if there is probable cause that firearms were not relinquished/sold within 24 hours
	2018	Full: May Ex parte: N/A				Adds affidavit option stating no possession (24 hours)	

Table C1 (cont.)

State	Year	Order to surrender	Conditions for order	Surrender to whom	Surrender timing	Compliance	LE seizing ability
NH	2000	Full: Shall Ex parte: May	Unconditional	Law enforcement	Not specified	None	Court may authorize LE to seize firearms if probable cause of non-compliance
NJ	1995	Full: May Ex parte: May	Unconditional	Law enforcement (via search and seizure)	Not specified	None	LE may be ordered to seize weapons where the judge has reasonable cause to believe weapon is located
	2018	Full: Shall Ex parte: May		Law enforcement (Ex parte: via search and seizure)	Full: immediate; Ex parte: not specified, although LE shall accompany respondent to firearms location	None	In addition to above, LE shall seize firearms when respondent is prohibited from returning to the scene (Full)
NM	2019	Full: Shall Ex parte: N/A	If respondent presents a credible threat to physical safety of household member	Law enforcement or licensed dealer	Within 48 hours of order service	File a receipt or declaration of non-relinquishment with the court within 72 hours of order	LE shall take possession of firearms discovered in plain sight or pursuant to a lawful search

Table C1 (cont.)

State	Year	Order to surrender	Conditions for order	Surrender to whom	Surrender timing	Compliance	LE seizing ability
NY	1997	Full: Shall/May Ex parte: Shall/May	Full: shall if conduct involved serious injury, use/threatened use of weapon, or violent felonious behavior; Ex parte: shall if respondent convicted of prior violent felony or violated prior order via violence/threats; May order if substantial risk of firearm use/threats (Full and Ex parte)	Law enforcement	Date and time specified in the order	None	Not specified
	2000	Full: Shall/May Ex parte: Shall/May	Full: shall if conduct involved serious injury, use/threatened use of weapon, or violent felonious behavior; Ex parte: shall if respondent convicted of prior violent felony or violated prior order via violence/threats or stalking; May order if substantial risk of firearm use/threats (Full and Ex parte)				
	2013	Full: Shall Ex parte: Shall	*Shall order* pertains to all conditions specified above				

Table C1 (cont.)

State	Year	Order to surrender	Conditions for order	Surrender to whom	Surrender timing	Compliance	LE seizing ability
NY cont.	2021	Full: Shall Ex parte: Shall					LE may be ordered by court to seize firearms when defendant willfully refuses surrender or for good cause shown
	2023	Full: Shall Ex parte: Shall					LE *shall* be ordered… (above)
NC	2003	Full: Shall Ex parte: Shall	If the court finds threats/use of deadly weapon, infliction of/threats to seriously injure aggrieved party/child, or suicidal threats	Sheriffs	Immediately upon order service or within 24h if unable to surrender at the time of service	None	Not specified
ND	1998	Full: May Ex parte: May	If the court has probable cause to believe that respondent is likely to use/display/threaten to use firearm/weapon in further acts of violence	Sheriff of county or chief of police	Not specified	None	Not specified
	2018	Full: May Ex parte: May			At the time and place determined by LE		LE may arrest respondent and take possession of firearm if not surrendered
OH		None					

Table C1 (cont.)

State	Year	Order to surrender	Conditions for order	Surrender to whom	Surrender timing	Compliance	LE seizing ability
OK		None					
OR	2020	Full: Shall Ex parte: N/A	Unconditional	LE, licensed dealer, or third party who does not reside with the respondent	Within 24 hours of becoming subject to or receiving a court order	File a declaration (and proof of transfer if applicable) w/ court and DA w/in 2 judicial days of order	Not specified
PA	1991	Full: May Ex parte: N/A	If the defendant has used/threatened use of weapons in abuse	Sheriff	Not specified	None	Not specified
	2006	Full: May Ex parte: May	Full: unconditional Ex parte: abuse involving weapons or immediate danger of abuse (including threats of abuse or suicide)	Full/Ex parte: Sheriff or eligible third party Full: licensed dealer	Within 24 hours of order service (or next business day as necessary by closure of sheriff's offices)	Provide affidavit of transfer to third party or licensed dealer to LE in 24 hrs	
	2019	Full: Shall Ex parte: May					
RI	2005	Full: May Ex parte: N/A	Unconditional	LE, eligible third party (excludes relatives), or licensed dealer	Within 24 hours (at hearing) or 48 hours upon receiving order	File receipt with court within 72 h of receiving order	Not specified

Table C1 (cont).

State	Year	Order to surrender	Conditions for order	Surrender to whom	Surrender timing	Compliance	LE seizing ability
RI cont.	2018	Full: Shall Ex parte: May	Unconditional	LE or licensed dealer	Within 24 hours of notice of the protective order	(see above)	Not specified
SC		None					
SD	1989	Full: May Ex parte: May	Unconditional	Law enforcement	Not specified	None	Not specified
TN	2009	Full: Shall Ex parte: N/A	Unconditional	Third party or by dispossessing "by any lawful means"	Within 48 hours of order issuance	Return firearm dispossession affidavit	Not specified
TX		None					
UT		None					
VT	2014	Full: May Ex parte: N/A	Unconditional	LE, licensed dealer, or third party	Immediately upon service	Third party: affidavit acknowledging receipt of the firearms	Not specified
	2022	Full: May Ex parte: May					
VA	2020	Full: Shall Ex parte: N/A	Unconditional	LE, licensed dealer, or third party	Within 24 hours of being served with a protective order	Certify in writing within 48 hours of order service	Not specified

Table C1 (cont.)

State	Year	Order to surrender	Conditions for order	Surrender to whom	Surrender timing	Compliance	LE seizing ability
WA	1994	Full: Shall/May Ex parte: Shall/May	Full/Ex parte: shall (may) if clear and convincing (preponderance of) evidence of firearm display, threats, or use in serious offense or prior ineligibility of possession; Ex parte: may if irreparable injury could result if order is not issued	Sheriff, legal counsel, or person designated by the court	Not specified	None	Not specified
	1996	Full: Shall/May Ex parte: Shall/May	"Felony" replaces "serious offense" in the above conditions for "may order" provisions (Full/Ex parte)	Sheriff/chief of police, legal counsel, or court-designated person			
	2014	Full: Shall/May Ex parte: Shall/May	Full/Ex parte: shall (may) if clear and convincing (preponderance of) evidence of firearm display, threats, or use in serious offense (felony) or prior ineligibility of possession; Full: shall if respondent represents a credible threat and is prohibited from specific conduct; Ex parte: may if irreparable injury could result if not issued	Sheriff/chief of police, legal counsel, or person designated by the court *(cont. below)*		File with the clerk of the court a proof of surrender and receipt form or a declaration of non-surrender form within 5 judicial days of the entry of the order (effective 12/1/2014)	

Table C1 (cont.)

State	Year	Order to surrender	Conditions for order	Surrender to whom	Surrender timing	Compliance	LE seizing ability
WA cont.	2020	Full: Shall/May Ex parte: Shall/May	(felony replaces "serious offense" for all provisions above)	Law enforcement	Not specified	(see above)	LE serving order shall conduct any search permitted by law for firearms
	2022	Full: Shall/May Ex parte: May	Full: shall if a preponderance of evidence of firearm display, threats, or use in a felony or if respondent is ineligible to possess a firearm; shall if respondent represents a credible threat and is prohibited from specific conduct; Full and Ex parte: may (unconditional)	Law enforcement	Immediately (or within 24 hours if personal service by LE is not possible and respondent did not appear at the hearing)		
WV		None					
WI	1996	Full: Shall Ex parte: N/A	Unconditional	Sheriff or approved third party	Not specified	None	Not specified
	2015	Full: Shall Ex parte: N/A			Within 48 hours	Firearm poss. form (if present); provide copy to court w/in 48 h of order	
WY		None					

Table C2. Characteristics of state relinquishment laws that apply to felony, MCV, and MCDV convictions.

State	Year	Order to surrender	Conditions	Surrender to whom	Surrender timing	Compliance	LE seizing ability
AL		None					
AK		None					
AZ		None					
AR		None					
CA	2018	Felony: Shall MCV: Shall MCDV: Shall	Conviction	Law enforcement (LE) or licensed dealer	Within 5 days of conviction (or within 14 days if in custody)	Must complete Prohibited Persons Relinquishment Form	Court shall order the search for and removal of firearms if probable cause of non-relinquishment
CO	2013	Felony: N/A MCV: N/A MCDV: Shall	Conviction	LE, licensed dealer, or eligible third party	Within 24h of order service in court (or 48 hours if served outside); court may allow up to 72 hours or 5 days if demonstrated need	File receipt with the court (and transferee bkgrd. check results if applicable) within 3 business days of relinquishment	Not specified
	2021	Felony: N/A MCV: N/A MCDV: Shall	Conviction		Within 24 hours of order service in court (or 48 hours if served outside); court may allow addl. 24 hours if demonstrated need	File affidavit and declaration with court + transferee bkgrd. check results if needed within 7 business days; compliance hearing 8-12 days after sentencing	Court shall issue search warrant if there is probable cause of failure to relinquish

Table C2 (cont.)

State	Year	Order to surrender	Conditions	Surrender to whom	Surrender timing	Compliance	LE seizing ability
CT	2002	Felony: Shall MCV and MCDV: *Shall* (pistol/revolver only)	Conviction	Eligible third party or commissioner of public safety	Within 2 business days of disqualifying event	Submit sale or transfer form within 2 business days if involving third party; none if surrendering to LE	Not specified
	2014	Felony: Shall MCV: Shall MCDV: Shall					
DE		None					
FL		None					
GA		None					
HI	1988	Felony: Shall MCV: Shall MCDV: Shall	Conviction	Not specified	Not specified	None	Not specified
	2000	Felony: Shall MCV: Shall MCDV: Shall		Chief of police, licensed dealer, or eligible third party			May seize firearms after 30 days
	2018	Felony: Shall MCV: Shall MCDV: Shall			Within 7 days of disqualification		May seize firearms after 7 days
				(cont. below)			

Table C2 (cont.)

State	Year	Order to surrender	Conditions	Surrender to whom	Surrender timing	Compliance	LE seizing ability
HI cont.	2020	Felony: Shall MCV: Shall MCDV: Shall	Conviction	(see above)	Within 48 hours of disqualification	None	May seize firearms after 48 hours
ID		Felony: May MCV: N/A MCDV: N/A	Conviction	Not specified	Not specified	None	Not specified
IL	2002	Felony: Shall MCV: N/A MCDV: N/A	As a condition of probation or conditional discharge	Not specified	At a time and place designated by the court	None	Not specified
	2013	Felony: Shall MCV: N/A MCDV: Shall					
	2014	Felony: Shall MCV: N/A MCDV: Shall	As a condition of probation or conditional discharge or if FOID card is revoked	Not specified; If FOID card is revoked: eligible transferee with FOID card		None; If FOID card is revoked: surrender FOID card to LE; complete firearm disposition form within 48 hours of FOID card revocation	Not specified; If FOID card is revoked: LE may petition the court to issue a warrant to search for and seize firearms and FOID card if failure to comply
	2022	Felony: Shall MCV: N/A MCDV: Shall				Must also provide copy of disposs. record to ILSP	

Table C2 (cont.)

State	Year	Order to surrender	Conditions	Surrender to whom	Surrender timing	Compliance	LE seizing ability
IN		None					
IA	2010	Felony: N/A MCV: N/A MCDV: Shall	If subject of the conviction is found to be in possession of a firearm	Eligible third party (or LE if court is unable to identify a party)	A date determined by the court	None	Not specified
KS		None					
KY		None					
LA	2019	Felony: N/A MCV: N/A MCDV: Shall		Sheriff (with option to subsequently transfer or sell to a third party)	Within 48 hours of order issuance and copy of order sent to sheriff	File proof of transfer with court within 5 days of transfer	Not specified
	2020	Felony: N/A MCV: N/A MCDV: Shall				File proof of transfer with court within 10 days of transfer	
ME		None					
MD	2019	Felony: N/A MCV: N/A MCDV: Shall	Conviction	LE or licensed dealer	Within 2 business days after the conviction	None	Court may authorize warrant for the removal of firearms if there is probable cause of failure to surrender

Table C2 (cont.)

State	Year	Order to surrender	Conditions	Surrender to whom	Surrender timing	Compliance	LE seizing ability
MA	1999	Felony: Shall MCV/MCDV: if sentence of 2+ years)	Shall surrender firearms following revocation of firearm ID card generated by conviction	Law enforcement	Firearm ID card revoked upon disqualifying event; surrender firearms without delay upon revocation of card	None	Not specified
	2015	Felony: Shall MCV: Shall (if sentence of 2+ years) MCDV: Shall		Law enforcement (but respondent may then transfer firearms to licensed dealer)			
MI		None					
MN	2015	Felony: N/A MCV: N/A MCDV: Shall	Conviction	LE, licensed dealer, or eligible third party;	Within 3 business days	File notarized affidavit/proof of transfer with the court within 2 business days of transfer	LE shall take immediate possession of firearms if preponderance of evidence of imminent risk
MS		None					
MO		None					
MT		None					
NE		None					

Table C2 (cont.)

State	Year	Order to surrender	Conditions	Surrender to whom	Surrender timing	Compliance	LE seizing ability
NV	2018	Felony: Shall MCV: N/A MCDV: Shall	Conviction	LE, person designated by the court, or licensed dealer	Within 24 hours of order service	Provide receipt or other necessary info. to court not later than 72 hours or 1 business day after transfer	Court may authorize LE to search and seize unrelinquished firearms if there is probable cause of failure to surrender within 24 hours
NH		None					
NJ	2018	Felony: N/A MCV: N/A MCDV: Shall	Conviction	LE (but may arrange for sale to licensed dealer within 5 days)	Immediately	Provide surrender receipt to prosecutor w/in 48 hrs of service; attest to no firearm possess.	LE may be ordered to search for and remove firearms if there is probable cause of failure to surrender
NM		None					
NY	2014	Felony: Shall MCV: N/A MCDV: N/A	Shall surrender firearms following revocation of license generated by conviction	LE	Not specified	None	LE acting pursuant to special duties are authorized to remove non-surrendered firearms
	2018	Felony: Shall MCV: N/A MCDV: Shall		LE (but may arrange for sale to licensed dealer)			
NC		None					
ND		None					

Table C2 (cont.)

State	Year	Order to surrender	Conditions	Surrender to whom	Surrender timing	Compliance	LE seizing ability
OH		None					
OK		None					
OR	2020	Felony: N/A MCV: N/A MCDV: Shall	Conviction	LE, licensed dealer, or third party who does not reside with the respondent	Within 24 hours of the court's order	File a declaration (and proof of transfer if applicable) with the court and DA within 2 judicial days of order	Not specified
PA	1996	Felony: Shall (violent felonies) MCV: N/A MCDV: N/A	Conviction	Sell/transfer to eligible third party who is not a member of the person's household	A reasonable period of time not to exceed 60 days from the date of imposition	None	Not specified
	2006	Felony: Shall (violent felonies) MCV: N/A MCDV: Shall					
	2019	Felony: Shall (violent felonies) MCV: N/A MCDV: Shall		Violent felonies: Sell/transfer to eligible third party (non-household member) MCDV: LE or licensed dealer	Violent felonies: a reasonable period of time not to exceed 60 days; MCDV: not longer than 24 hours following conviction	Violent felonies: none; MCDV: Provide LE with affidavit (if relinquishing to licensed dealer)	

Table C2 (cont.)

State	Year	Order to surrender	Conditions	Surrender to whom	Surrender timing	Compliance	LE seizing ability
RI	2018	Felony: N/A MCV: N/A MCDV: Shall	Plea or conviction	LE or licensed dealer	Within 24 hours of prohibition	File proof of surrender with court within 48 h of order service	Not specified
SC		None					
SD		None					
TN	2009	Felony: N/A MCV: N/A MCDV: Shall	Conviction	Third party or by dispossessing "by any lawful means"	Within 48 hours of order issuance	Return firearm dispossession affidavit	Not specified
	2017	Felony: N/A MCV: N/A MCDV: Shall	Plea or conviction		Within 48 hours of conviction		
TX		None					
UT		None					
VT		None					
VA		None					
WA		None					
WV		None					
WI		None					
WY		None					

Table C3. Citations of state relinquishment statutes and relevant laws.

State	DVRO relinquishment	Conviction relinquishment
Alaska	Alaska Stat. § 18.66.100(c)(7)	
Arizona	Ariz. Rev. Stat. § 13-3602	
California	Cal. Fam. Code §§ 6389, 6306(f)	Cal. Penal Code § 29810
Colorado	Colo. Rev. Stat. §§ 13-14-102, 13-14-105.5	Colo. Rev. Stat. § 18-6-801(8)(a)(I)(B)
Connecticut	Conn. Gen. Stat. §§ 53a-217(a), 29-36k	Conn. Gen. Stat. §§ 53a-217c(a), 53a-217(a), 29-36k
Delaware	Del. Code Ann. tit. 10, §§ 947-949, 1043-1045	
Hawaii	Haw. Rev. Stat. Ann. §§ 134-7, 134-A(b), 134-7.3	Haw. Rev. Stat. Ann. §§ 134-7, 134-A(b), 134-7.3
Idaho		Idaho Code § 19-3807
Illinois	750 Ill. Comp. Stat. §§ 60/214(b)(14.5), 60/217(a)(3); 430 Ill. Comp. Stat. § 65/9.5	430 Ill. Comp. Stat. §§ 65/8, 65/9.5; 730 Ill. Comp. Stat. § 5/5-6-3(a)(9)
Indiana	Ind. Code Ann. § 34-26-5-9	
Iowa	Iowa Code § 724.26	Iowa Code § 724.26
Louisiana	La. Code Crim Proc. Articles 1001-1002	La. Code Crim Proc. Articles 1001-1002
Maine	Me. Stat. tit. 19-A. §§ 4006, 4007, 4108, 4110	
Maryland	Md. Family Law Code Ann. §§ 4-505, 4-506, 4-506.1	Md. Code Ann., Crim. Proc. § 6-234
Massachusetts	Mass. Ann. Laws ch. 209A, § 3B; ch. 140, § 129D	Mass. Ann. Laws ch. 140, §§ 129B, 129D, 131(d)(i); ch. 265, § 13A
Minnesota	Minn. Stat. § 518B.01, subd. (6)	Minn. Stat. § 609.2242 subd. (3)(f)

Table C3 (cont.)

State	DVRO relinquishment statutes	Conviction relinquishment statutes
Nevada	Nev. Rev. Stat. Ann. §§ 33.031, 33.033	Nev. Rev. Stat. Ann. § 202.361
New Hampshire	N.H. Rev. Stat. Ann. § 173-B:4, B:5	
New Jersey	N.J. Stat. Ann. §§ 2C:25-28j, 2C:25-29b	N.J. Stat. Ann. § 2C:25-27
New Mexico	N.M. Stat. Ann. §§ 40-13-5, 40-13-13	
New York	N.Y. Fam. Ct. Act § 842-a	N.Y. Penal Law §§ 400.00(11), 265.00(17), 400.05(6); N.Y. Crim. Proc. Law § 370.25
North Carolina	N.C. Gen. Stat. § 50B-3.1	
North Dakota	N.D. Cent. Code §§ 14-07.1-02, 14-07.1-03	N.D. Cent. Code § 62.1-01-02
Oregon	Or. Rev. Stat. § 166.256	Or. Rev. Stat. § 166.259
Pennsylvania	23 Pa. Cons. Stat. §§ 6108, 6107, 6108.2, 6108.3	18 Pa. Cons. Stat. § 6105.2
Rhode Island	R.I. Gen. Laws §§ 8-8.1-3, 15-15-3	R.I. Gen. Laws § 11-47-5.4
South Dakota	S.D. Codified Laws § 25-10-24	
Tennessee	Tenn. Code Ann. § 36-3-625	Tenn. Code Ann. §§ 39-13-111, 36-3-625
Vermont	Vt. Stat. Ann. tit. 20 § 2307; Vt. Stat. Ann. tit. 15 § 1104(a)(1)	
Virginia	Va. Code Ann. § 18.2-308.1:4	
Washington	Wash. Rev. Code §§ 9.41.800, 9.41.801, 9.41.804, 7.105.310	Wash. Rev. Code § 9.41.098(1)
Wisconsin	Wis. Stat. §§ 813.12(4m), 813.1285	

APPENDIX D: AIM 2 REGRESSION RESULTS

Table D1. Negative binomial regression estimates of the association of state-level DVRO relinquishment laws with suicide (1991-2021).

	Firearm Suicide		**Non-firearm Suicide**		**Suicide**	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
Full/ex parte relinquishment law						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	0.976	0.94, 1.01	1.004	0.97, 1.04	0.991	0.96, 1.02
Any relinquishment law	**0.956***	**0.92, 1.00**	**0.963***	**0.93, 1.00**	0.976	0.94, 1.01
Waiting period	1.001	0.97, 1.03	0.994	0.96, 1.03	1.001	0.98, 1.02
ERPO law	0.957	0.91, 1.00	**0.971***	**0.95, 0.99**	**0.959***	**0.93, 0.99**
Comp. background checks	0.990	0.94, 1.04	0.987	0.96, 1.02	0.991	0.96, 1.02
Permit-to-purchase	**0.961***	**0.93, 0.99**	0.998	0.95, 1.05	0.987	0.95, 1.02
MCDV or MCV restrictions	0.991	0.97, 1.02	1.009	0.98, 1.03	0.997	0.98, 1.02
Population density	**0.998*****	**1.00, 1.00**	**0.999*****	**1.00, 1.00**	**0.999****	**1.00, 1.00**
% Black	1.002	0.98, 1.03	1.004	0.99, 1.02	0.996	0.98, 1.02
Unemployment rate	1.001	0.99, 1.01	1.007	1.00, 1.01	1.003	1.00, 1.01
Educational attainment	1.011	1.00, 1.02	**1.023*****	**1.02, 1.03**	1.007	1.00, 1.02
Per capita ethanol consumption	**1.200****	**1.07, 1.34**	0.996	0.90, 1.10	**1.163****	**1.06, 1.28**
Poverty rate	**1.006****	**1.00, 1.01**	1.002	1.00, 1.01	**1.004****	**1.00, 1.01**
Firearm ownership proxy	**1.019*****	**1.01, 1.02**	**0.975*****	**0.97, 0.98**	1.000	1.00, 1.00
Overdose death rate	1.001	1.00, 1.00	1.001	1.00, 1.00	**1.001***	**1.00, 1.00**

* $p < .05$; ** $p < .01$; *** $p < .001$

Table D2. Negative binomial regression estimates of the association of state-level DVRO relinquishment laws with homicide (1991-2020).

	Firearm Homicide		**Non-firearm Homicide**		**Homicide**	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
Full/ex parte relinquishment law						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	1.078	0.99, 1.17	1.018	0.95, 1.09	1.050	0.98, 1.12
Any relinquishment law	1.047	0.94, 1.16	1.010	0.94, 1.08	1.026	0.94, 1.12
Waiting period	1.019	0.96, 1.08	1.014	0.95, 1.08	1.014	0.97, 1.06
ERPO law	**0.891***	**0.81, 0.98**	0.985	0.94, 1.03	**0.924***	**0.86, 1.00**
Comp. background checks	0.982	0.88, 1.09	0.984	0.92, 1.06	0.977	0.90, 1.06
Permit-to-purchase	0.937	0.78, 1.12	**1.059***	**1.00, 1.12**	0.977	0.84, 1.13
MCDV or MCV restrictions	1.082	1.00, 1.17	1.019	0.96, 1.08	1.059	1.00, 1.12
Concealed carry permitting						
No/may issue	1.000	Ref.	1.000	Ref.	1.000	Ref.
Shall issue	**1.094****	**1.02, 1.17**	0.987	0.93, 1.04	1.055	1.00, 1.12
Permitless	1.111	0.91, 1.35	0.961	0.88, 1.05	1.059	0.91, 1.24
Population density	1.003	1.00, 1.01	**0.998***	**1.00, 1.00**	1.001	1.00, 1.00
% Population 15-24 years	1.035	1.00, 1.07	1.012	0.98, 1.05	**1.032***	**1.01, 1.06**
% Black	1.025	0.98, 1.08	1.033	1.00, 1.07	1.024	0.99, 1.06
Unemployment rate	0.995	0.98, 1.01	0.989	0.98, 1.00	0.992	0.98, 1.01
Educational attainment	**1.029****	**1.01, 1.05**	0.994	0.98, 1.01	**1.025*****	**1.01, 1.04**
Per capita ethanol consumption	1.210	0.96, 1.52	**1.195***	**1.00, 1.42**	**1.193***	**1.02, 1.40**
Poverty rate	1.003	1.00, 1.01	1.000	0.99, 1.01	1.002	1.00, 1.01
Law enforcement per 100,000	0.999	1.00, 1.00	1.000	1.00, 1.00	1.000	1.00, 1.00
Incarceration rate	1.000	1.00, 1.00	1.000	1.00, 1.00	1.000	1.00, 100
Firearm ownership proxy	**1.011****	**1.00, 1.02**	0.995	0.99, 1.00	**1.006***	**1.00, 1.01**
Robbery rate	**1.002*****	**1.00, 1.00**	**1.001*****	**1.00, 1.00**	**1.002*****	**1.00, 1.00**

* $p < .05$; ** $p < .01$; *** $p < .001$

Table D3. Negative binomial regression estimates of the association of state-level DVRO relinquishment laws with IPH (1991-2020).

	Firearm IPH		**Non-firearm IPH**		**IPH**	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
Full/ex parte relinquishment law						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	1.047	0.95, 1.16	1.068	0.98, 1.16	1.045	0.97, 1.13
Any relinquishment law	1.037	0.97, 1.11	1.023	0.96, 1.09	1.037	0.98, 1.09
ERPO law	0.948	0.85, 1.06	1.017	0.95, 1.09	0.971	0.91, 1.04
Comp. background checks	1.009	0.89, 1.15	0.977	0.93, 1.03	0.988	0.91, 1.08
Permit-to-purchase	0.890	0.76, 1.04	0.939	0.82, 1.07	**0.906***	**0.83, 0.99**
Violent misdemeanor restrictions	1.055	0.90, 1.24	0.952	0.87, 1.04	1.024	0.92, 1.14
MCDV firearm restrictions	1.033	0.93, 1.15	1.032	0.96, 1.11	1.020	0.95, 1.09
Population density	0.999	1.00, 1.00	**0.998***	**1.00, 1.00**	**0.998***	**1.00, 1.00**
% Black	1.009	0.97, 1.05	1.012	0.97, 1.06	1.010	0.98, 1.04
% Divorced	0.971	0.93, 1.02	**1.070***	**1.01, 1.13**	1.007	0.97, 1.04
Unemployment rate	1.017	1.00, 1.04	0.996	0.98, 1.01	1.005	0.99, 1.02
Educational attainment	1.014	0.99, 1.04	**0.976***	**0.96, 1.00**	1.001	0.98, 1.02
Per capita ethanol consumption	1.147	0.96, 1.37	1.113	0.84, 1.47	1.115	0.94, 1.32
Poverty rate	0.998	0.99, 1.01	0.992	0.98, 1.00	0.996	0.99, 1.00
Law enforcement per 100,000	1.001	1.00, 1.00	1.000	1.00, 1.00	**1.000***	**1.00, 1.00**
Firearm ownership proxy	**1.015****	**1.00, 1.03**	0.998	0.99, 1.01	**1.009****	**1.00, 1.01**
Non-IPH rate	**1.074*****	**1.05, 1.09**	**1.041*****	**1.03, 1.05**	**1.060*****	**1.05, 1.07**

* $p < .05$; ** $p < .01$; *** $p < .001$

Table D4. Negative binomial regression estimates of the association of state-level MCDV relinquishment laws with suicide (1991-2021).

	Firearm Suicide		**Non-firearm Suicide**		**Suicide**	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
Any MCDV relinquishment law						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	1.000	0.97, 1.03	0.982	0.96, 1.01	0.997	0.97, 1.02
MCDV relinquishment law	0.963	0.93, 1.00	0.976	0.95, 1.00	0.978	0.95, 1.00
Waiting period	0.999	0.97, 1.03	0.991	0.96, 1.02	1.000	0.98, 1.02
ERPO law	**0.955***	**0.92, 1.00**	**0.970***	**0.95, 0.99**	**0.959****	**0.93, 0.99**
Comp. background checks	0.993	0.94, 1.05	0.991	0.96, 1.02	0.993	0.97, 1.02
Permit-to-purchase	**0.966***	**0.94 1.00**	1.004	0.96, 1.05	0.990	0.96, 1.02
Violent misdemeanor restrictions	0.956	0.88, 1.04	**0.942****	**0.91, 0.98**	0.973	0.93, 1.02
DVRO firearm restrictions	1.004	0.97, 1.04	0.977	0.95, 1.01	0.997	0.97, 1.02
Population density	**0.998*****	**1.00, 1.00**	**0.999*****	**1.00, 1.00**	**0.999****	**1.00, 1.00**
% Black	1.003	0.98, 1.03	1.006	0.99, 1.02	0.997	0.98, 1.02
Unemployment rate	1.001	0.99, 1.01	1.007	1.00, 1.02	1.002	1.00, 1.01
Educational attainment	1.012	1.00, 1.03	**1.023*****	**1.02, 1.03**	1.007	1.00, 1.02
Per capita ethanol consumption	**1.209****	**1.08, 1.36**	0.998	0.90, 1.11	**1.167****	**1.06, 1.29**
Poverty rate	**1.005****	**1.00, 1.01**	1.002	1.00, 1.01	**1.004****	**1.00, 1.01**
Firearm ownership proxy	**1.019*****	**1.01, 1.02**	**0.975*****	**0.97, 0.98**	1.000	1.00, 1.00
Overdose death rate	1.001	1.00, 1.00	**1.002***	**1.00, 1.00**	**1.002***	**1.00, 1.00**

* $p < .05$; ** $p < .01$; *** $p < .001$

Table D5. Negative binomial regression estimates of the association of state-level MCDV relinquishment laws with homicide (1991-2020).

	Firearm Homicide		**Non-firearm Homicide**		**Homicide**	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
Any MCDV relinquishment law						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	**0.913***	**0.84, 1.00**	0.981	0.93, 1.04	**0.937***	**0.88, 1.00**
MCDV relinquishment law	0.947	0.85, 1.06	0.961	0.91, 1.02	0.950	0.87, 1.03
Waiting period	1.014	0.96, 1.07	1.019	0.96, 1.09	1.014	0.97, 1.07
ERPO law	**0.897***	**0.82, 0.99**	0.981	0.94, 1.02	**0.926***	**0.86, 0.99**
Comp. background checks	0.994	0.89, 1.12	0.973	0.91, 1.04	0.979	0.89, 1.07
Permit-to-purchase	0.953	0.78, 1.16	**1.048***	**1.00, 1.09**	0.980	0.84, 1.15
Violent misdemeanor restrictions	0.948	0.81, 1.12	**1.108***	**1.03, 1.20**	1.021	0.90, 1.16
DVRO firearm restrictions	0.948	0.88, 1.02	0.990	0.94, 1.05	0.966	0.92, 1.02
Concealed carry permitting						
No/may issue	1.000	Ref.	1.000	Ref.	1.000	Ref.
Shall issue	**1.094***	**1.02, 1.18**	0.986	0.93, 1.04	1.056	1.00, 1.12
Permitless	1.101	0.90, 1.34	0.950	0.88, 1.03	1.049	0.90, 1.22
Population density	1.002	1.00, 1.01	**0.998***	**1.00, 1.00**	1.001	1.00, 1.00
% Population 15-24 years	**1.043****	**1.01, 1.08**	1.013	0.98, 1.05	**1.036****	**1.01, 1.06**
% Black	1.029	0.98, 1.08	1.031	1.00, 1.07	1.026	0.99, 1.07
Unemployment rate	0.997	0.98, 1.02	0.990	0.98, 1.00	0.994	0.98, 1.01
Educational attainment	**1.029****	**1.01, 1.05**	0.994	0.98, 1.01	**1.025*****	**1.01, 1.04**
Per capita ethanol consumption	1.246	0.99, 1.56	**1.227***	**1.04, 1.45**	**1.227***	**1.05, 1.44**
Poverty rate	1.003	1.00, 1.01	1.000	0.99, 1.01	1.002	1.00, 1.01
Law enforcement per 100,000	0.999	1.00, 1.00	1.000	1.00, 1.00	1.000	1.00, 1.00
Incarceration rate	1.000	1.00, 1.00	1.000	1.00, 1.00	1.000	1.00, 1.00
Firearm ownership proxy	**1.010***	**1.00, 1.02**	0.995	0.99, 1.00	**1.005***	**1.00, 1.01**
Robbery rate	**1.002*****	**1.00, 1.00**	**1.001*****	**1.00, 1.00**	**1.002*****	**1.00, 1.00**

* $p < .05$; ** $p < .01$; *** $p < .001$

Table D6. Negative binomial regression estimates of the association of state-level MCDV relinquishment laws with IPH (1991-2020).

	Firearm IPH		**Non-firearm IPH**		**IPH**	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
Any MCDV relinquishment law						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	0.992	0.91, 1.08	0.973	0.90, 1.05	0.994	0.93, 1.06
MCDV relinquishment law	1.101	1.00, 1.21	1.010	0.90, 1.14	1.047	0.99, 1.11
ERPO law	0.949	0.87, 1.04	1.019	0.95, 1.09	0.973	0.92, 1.03
Comp. background checks	1.001	0.89, 1.13	0.978	0.93, 1.03	0.986	0.91, 1.07
Permit-to-purchase	0.875	0.76, 1.01	0.939	0.82, 1.07	**0.901***	**0.83, 0.98**
Violent misdemeanor restrictions	1.071	0.90, 1.27	0.953	0.87, 1.04	1.031	0.92, 1.16
DVRO firearm restrictions	0.973	0.88, 1.07	0.947	0.88, 1.02	0.975	0.91, 1.04
Population density	0.999	1.00, 1.00	**0.998***	**1.00, 1.00**	0.998	1.00, 1.00
% Black	1.007	0.97, 1.05	1.012	0.97, 1.06	1.010	0.98, 1.04
% Divorced	0.979	0.94, 1.02	**1.070***	**1.01, 1.13**	1.010	0.98, 1.05
Unemployment rate	1.015	0.99, 1.04	0.996	0.98, 1.01	1.005	0.99, 1.02
Educational attainment	1.010	0.99, 1.03	**0.975***	**0.96, 0.99**	0.999	0.98, 1.02
Per capita ethanol consumption	1.077	0.88, 1.32	1.112	0.82, 1.50	1.089	0.90, 1.31
Poverty rate	0.999	0.99, 1.01	0.992	0.98, 1.01	0.996	0.99, 1.00
Law enforcement per 100,000	1.001	1.00, 1.00	1.000	1.00, 1.00	**1.000***	**1.00, 1.00**
Firearm ownership proxy	**1.016****	**1.01, 1.03**	0.999	0.99, 1.01	**1.009*****	**1.00, 1.01**
Non-IPH rate	**1.074*****	**1.05, 1.09**	**1.041*****	**1.03, 1.05**	**1.060*****	**1.05, 1.07**

* $p < .05$; ** $p < .01$; *** $p < .001$

Table D7. Negative binomial regression estimates of the association of state-level felony relinquishment laws with suicide (1991-2021).

	Firearm Suicide		**Non-firearm Suicide**		**Suicide**	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
Felony relinquishment						
No relinquishment law	1.000	Ref.	1.000	Ref.	1.000	Ref.
Felony relinquishment law	**0.858*** **	**0.82, 0.89**	**0.950*** **	**0.93, 0.97**	**0.955** **	**0.92, 0.99**
Waiting period	1.002	0.98, 1.03	0.990	0.96, 1.02	1.001	0.98, 1.02
ERPO law	0.973	0.94, 1.00	0.977	0.95, 1.00	**0.964***	**0.93, 0.99**
Comp. background checks	1.000	0.97, 1.03	0.993	0.96, 1.02	0.994	0.97, 1.02
Permit-to-purchase	**0.969***	**0.94, 1.00**	1.007	0.96, 1.05	0.991	0.96, 1.03
Violent misdemeanor restrictions	0.962	0.90, 1.03	**0.950** **	**0.92, 0.98**	0.978	0.93, 1.02
DVRO firearm restrictions	1.002	0.97, 1.03	0.983	0.95, 1.01	0.996	0.97, 1.02
Population density	**0.998*** **	**1.00, 1.00**	**0.999*** **	**1.00, 1.00**	**0.999** **	**1.00, 1.00**
% Black	0.999	0.97, 1.02	1.003	0.99, 1.02	0.995	0.98, 1.01
Unemployment rate	1.003	1.00, 1.01	1.007	1.00, 1.02	1.003	1.00, 1.01
Educational attainment	1.010	1.00, 1.03	**1.022*** **	**1.01, 1.03**	1.006	1.00, 1.02
Per capita ethanol consumption	**1.196** **	**1.08, 1.33**	0.987	0.89, 1.09	**1.158** **	**1.05, 1.28**
Poverty rate	**1.005** **	**1.00, 1.01**	1.002	1.00, 1.00	**1.004** **	**1.00, 1.01**
Firearm ownership proxy	**1.019*** **	**1.01, 1.02**	**0.975*** **	**0.97, 0.98**	1.000	1.00, 1.00
Overdose death rate	1.001	1.00, 1.00	1.001	1.00, 1.00	**1.001***	**1.00, 1.00**

* $p < .05$; ** $p < .01$; *** $p < .001$

Table D8. Negative binomial regression estimates of the association of state-level felony relinquishment laws with homicide (1991-2020).

	Firearm Homicide		**Non-firearm Homicide**		**Homicide**	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
Felony relinquishment						
No relinquishment law	1.000	Ref.	1.000	Ref.	1.000	Ref.
Felony relinquishment law	0.924	0.78, 1.09	**0.927****	**0.88, 0.97**	0.922	0.83, 1.03
Waiting period	1.007	0.95, 1.07	1.019	0.96, 1.08	1.010	0.96, 1.06
ERPO law	0.915	0.83, 1.01	0.994	0.96, 1.03	0.943	0.88, 1.01
Comp. background checks	0.997	0.9, 1.11	0.978	0.92, 1.04	0.982	0.90, 1.07
Permit-to-purchase	0.958	0.79, 1.17	**1.051***	**1.01, 1.10**	0.984	0.84, 1.16
Violent misdemeanor restrictions	0.976	0.83, 1.15	**1.113****	**1.03, 1.20**	1.043	0.92, 1.19
DVRO firearm restrictions	0.986	0.93, 1.04	0.995	0.94, 1.05	0.992	0.95, 1.04
Concealed carry permitting						
No/may issue	1.000	Ref.	1.000	Ref.	1.000	Ref.
Shall issue	**1.091***	**1.02, 1.17**	0.982	0.93, 1.04	1.052	0.99, 1.11
Permitless	1.104	0.91, 1.34	0.951	0.88, 1.03	1.051	0.91, 1.22
Population density	1.003	1.00, 1.01	**0.998***	**1.00, 1.00**	1.001	1.00, 1.00
% Population 15-24 years	**1.041***	**1.01, 1.08**	1.012	0.98, 1.05	**1.034****	**1.01, 1.06**
% Black	1.024	0.97, 1.08	1.028	0.99, 1.06	1.022	0.98, 1.06
Unemployment rate	0.996	0.98, 1.01	0.991	0.98, 1.00	0.993	0.98, 1.01
Educational attainment	**1.027****	**1.01, 1.04**	0.994	0.98, 1.01	**1.023****	**1.01, 1.04**
Per capita ethanol consumption	1.207	0.96, 1.52	**1.212***	**1.02, 1.44**	**1.198***	**1.02, 1.41**
Poverty rate	1.002	1.00, 1.01	1.000	0.99, 1.01	1.001	1.00, 1.01
Law enforcement per 100,000	0.999	1.00, 1.00	1.000	1.00, 1.00	1.000	1.00, 1.00
Incarceration rate	1.000	1.00, 1.00	1.000	1.00, 1.00	1.000	1.00, 1.00
Firearm ownership proxy	**1.011****	**1.00, 1.02**	0.996	0.99, 1.00	**1.006***	**1.00, 1.01**
Robbery rate	**1.002*****	**1.00, 1.00**	**1.001*****	**1.00, 1.00**	**1.002*****	**1.00, 1.00**

* $p < .05$; ** $p < .01$; *** $p < .001$

Table D9. Negative binomial regression estimates of the association of state-level felony relinquishment laws with IPH (1991-2020).

	Firearm IPH		**Non-firearm IPH**		**IPH**	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
Felony relinquishment						
No relinquishment law	1.000	Ref.	1.000	Ref.	1.000	Ref.
Felony relinquishment law	1.094	0.91, 1.32	0.890	0.79, 1.01	0.981	0.92, 1.05
ERPO law	0.937	0.85, 1.04	1.044	0.97, 1.12	0.979	0.92, 1.04
Comp. background checks	0.998	0.87, 1.14	0.998	0.95, 1.05	0.993	0.91, 1.08
Permit-to-purchase	0.889	0.77, 1.03	0.954	0.84, 1.08	**0.912***	**0.84, 0.99**
Violent misdemeanor restrictions	1.068	0.89, 1.29	0.943	0.87, 1.02	1.024	0.91, 1.15
DVRO firearm restrictions	0.986	0.93, 1.05	0.964	0.91, 1.02	0.983	0.94, 1.03
Population density	0.999	1.00, 1.00	**0.998***	**1.00, 1.00**	0.998	1.00, 1.00
% Black	1.011	0.97, 1.05	1.009	0.97, 1.05	1.010	0.98, 1.04
% Divorced	0.971	0.92, 1.02	**1.071***	**1.01, 1.13**	1.006	0.97, 1.04
Unemployment rate	1.015	0.99, 1.04	0.998	0.98, 1.02	1.006	1.00, 1.02
Educational attainment	1.013	0.99, 1.04	**0.973****	**0.95, 0.99**	0.999	0.98, 1.02
Per capita ethanol consumption	1.132	0.93, 1.37	1.136	0.86, 1.50	1.126	0.95, 1.34
Poverty rate	0.998	0.99, 1.01	0.991	0.98, 1.00	0.996	0.99, 1.00
Law enforcement per 100,000	1.001	1.00, 1.00	1.000	1.00, 1.00	**1.000***	**1.00, 1.00**
Firearm ownership proxy	**1.016****	**1.01, 1.03**	0.999	0.99, 1.01	**1.009****	**1.00, 1.01**
Non-IPH rate	**1.076*****	**1.05, 1.10**	**1.040*****	**1.03, 1.05**	**1.060*****	**1.05, 1.07**

* $p < .05$; ** $p < .01$; *** $p < .001$

Table D10. Negative binomial regression estimates from sensitivity tests using unweighted and unimputed IPH data (1991-2020).

	Firearm IPH		**Non-firearm IPH**		**IPH**	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
Full/ex parte relinquish. law						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	0.996	0.89, 1.11	**1.158****	**1.04, 1.29**	1.035	0.94, 1.14
DVRO relinquishment law	0.986	0.92, 1.06	1.076	0.97, 1.19	1.030	0.96, 1.11
Order type (full, ex parte)						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	1.003	0.90, 1.12	**1.142***	**1.03, 1.26**	1.035	0.95, 1.13
Relinquishment (full only)	1.013	0.89, 1.15	1.031	0.93, 1.15	1.030	0.92, 1.15
Relinquish. (full/ex parte)	0.957	0.91, 1.01	1.122	1.00, 1.26	1.030	0.97, 1.10
Court discretion (may, shall)						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	0.999	0.90, 1.11	**1.137****	**1.03, 1.25**	1.031	0.95, 1.12
May order relinquishment	1.037	0.91, 1.18	1.153	1.00, 1.33	1.100	0.97, 1.25
Shall order (full only)	0.969	0.81, 1.15	0.965	0.84, 1.11	0.970	0.84, 1.12
Shall order (full/ex parte)	0.959	0.90, 1.02	1.104	0.96, 1.26	1.030	0.94, 1.13
MCDV relinquishment						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No MCDV firearm restrictions	0.939	0.84, 1.05	0.900	0.80, 1.01	0.954	0.86, 1.06
MCDV relinquishment law	1.053	0.92, 1.20	1.046	0.93, 1.17	1.037	0.95, 1.14
Felony relinquishment						
No relinquishment law	1.000	Ref.	1.000	Ref.	1.000	Ref.
Felony relinquishment law	**0.877***	**0.78, 0.99**	0.924	0.78, 1.10	0.913	0.79, 1.05

* $p < .05$; ** $p < .01$; *** $p < .001$

Table D11. Poisson regression estimates of the association of state-level DVRO relinquishment provisions with suicide, homicide, and IPH.

	Firearm Suicide		**Non-firearm Suicide**		**Suicide**	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
Full/ex parte relinquish. law						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	0.965	0.93, 1.00	1.005	0.97, 1.04	0.989	0.96, 1.02
DVRO relinquishment law	**0.947****	**0.91, 0.98**	**0.962***	**0.93, 1.00**	0.969	0.93, 1.01
Order type (full, ex parte)						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	0.974	0.94, 1.01	1.010	0.98, 1.04	0.993	0.96, 1.02
Relinquishment (full only)	0.969	0.93, 1.01	0.975	0.94, 1.01	0.980	0.94, 1.02
Relinquish. (full/ex parte)	**0.920*****	**0.89, 0.96**	**0.947****	**0.91, 0.98**	**0.955***	**0.92, 0.99**
Court discretion (may, shall)						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	0.980	0.95, 1.01	1.009	0.98, 1.04	0.995	0.96, 1.03
May order relinquishment	0.995	0.94, 1.06	0.987	0.93, 1.04	0.999	0.94, 1.07
Shall order (full only)	0.973	0.92, 1.02	**0.965***	**0.93, 1.00**	0.975	0.94, 1.01
Shall order (full/ex parte)	**0.888*****	**0.84, 0.94**	**0.939****	**0.90, 0.98**	**0.941****	**0.90, 0.98**

	Firearm Homicide		**Non-firearm Homicide**		**Homicide**	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
Any DVRO relinquishment						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	1.065	0.97, 1.16	1.017	0.95, 1.09	1.046	0.97, 1.13
DVRO relinquishment law	1.075	0.93, 1.24	1.005	0.94, 1.08	1.048	0.94, 1.17
Order type (full, ex parte)						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	1.065	0.98, 1.16	1.026	0.96, 1.10	1.047	0.97, 1.13
Relinquishment (full only)	1.076	0.96, 1.20	1.024	0.96, 1.09	1.052	0.96, 1.15
Relinquish. (full/ex parte)	1.075	0.89, 1.29	0.987	0.92, 1.06	1.044	0.91, 1.20
Court discretion (may, shall)						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	1.072	0.99, 1.17	1.026	0.95, 1.10	1.052	0.98, 1.13
May order relinquishment	1.121	0.99, 1.27	1.005	0.93, 1.08	1.076	0.97, 1.19
Shall order (full only)	1.072	0.96, 1.20	1.039	0.97, 1.12	1.055	0.96, 1.16
Shall order (full/ex parte)	1.026	0.82, 1.29	0.971	0.90, 1.05	1.010	0.85, 1.20

Table D11 (cont.)

	Firearm IPH		Non-firearm IPH		IPH	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
Full/ex parte relinquish. law						
Purchase/poss. restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	1.060	0.95, 1.18	1.069	0.99, 1.16	1.052	0.98, 1.13
DVRO relinquishment law	1.042	0.97, 1.12	1.023	0.96, 1.09	1.039	0.99, 1.09
Order type (full, ex parte)						
DVRO firearm restrictions	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	1.057	0.95, 1.18	1.071	0.99, 1.16	1.052	0.97, 1.14
Relinquishment (full only)	1.033	0.96, 1.12	1.031	0.96, 1.10	1.038	0.98, 1.1
Relinquish. (full/ex parte)	1.051	0.94, 1.18	1.016	0.93, 1.11	1.041	0.98, 1.11
Court discretion (may, shall)						
DVRO firearm restrictions	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	1.060	0.96, 1.18	1.067	0.99, 1.15	1.052	0.98, 1.13
May order relinquishment	1.061	0.97, 1.16	1.084	1.00, 1.18	1.074	0.99, 1.16
Shall order (full only)	1.033	0.95, 1.13	1.002	0.93, 1.08	1.026	0.97, 1.09
Shall order (full/ex parte)	1.032	0.89, 1.19	0.988	0.90, 1.08	1.020	0.94, 1.1

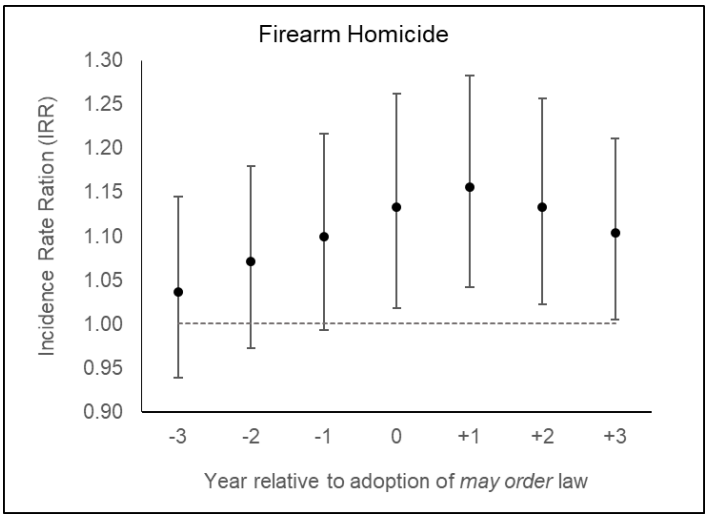
* $p < .05$; ** $p < .01$; *** $p < .001$

Table D12. Poisson regression estimates of the association of state-level conviction-based relinquishment provisions with suicide, homicide, and IPH.

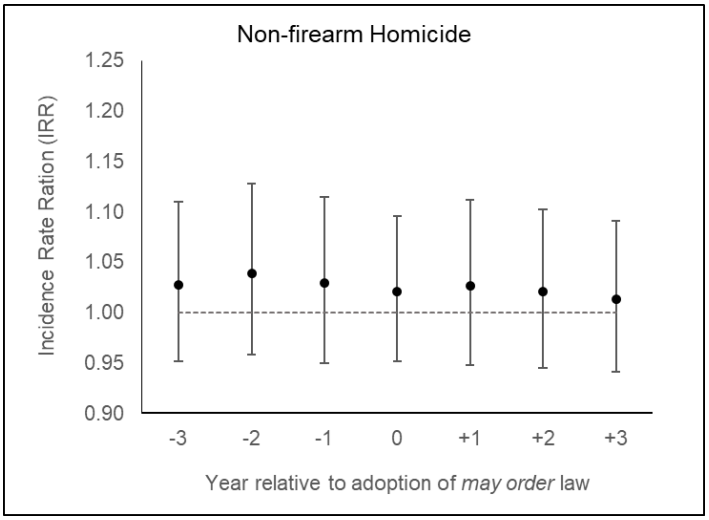
	Firearm Suicide		**Non-firearm Suicide**		**Suicide**	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
MCDV relinquishment						
Purchase/poss restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	0.997	0.97, 1.03	0.997	0.95, 1.00	0.989	0.96, 1.02
MCDV relinquishment law	**0.956***	**0.92, 1.00**	**0.956***	**0.95, 1.00**	0.973	0.95, 1.00
Felony relinquishment						
No relinquishment law	1.000	Ref.	1.000	Ref.	1.000	Ref.
Felony relinquishment law	**0.868*****	**0.83, 0.91**	**0.956*****	**0.93, 0.98**	**0.956****	**0.93, 0.98**
	Firearm Homicide		**Non-firearm Homicide**		**Homicide**	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
MCDV relinquishment						
Purchase/poss restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	0.944	0.85, 1.06	0.999	0.94, 1.06	0.963	0.88, 1.05
MCDV relinquishment law	1.044	0.93, 1.18	0.974	0.92, 1.03	1.019	0.93, 1.12
Felony relinquishment						
No relinquishment law	1.000	Ref.	1.000	Ref.	1.000	Ref.
Felony relinquishment law	0.971	0.83, 1.14	**0.930*****	**0.89, 0.97**	0.950	0.85, 1.07
	Firearm IPH		**Non-firearm IPH**		**IPH**	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
MCDV relinquishment						
Purchase/poss restrictions only	1.000	Ref.	1.000	Ref.	1.000	Ref.
No firearm restrictions	0.986	0.90, 1.08	0.974	0.91, 1.05	0.993	0.93, 1.06
MCDV relinquishment law	**1.106***	**1.01, 1.22**	1.012	0.90, 1.14	1.053	1.00, 1.11
Felony relinquishment						
No relinquishment law	1.000	Ref.	1.000	Ref.	1.000	Ref.
Felony relinquishment law	1.079	0.90, 1.29	0.889	0.79, 1.00	0.973	0.91, 1.04

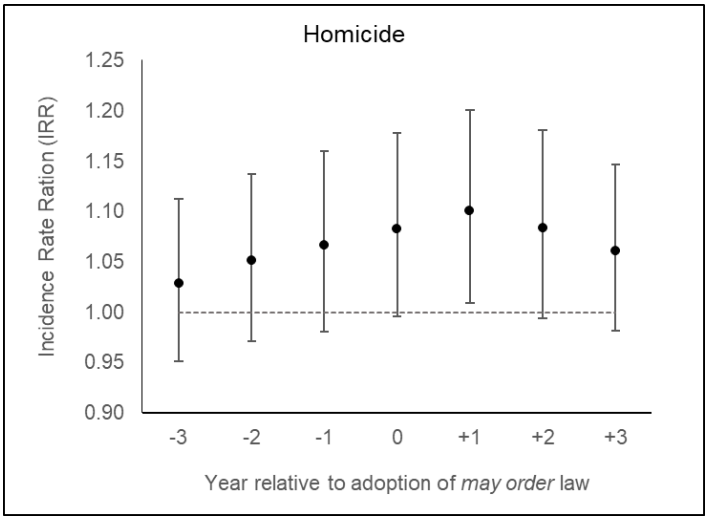
* $p < .05$; ** $p < .01$; *** $p < .001$

Figure D1. Estimated associations of *may order* relinquishment laws with homicide measures at adoption and in 1-, 2-, and 3-year lead and lag models.



Note: the 1-year lag estimates presented in the Results chapter correspond to those denoted as +1 in the figure.





APPENDIX E: AIM 2 ASCM RESULTS

Table E1. Treated states and donor pools in ASCM analyses of DVRO, MCDV, and felony relinquishment law adoption.

DVRO Relinquishment		MCDV Relinquishment		Felony Relinquishment		
Adopting State, Year	**Donor pool**	**Adopting State, Year**	**Donor pool**	**Adopting State, Year**	**Donor pool**	
New Hampshire, 2000	Arkansas	Pennsylvania, 2006	Alaska	Massachusetts, 1999	Alabama*	New Hampshire
Connecticut, 2002	Georgia	Tennessee, 2009	Arkansas	Illinois, 2002	Alaska	New Jersey
Indiana, 2002	Idaho	Iowa, 2010	Florida*	Connecticut, 2002	Arizona	New Mexico
Maine, 2004	Kentucky*	Illinois, 2013	Georgia	New York, 2014	Arkansas	North Carolina
North Carolina, 2004	Mississippi	Colorado, 2013	Idaho	California, 2018	Colorado	North Dakota
Rhode Island, 2005	Missouri	Connecticut, 2014	Kentucky*	Nevada, 2018	Delaware	Ohio
Nevada, 2008	Montana*	Massachusetts, 2015	Michigan		Florida*	Oklahoma
Tennessee, 2009	North Dakota	Minnesota, 2015	Mississippi		Georgia	Oregon
Iowa, 2010	Ohio	California, 2018	Missouri		Idaho	Pennsylvania
Colorado, 2013	Oklahoma	New Jersey, 2018	Montana*		Indiana	Rhode Island
Vermont, 2014	South Dakota	New York, 2018	New Hampshire		Iowa	South Carolina
Minnesota, 2015	Wyoming	Rhode Island, 2018	North Carolina		Kansas*	South Dakota
		Nevada, 2018	North Dakota		Kentucky*	Tennessee
			Ohio		Louisiana	Texas
			Oklahoma		Maine	Utah
			Wisconsin		Maryland	Vermont
			Wyoming		Michigan	Virginia
					Minnesota	Washington
					Mississippi	West Virginia
					Missouri	Wisconsin
					Montana*	Wyoming
					Nebraska*	

Note: * indicates states that were excluded from IPH analyses due to inconsistent reporting of homicide data.
DVRO relinquishment law adoptions that were excluded as pre-1999 or post-2018: PA (1991), HI (1993), MA (1994), DE (1994), WA (1994), CA (1995), NJ (1995), IL (1996), AK (1996), WI (1996), NY (1997), MD (1997), AZ (1997), ND (1998; *may order* directive but no purchase or possession restrictions for DVRO respondent), LA (2019), NM (2019), OR (2020), VA (2020).

Table E2. State-specific estimates from ASCM models of the treatment effects of DVRO relinquishment law adoption on suicide.

	Firearm Suicide				**Non-firearm Suicide**				**Suicide**			
State, adopt year	ATT	SE	*p*	RMSPE	ATT	SE	*p*	RMSPE	ATT	SE	*p*	RMSPE
N.H., 2000	-0.091	0.435	0.835	0.295	-0.085	0.268	0.750	0.173	-0.05	0.533	0.925	0.348
Conn., 2002	-0.733	1.217	0.547	0.307	-0.638	0.813	0.433	0.248	-1.431	2.043	0.484	0.564
Indiana, 2002	-0.468	0.550	0.395	0.156	-0.01	0.342	0.977	0.135	-0.403	0.796	0.612	0.201
Maine, 2004	**0.438**	**0.110**	**< 0.001**	**0.353**	-0.444	0.288	0.123	0.204	-0.025	0.329	0.940	0.472
N.C., 2004	-0.360	0.432	0.405	0.148	0.05	0.378	0.896	0.141	-0.347	0.677	0.609	0.115
R.I., 2005	-0.319	1.210	0.792	0.436	0.642	1.005	0.523	0.341	0.32	2.16	0.882	0.594
Nevada, 2008	-2.018	1.209	0.095	0.652	**-0.681**	**0.211**	**0.001**	**0.185**	-2.645	1.899	0.164	0.765
Tennessee, 2009	**-0.454**	**0.154**	**0.003**	**0.099**	-0.235	0.221	0.287	0.133	**-0.458**	**0.218**	**0.036**	**0.182**
Iowa, 2010	**-0.860**	**0.336**	**0.010**	**0.252**	-0.251	0.195	0.197	0.167	-0.801	0.509	0.115	0.213
Colorado, 2013	-0.515	0.458	0.261	0.288	0.414	0.218	0.057	0.319	0.068	0.301	0.821	0.434
Vermont, 2014	**-0.657**	**0.333**	**0.049**	**0.682**	0.352	0.289	0.223	0.556	-0.416	0.245	0.089	0.724
Minnesota, 2015	**-1.438**	**0.23**	**< 0.001**	**0.274**	0.117	0.4	0.770	0.273	-1.072	0.697	0.124	0.227

Note: rows highlighted in gray indicate ASCM models that were excluded from meta-analyses due to poor fit (RMSPE > 0.5 or large gaps in the observed and predicted outcomes immediately preceding the policy change).

Table E3. State-specific estimates from ASCM models of the treatment effects of DVRO relinquishment law adoption on homicide.

	Firearm Homicide				**Non-firearm Homicide**				**Homicide**			
State, adopt year	ATT	SE	*p*	RMSPE	ATT	SE	*p*	RMSPE	ATT	SE	*p*	RMSPE
N.H., 2000	-0.051	0.345	0.884	0.095	-0.387	0.295	0.190	0.137	-0.518	0.495	0.296	0.128
Conn., 2002	-1.345	1.642	0.413	0.415	-0.295	0.694	0.671	0.322	-1.6	2.159	0.459	0.701
Indiana, 2002	**-0.983**	**0.595**	**0.099**	**0.381**	-0.447	0.444	0.314	0.163	**-1.615**	**0.757**	**0.033**	**0.259**
Maine, 2004	0.189	0.267	0.480	0.211	0.212	0.199	0.288	0.154	0.297	0.35	0.395	0.280
N.C., 2004	**-0.94**	**0.436**	**0.031**	**0.155**	-0.153	0.135	0.256	0.127	**-1.148**	**0.397**	**0.004**	**0.148**
R.I., 2005	-1.257	1.581	0.427	0.383	0.051	0.661	0.938	0.238	-1.28	2.148	0.551	0.457
Nevada, 2008	**-2.223**	**0.864**	**0.010**	**0.466**	**-0.315**	**0.101**	**0.002**	**0.319**	**-3.00**	**1.205**	**0.013**	**0.662**
Tennessee, 2009	-0.267	0.548	0.626	0.191	-0.103	0.062	0.098	0.077	-0.537	0.698	0.441	0.226
Iowa, 2010	-0.114	0.163	0.486	0.175	0.018	0.106	0.861	0.103	-0.232	0.166	0.163	0.247
Colorado, 2013	-0.413	0.359	0.249	0.276	0.017	0.092	0.851	0.155	-0.951	0.552	0.085	0.290
Vermont, 2014	**-0.544**	**0.164**	**0.001**	**0.285**	-0.03	0.205	0.882	0.205	**-0.597**	**0.225**	**0.008**	**0.429**
Minnesota, 2015	**-0.536**	**0.208**	**0.010**	**0.230**	0.074	0.155	0.631	0.116	**-0.956**	**0.316**	**0.003**	**0.351**

Note: rows highlighted in gray indicate ASCM models that were excluded from meta-analyses due to poor fit (RMSPE > 0.5 or large gaps in the observed and predicted outcomes immediately preceding the policy change).

Table E4. State-specific estimates from ASCM models of the treatment effects of DVRO relinquishment law adoption on IPH.

	Firearm IPH				**Non-firearm IPH**				**IPH**			
State, adopt year	ATT	SE	*p*	RMSPE	ATT	SE	*p*	RMSPE	ATT	SE	*p*	RMSPE
N.H., 2000	**-0.179**	**0.07**	**0.011**	**0.145**	**-0.313**	**0.072**	**< 0.001**	**0.122**	**-0.303**	**0.132**	**0.022**	**0.104**
Connecticut, 2002	-0.038	0.175	0.826	0.079	-0.042	0.182	0.817	0.036	-0.111	0.341	0.746	0.044
Indiana, 2002	**-0.223**	**0.049**	**< 0.001**	**0.044**	-0.088	0.06	0.143	0.041	**-0.5**	**0.138**	**< 0.001**	**0.043**
Maine, 2004	-0.073	0.047	0.125	0.085	-0.06	0.099	0.547	0.128	-0.196	0.15	0.191	0.126
N.C., 2004	-0.042	0.067	0.533	0.043	0.012	0.199	0.952	0.034	-0.123	0.173	0.475	0.083
Rhode Island, 2005	0.003	0.216	0.987	0.138	0.188	0.148	0.205	0.080	0.199	0.284	0.483	0.174
Nevada, 2008	-0.182	0.155	0.242	0.163	-0.108	0.076	0.153	0.126	-0.258	0.271	0.342	0.212
Tennessee, 2009	-0.075	0.098	0.443	0.108	0.031	0.023	0.180	0.042	-0.041	0.046	0.367	0.143
Iowa, 2010	-0.009	0.071	0.897	0.061	-0.02	0.069	0.775	0.040	-0.021	0.098	0.832	0.059
Colorado, 2013	0.016	0.15	0.917	0.099	-0.034	0.022	0.120	0.041	-0.01	0.167	0.953	0.119
Vermont, 2014	0.078	0.155	0.614	0.111	**0.23**	**0.027**	**< 0.001**	**0.099**	**0.244**	**0.094**	**0.010**	**0.143**
Minnesota, 2015	-0.058	0.178	0.743	0.064	0.033	0.037	0.366	0.059	-0.03	0.117	0.794	0.107

Note: rows highlighted in gray indicate ASCM models that were excluded from meta-analyses due to poor fit (RMSPE > 0.1 or large gaps in the observed and predicted outcomes immediately preceding the policy change).

Table E5. State-specific estimates from ASCM models of the treatment effects of MCDV relinquishment law adoption on suicide.

	Firearm Suicide				**Non-firearm Suicide**				**Suicide**			
State, adopt year	ATT	SE	*p*	RMSPE	ATT	SE	*p*	RMSPE	ATT	SE	*p*	RMSPE
Pennsylvania, 2006	-0.088	0.202	0.664	0.172	0.223	0.312	0.476	0.140	0.401	0.596	0.501	0.194
Tennessee, 2009	**-0.506**	**0.251**	**0.044**	**0.119**	0.131	0.144	0.362	0.103	-0.329	0.448	0.463	0.198
Iowa, 2010	-0.615	0.405	0.129	0.259	-0.173	0.312	0.579	0.172	-1.11	0.737	0.132	0.265
Illinois, 2013	-0.409	0.4	0.307	0.132	0.43	0.378	0.255	0.144	0.255	0.908	0.779	0.158
Colorado, 2013	0.209	0.329	0.524	0.257	0.243	0.274	0.374	0.330	0.414	0.669	0.536	0.466
Connecticut, 2014	-0.99	0.526	0.060	0.284	0.775	0.69	0.261	0.245	0.031	1.435	0.983	0.335
Mass., 2015	-0.941	0.806	0.289	0.289	0.712	0.737	0.334	0.402	-0.005	1.565	0.997	0.306
Minnesota, 2015	-0.666	0.655	0.310	0.207	0.485	0.56	0.387	0.237	-0.279	0.64	0.663	0.164
California, 2018	**-0.636**	**0.134**	**< 0.001**	**0.319**	0.447	0.654	0.494	0.386	-0.035	1.645	0.983	0.496
New Jersey, 2018	-0.652	0.525	0.215	0.458	0.33	0.642	0.608	0.348	-0.377	0.579	0.515	0.462
New York, 2018	-0.136	0.343	0.691	0.250	0.519	0.475	0.275	0.365	-0.073	1.143	0.949	0.277
Rhode Island, 2018	-0.578	0.477	0.226	0.373	**-0.585**	**0.19**	**0.002**	**0.506**	-1.443	0.661	0.689	0.689
Nevada, 2018	-0.268	1.036	0.796	0.591	**-1.336**	**0.366**	**< 0.001**	**0.179**	-0.917	1.742	0.599	0.738

Note: rows highlighted in gray indicate ASCM models that were excluded from meta-analyses due to poor fit (RMSPE > 0.5 or large gaps in the observed and predicted outcomes immediately preceding the policy change).

Table E6. State-specific estimates from ASCM models of the treatment effects of MCDV relinquishment law adoption on homicide.

	Firearm Homicide				**Non-firearm Homicide**				**Homicide**			
State, adopt year	ATT	SE	*p*	RMSPE	ATT	SE	*p*	RMSPE	ATT	SE	*p*	RMSPE
Pennsylvania, 2006	-0.345	0.789	0.662	0.206	-0.009	0.14	0.948	0.074	-0.492	0.871	0.572	0.247
Tennessee, 2009	-0.093	0.334	0.781	0.171	**-0.076**	**0.021**	**< 0.001**	**0.072**	-0.262	0.368	0.477	0.189
Iowa, 2010	0.021	0.43	0.962	0.162	0.039	0.133	0.770	0.106	-0.029	0.57	0.960	0.211
Illinois, 2013	0.756	0.608	0.214	0.359	-0.071	0.102	0.489	0.128	0.674	0.622	0.278	0.449
Colorado, 2013	-0.454	0.447	0.310	0.163	-0.012	0.042	0.766	0.111	-0.501	0.504	0.321	0.164
Connecticut, 2014	-0.862	0.495	0.082	0.311	0.248	0.155	0.110	0.172	-0.584	0.667	0.382	0.397
Mass., 2015	-1.061	1.053	0.314	0.263	0.131	0.16	0.412	0.190	-0.992	1.121	0.376	0.311
Minnesota, 2015	-0.3	0.449	0.504	0.136	**0.22**	**0.104**	**0.034**	**0.059**	-0.34	0.365	0.352	0.179
California, 2018	**-1.827**	**0.365**	**< 0.001**	**0.655**	**0.2**	**0.071**	**0.005**	**0.192**	**-2.097**	**1.026**	**0.041**	**0.678**
New Jersey, 2018	-1.422	1.374	0.301	0.350	0.117	0.175	0.504	0.133	-1.48	1.369	0.280	0.447
New York, 2018	-0.927	0.541	0.087	0.260	**0.152**	**0.057**	**0.008**	**0.186**	-1.394	0.716	0.051	0.360
Rhode Island, 2018	-0.876	0.716	0.221	0.429	-0.178	0.132	0.177	0.211	-1.445	0.984	0.142	0.560
Nevada, 2018	-0.416	0.59	0.481	0.208	-0.306	0.196	0.120	0.200	-0.915	0.534	0.086	0.402

Note: rows highlighted in gray indicate ASCM models that were excluded from meta-analyses due to poor fit (RMSPE > 0.5 or large gaps in the observed and predicted outcomes immediately preceding the policy change).

Table E7. State-specific estimates from ASCM models of the treatment effects of MCDV relinquishment law adoption on IPH.

	Firearm IPH				**Non-firearm IPH**				**IPH**			
State, adopt year	ATT	SE	*p*	RMSPE	ATT	SE	*p*	RMSPE	ATT	SE	*p*	RMSPE
Pennsylvania, 2006	-0.033	0.06	0.576	0.051	0.121	0.065	0.064	0.023	0.057	0.03	0.056	0.073
Tennessee, 2009	-0.04	0.042	0.351	0.084	0.014	0.014	0.326	0.038	-0.051	0.05	0.312	0.109
Iowa, 2010	-0.031	0.018	0.078	0.042	-0.02	0.081	0.808	0.029	-0.032	0.063	0.614	0.057
Illinois, 2013	**0.088**	**0.029**	**0.003**	**0.049**	0.02	0.062	0.750	0.033	0.132	0.036	**< 0.001**	0.046
Colorado, 2013	-0.004	0.051	0.934	0.089	**-0.072**	**0.023**	**0.001**	**0.037**	-0.1	0.078	0.202	0.095
Connecticut, 2014	-0.11	0.064	0.086	0.062	0.032	0.017	0.062	0.057	-0.083	0.044	0.063	0.041
Mass., 2015	-0.126	0.083	0.127	0.058	0.008	0.031	0.781	0.079	-0.119	0.091	0.189	0.095
Minnesota, 2015	-0.042	0.026	0.102	0.040	0.013	0.023	0.590	0.049	0.013	0.07	0.856	0.074
California, 2018	**-0.118**	**0.043**	**0.006**	**0.047**	0.016	0.019	0.378	0.041	-0.11	0.064	0.087	0.053
New Jersey, 2018	-0.137	0.082	0.094	0.081	-0.046	0.048	0.339	0.069	**-0.205**	**0.101**	**0.042**	**0.111**
New York, 2018	0.083	0.138	0.548	0.034	0.069	0.039	0.080	0.058	0.135	0.214	0.528	0.087
Rhode Island, 2018	**-0.151**	**0.075**	**0.045**	**0.115**	-0.042	0.032	0.186	0.109	**-0.203**	**0.092**	**0.027**	**0.184**
Nevada, 2018	**-0.217**	**0.087**	**0.012**	**0.098**	**-0.271**	**0.072**	**< 0.001**	**0.094**	**-0.39**	**0.146**	**0.008**	**0.152**

Note: rows highlighted in gray indicate ASCM models that were excluded from meta-analyses due to poor fit (RMSPE > 0.1 or large gaps in the observed and predicted outcomes immediately preceding the policy change).

Table E8. State-specific estimates from ASCM models of the treatment effects of felony relinquishment law adoption on suicide.

	Firearm Suicide				**Non-firearm Suicide**				**Suicide**			
State, adopt year	ATT	SE	*p*	RMSPE	ATT	SE	*p*	RMSPE	ATT	SE	*p*	RMSPE
Mass., 1999	-0.124	0.263	0.638	0.063	-0.465	0.238	0.050	0.080	**-0.752**	**0.215**	**0.001**	**0.123**
Illinois., 2002	**-0.312**	**0.079**	**< 0.001**	**0.069**	-0.169	0.201	0.400	0.004	-0.223	0.231	0.336	0.116
Connecticut, 2002	-0.461	0.278	0.098	0.213	0.099	0.325	0.760	0.104	-0.258	0.325	0.428	0.271
New York, 2014	**-0.597**	**0.209**	**0.004**	**0.101**	0.574	0.628	0.361	0.254	-0.559	0.478	0.242	0.253
California, 2018	-0.613	1.336	0.647	0.010	0.214	0.701	0.761	0.076	-0.575	0.893	0.519	0.200
Nevada, 2018	0.022	0.662	0.974	0.287	**-1.214**	**0.241**	**< 0.001**	**0.191**	-0.738	0.745	0.322	0.392

Table E9. State-specific estimates from ASCM models of the treatment effects of felony relinquishment law adoption on homicide.

	Firearm Homicide				**Non-firearm Homicide**				**Homicide**			
State, adopt year	ATT	SE	*p*	RMSPE	ATT	SE	*p*	RMSPE	ATT	SE	*p*	RMSPE
Mass., 1999	-0.144	0.327	0.660	0.072	0.195	0.187	0.298	0.016	-0.125	0.172	0.467	0.065
Illinois., 2002	**-1.076**	**0.49**	**0.028**	**0.080**	-0.332	0.221	0.133	0.100	**-1.214**	**0.355**	**0.001**	**0.093**
Connecticut, 2002	-0.236	0.573	0.681	0.204	0.188	0.11	0.088	0.070	-0.058	0.543	0.915	0.240
New York, 2014	**-1.118**	**0.42**	**0.008**	**0.223**	-0.03	0.391	0.938	0.038	**-1.061**	**0.518**	**0.041**	**0.275**
California, 2018	-0.791	0.685	0.249	0.299	-0.289	0.259	0.265	0.015	-1.337	0.855	0.118	0.534
Nevada, 2018	**-1.289**	**0.56**	**0.021**	**0.155**	-0.123	0.1	0.220	0.177	**-1.596**	**0.376**	**< 0.001**	**0.258**

Note: rows highlighted in gray indicate ASCM models that were excluded from meta-analyses due to poor fit (RMSPE > 0.5 or large gaps in the observed and predicted outcomes immediately preceding the policy change).

Table E10. State-specific estimates from ASCM models of the treatment effects of felony relinquishment law adoption on IPH.

	Firearm IPH				**Non-firearm IPH**				**IPH**			
State, adopt year	ATT	SE	*p*	RMSPE	ATT	SE	*p*	RMSPE	ATT	SE	*p*	RMSPE
Mass., 1999	-0.093	0.109	0.393	0.005	-0.016	0.064	0.806	0.023	-0.057	0.098	0.558	0.033
Illinois., 2002	**0.1**	**0.037**	**0.006**	**0.044**	**-0.112**	**0.019**	**< 0.001**	**0.024**	0.011	0.05	0.820	0.030
Connecticut, 2002	-0.016	0.046	0.720	0.030	0.023	0.019	0.217	0.032	0.011	0.059	0.850	0.048
New York, 2014	0.333	0.195	0.087	0.004	0.019	0.058	0.742	0.018	-0.053	0.06	0.378	0.059
California, 2018	0.151	0.138	0.275	0.012	-0.094	0.079	0.234	0.013	0.042	0.09	0.638	0.048
Nevada, 2018	**-0.226**	**0.061**	**< 0.001**	**0.069**	-0.251	0.199	0.206	0.024	**-0.381**	**0.075**	**< 0.001**	**0.114**

Note: rows highlighted in gray indicate ASCM models that were excluded from meta-analyses due to poor fit (RMSPE > 0.1 or large gaps in the observed and predicted outcomes immediately preceding the policy change).

Figure E1. Meta-analyses of MCDV relinquishment effects on firearm, non-firearm, and overall suicide using ASCM estimates.

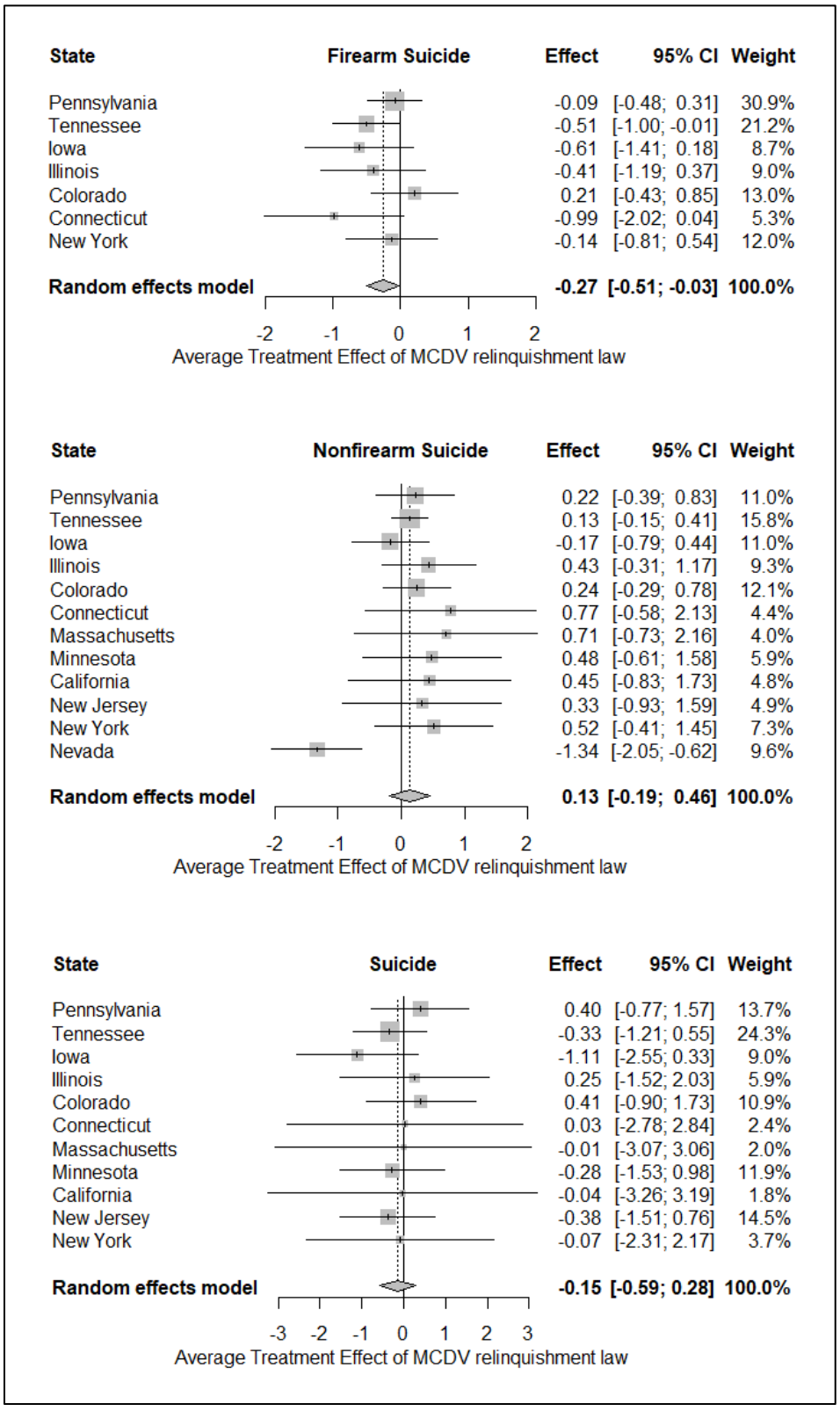


Figure E2. Meta-analyses of MCDV relinquishment effects on firearm, non-firearm, and overall homicide using ASCM estimates.

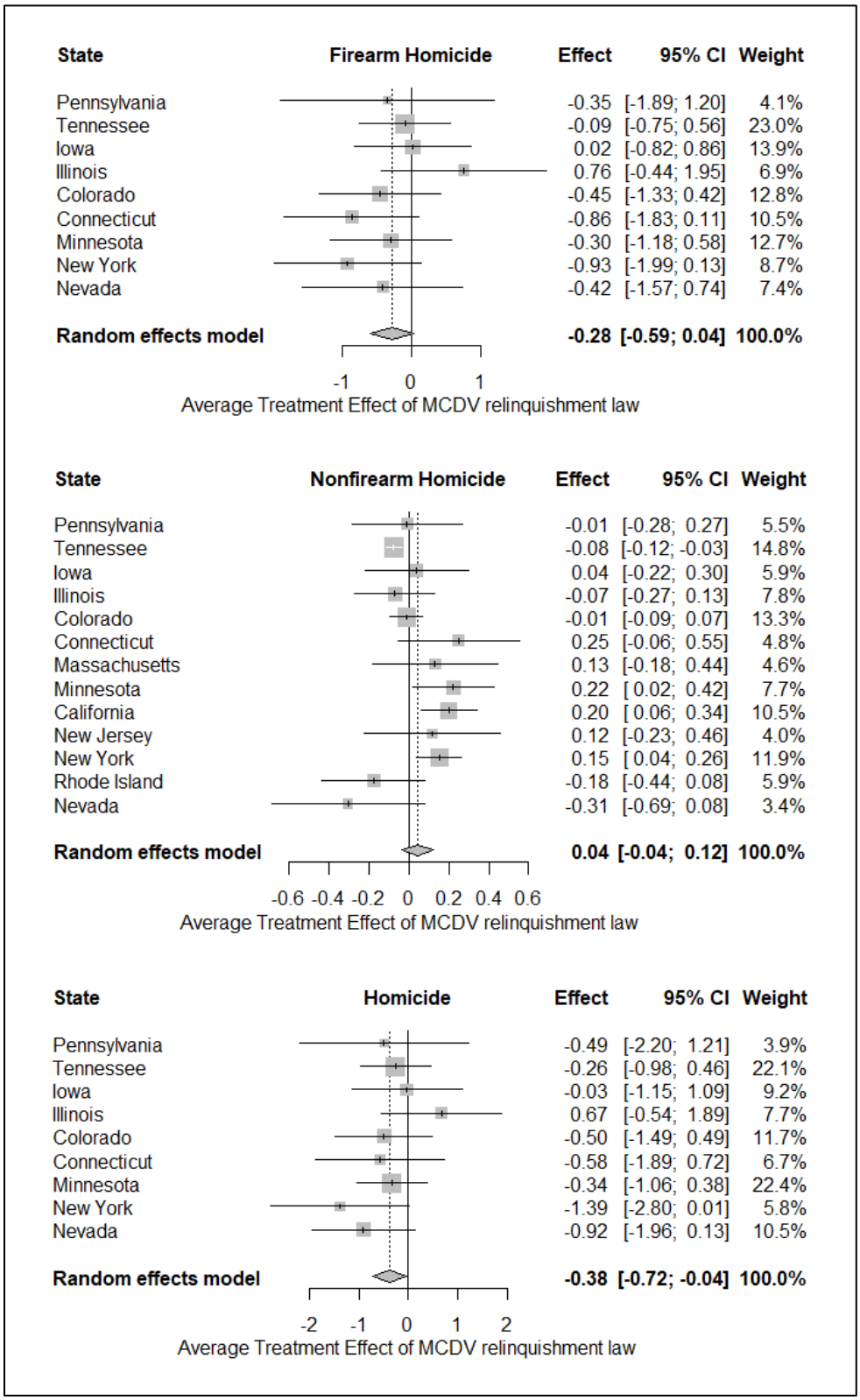


Figure E3. Meta-analyses of MCDV relinquishment effects on firearm, non-firearm, and overall IPH using ASCM estimates.

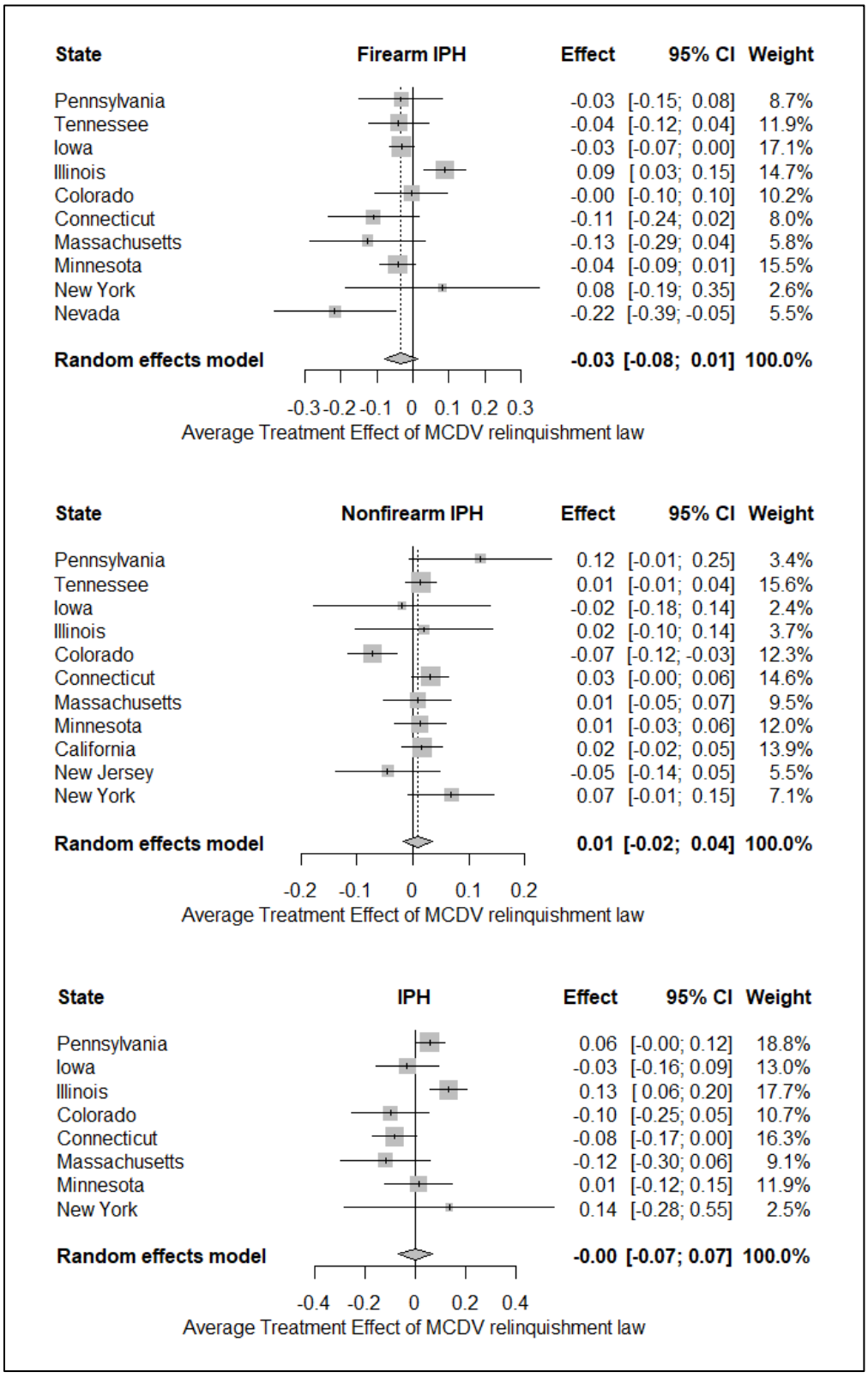


Figure E4. Meta-analyses of felony relinquishment effects on firearm, non-firearm, and overall suicide using ASCM estimates.

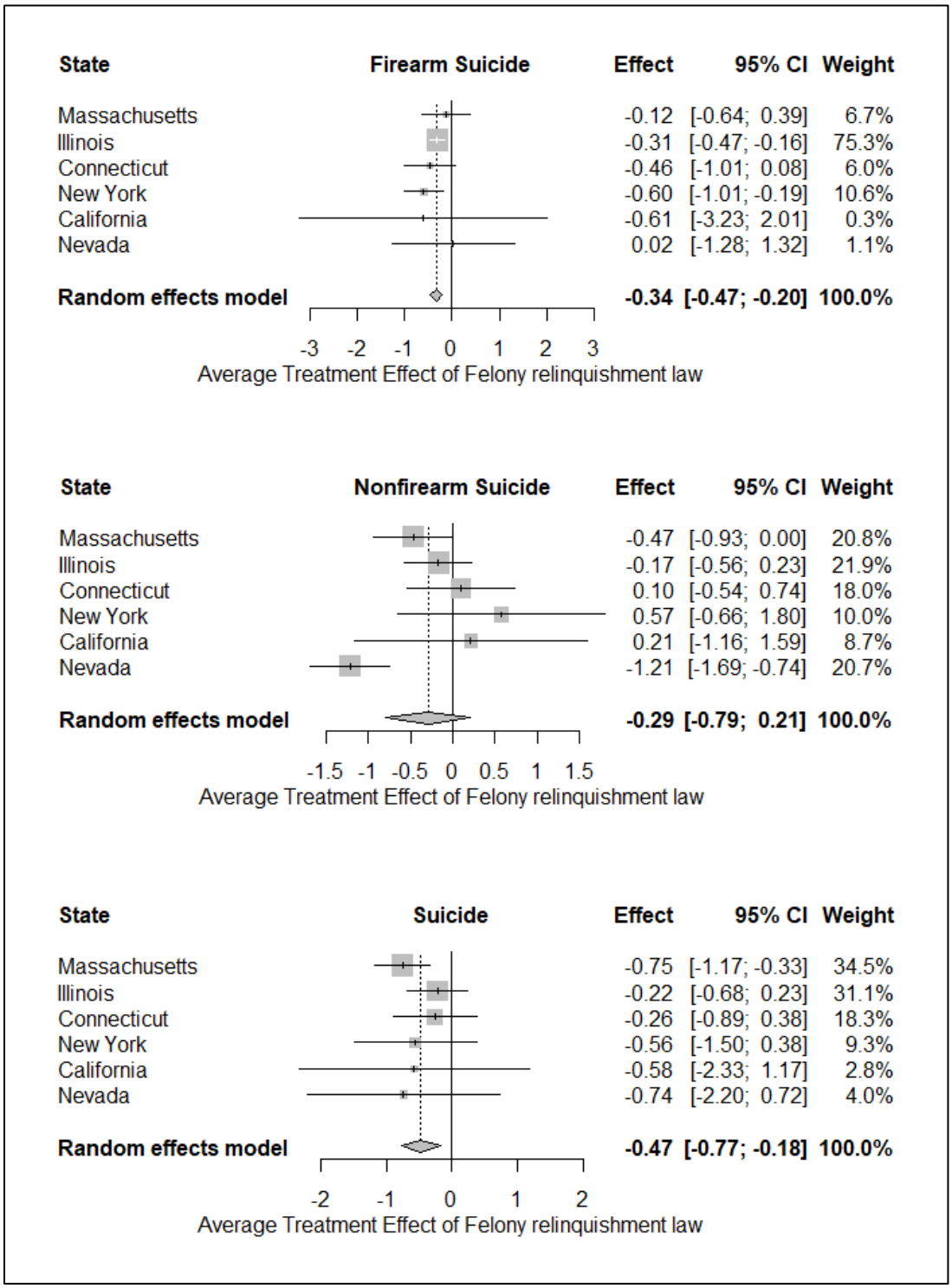


Figure E5. Meta-analyses of felony relinquishment effects on firearm, non-firearm, and overall homicide using ASCM estimates.

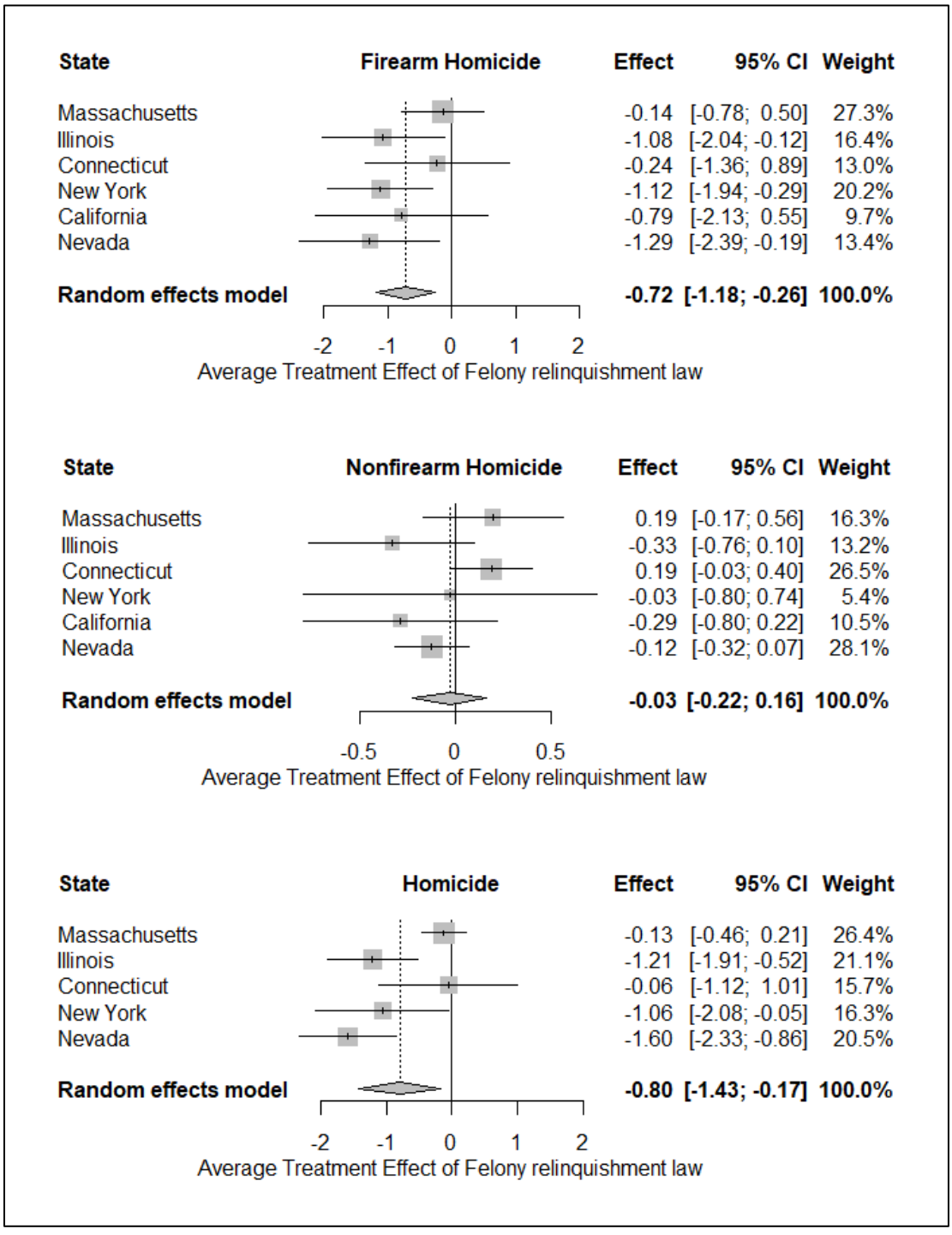


Figure E6. Meta-analyses of felony relinquishment effects on firearm, non-firearm, and overall IPH using ASCM estimates.