Spring 5-8-2023

Three Essays on the Relationship Between Mental Illness

Miranda Baumann

Recommended Citation
Baumann, Miranda, "Three Essays on the Relationship Between Mental Illness." Dissertation, Georgia State University, 2023.
doi: https://doi.org/10.57709/35549679

ABSTRACT

THREE ESSAYS ON THE RELATIONSHIP BETWEEN
MENTAL ILLNESS AND FIREARMS

BY

MIRANDA LAURIANNE BAUMANN

MAY, 2023

Committee Chair: Dr. William J. Sabol

Major Department: Criminal Justice & Criminology

Access to firearms among individuals with mental health problems has been a source of protracted debate among policymakers, the media, and the public, writ large. At the center of this debate is the question of whether mental illness drives the nation's gun violence problem. The lack of substantial empirical evidence, due in part to limited access to quality data, plays a significant role in perpetuating ongoing debate. To address this problem, I conducted three studies that explored the relationship between mental health problems and firearm access using empirical methods and data sources that have gone underutilized in the mental illness-firearm literature.

Using data from the National Comorbidity Study Replication (NCS-R), my first paper compared clinical, cultural, and criminological explanations for firearm access and carrying among people with and without mental health problems. My second paper estimates a predictive model to approximate multiyear firearm access among individuals with mental illnesses using data from both the NCS-R and the National Survey of Drug Use and Health. The paper also includes a simulation analysis to explore the potential effects of various firearm policies on gun access among the target population. Finally, because data on gun access, alone, is of limited use in

explicating the relationship between mental illness and gun violence, the third paper will report the results of a study exploring the consequences of gun access among a sample of individuals with severe mental illnesses recently released from inpatient treatment.

THREE ESSAYS ON THE RELATIONSHIP BETWEEN MENTAL ILLNESS AND FIREARMS

BY

MIRANDA LAURIANNE BAUMANN

A Dissertation Submitted in Partial Fulfillment
of the Requirements for the Degree
of
Doctor of Philosophy
in the
Andrew Young School of Policy Studies
of
Georgia State University

GEORGIA STATE UNIVERSITY
2023

ACCEPTANCE

This dissertation was prepared under the direction of the candidate's Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Criminal Justice and Criminology in the Andrew Young School of Policy Studies of Georgia State University.

Dissertation Chair: Dr. William Sabol

Committee: Dr. Dean Dabney
Dr. Brent Teasdale
Dr. Volkan Topalli

Electronic Version Approved:

Ann-Margaret Esnard, Interim Dean
Andrew Young School of Policy Studies
Georgia State University
MAY, 2023

Dedication

This dissertation is dedicated to my son, Shi. Thank you for choosing me to be your mom and for reminding me that, when in doubt, the answer is 42. You are my favorite human.

אני אוהבת אותך, מאמי.

Acknowledgments

I could fill a thousand pages with thanks and still not be able to do justice to all the people I owe debts of gratitude for this journey. But I'll try.

None of this would have been possible without the steadfast support of my family. I am blessed to be daughter to three of the most brilliant, loving people I have ever known, whose love and guidance have sustained me through difficult and joyous times, alike. Mom, you are my best friend and mentor. Thank you for nurturing a voracious intellectual curiosity in me, for accepting me as I am, and for allowing me a space to express my ideas and beliefs unfettered. Dad, thank you for teaching me how to solve problems, for showing me that there is always something to be learned by listening, and for believing that your daughter would find her way. And Steve, thank you for joyfully cheering me on throughout these last years. I am so grateful to have you and my brothers and sisters in my life.

I am also indebted to the members of my dissertation committee: my chair, Bill Sabol, and members Dean Dabney, Brent Teasdale, and Volkan Topalli. Each of you have played pivotal roles in my success as a student and a scholar, and I am grateful to be able to call each of you my friends. Thank you. Bill, thank you for the endless hours at Panera helping me articulate my ideas for this and so many other projects. Your thoughtful comments and suggestions helped me develop those ideas into a work I am proud of. And finally, thank you for helping me learn when to stop, because I think I was born without brakes. Brent, I would not be here without you. Thank you for taking a chance with me and for teaching me how to do work that matters. Dean, thank you for teaching me how to be a scholar and a researcher and for broadening my perspective. And finally, thank you Volkan, for seeing something in me that was worth nurturing and setting me on this journey in the first place.

Table of Contents

List of Tables

Page

List of Figures

Page

List of Acronyms

AME	Average Marginal Effect
ATF	Bureau of Alcohol, Tobacco, Firearms, and Explosives
CDC	Centers for Disease Control
DSM	Diagnostic and Statistical Manual of Mental Disorders
GCA	Gun Control Act of 1968
HGO	Household Gun Ownership
HiTOP	Hierarchical Taxonomy of Psychopathology
III	Interstate Identification Index
IPV	Intimate Partner Violence
K6	Kessler 6-Item Psychological Distress Instrument
K10	Kessler 10-Item Psychological Distress Instrument
MHFL	Mental Health-Based Firearm Legislation
MHSS	Mental Health Surveillance Study
NCCUSL	National Conference of Commissioners on Uniform State Laws
NCIC	National Crime Information Center
NCIPC	National Center for Injury Prevention and Control
NCS-R	National Comorbidity Study Replication
NESARC	National Epidemiologic Survey on Alcohol and Related Conditions
NIAA	National Instant Criminal Background Check System Improvement Amendments Act of 2007
NICS	National Instant Criminal Background Check System
NRA	National Rifle Association
NSDUH	National Survey on Drug Use and Health
OR	Odds Ratio
PAOR	Partially Adjusted Odds Ratio
PP	Predicted Probability
SAMHSA	Substance Abuse and Mental Health Services Administration
SMI	Serious Mental Illness
STARRS	Study to Assess Risk and Resilience in Servicemembers—Longitudinal Study
TAG	Technical Advisory Group
WHODAS-II	World Health Organization Disability Assessment Schedule II
WMH-CIDI	World Health Organization Composite International Diagnostic Interview

Introduction

Gun violence represents a major source of preventable premature mortality in the United States. In the decade between 2003 and 2012, there were an average of 82 firearm-related deaths every day (Wintemute, 2015). Since then, rates of firearm homicide and suicide have risen substantially (Goldstick et al., 2021; Kaufman & Delgado, 2022; Simon, 2022), and firearm-related injuries have now supplanted motor vehicle injuries as the leading cause of injury-related deaths among people aged 24 and younger (Lee et al., 2022). According to a recent analysis of data from the Centers for Disease Control and Prevention (CDC), rates of firearm homicide increased by over 80% for men and women between 2014 and 2021 (Rees et al., 2022). Similarly, rates of nonfatal firearm injury have been on the rise in recent decades (Fowler et al., 2015; Kalesan et al., 2017; Tasigiorgos et al., 2015).

The costs of the gun violence epidemic are not borne equally across the entire population. Young black males living in urban settings bear the greatest burden of firearm homicide risk—over 22 times higher than non-Hispanic white men—while older white males are at highest risk of firearm suicide (Rees et al., 2022). This disparity has persisted over time and place (Bottiani et al., 2021; Wintemute, 2015). Black females are also disproportionately affected by gun violence. In 2012, black females in their early twenties were victims of firearm homicides at higher rates than white males and more than six times that of white females (Wintemute, 2015). This disparity remains a persistent trend (Degli Esposti et al., 2022; Petrosky et al., 2017). The relative risk of gun violence perpetration also appears to be highly concentrated among young urban black males (Blumstein & Cork, 1996; Petrie et al., 2004). By the end of the 20th century, over half of firearm homicides were committed by offenders between the ages of 14 and 24, and

an increasing proportion of those homicides were committed by black males (Harlow, 2001); these trends have also persisted into the 21st century (Planty & Truman, 2013).

And yet, this reality does not drive gun policy discourse or reform. Instead, high-profile mass shootings, a comparatively rare form of gun violence, receive disproportionate media and political attention (Schildkraut, 2016; Schildkraut & Elsass, 2016). These incidents also have an outsized effect on the introduction of state and federal firearm legislation (Schildkraut & Hernandez, 2014), much of which focuses on mental health.

Despite a dearth of evidence causally connecting mental illness with gun violence, the introduction and expansion of mental health-based firearms laws (MHFLs) designed to restrict access among individuals with mental health problems remains the focus of much of the public policy discourse surrounding gun violence[1] prevention (Metzl & MacLeish, 2015; Mueller, 2018; Summers, 2021). In fact, the regulation of gun access among the mentally ill represents one of the few areas of relative agreement among gun policy experts from across the political and ideological spectrums (Morral et al., 2018). Far too little is known about the patterns of gun access and use among this population to support this policy consensus or the laws in which these beliefs have been embedded (Smart et al., 2020). The recurrent calls for MHFLs in the aftermath of mass shootings often neglect open questions regarding a) the proportion of interpersonal gun violence directly attributable to mental illness; b) the role of other potentially more significant risk factors for gun violence; c) the effects of focusing restrictive gun policy on people with mental illnesses; and d) the unintentional mental health consequences of such policies on affected individuals. There is a paucity of data available to empirically examine this supposed

[1] Here, the term "gun violence" refers to all intentional gun-related injury and death, whether self-directed or interpersonal. Throughout the essays in this dissertation, I will distinguish the two so that gun violence refers to interpersonal gun crimes and gun suicide refers to gun-related suicides and suicide attempts.

mental health-gun violence connection. Consequently, few studies have directly examined the role of mental illness in gun violence (but see Steadman et al., 2015). As a result, most of what we know is limited to studies of mental illness and violence, more generally.

The Link Between Mental Illness and Violence

Prior to the 1990s, serious mental illness—at the time generally accepted to mean major psychotic and mood disorders—was not considered a risk factor for violence (Junginger & McGuire, 2004; Monahan & Steadman, 1983; Sirotich, 2008). But with the introduction of well-designed, population-based surveys and longitudinal studies in the early 1990s, evidence emerged indicating the presence of a modestly elevated risk for violence perpetration (Steadman et al., 1998; Swanson et al., 1990). Interestingly, studies have often found gender symmetry, despite substantially lower rates of violence perpetration among women in the general population (e.g., Roché et al., 2021; Stueve & Link, 1998). That said, violence committed by women with mental disorders tends to be less severe and is contextually different from that committed by men (e.g., Hiday et al., 1998; Robbins et al., 2003).

Some of the strongest (and most controversial) relationships between mental illnesses and violence involve the presence of psychopathy and antisocial traits (Bergstrøm et al., 2018; Sirotich, 2008). An estimated 19% of violent crime is attributable to personality disorders such as antisocial personality disorder (ASPD; Yu et al., 2012) despite low disorder prevalence in the general population (around 3%; Moran, 1999). Disorders of this type are typically characterized by persistent interpersonally violative behavior, failure to conform to social norms, and lack of remorse (American Psychiatric Association, 2013). Research has demonstrated the elevated risk for violence associated with ASPD and its precursor conduct disorder in samples of inmates (Dellazizzo et al., 2018; Roberts & Coid, 2010), forensic psychiatric patients (Coid et al., 2015),

civil psychiatric patients (Hodgins et al., 2008; Krakowski & Czobor, 2018), and the general population (Coid et al., 2009; Coid et al., 2017; Reising et al., 2019). This risk is especially elevated for individuals with the extreme presentation of ASPD, psychopathy (Bergstrøm et al., 2018; Coid & Ullrich, 2010; Neumann & Hare, 2008).

While the relationship between ASPD/psychopathy and violence is well-established, readers should be cautioned against generalizing these findings to mental illness, more broadly. Because of the diagnostic emphasis on behavior that is harmful to others, there is significant overlap between the diagnostic criteria for ASPD and its supposed sequalae (e.g., violence; Ahonen et al., 2019). Thus, its categorization as a mental disorder (given the current criteria) has been a source of controversy and protracted debate over the "medicalization" of deviance (Sadler, 2008). In practical terms, this means the prevalence of ASPD is extremely sensitive to the inclusion of criminal and other violent behavior indicators (Schnittker et al., 2020), and as a result, mental illness is likely overestimated in carceral settings (Ogloff, 2006). This conflation of "bad" with "mad" makes ASPD, on its own, a poor predictor of violence in the context of mental illness.

Alternatively, psychotic delusions have been identified as significant, independent risk factors for violence (Link et al., 1992; Link et al., 1999; McNiel et al., 2000; Taylor et al., 1994). When certain psychotic symptoms override individuals' self-control faculties or make them feel threatened (the so-called threat/control-override [TCO] delusions), they are more likely to respond with violence (Link et al., 1999). Further examination of this TCO delusion-violence relationship reveals that responses to these symptoms are often gender-driven, with men more apt to respond with "fight or flight" and women more likely to "tend and befriend" (Teasdale et al., 2006, p. 650). While significant, the salience of these findings may be limited, because not

all violence, let alone gun violence, perpetrated by those with mental illness occurs in the context of psychotic delusions. When compared to other explanations for violence, psychosis is not often antecedent to violence (Skeem et al., 2016). Moreover, the heightened risk for violence attributable to psychosis may be limited to periods of acute symptom severity such as before, during, or immediately following treatment (Link & Stueve, 1998). Rather, much of the risk of violence among individuals with psychotic and other mental disorders appears to be dynamically linked to social-situational factors (Adams & Yanos, 2020; Stuart, 2003). As a result, scholars have argued for further research into the impact of motivational and general criminogenic factors on violence in the context of mental disorder (Junginger et al., 2006; Junginger & McGuire, 2004; Silver, 2006).

Since then, studies have found that social-situational and general criminogenic factors are often better predictors of violence among people with serious mental health problems than disorder-related factors (Swanson, McGinty, et al., 2015). For example, several studies report that stressful life events are significantly associated with violence among this population and account for a substantial portion of the mental illness-violence relationship (for examples, see Silver & Teasdale, 2005; Steadman & Ribner, 1982). Similar findings highlight the reinforcing and interlinked nature of extra-clinical social factors that place individuals with serious mental illnesses at substantially higher risk for violence. This research demonstrates that the intersection of mental illness and high-risk characteristics (e.g., residence in high crime neighborhoods, stressful life events, limited or conflicted social supports) dramatically increase the risk of victimization (Silver, 2002; Teasdale, 2009; Teasdale et al., 2014) and violence perpetration (Swanson et al., 2002), which in turn increase the risk of subsequent violent offending (Ballard & Teasdale, 2016). This implies that individuals with mental illness make up

a high-risk category due, at least to some extent, to their disproportionate representation as residents in impoverished communities characterized by high levels of social disorganization, crime, and other general risk factors for violence (Freedman & Woods, 2013; Silver, 2000b; Silver et al., 2002). In other words, people with mental illnesses experience increased vulnerability or exposure to the same risk factors that are relevant to violent outcomes in the general population (Adams & Yanos, 2020; Sirotich, 2008; Whiting et al., 2021). The genesis of this vulnerability remains unclear (Teasdale, 2009), and the significant degree of risk heterogeneity that individuals with mental illnesses experience in the face of these criminogenic influences suggest other factors may influence outcomes.

In fact, a substantial body of evidence suggests underlying substance use comorbidities account for much of the excess risk not explained by general dispositional and contextual factors (for a systematic review, see Whiting et al., 2020). One study using data from the 2001-2005 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) found no evidence that serious mental illness (defined to include major depressive disorder, schizophrenia, and bipolar disorder) independently predicted violence (Elbogen & Johnson, 2009). The NESARC, a nationally representative two-wave study of mental disorders, substance use problems/disorders, and related risk factors (Grant & Dawson, 2006), provided the first comprehensive picture of the association between mental illness and substance use and their sequelae (Hasin & Grant, 2015). Elbogen and Johnson's (2009) study used these data to determine whether serious mental illness at Wave I was predictive of Wave II violence, net of dispositional (sociodemographic characteristics), historical (e.g., prior violence perpetration, childhood abuse), clinical (diagnoses and perceived threats), contextual (past year adverse life events), and substance-related (substance abuse and/or dependence) factors. Severe mental

illness, alone, was not predictive of violence; however, mental illness in the context of substance-related comorbidity and other general risk factors for violence was. To illustrate, compared to the whole sample's base rate probability of violence perpetration (*pp* = .029), the predicted probability of violence among individuals with serious mental illnesses was only significantly elevated in the context of prior violence (*pp* ≈ .07) and/or substance use comorbidities (*pp* ≈ .12 and .08, respectively). Other studies have also found that comorbid substance use problems explain much of the relationship between mental illness and violence (e.g., Roché et al., 2021; Steadman et al., 1998). These findings have been corroborated by meta-analyses examining violence among individuals with bipolar disorder (Fazel et al., 2010) and schizophrenia (Fazel et al., 2009). In both populations, substance abuse comorbidities were associated with six- and nine- fold increases in rates of violence over general population, respectively.

These findings are relevant to the gun violence discussion insofar as they call into question the logic of framing the nation's gun violence problem as a mental health issue. First, if mental illness is a unique risk factor for violence, women should be more prone to gun violence, given their increased susceptibility to disorder-related violence risk (Robbins et al., 2003). But this does not appear to be the case. Women commit significantly less gun violence than men (Kaplan & Geling, 1998), even though they have higher rates of mental illness (Kessler et al., 2005). This implies a more nuanced relationship between mental illness and gun violence. Additionally, these findings indicate that there is a great deal of risk heterogeneity among individuals with severe mental illness, with some non-substance abusing groups experiencing no greater risk of violence than the unaffected general population (Fazel et al., 2009). In fact, empirically strong meta-analyses find that serious mental illness is responsible for only about 5%

of all violent crime perpetration (e.g., Fazel & Grann, 2006). Thus, firearm laws focused solely on restricting access among individuals with severe mental health problems are unlikely to produce tangible results. If the relationship between mental illness and gun violence is analogous to violence more generally, these studies imply that gun violence perpetrated by people with mental disorders, like violence more generally, is a rare phenomenon that accounts for a negligible minority of all gun violence.

Mental Illness and Gun Violence

While violence perpetrated by people with mental disorders appears to be rare in the absence of more traditional criminogenic risk factors, it is unclear whether the same holds true for gun violence. To date, only a few studies have examined the relationship between mental illness and gun violence directly. A brief narrative review of these and similar studies follows.

In a reexamination of data from the MacArthur Study of Mental Disorder and Violence (MacRisk), a year-long longitudinal study of violence among individuals recently discharged from inpatient psychiatric hospitals, Steadman and his colleagues (2015) found that violence involving guns was perpetrated by only 2% of the study population. Contrary to media narratives and widespread public opinion (Coverdale et al., 2013), the researchers found that gun violence committed against strangers was extremely rare (1%). Although the study period encompassed only the first year following discharge and included respondents for whom at least one 10-week follow up interview was conducted, this marks a transient period of increased risk for violence (Link & Stueve, 1998). Thus, Steadman and his colleagues' (2015) findings are suggestive that, even during times of heightened risk, gun violence among individuals with serious mental health problems is rare.

Using data from the 2004 Survey of Inmates in State Correctional Facilities, Kivisto (2017) compared offense characteristics among 838 offenders with (12%) and without (88%) a history of psychiatric inpatient treatment (i.e., lifetime history of any overnight stay for a mental or emotional problem) who were incarcerated for a violent offense involving the discharge of a firearm. Overall, there was no significant difference in the use firearms between the two groups; however, women were substantially overrepresented in the previously hospitalized group (22% vs 8%), as were white offenders (48% vs 25%). Substance dependence was also substantially more common in the previously hospitalized group (67% vs 47%). Kivisto then examined the relationships between prior hospitalization status and victim-offender relationship, number of victims, location of crime, and source of guns. Each model adjusted for age, sex, race, marital status, and substance dependence. Inmates with a history of hospitalization were about half as likely to shoot strangers and almost twice as likely to shoot people they knew. In contrast, no substantial differences were found in the number of victims, location of crime, or source of guns. While the validity of the mental illness indicator used in this study is questionable (i.e., self-report, lifetime indicator), these findings corroborate results from studies examining homicide characteristics among offenders with mental illness (e.g., Almomen et al., 2022; Matejkowski et al., 2014; Taylor & Gunn, 1999).

Swanson et al. (2020) explored the relationship between involuntary mental health holds and arrests for gun-related crime among individuals with mental illness using data from a study of Floridians living in Miami-Dade and Pinellas counties and receiving public mental health services. Between January 1998 and December 2011, 32,920 people were subjected to involuntary short-term holds, and 2,778 were subsequently involuntarily committed. Using longitudinal risk modeling, the researchers compared the hazard ratios for violent crime arrests

among those with no holds or commitments, those with involuntary short-term holds only, and those who were involuntarily committed. While individuals who had been involuntarily committed were at elevated risk for arrest for violence not involving firearms, their risk was substantially lower than seen among the individuals who had been held but not committed ($HR_{committed}$ = 1.29 vs HR_{held} = 1.86, where the referent group is those with no hold or commitment). More importantly, involuntary commitment was not significantly associated with increased risk of arrest for gun-related crime, while short-term hold was. In a separate analysis of this study population, Swanson et al. (2016) compared the incidence of suicide and arrest for violent crimes among individuals with and without legal disqualifications from firearm possession. Between 2002 and 2011, a large majority of the study population was never disqualified (58,731, 71.88%), while 10,414 (12.75%) experienced a gun-disqualifying involuntary civil commitment, 17,078 (20.9%) were disqualified due to criminal record, and a minority of individuals were dually disqualified (4,578, 5.6%). While arrest rates for violent crime among the study population were almost double the general population, the proportion involving firearms was substantially lower for the study population (13% vs 24%). Among those arrested for gun-involved violent crime during the study period, 62% were legally prohibited from possessing firearms; however, most were prohibited due to criminal record (49%) or dual disqualification (10%) as opposed to mental health adjudication alone (3%). These findings lend support to the contention that the bulk of gun-related violence is committed by individuals who are not subject to firearm access restrictions (McMahon, 2019; Silver et al., 2018). They also raise doubts about the extent to which background checks—the main mechanism through which firearm disqualifications function—can actually prevent firearm access (Skeem & Mulvey, 2020).

A few studies have explored the relationship indirectly by modeling the impact of mental health problems and gun access on general measures of violence and aggression (e.g., Paper III). For example, one study explored temporal associations between mental health problems and gun-related behaviors using two waves of the Dating It Safe Study, a multi-year longitudinal study of young adult dating violence (Lu & Temple, 2019). Their analyses included self-administered assessments obtained during wave 6 to identify anxiety, depression, posttraumatic stress disorder, borderline personality disorder, stress, impulsivity, and general hostility; an indicator of past year mental health treatment from the 8th wave; and past year gun access, ownership, carrying, and gun-involved threats toward others during the 8th wave. In the models predicting gun carrying during wave 8, neither past year mental health treatment nor wave 6 mental health problems emerged as significant predictors. Only impulsivity, gun access, and gun ownership were significantly associated with past year carrying. Unsurprisingly, gun access and ownership imparted the most substantial increases in odds (4.74 and 5.22, respectively). Similarly, neither past year mental health treatment nor wave 6 mental health problems were significantly associated with past year gun threats when all variables were included in the model. Instead, gun access and general hostility increased the odds of threatening others with guns by 18.15 and 3.51 times, respectively. The use of abbreviated self-report assessments of symptoms rather than diagnostic assessments of the presence or absence of disorders limits the generalizability of this study to the broader issue of the role of mental illness in gun violence. That said, Lu's and Temple's (2019) findings call into question the saliency of mental health characteristics in the explanation of gun-related behaviors.

Taken together, these studies suggest that gun violence risk among individuals with severe mental illness, like their risk for violence more generally, is concentrated among a small

portion of the population with various extra-clinical risk factors. To put this in perspective, imagine that we could prevent every act of interpersonal violence committed by individuals targeted by MHFLs. Given that guns are involved in less than 20% of all violent crimes (Alper & Glaze, 2019; Lauritsen & Lentz, 2019; Planty & Truman, 2013), of which only about 5% involve perpetrators with mental disorders (Fazel & Grann, 2006; Swanson, 1994; Van Dorn et al., 2012), the argument that substantial reductions in gun violence can be achieved by prohibiting people with serious mental health problems from owning or accessing firearms appears dubious. Rather, we would be left to grapple with the remaining 95% of violence (Swanson, 2021), most gun violence, and nearly every mass shooting event (McMahon, 2019).

Conversely, we might expect more meaningful reductions in gun-involved suicides as a result of MHFLs (Swanson, McGinty, et al., 2015); however, evaluations of such laws have not been wholly supportive of their effectiveness as suicide prevention policies. While they do appear to prevent some suicides among especially high-risk individuals (Swanson et al., 2019; Swanson et al., 2017), few firearm-involved suicides are preceded by disqualifying mental health adjudications (Kagawa et al., 2018; Swanson et al., 2016). In fact, less than half of suicide decedents have contact with mental health services of any kind in the year prior to their deaths (Luoma et al., 2002; Pirkis & Burgess, 1998; Walby et al., 2018). As a result, gun policies that reduce firearm access universally (e.g., permit requirements) may be more effective in reducing suicide than MHFLs (Andrés & Hempstead, 2011).

The Elusiveness of Empirical Evidence

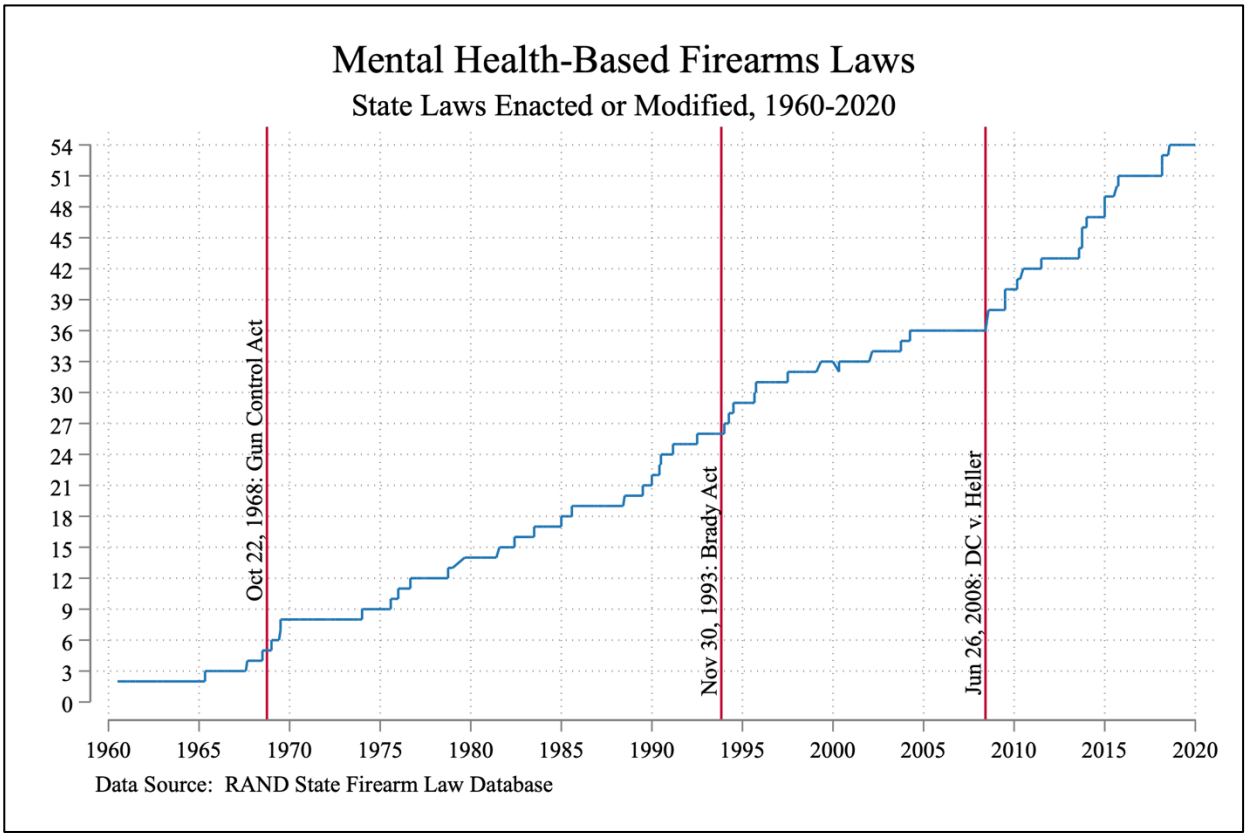
Clearly, our understanding of the associations among mental illness, firearms, and violence has advanced in recent years. But there is still a great deal we simply do not know. At the most basic level, gun access, carrying, and use among people with mental illnesses is poorly

understood (Ahonen et al., 2019). Still, MHFLs have proliferated since the latter half of the 20th century (Figure I.1). Building a deeper understanding of the role of firearms in the lives of people with mental illnesses could go a long way toward identifying more targeted interventions that limit the burden of rights restrictions to people displaying patterns of ownership or use with demonstrated associations with violence or suicide. Unfortunately, data limitations have presented a major roadblock for researchers.

To date, only two major studies of mental illness—MacRisk and the National Comorbidity Survey Replication (NCS-R; Kessler & Merikangas, 2004)—have included probes about firearm availability and use. Each study has its strengths and weaknesses. In both cases,

Figure I.1

Mental Health-Based Firearm Laws, 1965-2020



the low base rate of gun-involved violence (MacRisk) and aggression (NCS-R) precludes most methods of inferential analysis. While MacRisk provides measures of psychopathology and gun access across multiple follow-up periods, only one follow-up includes a control group. Conversely, the NCS-R provides data on a nationally representative sample of adults in the contiguous United States, but it is a cross-sectional study. Both studies' firearm-related measures are limited; neither assesses how or where firearms were obtained, nor does either study examine reasons for purchase among owners. Finally, the NCS-R and MacRisk are about 20 and 30 years old, respectively, and no comprehensive reassessments or updated longitudinal studies have been conducted. While MHFLs treat the supposed relationship between mental illness and gun violence as static and, to varying degrees, immutable, we don't know whether changing trends in gun ownership and attitudes toward guns among the general public are applicable to this population. As a result, there are no contemporary estimates of firearm access, carrying, or use among individuals with mental illnesses.

The high cost of developing and implementing large-scale or longitudinal psychiatric epidemiological studies of this nature is certainly a major contributing factor to this modern data gap (Kessler, 2007). But cost alone does not explain the near total absence of gun-related measures in recent surveys. Rather, available federal funding primarily goes to criminal justice research on gun crime and illegal firearm access (Carlson & James, 2021), with far less emphasis being placed on understanding patterns of normative firearm ownership or use among various populations.

Where Does This Leave Us Now?

Federal support for a comprehensive firearm research agenda is vital to the development of a robust body of knowledge regarding the causes and sequela of gun violence (Rajan et al.,

2018), especially as they relate to mental illness. These research needs have yet to be addressed. At the same time, state politicians continue to introduce MHFLs in the absence of empirical evidence, stoking fears among the public and perpetuating misconceptions about the dangerousness of mental illness. Given the significant constitutional and public health implications of mental health-focused firearm policy, researchers must continue to find novel ways to empirically evaluate the relationship between mental illness and gun violence. Existing psychiatric epidemiological studies can be reexamined from the sociological and criminological perspectives to provide more comprehensive insights into the correlates of firearm access, carrying, and use. Estimates of firearm access and use can be generated by layering traditionally unconnected criminal justice, public health, and epidemiological datasets (Friedman, 2006; NORC, 2020). Existing panel series can be exploited to explore shifting trends in access among individuals with mental health problems previously only reported in rich, cross-sectional epidemiological studies. Powell and Sacks (2020) recently challenged researchers to strive to develop "creative linkages" across a diverse set of data sources to facilitate further research. This is the challenge motivating my dissertation.

Purpose of Studies

Little is known about 1) how or why people with mental illnesses own or use firearms; 2) the prevalence of access in this population over time; or 3) the behavioral consequences of access (Ahonen et al., 2019). My dissertation aims to fill these gaps in our current understanding of the role of mental illness in firearm-related outcomes. In so doing, I hope to stimulate further debate over the wisdom and efficacy of MHFLs and encourage the adoption of effective firearm policy that better balances the sanctity of individual civil liberties with the societal need for public safety. To that end, my dissertation includes the following three papers.

Paper I explores patterns of gun ownership and access among individuals with and without mental illnesses. Using data from the NCS-R, a nationally representative psychiatric epidemiological study of the prevalence and correlates of mental illness, I examine the relative significance of competing clinical, sociological, and criminological explanations for gun access among individuals with and without mental health problems. I then extend this comparative analysis to past month gun carrying. The primary goal of this study is to determine whether firearm access and carrying are qualitatively distinct phenomena in the context of mental health problems. This study makes an important contribution to the literature by bridging the gap between clinical and sociological explanations for firearm-related behaviors.

Paper II presents a novel extrapolation of the prevalence of firearm access observed in the NCS-R to recent years of the National Survey on Drug Use and Health (NSDUH; Substance Abuse and Mental Health Services Administration, 2014). I estimate a prediction model for firearm access using NCS-R data and apply that model to years 2009 through 2019 of the NSDUH. I also discuss the policy implications of changes in MHFLs.

Finally, Paper III reports the findings from a study coauthored with Dr. Brent Teasdale exploring the relationships among serious mental illness, firearm access, violence, and suicidal ideation (Baumann & Teasdale, 2018). Data from the first follow-up period of the MacRisk study were analyzed to determine if firearm access was significantly associated with violence and suicidal ideation when controlling for various risk factors and demographic characteristics. The inclusion of a community control group allowed us to examine if these associations varied substantially by patient status. That is, our analyses explored the possibility that the consequences of firearm access could be qualitatively different for people with and without

serious mental illness. Paper III is one of only a handful of studies that has examined the role of firearms in clinically relevant outcomes (i.e., violence and suicidality).

Defining and Operationalizing Mental Illness

It is important to note that each of these papers operationalize mental illness in a different way. Practically speaking, these differences are a function of measurement variability across the included studies, but they also reflect changes to diagnostic criteria and measurement over time. These operationalizations share a common clinical perspective that is distinct from policy-relevant legal definitions of mental illness. This distinction is not inconsequential.

The search for a coherent definition of mental illness that cuts across both legal and psychiatric contexts remains both elusive and consequential (Walvisch, 2017). From a legal perspective, the definition of mental illness determines how both criminal and civil cases involving people with mental illnesses are handled and, as a result, how many people are subsequently subjected to 'psychiatric detention' (e.g., Slobogin, 2006). States vary in their legal definitions of mental illness; however, laws "rarely [define] the term with precision, often using broad, general, and circular definitions that contain few limitations," (Winick, 1995, p. 554). As a result, many courts defer to clinicians to determine if their states' statutory definitions are satisfied. And yet, the psychiatric approach has fared little better and has led some researchers and practitioners to argue that "the concept of mental disorder is so amorphous, protean, and heterogeneous that it inherently defies definition—creating a hole at the center of psychiatric classification" (Frances & Widiger, 2012, p. 111). This ambiguity leads to wide variation in the operationalization of mental illness in research.

In the most general sense, the psychiatric model refers collectively to all types of clinically significant mental disorders, which the Diagnostic and Statistical Manual of Mental Disorders 5th Edition (DSM-V) defines as:

> … syndrome[s] characterized by clinically significant disturbance in an individual's cognition, emotion regulation, or behavior that reflects a dysfunction in the psychological, biological, or developmental processes underlying mental functioning. Mental disorders are usually associated with significant distress or disability in social, occupational, or other important activities. (American Psychiatric Association, 2013, p. 20)

Explicit in this definition is the significance of both dysfunction and distress, the importance of which is echoed in the definition of serious mental illness adopted by the Substance Abuse and Mental Health Services Administration (SAMHSA). Pursuant to Public Law 102-321 (1992), SAMHSA defines adults, age 18 and older, as having a serious mental illness if they:

> … currently or at any time during the past year, have had a diagnosable mental, behavioral, or emotional disorder of sufficient duration to meet diagnostic criteria specified within DSM-III-R that has resulted in functional impairment… Functional impairment is defined as difficulties that substantially interfere with or limit role functioning in one or more major life activities including basic daily living skills…; instrumental living skills…; and functioning in social, family, and vocational/educational contexts. (SAMHSA, 1993, p. 29425)

Together, distress and impairment form the foundation of mental illness definitions used in several ongoing national surveys, including the National Survey on Drug Use and Health

(NSDUH; Center for Behavioral Health Statistics and Quality, 2014). This general measure of psychopathology—commonly referred to as the p factor (Caspi et al., 2014)—is sufficient to estimate the prevalence and severity of mental health problems in society; however, its lack of clinical specificity may limit efforts to explore the complex relationships between various mental health problems and their sequalae, including firearm-related behaviors.

The operationalizations of mental illness used in my dissertation papers are consistent with the definitions offered by the DSM and SAMHSA. My first paper defines grouped categories of 4th Edition DSM disorders (DSM-IV; American Psychiatric Association, 1994) and levels of disorder severity. The groups include anxiety, mood, impulse-control, and mixed disorders. Grouping disorders with similar constellations of symptoms is more parsimonious than using individual disorders and more informative than using a single indicator of mental illness. The inclusion of disorder severity—conceptualized as a function of psychological distress, disorder-related functional impairment, hospitalization, and/or self-harm—more closely aligns with the SAMHSA definition of mental illness. I use a similar general measure of psychopathology in my second paper to identify the presence of mental illness, allowing me to forecast aggregate rates of firearm access over time among people with and without mental illnesses. My third paper uses an indicator to distinguish between the MacRisk patient and community samples. Mental disorders among the patients recruited into the MacRisk study were measured using the 3rd Revised Edition (DSM-III-R; American Psychiatric Association, 1989). Together, the use of different operationalizations in my dissertation allows me to explore whether findings from the analyses of the relationship between mental illness and firearms are sensitive to or robust against variations in the definition of mental illness.

Paper I: Mental Illness, Gun Access & Carrying:

A Test of Competing Hypotheses

Firearm ownership and access is common in the United States. According to a recent Pew study, an estimated 41% of adults live in homes with one or more firearms belonging to them or others in their households (Schaeffer, 2021). These findings are consistent with results from the 2021 National Firearm Survey which estimate that 31.9% of adults personally own firearms (English, 2021). That same survey found that the average owner possesses five firearms. In total, Americans are believed to own more than 393,000,000 firearms, which amounts to a civilian-held stock of roughly 120.5 per 100 persons in the population (Karp, 2018). This is likely an underestimate, as approximately 18% of households purchased firearms (many for the first time) during the COVID-19 pandemic, adding at least 40,000,000 to the civilian-held stock (NORC, 2022).

Since the early 20th century, public polling research has provided some insight into the social distribution and symbolic meaning of firearms in the United States (Erskine, 1972; Wright & Marston, 1975). For quite a while, these polls showed that ownership was most common among middle-class or affluent white, Protestant men living in racially homogenous rural areas (Wright & Marston, 1975). Hunting and recreation were commonly cited reasons for owning guns (Yamane, 2017), and for many, socialization into this gun culture began at an early age (Lizotte & Bordua, 1980; Lizotte et al., 1981). Growing social anxieties about violent crime during the 1970s, coupled with a concomitant move in firearm advertising away from recreation and toward self-defense, shifted the cultural meaning of firearms toward protection of the self, family, and home (Yamane et al., 2018). Since then, empirical research has predominantly focused on the nexus between guns and violence (Carlson, 2020). As a result, gun possession

among various groups has been broadly characterized as either normative, criminal, or as in the case of people with mental disorders, pathological.

The near blanket characterization of firearm access among people with mental illnesses as pathological or risky, especially in the wake of highly publicized mass shootings, has had a profound effect on how this population is viewed (Duxbury et al., 2018; McGinty et al., 2016; McGinty, Webster, Jarlenski, et al., 2014) and what we know about them (Ahonen et al., 2019). Not only are they routinely stigmatized and labeled violent (Corrigan & Kleinlein, 2005; Link et al., 2004), but they have also been used as political scapegoats in the battle over gun reform (Pryal, 2013, 2014). The consequences of the stigma attached to mental disorder are manifold and deleterious (Corrigan & Kleinlein, 2005; Rüsch et al., 2005); stigmatized persons experience increased risk for violent victimization (e.g., Harris et al., 2022; Teasdale, 2009), suicide (Sudak et al., 2008), poorer health outcomes (Knaak et al., 2017), and are less likely to seek mental health care (Corrigan et al., 2014). And in the case of firearms, it has led to the widespread passage of laws abrogating their 2nd Amendment rights, often without qualification or exception.

While we know enough to know that mental illness, alone, does not *cause* gun violence (Swanson, McGinty, et al., 2015), we know surprisingly little about guns in the lives of people with mental disorders (Ahonen et al., 2019; McGinty, Webster, & Barry, 2014). Whereas there is a robust body of literature exploring various aspects of the social lives of firearms in the general population, similar research on people with mental disorders is sparse. What does exist typically focuses on clinical factors that put people at risk of gun-involved suicide (e.g., Ilgen et al., 2008; Miller et al., 2009; Richards et al., 2022). Thus, it is difficult to know whether gun access, carrying, or use in the context of mental illness are analogous to or qualitatively different from the experiences of the general population.

The current study seeks to fill this gap by comparing the saliency of several clinical, social, and criminological explanations for firearm access and carrying among a nationally representative sample of people with and without mental disorders. I begin by reviewing what is known about gun access and carrying among individuals with mental disorders. I then briefly describe alternative psychological, cultural, and criminological explanations for these phenomena before introducing the current study.

Firearms and Mental Illness

Mental health research involving firearms typically limit their analyses to either the clinical correlates that may explain access (e.g., Ilgen et al., 2008; Kolla et al., 2011; Miller et al., 2009) or the effect of firearm access on outcomes such as suicide (e.g., Richards et al., 2022). One exception is a recent study of patients admitted into an inpatient unit for treatment of comorbid substance disorders between early 2014 and mid-2020 (Weleff et al., 2022). During intake, sociodemographic information was collected, and patients were screened for firearm access and other risk factors associated with suicide. Information on firearm access was obtained for 3,390 of the 4,055 unique patients who entered treatment during the study period. Of those, 691 (9.4%) reported the presence of one or more firearms in the home, a rate substantially lower than is estimated in the general population (41%; Schaeffer, 2021), potentially due to low socioeconomic status among the patients relative to the general population. To better understand access in their study population, the researchers performed a multivariate logistic analysis regressing firearm access on several clinical and social indicators. These included disorder at admission, time of day at admission, prior psychiatric inpatient treatment, various suicide risk indicators, age, sex, sexual orientation, marital status, employment status, cohabitants, and children. They found that firearm access was significantly more likely to

be reported by married patients who were employed at the time of treatment. Interestingly, they found no significant difference in access by sex. This may reflect that the female patients lived with others who owned firearms (no breakdown of marital status or household composition by sex was reported). Alternatively, this could suggest disorder-related gender symmetry.

Heinz et al. (2016) examined bivariate associations between firearm ownership and a range of demographic, psychosocial, and behavioral factors in a small sample of veterans receiving residential treatment for PTSD at a Veterans Affairs Medical Center. Like general population trends, firearm ownership was more common among the patients who were men, married, white, employed, had higher household incomes, and lived in stable housing. Ownership was less common among patients who reported suicidal ideation, had been sexually harassed in the military, spent more time in jail or prison, or who scored higher on any category of childhood trauma other than physical abuse. Patients who served in a war zone, scored higher on a combat exposure scale, and reported more frequent aggressive driving were more likely to report ownership. There were no substantial differences in symptom severity, arrest histories, or prior suicide attempts between groups at the bivariate level. Unfortunately, the researchers did not report any further analyses, so it is not clear which factors are truly predictive of firearm ownership when modeled simultaneously. Furthermore, their findings may not generalize well to the whole population of persons with mental illnesses.

The most generalizable study conducted, to date, on patterns of firearm ownership and carrying among people with and without mental disorders was conducted by Swanson, Sampson, et al. (2015). Using data from the National Comorbidity Survey Replication (NCS-R; see Methods section), Swanson and his colleagues assessed the relationship between impulsive angry behavior (engaging at least one of three violent or aggressive behaviors due to anger) and firearm

ownership and carrying. Their analyses included a series of bivariate logistic models regressing several outcomes on mental disorders while controlling for sociodemographic characteristics. The outcomes they modeled included: 1) firearm access, 2) past month gun carrying, 3) firearm access and angry impulsivity, and 4) past month gun carrying and angry impulsivity. Results from these analyses indicated that, while none of the disorders were significantly associated with gun access, past month carrying was significantly more likely among respondents who met criteria for one internalizing (e.g., an anxiety disorder) or externalizing disorder (e.g., conduct disorder). When firearm access and angry impulsivity was modeled, having any number of internalizing and externalizing disorders was associated with higher odds of access. The same was true when past month carrying and angry impulsivity was modeled, although significantly higher odds were also observed among respondents meeting criteria for a Cluster A personality disorder (i.e., odd, eccentric). Few people with the angry impulsive traits who also reported firearm access had ever been hospitalized.

Overall, these findings are not surprising. Angry, impulsive people do angry, impulsive things, which includes carrying guns around. That said, readers should be cautioned to consider the implications of the analytic choices made here when interpreting these results. First, the researchers excluded any respondents who reported ever having had a job that required a firearm (n = 309). No rationale was given for the choice to exclude them rather than include a control variable in their regression models. Second, the use of combined indicators of angry impulsivity and gun access or carrying as dependent variables may present problems with their models. Given a) the substantially lower number of respondents who were both angrily impulsive *and* had access to or carried firearms and b) the number of categorical variables in the models eating up degrees of freedom, the potential for separation is not insubstantial. Separation occurs when

the dependent variable partially (i.e., quasi-complete) or fully (i.e., complete) distinguishes categories of the independent variables. Among other things, this can lead to biased estimates and large standard errors (Mansournia et al., 2018). The authors did not report standard errors in their model table. The use of combined dependent variables also required the reclassification of substantial proportions of respondents who reported firearm access (~69%) and past month carrying (~60%) as negative responses. As a result, the findings reported by Swanson, Sampson, et al. (2015) should not be considered representative of gun access or carrying, generally. Instead, they represent a small minority of individuals whose firearm-related behaviors may be better explained by historical criminological instead of clinical characteristics.

In sum, strikingly little is known about firearm access and carrying among people with mental disorders. Studies have examined clinical correlates; however, few have explored the possibility that access and carrying among this population are analogous to the general population. And to date, none have evaluated the salience of alternative sociological and criminological explanations.

Alternative Explanations

Dispositional Factors

Recent research suggests firearm owners display greater dispositional disinhibition than nonowners (Anestis et al., 2021; Diener & Kerber, 1979). While disinhibition has received significant attention in the psychological (e.g., Reynolds et al., 2006), criminological (e.g., Gottfredson & Hirschi, 2022; Grasmick et al., 1993), and psychiatric literatures (e.g., Moeller et al., 2001), there continues to be substantial variability in its conceptualization and operationalization across studies and disciplines (Sharma et al., 2014; Venables et al., 2018). Broadly speaking, dispositional (or trait) disinhibition "describe[s] a general phenotypic

propensity toward impulse control problems entailing a lack of planfulness and foresight, impaired regulation of affect and urges, insistence on immediate gratification, and deficient behavioral constraint" (Patrick et al., 2009, p. 925). From a psychiatric perspective, dispositional disinhibition appears to be a transdiagnostic liability for psychopathology, especially in the presence of externalizing phenomena (Krueger et al., 2007). That said, behavioral disinhibition and its consequences occur across diverse contexts, of which mental illness is but one.

Cultural Factors

To my knowledge, cultural factors have been wholly neglected in studies of mental illness and firearms. This is an unfortunate oversight, because it ignores evidence that situates both the experience of mental illness (Lopez & Guarnaccia, 2000) and the development of firearm-related attitudes and activities (Mencken & Froese, 2019; Yamane, 2017) squarely within cultural contexts. People with and without mental health problems are exposed to the same cultural influences that are believed to impact gun-related behaviors among the general population, and so it remains an open question whether these factors are significantly related to firearm access and carrying.

Decades of gun research has demonstrated higher rates of firearm ownership among Protestants than others (e.g., Ellison, 1991; Kleck, 2017; Little & Vogel, 1992; Wright & Marston, 1975). Most of the early studies used indicator variables of *Protestant* versus *Not Protestant*, subsuming a broad range of denominations and traditions within a single category of religious affiliation and setting it in contrast to all others. While this approach has been criticized in recent years for its lack of precision and theoretical clarity (e.g., Yamane, 2016), these findings appear to have withstood the test of time (Vegter & den Dulk, 2021).

Existing research also repeatedly finds that population density, specifically residence in rural communities, is associated with increased rates of firearm ownership, irrespective of Census region (Azrael et al., 2004; Bryant & Shoemaker, 1988; Erskine, 1972; Newton & Zimring, 1969; Parker et al., 2017; Wright & Marston, 1975). This relationship seems intuitively obvious, because people living in rural communities also live in closer proximity to wildlife, increasing the relevance of firearm ownership for defense or recreation. Exposure to guns and gun culture during childhood also appears to be especially significant for outcomes across the lifecourse (Lanterman & Blithe, 2018). Indeed, childhood socialization has been a consistent and strong predictor of firearm ownership during adulthood over time and across studies (Cook & Ludwig, 1996; Diener & Kerber, 1979; Lizotte & Bordua, 1980; Schutten et al., 2021).

Additionally, several gun studies have identified racial prejudice as a significant predictor of gun ownership (see, for example, Cao et al., 1997; Filindra et al., 2021; O'Brien et al., 2013; Young, 1985). This research suggests that a broad range of racially biased beliefs, from agreement with racial stereotypes to explicitly racist attitudes (especially among white males), increase the likelihood of gun ownership for both instrumental (e.g., in response to a racialized fear of crime; Young, 1985) and symbolic reasons (e.g., as cultural signaling; Filindra et al., 2021). Importantly, these findings appear to be robust across a variety of samples with different measures of prejudice.

Criminogenic Factors

The salience of criminogenic factors as potential drivers of gun-related behaviors among people with mental illnesses is implied by the substantial overlap seen in social determinants of mental health and crime (Baranyi et al., 2021; Caruso, 2017), and the work of a core group of scholars further underscores the need for attendance to this perspective (e.g., Arboleda-Florez et

al., 1998; Draine, 2002; Link et al., 1999; Silver, 2000a, 2006; Silver & Teasdale, 2005). Early intimate partner violence (IPV) victimization has been connected to subsequent gun access among teens and young adults (Sigel et al., 2019) and increased gun carrying among males (Howard et al., 2008). More generally, criminological research links criminal victimization to gun ownership (e.g., Kleck et al., 2011), although not always consistently (see, for example, Burton et al., 2021; Hill et al., 1985; Logan & Lynch, 2022; Wallace, 2022). Childhood physical abuse and parental violence have also been implicated as a source of socialization leading to later violence (e.g., Langhinrichsen-Rohling et al., 2004) and weapon use (e.g., Murrell et al., 2005; Tracy et al., 2016; Wamser-Nanney et al., 2019).

Several studies report strong correlations between gun violence and drug and alcohol abuse (Banks et al., 2017; Branas et al., 2016). Among youth, substance use is consistently associated with risky gun behaviors (e.g., carrying, threatening) across urban (e.g., Carter et al., 2020; Farrell et al., 1992; Sheley, 1994) and rural settings (Cunningham et al., 2000; Kingery et al., 1990) and over time (DuRant et al., 1997; Muula et al., 2008). This relationship may be especially strong among individuals who initiate substance use earlier, as suggested by recent research on alcohol use initiation (Baiden et al., 2021).

The Current Study

Little is known about gun-related behaviors in the context of mental illness. What research does exist focuses narrowly on the clinical and psychological factors that may impart an increased risk of gun violence or suicide. But what if people with mental illnesses possess and use firearms for the same reasons as others? Should gun-related behaviors among this population best be understood as social or psychopathological phenomena? These questions

remain unanswered because comparative analyses of competing explanations for gun violence in the context of disorder are currently lacking.

To address this gap, the current study analyzes data from a comprehensive, psychiatric epidemiologic study to examine the relative significance of certain clinical, sociological, and criminological explanations for gun access and carrying. Specifically, I aim to address the following questions:

Q_{1a}: Are clinical factors (e.g., disorder, severity, treatment) significantly associated with firearm access, net of other explanations (e.g., sociological, criminological)?

H_{1a}: I do not expect clinical factors to be significantly associated with firearm access when other explanations are considered.

Q_{1b}: Are the effects of alternative explanations contingent on clinical characteristics?

H_{1b}: I do not expect significant interactions between alternative explanations for firearm access and clinical characteristics.

Q_2: How are clinical factors associated with past 30-day gun carrying?

H_{2a}: I do not expect significant associations between clinical characteristics and gun carrying.

H_{2b}: Nor do I expect the impact of clinical factors to be conditioned on alternative measures or sociodemographic characteristics.

Methods

Data

This study utilizes publicly available data from the Part II sample of the National Comorbidity Survey Replication (NCS-R; Kessler & Merikangas, 2004), a nationally representative psychiatric epidemiologic survey of non-institutionalized, English-speaking adults

conducted in the contiguous United States between 2001 and 2003. In total, 9,282 participants received Part I diagnostic and mental health service use assessments. Respondents who a) met lifetime criteria for one or more core disorders, b) ever sought treatment for a mental disorder, or c) ever formulated a plan or attempted to commit suicide were recruited to participate in Part II of the interview schedule. Two additional strata were included for comparison: 1) a probability sample of respondents who did not meet criteria for the first stratum but a) did meet subthreshold criteria for a disorder, b) sought treatment for mental health or substance use problems, c) were suicidal at some point, or d) took psychotropic medication for any reason; and 2) a probability sample of all other respondents. The Part II interview (n = 5,692) included additional disorder screening, assessment of risk factors for the core disorders, and other related characteristics. Firearm-related questions were only asked during Part II of the study. Therefore, the current analyses are limited to the Part II respondents who provided complete, valid responses for all measures included in one or more models (n = 5,481). Composite probability weights accounting for Part I response and sampling characteristics (e.g., variation in geography, households, various strata) and Part II response rates was provided by the study authors (a comprehensive explanation of the weighting process can be found in Kessler, Berglund, et al., 2004). All my analyses utilize these weights.

Key Dependent and Independent Measures

Firearm-Related Measures. Part II respondents were asked a series of questions about their access to and use of firearms and other weapons, including: 1) "How many guns that are in working condition do you have in your house, including handguns, rifles, and shotguns?;" 2) Not counting times you were hunting or shooting targets, how many days during the past 30 days did you carry a gun outside your home?;" and 3) "Did you ever have a job that required you to carry

a gun, such as being in the army forces, the police, or security business?" Dependent variables for the present study were drawn from these questions. The gun accessibility and past month carrying data were dichotomized to produce measures of any working guns in the home and any days carrying outside the home, respectively. The gun-related employment measure was included to control for possible confounding due to job-related firearm requirements. This measure is conservative insofar as it indicates lifetime, as opposed to current, gun-involved employment.

Mental Disorders and Other Clinical Measures. The presence of past year mental disorders was assessed during Parts I & II using the World Mental Health Survey version of the World Health Organization's Composite International Diagnostic Interview (WMH-CIDI; Kessler & Üstün, 2004). This fully structured lay interview generates past year and lifetime diagnoses according to both the International Classification of Diseases, 10th Revision (ICD-10; World Health Organization, 1992) and the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV; American Psychiatric Association, 1994). The current study includes 17 past year disorders generated using DSM-IV hierarchy-free criteria, including anxiety disorders (agoraphobia, generalized anxiety disorder [GAD], posttraumatic stress disorder [PTSD], social phobia, and specific phobias), mood disorders (bipolar I and II, dysthymia, major depressive disorder [MDD]), impulse control disorders2 (attention-deficit/hyperactivity disorder [ADHD], conduct disorder [CD], intermittent explosive disorder [IED], and oppositional defiant disorder [ODD]), and substance use disorders (alcohol and drug abuse and dependence disorders).

[2]Screening for ADHD, CD, and ODD were limited to respondents aged 44 or younger.

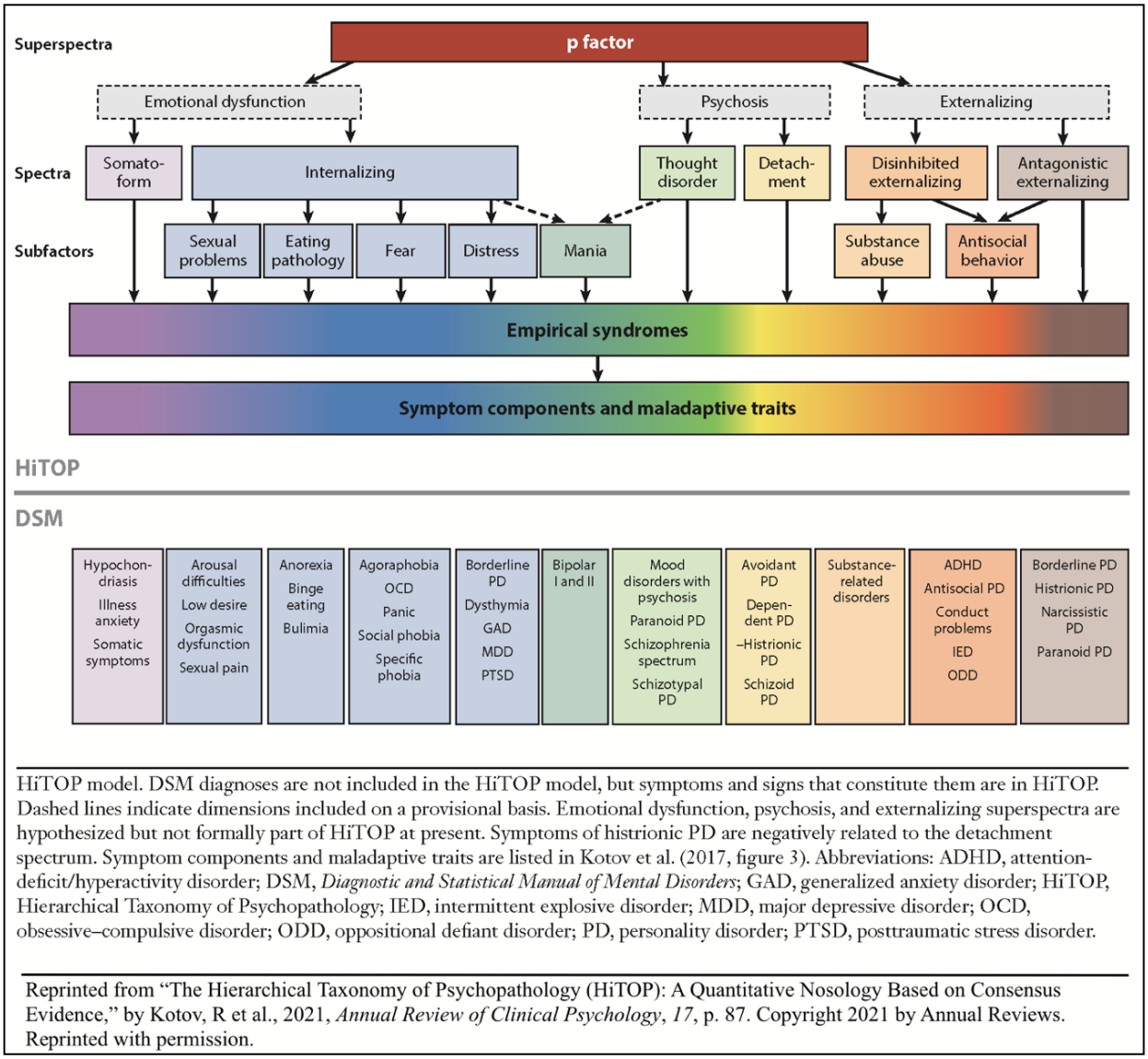
My study operationalized the presence of mental disorder dimensionally, such that respondents were coded 0 ("No Disorder") if they did not meet criteria for any 12-month DSM-IV disorder, 1 ("Anxiety Disorder(s)") if they only met criteria for one or more anxiety disorders, 2 ("Mood Disorder(s)") if they only met criteria for one of the mood disorders, 3 ("Impulse-Control Disorder(s)") if they met criteria for ADHD, CD, IED, and/or ODD only, and 4 ("Multi-Category Disorders") if they met criteria for disorders in more than one of these groups. Substance-related disorders were modeled separately, and respondents were coded 0 if they did not meet criteria for one or more substance abuse or dependence disorder and 1 if they did. Overall, this is consistent with the Hierarchical Taxonomy of Psychopathology (HiTOP) approach to classifying mental illness (Kotov et al., 2017), which is illustrated in Figure 1.1.

Briefly, HiTOP was developed by a consortium of influential researchers tasked with the development of a model of psychopathology for use in both clinical practice and research settings (Kotov et al., 2021). HiTOP accounts for the high rate of intra-disorder heterogeneity and inter-disorder comorbidity by organizing commonly co-occurring features of psychopathology together into specific dimensions that are organized hierarchically. This hierarchy ranges from very narrow symptom features to internalizing (or emotional dysfunction) and externalizing superspectra to an overarching general factor, p, of psychopathology (Kotov et al., 2021). Importantly, this structure preserves the model's applicability to studies using an array of classification methodologies, including DSM diagnostic criteria.

Additionally, the NCS-R obtained information from respondents regarding their mental health histories and current disorder-related distress and impairment. Respondents reported past year psychiatric hospitalizations, mental health treatment, and prescription medication use. The current analyses include indicator variables for these treatment histories. They were also asked a

Figure 1.1

The HiTOP Model of Mental Disorder



HiTOP model. DSM diagnoses are not included in the HiTOP model, but symptoms and signs that constitute them are in HiTOP. Dashed lines indicate dimensions included on a provisional basis. Emotional dysfunction, psychosis, and externalizing superspectra are hypothesized but not formally part of HiTOP at present. Symptoms of histrionic PD are negatively related to the detachment spectrum. Symptom components and maladaptive traits are listed in Kotov et al. (2017, figure 3). Abbreviations: ADHD, attention-deficit/hyperactivity disorder; DSM, *Diagnostic and Statistical Manual of Mental Disorders*; GAD, generalized anxiety disorder; HiTOP, Hierarchical Taxonomy of Psychopathology; IED, intermittent explosive disorder; MDD, major depressive disorder; OCD, obsessive–compulsive disorder; ODD, oppositional defiant disorder; PD, personality disorder; PTSD, posttraumatic stress disorder.

series of questions about suicidal ideation, planning, and subsequent attempts. Here, only past year suicide attempts are considered. To assess functional impairment due to mental health problems, respondents who met criteria for one or more mental disorders were administered the Sheehan Disability Scale (SDS; Leon et al., 1997), a brief, four-item instrument designed to

assess the extent of disorder-specific impairment across four domains of functioning (Table 1.1). The SDS was administered for each major diagnosable mental disorder. The NCS-R also assessed general functioning using a modified version of the World Health Organization's Disability Assessment Schedule II (WHODAS-II; Rehm et al., 1999). This modified WHODAS-II assesses disability across five domains of functioning: life activities, understanding and communicating, getting around, self-care, and getting along with others (Table 1.1). Following the scoring convention presented by Von Korff and his colleagues (2008), a global WHODAS-II measure, ranging from 0 (hypothetical perfect functioning) to 100 (hypothetical worst functioning), was generated for use in the current study. Part II respondents also received the "Kessler" 10-item Psychological Distress Scale (K10; Kessler et al., 2003), a brief self-report screening instrument used to identify nonspecific mental health problems in the general population. The K10 assesses symptom frequency across five general domains of psychological distress (i.e., depression, anxiety, motor agitation, fatigue, and feelings of worthlessness) during the month in the prior year when symptoms were the worst. Each item was reverse scored 0 for "None of the Time" to 4 for "All of the Time" and summed to derive a total K10 score.

Disorder severity is assessed using a modified version of the severity index introduced by Wang and his colleagues (2006). Respondents met criteria for severe illness if they a) received a diagnosis of bipolar I or nonaffective psychosis, b) reported a past year suicide attempt or psychiatric hospitalization, c) endorsed three or more areas of "severe" or "very severe" role impairment on the SDS, or d) endorsed three or more areas of "medium" role impairment on the SDS and either received four or more mental disorder diagnoses, reported more than five days of psychiatric hospitalization, or received a multivariate functional impairment score of less than 55. Respondents who reported "moderate" disorder-related role impairment on any SDS domain

Table 1.1

NCS-R Impairment Questions

Instrument	Question Text	Original Coding
SDS	*Thinking about the month or longer in the past 12 months when your [disorder-specific symptom] was most severe. How much did [it] interfere with*: Your home management, like cleaning, shopping, and taking care of the (house/apartment)? Your ability to work? Your ability to form and maintain close relationships with other people? Your social life?	not at all-severely; 0-10
WHODAS-II	*[Thinking about the past 30 days]:*	0-30 days
(Life Activities Domain)	How many days were you totally unable to work or carry out your normal activities? How many days were you able to work and carry out your normal activities, but had to cut down on what you did or not get as much done as usual? How many days did you cut back on the quality of your work or how carefully you worked? How many days did it take an extreme effort to perform up to your usual level at work or at your other normal daily activities because of problems with either your physical health, your mental health, or your use of alcohol or drugs?	
	How much difficulty did you have in each of the following areas:	
(Understand/ Communicate Domain)	Concentrating on doing something for ten minutes? Understanding what was going on around you? Remembering to do important things? Learning a new task – for example, learning how to get to a new place?	none – severe difficulty, can't do; 0-3, 4
(Getting Around Domain)	Standing for long periods, such as 30 minutes? Moving around inside your home? Walking a long distance such as half a mile?	
(Self-Care Domain)	Washing your whole body? Getting dressed? Staying by yourself for a few days?	
(Getting Along with Others Domain)	Starting and maintaining a conversation? Dealing with people you did not know well? Maintaining friendships? Making new friends? Controlling your emotions while you were around people?	

were classified as having moderate disorder severity, and all other disorders were classified as mild. This modified measure differs from the original severity index insofar as it does not

include nonaffective psychosis and substitutes a score of two standard deviations above the mean or higher on a multiplicative measure of impairment (global WHODAS-II) and psychological distress (K10) for the original predicted functional impairment model (Wang et al., 2006). Data access limitations prompted the decision to exclude the psychosis measure and substitute the WHODAS-II/K10 score for the original functional impairment score. The combination of serious psychological distress and functional impairment measures has been established as a reliable means of estimating the presence and severity of mental disorders (Center for Behavioral Health Statistics and Quality, 2018a). Furthermore, the combined WHODAS-II/K10 measure shows moderate correlation with total number of mental disorders ($r = .4619$, $p<.0001$) and the number of severely impaired SDS domains ($r = .5603$, $p<.0001$).

Alternative Explanatory Measures

To determine whether the same factors explain firearm-related outcomes among individuals with and without mental health problems, my analyses include several measures that have been identified by the psychological, sociological, and criminological literatures as relevant to gun ownership and carrying. Data availability does limit my choice of explanations to explore, as well as my operationalization of those measures; however, the wide range of personal and biographical information obtained by the NCS-R allows for a comprehensive comparative analysis. These measures are discussed below.

Dispositional Disinhibition. To assess the role of dispositional disinhibition, my analyses include the following items from the NCS-R's personality disorder screener: 1) "Giving into my urges gets me into trouble," 2) "I have tantrums or angry outbursts," 3) "I have been arrested/at times done things that could get a person arrested," 4) "I lose my temper and get into physical fights," 5) "I take chances and do reckless things," 6) "It's hard for me to stay out of

trouble," and 7) "Sometimes I get so angry I break or smash things." Because the items used to identify dispositional disinhibition are taken from a personality disorder screener that was not specifically designed to produce a trait disinhibition subscale, I conducted an exploratory factor analysis (EFA) for binary data on the items following the procedure summarized by Uebersax (2000). Put simply, this heuristic method involves generating a matrix of the tetrachoric correlations among pairs of dichotomous variables and then factor analyzing that matrix. This is possible because the tetrachoric correlation between two dichotomous variables approximates the Pearson correlation coefficient that would be obtained if the variables were measured continuously (Drasgow, 2014). The analysis yielded a two-factor solution that accounted for 89.58% of the common variance (Table 1.2). The first factor, angry impulsivity, is consistent with prior work by Swanson et al. (2015) that found the presence of one or more angry impulsive behaviors was significantly associated with firearm access and carrying. Items associated with risky behaviors and criminal or otherwise problematic outcomes loaded significantly onto a second factor, which I distinguish as criminogenic disinhibition. Predicted scores for these two factors are included in the subsequent analyses.

Cultural Factors. Unfortunately, while the data available for analysis from the NCS-R is broad, it is limited with respect to cultural and attitudinal indicators that may be relevant to firearm-related outcomes. That said, measures of religious affiliation, childhood rurality, and racial preference are available for inclusion in the current study.

My analyses include a nominal religion measure that utilizes broad categories of religious affiliation (e.g., Protestantism); however, I distinguish other categories as well, including Catholicism, Other Religions (e.g., Buddhism, Islam, Judaism), and Agnosticism/Atheism/No

Table 1.2

Exploratory Factor Analysis of NCS-R Disinhibition Items

Items	Factor		Dimension
	1	2	
Sometimes I get so angry I break or smash things.	**0.9818**	-0.0740	Angry Impulsivity
I have tantrums or angry outbursts.	**0.6022**	0.1613	
I lose my temper and get into physical fights.	**0.4658**	0.4221	
I take chances and do reckless things.	-0.0214	**0.8476**	Criminogenic Disinhibition
Giving into my urges gets me into trouble.	-0.0072	**0.6710**	
It's hard for me to stay out of trouble.	0.0822	**0.6389**	
I have been or could have been arrested.	0.0456	**0.5290**	

Notes. Extraction method = Iterated Principal Factors; Rotation method = Oblique Promax; Factor loadings greater than .45 are in bold; Cross loadings are underlined.

Preference. While the NCS-R did not evaluate gun-related childhood socialization directly, an available proxy measure consistent with the literature, childhood rurality, is included in the current study. Respondents were asked if they were "raised mostly in a large city, suburbs of a large city, a small city, a town or village, or in a rural area." About two percent of respondents reported having "moved around," so an additional category was included to account for these observations. I also include a racial preference probe as a proxy measure for racial prejudice. Respondents were asked, "How important do you think it is for people who are from your same racial and ethnic group to marry other people who are also from that group – very important, somewhat, not very, or not at all important?" Responses were reverse coded so that higher scores corresponded to greater within-race preference. This measure is consistent with previous work by Kleck and Kovandzic (2009) that demonstrated a relationship between within-race preference among white males and gun ownership. But in the present case, all Part II respondents received the probes, so the effect can be assessed among men and women from all included racial and ethnic groups.

Criminogenic Measures. To explore the relevance of criminogenic factors, I include measures of young adult dating violence, parental modeling of violence, and adolescent initiation of alcohol and drug use.3 During the marriage module, Part II respondents were probed about intimate partner violence (IPV) during their teen and young adult dating relationships (before age 21). Specifically, they were asked to quantify the number of relationships during which they or their partner(s) ever pushed; grabbed or shoved; threw something; slapped or hit; kicked, bit, or hit with a fist; beat up; choked; burned or scalded; or threatened each other with a knife or gun. I combined these probes to create a categorical indicator of early IPV victim/offender overlap. Respondents were coded 0 ("No early IPV") if they did not report perpetrating or experiencing early IPV or if they did not start dating until after age 21. Respondents who reporting being a victim but never an offender were coded 1 ("Victim"), those who reported being a perpetrator but never a victim were coded 2 ("Offender"), and those who reported both perpetration and victimization were coded 3 ("Vic/Off"). I use this variable to examine the impact of prior victimization on gun access and carrying behaviors. As part of the childhood module, NCS-R respondents were asked, "When you were growing up, how often did someone in your household push, grab, shove, throw something at, slap or hit you – often, sometimes, rarely, or never?" A follow-up question was asked to determine the perpetrator (e.g., parent, sibling). I reverse-coded this item such that 0 corresponds to "Never" and 3 to "Often." To isolate the impact of child physical abuse, as opposed to sibling bullying or fighting, cases in which perpetration was reported as sibling-only or unknown were recoded as "Never." Respondents were then asked, "Did [the man/woman who raised you] often get into physical fights?" Parental violence was

[3]The NCS-R's clinical orientation toward the measurement of risk factors precludes examination of fear of crime and other attitude- and belief- based measures potentially related to firearm access and carrying.

considered present (coded 1) if respondents responded "Yes" to either the maternal or paternal probe and absent (0) otherwise. I also include measures of childhood alcohol and drug use initiation. Therefore, I include an ordinal measure of early alcohol use initiation based on a question from the substance use module. Respondents were asked, "How old were you when you first started drinking at least 12 drinks a year—including either a glass of wine, a can or bottle of beer, or a shot or jigger of liquor either alone or in a mixed drink?" I split the responses into three categories: 0 "Not an Early Starter" (initiation>17-years old), 1 "Early Starter" (age 13-17), and 2 "Very Early Starter" (initiation<13-years old). To measure illicit drug use during adolescence, I combined similar initiation measures for cannabis, cocaine (of any form), and prescription drugs to create an indicator of any illicit substance use before the age of 18 (0 "No," 1 "Yes").

Sociodemographic Controls. Finally, I account for several sociodemographic control variables, including: age (18-99), sex (0 "Female," 1 "Male"), race/ethnicity (0 "Non-Hispanic White," 1 "Non-Hispanic Black," 2 "Hispanic," and 3 "Other—Asian American, Native American, Alaskan Native, Hawaiian, or Pacific Islander"), marital status (0 "Married/Cohabitating," 1 "Divorced/Separated/Widowed," and 2 "Never Married"), education (0 "0-11 Years," 1 "12 Years," 2 "13-15 Years," and 3 "16+ Years"), annual household income (0 "Less than $20,000," 1 "$20,000-$49,999," 2 "$50,000-$74,999," and 3 "$75,000+"), children in the home (0 "None," 1 "One," 2 "Two," 3 "Three+"), and Census region of current residence (1 "Northeast," 2"Midwest," 3"South," and 4 "West").

Analytic Strategy

All analyses reported here were conducted using Stata version 17.0 (StataCorp, 2019) and included the Part II composite weights to adjust for sampling characteristics and differential

nonresponse, as well as robust standard errors generated using the first-order Taylor-series linearization method.

First, I obtained weighted sample statistics for each dependent, independent, and control variable, followed by the bivariate crosstabulations between each model predictor and outcome. I then used logistic regressions to test the relative significance of mental health, dispositional, cultural, and criminological explanations for variation in 1) firearm access, and 2) past month carrying. For each outcome, I began by modeling the main effects of mental disorder type and past year treatment while controlling for the sociodemographic characteristics discussed above. The dispositional, cultural, and criminological variables were then incrementally added to the regressions to test hypotheses 1a and 2a. To account for the possibility that the relationships between mental illness and firearm access or carrying are a function disorder severity, as opposed to type, I then reran the models with disorder severity in place of disorder type and past year inpatient treatment (the latter of which is accounted for in the severity index). Next, I conducted tests of hypotheses 1b and 2b—that the effects of clinical characteristics on firearm access and carrying, respectively, are not conditioned on the alternative explanatory variables or controls—by interacting each of the clinical variables with the rest of the variables in the full main effects models (i.e., those including the clinical, dispositional, cultural, *and* criminological covariates). I also investigated interactions between other model parameters with the community-contributed Stata command `mfpigen` (Royston & Sauerbrei, 2008, pp. 174-181), which tests an interaction model for each pair of variables adjusted for potential confounding by the remaining covariates. Finally, I estimated best fit interaction models for each outcome.

Analytic Rationale. Given that the outcomes of interest in the current study are binary, I chose to employ logistic regression analysis, which can be expressed as:

$$\text{logit}\big(\pi(x)\big) = \log\big(\pi(x)\big) = \log\left(\frac{\pi(x)}{1-\pi(x)}\right) = \alpha + \beta_1 X_1 + \cdots + \beta_n X_n \quad (1.1)$$

where $\pi(x)$ is the conditional probability of a positive outcome. Logistic regression uses a nonlinear transformation, the logit *link function* to transform the estimated conditional probabilities, $\hat{\pi}(x)$, into log odds ranging from 0 to +∞. This preserves the linearity of the model covariates. After the logistic model is fit, the $\hat{\pi}(x)$ are transformed back using the cumulative distribution function (CDF), $\Lambda\big(\pi(x)\big)$, by exponentiating the log odds back into conditional probabilities:

$$\hat{\pi}(x_i) = \Lambda\big(\hat{\pi}(x_i)\big) = g^{-1}\left(\text{logit}\big(\hat{\pi}(x_i)\big)\right) = \frac{\exp(x_i\boldsymbol{\beta})}{1+\exp(x_i\boldsymbol{\beta})} \quad (1.2)$$

where g^{-1} is the inverse function and $x_i\boldsymbol{\beta}$ is the vector of the regression model coefficients for observation *i*.

Logistic regressions are generally estimated using maximum likelihood estimation (MLE), where the regression coefficients are their maximum likelihood (ML) estimates. The MLE method computes parameter estimates that maximize the likelihood that the underlying model being assumed generated the observed data. In other words, for each combination of parameter estimate values, the MLE procedure computes the likelihood of generating the observed sample statistic if those estimated values represent the true population parameters (Long & Freese, 2014). This process continues until the MLE function converges (i.e., is identified). The ML estimate for a given parameter, $\hat{\beta}$, is the point at which the likelihood takes its highest value. The ML estimator, conditioned on $x_i\boldsymbol{\beta}$**,** is derived from the product of the probability density of y_i (Wooldridge, 2015):

$$f(y|x_i;\boldsymbol{\beta}) = [\pi(x)^y][1-\pi(x)]^{1-y} \quad (1.3)$$

where $\pi(x)^y$ is the probability that y = 1, given an observed value of 1, $[1-\pi(x)]^{1-y}$ is the probability that $1-y$ = 0, given an observed value of 1. For computational ease, this is transformed into the log-likelihood function and summed across all observations, i_n:

$$\mathcal{L}(\boldsymbol{\beta}) = \sum_{i=1}^{n} y_i \log[\pi(x)] + (1-y_i)\log[1-\pi(x)] \tag{1.4}$$

Unlike linear regression, where regression coefficients can be directly estimated (e.g., using the method least squares), there is no direct solution for MLE in the logistic case. Rather, the iterative Newton-Raphson algorithm is used to find the root of the score function, (i.e., the derivative of the log-likelihood; Agresti, 2012). In simple terms, the Newton-Raphson algorithm for ML estimates of a log-likelihood in the multivariate case involves choosing some starting point, x_0, and approximating the derivative of the function, $f(x_0)$, at that point (i.e., the slope for the tangent line to the curve at $\big(x_0, f(x_0)\big)$). The point where the tangent line intersects the x-axis becomes the next value, x_1, and the process repeats as:

$$x_{n+1} = x_n - \frac{\mathrm{f}(x_n)}{f'(x_n)} \tag{1.5}$$

until the difference between x_{n+1} and x_n is smaller than some very small, predetermined termination point.

Because the NCS-R Part II data are drawn from a complex sample that oversampled participants based on mental health status, alternative methods are suggested to properly compute model parameters and their standard errors.[4] There are two important assumptions underlying MLE: all observations 1) have an equal response probability, and 2) are independent

[4]The inclusion of sampling weights when making inferences from survey data remains a hotly debated topic (Heeringa et al., 2017); however, Chambers and Skinner (2003) demonstrate that survey weights that reflect an *informative sample design* (i.e., the design features are related to variables of interest) should be included in analyses. My paper follows this guidance.

from one other. These assumptions are violated when data are collected using complex sampling designs, such as clustered sampling and stratification. Pseudo-maximum likelihood estimation (pMLE), the method used in my analyses, has been developed to generate unbiased finite population parameter estimates, $\boldsymbol{B}s$, when analyzing complex survey data (Heeringa et al., 2017). Under this approach, the *pseudo* population log-likelihood of $\boldsymbol{B}$, given a vector of observed covariates, X, is the weighted sum of the individual log-likelihoods:

$$p\mathcal{L}(\boldsymbol{B}|X) = \sum_{i=1}^{n} \{y_i \log[\pi(x)] + (1 - y_i)\log[1 - \pi(x)]\}^{w_i} \quad (1.6)$$

where w_i is the sampling weight for observation *i*. In other words, the sample weights are used to estimate the likelihood equations we would observe if our data represented a census (Pfeffermann, 1993). The Newton-Raphson algorithm can still be used to maximize the pseudo-likelihood function (Heeringa et al., 2017).

When data are drawn from simple random samples, the data generating process (i.e., underlying model) is often assumed to account for the sampling variation in the true population parameters (Mansournia et al., 2021). This is not possible in the case of complex data, because the parameter of interest (e.g., mean, coefficient) is estimated as a nonlinear, weighted combination of estimates for each design strata, primary sampling unit, and individual case (Heeringa et al., 2017). Application of the Taylor Series expansion to the parameter of interest provides a linear approximation for the estimate, allowing for the computation of an approximate variance. This method has been extended to logistic regression (Binder, 1983) and is the standard procedure implemented by Stata.

Finally, I report results from these models in terms of average marginal effects (AMEs) instead of log odds or odds ratios. I chose this reporting method for a few reasons. First, log

odds are difficult to interpret, and odds ratios $\left(\frac{\frac{P_{group}}{1-P_{group}}}{\frac{P_{base}}{1-P_{base}}}\right)$ are often misinterpreted as relative risks $\left(\frac{P_{group}}{P_{base}}\right)$. AMEs are calculated as probabilities, making them substantially easier to understand. For categorical variables, the AME is the discrete change in the probability of a positive outcome from the base category. For continuous variables, the AME is the derivative of the response, $\frac{\partial x}{\partial y}$. Second, neither log odds nor odds ratios provide a sense of the magnitude of effects. Reporting results in terms of AMEs—differences in probabilities—provides this information. Each model's odds ratios and their 95% confidence intervals are reported in Appendix A tables.

Results

Descriptive statistics for the NCS-R sample are reported in Table 1.3. Consistent with the Part II oversampling of people with mental health problems, there are substantial differences between the raw and weighted means among the clinical characteristics. For example, 43.97% of the study sample met criteria for one or more 12-month disorder while accounting for only 29.43% of the population. Slightly higher proportions of the sample reported problematic drug or interpersonal experiences than is estimated in the population. But this is not surprising, given the significant overlap in risk factors for mental health and other social problems (Baranyi et al., 2021). In contrast, the sample proportions are comparable to the approximated population estimates for many of the non-clinical variables. Roughly a third of the sample, representing just over a third of the population, reported the presence of one or more working firearm in the home, while only about 4% (4.59% of the population) reported past month gun carrying. The survey sample also appears to be representative with respect to religious affiliation, racial preference,

Table 1.3

Weighted Sample Description

	Raw Mean/%	Weighted Mean/%	SE	Range
Firearm-Related Outcomes				
Gun Access	32.91%	35.51%	.0156	0-1
Past Month Carrying	3.92%	4.59%	.0038	0-1
Clinical Characteristics				
Mental Disorders				
No Disorder	56.03%	70.57%	.0095	0-1
Anxiety Disorder(s)	21.07%	14.87%	.0063	0-1
Mood Disorder(s)	4.45%	2.94%	.0020	0-1
Impulse Control Disorder(s)	2.90%	2.21%	.0019	0-1
Multi-Category Disorders	15.54%	9.41%	.0044	0-1
Disorder Severity				
Mild	18.39%	13.90%	.0065	0-1
Moderate	17.97%	11.41%	.0049	0-1
Severe	9.21%	5.52%	.0028	0-1
Substance Abuse/Dependence	4.93%	3.84%	.0037	0-1
Inpatient Treatment	1.57%	0.87%	.0001	0-1
Mental Health Treatment	11.88%	8.32%	.0046	0-1
Dispositional Factors				
Angry Impulsivity	.1716	.1320	.0047	0-1.07
Criminogenic Disinhibition	.2513	.2132	.0061	0-1.17
Cultural Factors				
Religious Affiliation				
Protestantism	52.71%	53.66%	.0143	0-1
Catholicism	23.77%	25.04%	.0145	0-1
Other Religion	7.94%	7.32%	.0051	0-1
Agnostic/Atheist/No Pref	15.58%	13.98%	.0106	0-1
Importance of Intraracial Marriage				
Not Important at All	36.53%	34.61%	.0120	0-1
Not Very Important	22.79%	22.46%	.0084	0-1
Somewhat Important	24.28%	24.84%	.0084	0-1
Very Important	16.40%	18.09%	.0099	0-1
Childhood Rurality				
Large City	21.93%	21.25%	.0095	0-1
Suburbs	18.19%	16.06%	.0110	0-1
Small City	19.72%	19.21%	.0129	0-1
Town/Village	19.16%	20.10%	.0108	0-1
Rural Area	19.14%	21.87%	.0150	0-1
Moved Around	1.86%	1.51%	.0027	0-1
Criminological Factors				
Childhood Alcohol Use Initiation				
None	66.32%	69.80%	.0095	0-1
Early (13-17)	29.30%	26.24%	.0075	0-1
Very Early (>13)	3.94%	3.95%	.0043	0-1
Drug Use Before 18	29.52%	24.62%	.0086	0-1

Table 1.3 Continued.

	Raw Mean/%	Weighted Mean/%	SE	Range
Early IPV				
None	79.95%	83.63%	.0089	0-1
Victim Only	9.05%	7.98%	.0072	0-1
Offender Only	2.70%	2.19%	.0027	0-1
Victim/Offender	8.30%	6.21%	.0047	0-1
Childhood Physical Abuse				
Never	66.36%	70.78%	.0108	0-1
Rarely	14.94%	13.75%	.0063	0-1
Sometimes	11.88%	10.55%	.0069	0-1
Often	6.59%	4.92%	.0039	0-1
Parental Criminality	2.50%	1.91%	.0025	0-1
Parental Violence	9.62%	8.00%	.0057	0-1
Control Variables				
Gun-Related Job	10.42%	11.38%	.0052	0-1
Age	43.27	45.01	.4646	18-98
Male	41.67%	46.65%	.0103	0-1
Race				
Non-Hispanic White	73.27%	72.58%	.0185	0-1
Non-Hispanic Black	12.57%	12.25%	.0107	0-1
Hispanic	9.41%	11.29%	.0119	0-1
Other	4.74%	3.88%	.0040	0-1
Marital Status				
Married/Cohabitating	56.41%	55.58%	.0126	0-1
Divorced/Separated/Widowed	22.06%	21.23%	.0071	0-1
Never Married	21.53%	23.19%	.0116	0-1
Annual Household Income				
<$20,000	21.15%	22.51%	.0120	0-1
$20,000-$49,999	31.31%	29.67%	.0086	0-1
$50,000-$74,999	18.90%	18.90%	.0079	0-1
$75,000+	28.64%	28.92%	.0142	0-1
Children in Home				
None	69.80%	71.17%	.0099	0-1
One	12.83%	12.29%	.0062	0-1
Two	11.04%	10.61%	.0073	0-1
Three+	6.33%	5.94%	.0039	0-1
Region				
Northeast	18.30%	18.99%	.0308	0-1
Midwest	27.55%	23.46%	.0184	0-1
South	32.51%	35.53%	.0185	0-1
West	21.64%	22.02%	.0195	0-1

Note: Variables measured across 5,481 observations, representing a population of 200,862,100; Percentages may not add to 100% due to rounding errors; Taylor Series linearized standard errors reported.

childhood rurality, and many of the sociodemographic controls (females and Midwesterners were slightly oversampled).

Table 1.4 presents the results of individual bivariate tests of association between the explanatory variables and the outcomes (see Appendix Table A.1 for the pairwise correlation matrix for all study variables). These results suggest nuanced relationships between clinical factors and gun-related outcomes. Respondents with severe disorders and those with histories of inpatient or other mental health treatment were substantially less likely than those without disorders to report access to firearms. Similarly, respondents with anxiety and multiple category disorders were less likely to report access, although respondents who met criteria for impulse control disorders were more likely. In contrast, none of the mental health characteristics appear to be associated with gun carrying at the bivariate level.

The patterns of association between the various competing explanatory variables and the outcomes are mixed. There are mean differences in dispositional disinhibition among those who reported access or carrying and those who did not, but the relationships appear inconsistent across outcomes. Associations with the cultural factors appear to be consistent with the literature: Higher proportions of firearm access and carrying were reported by Protestants, those with more racially prejudiced attitudes toward marriage, and those who grew up in rural communities or moved around (likely a proxy for being raised in military families). Interestingly, the outcome distributions do not vary consistently with the criminological factors. Victims of early IPV and childhood physical abuse were substantially more likely to report access and carrying than those who did not report those experiences. Parental histories of criminality and violence are associated with higher prevalence of reported carrying but not access, whereas early alcohol use initiation was associated with higher prevalence of reported access but not carrying. Drug use during childhood and adolescence does not appear related to either outcome.

Table 1.4

Bivariate Associations Between Explanatory Covariates and Outcomes

	Access		Carrying	
	Mean/%	**SE**	**Mean/%**	**SE**
Clinical Characteristics				
Mental Disorders				
No Disorder	37.09%	.0167	4.41%	.0046
Anxiety Disorder(s)	30.85%	.0227	3.84%	.0096
Mood Disorder(s)	36.48%	.0489	5.07%	.0174
Impulse Control Disorder(s)	42.30%	.0519	9.92%	.0283
Multi-Category Comorbid Disorders	29.05%	.0178	5.73%	.0162
	$F_{(3.12, 131.15)} = 5.2147^{**}$		$F_{(2.85, 119.50)} = 1.5809$	
Disorder Severity				
Mild	33.93%	.0254	5.16%	.0077
Moderate	32.03%	.0197	4.73%	.0100
Severe	26.58%	.0225	5.48%	.0140
	$F_{(2.11, 88.55)} = 6.5324^{**}$		$F_{(2.76, 116.01)} = 0.4077$	
Substance Abuse/Dependence				
No	35.62%	.0157	4.54%	.0041
Yes	32.54%	.0436	5.91%	.0195
	$F_{(1, 42)} = 0.5125$		$F_{(1, 42)} = 0.5201$	
Inpatient Treatment				
No	35.60%	.0157	4.59%	.0038
Yes	24.37%	.0437	4.86%	.0248
	$F_{(1, 42)} = 4.9695^{*}$		$F_{(1, 42)} = 0.0126$	
Mental Health Treatment				
No	36.54%	.0159	4.76%	.0039
Yes	24.09%	.0243	2.78%	.0095
	$F_{(1, 42)} = 26.1235^{***}$		$F_{(1, 42)} = 2.6377$	
Dispositional Factors				
Angry Impulsivity[a]	.1210	.0074	.1806	.0193
	$F_{(1, 42)} = 3.61^{\dagger}$		$F_{(1, 42)} = 7.39^{**}$	
Criminogenic Disinhibition[a]	.2164	.0077	.3300	.0325
	$F_{(1, 42)} = 0.5528$		$F_{(1, 42)} = 12.92^{***}$	
Cultural Factors				
Religious Affiliation				
Protestantism	41.96%	.0173	5.52%	.0057
Catholicism	26.93%	.0238	2.37%	.0057
Other Religion	24.77%	.0297	5.48%	.0186
Agnostic/Atheist/No Pref	31.71%	.0275	4.54%	.0085
	$F_{(2.65, 111.49)} = 18.2277^{***}$		$F_{(2.58, 108.28)} = 3.7896^{*}$	
Importance of Intraracial Marriage				
Not Important at All	27.50%	.0171	3.95%	.0065
Not Very Important	34.22%	.0226	4.62%	.0091
Somewhat Important	39.94%	.0206	3.83%	.0071
Very Important	46.33%	.0300	6.83%	.0107
	$F_{(2.90, 121.96)} = 19.4956^{***}$		$F_{(2.51, 105.27)} = 2.4224^{\dagger}$	

Table 1.4 Continued.

	Guns		Carrying	
	Mean/%	**SE**	**Mean/%**	**SE**
Childhood Rurality				
Large City	21.30%	.0168	3.59%	.0085
Suburbs	32.73%	.0218	3.79%	.0089
Small City	30.36%	.0204	2.84%	.0060
Town/Village	35.82%	.0223	4.36%	.0090
Rural Area	54.88%	.0298	7.85%	.0096
Moved Around	45.53%	.0708	5.54%	.0259
	$F_{(3.83, 160.68)} = 30.8561^{***}$		$F_{(4.26, 179.04)} = 4.6550^{**}$	
Criminological Factors				
Childhood Alcohol Use Initiation				
None	34.33%	.0135	4.19%	.0042
Early (13-17)	39.41%	.0271	5.63%	.0081
Very Early (>13)	31.18%	.0404	5.05%	.0168
	$F_{(1.81, 76.03)} = 4.1386^{*}$		$F_{(1.97, 82.89)} = 1.7204$	
Drug Use Before 18				
No	36.16%	.0159	4.33%	.0042
Yes	33.43%	.0249	5.39%	.0073
	$F_{(1, 42)} = 1.3656$		$F_{(1, 42)} = 1.9001$	
Early IPV				
None	34.95%	.0156	4.06%	.0041
Victim Only	43.05%	.0274	9.40%	.0138
Offender Only	33.59%	.0503	1.85%	.0113
Victim/Offender	33.94%	.0314	6.60%	.0201
	$F_{(2.88, 120.82)} = 3.4440^{*}$		$F_{(2.45, 103.10)} = 7.1886^{***}$	
Childhood Physical Abuse				
Never	35.08%	.0170	4.24%	.0045
Rarely	36.31%	.0194	4.52%	.0102
Sometimes	38.01%	.0263	7.74%	.0139
Often	31.36%	.0428	2.43%	.0037
	$F_{(2.88, 120.81)} = 3.4038^{*}$		$F_{(2.80, 117.50)} = 3.5098^{*}$	
Parental Criminality				
No	35.51%	.0154	4.48%	.0035
Yes	35.11%	.0646	10.13%	.0418
	$F_{(1, 42)} = .0044$		$F_{(1, 42)} = 4.2362^{*}$	
Parental Violence				
No	35.58%	.0162	4.47%	.0039
Yes	34.67%	.0266	6.02%	.0096
	$F_{(1, 42)} = .1146$		$F_{(1, 42)} = 2.9036^{\dagger}$	

Notes: n = 5,456 – 5,481 observations, representing a population of between 200,336,275 and 200,862,100; Reported F-statistics generated from Rao-Scott (1984) design-adjusted X^2 statistics for tests of association; Taylor series linearized standard errors reported.

[a]Mean comparison between positive and negative (not shown) gun access and carrying responses.

*** p<.001, ** p<.01, * p<.05, † p<.1

Multivariate Models Predicting Access

I estimated two sets of models predicting firearm access (Tables presented in Appendix A). The first set operationalized mental illness by disorder type, with a separate inpatient treatment indicator (Table A.2). The second included a disorder severity indicator that incorporated inpatient treatment (Table A.3). For each set of models, Model 1 included the clinical characteristics and sociodemographic variables; Models 2-4 incrementally added each set of alternative explanatory predictors (i.e., dispositional, cultural, and criminological). Modified measures of fit, including the pseudo log-likelihood ($p\mathcal{L}$), Akaike's information criterion (AIC), Bayesian information criterion (BIC), and McFadden's adjusted R^2 were generated using the community-contributed `fitstat` command (Long & Freese, 2014).[5]

Results from these models provide general support for hypotheses H_{1a} and H_{1b}. Neither type of disorder nor severity was significantly associated with firearm access across any of the models. Insignificant adjusted Wald tests of the equivalence of each level of disorder type/severity confirmed these findings. Similarly, past year inpatient treatment was unassociated with access. The one exception was past year mental health treatment, which reduced the odds of reporting firearm access by a factor of nearly ½, irrespective of model or mental illness operationalization. But overall, the clinical characteristics were poorly predictive of firearm access. In contrast, significant associations with access were observed among nearly all the alternative explanatory variables and sociodemographic controls. Only early alcohol use initiation was insignificant. Overall, the model results were as expected; however, angry impulsivity was unexpectedly negatively associated with access. Additional analyses comparing

[5]Due to the inclusion of survey weights in the regression analyses, `fitstat` computes AIC, BIC, and R^2 using the pseudo-likelihood.

the effects of the clinical correlates with each group of competing explanatory variables individually resulted in the same pattern of results (see supplemental file[6]). Finally, interacting each of the clinical characteristics with the sociodemographic controls and alternative explanatory variables failed to reveal any significant interaction effects in either the disorder type or severity models (see supplemental file). In other words, there is no relationship between mental disorder and firearm access net of other factors (H_{1a}), and none of the effects of the control or alternative explanatory variables on firearm access depend on mental health status or treatment history (H_{1b}).

The fit statistics within each model appear to be relatively consistent (Table 1.5). The BIC statistic is consistently larger than the AIC, because it imposes a more substantial penalty for the number of parameters included in a model. Across models, the BIC trends with the adjusted pseudo-R^2, which also imposes a penalty based on the number of included parameters. For any given explanatory model, the fit statistics for the disorder type and severity models are nearly the same, suggesting that support for hypothesis H_{1a} is robust to the different operationalizations of mental illness. According to the guidelines suggested by Raftery (1995), the difference in the BIC across models provides very strong support (i.e., greater than 10-point difference) in favor of the cultural model over the clinical or dispositional models and weak support (i.e., less than 2-point difference) over the full criminological model. When the other fit statistics are considered, there is stronger support for the criminological model; therefore, I continue with a discussion of the AMEs for the full models with all explanatory variables included (Table 1.6).

[6] Supplemental analysis file available from author upon request.

Table 1.5

Fit Statistics for the Multivariate Models Predicting Access

	Disorder Type Models			
Test Statistic	**Clinical**	**Dispositional**	**Cultural**	**Criminological**
$p\mathcal{L}$	-3117.906	-3114.859	-2965.080	-2943.916
AIC	6285.812	6283.719	6006.159	5973.832
BIC	6450.928	6462.044	6257.136	6257.832
McFadden's Adjusted R^2	0.114	0.115	0.154	0.158
	Disorder Severity Models			
Test Statistic	**Clinical**	**Dispositional**	**Cultural**	**Criminological**
$p\mathcal{L}$	-3119.084	-3116.185	-2966.313	-2945.438
AIC	6284.169	6282.370	6004.627	5972.877
BIC	6436.076	6447.486	6242.394	6243.668
McFadden's Adjusted R^2	0.115	0.115	0.154	0.158

Note: From left to right, the models are additive with respect to the variables included.

To put these findings in perspective, Figure 1.2 displays the AMEs for the competing explanatory variables graphically with their 95% confidence intervals, highlighting the comparative (in)significance of the clinical versus alternative explanations for firearm access. Irrespective of how it is conceptualized, experiencing a mental disorder does not appreciably increase the probability that a person has access to firearms. In fact, having sought treatment from any kind of mental health professional in the past year reduces one's probability by almost 10%. That equates to a 27% probability for otherwise average respondents, compared to the average 36% probability.

On the other hand, cultural factors appear to have the strongest positive effects on firearm access. Being raised in a rural area, as opposed to a city, increases the probability of access by almost 25%. That is, by far, the largest effect of any of the factors considered. People who moved around as children are also more likely than people raised in cities to report access (16%

Table 1.6

Average Marginal Effects for Main Effects Access Models

	Model			
	Disorder Type		Disorder Severity	
	AME (SE)		AME (SE)	
Clinical Characteristics				
Mental Disorders				
Anxiety Disorder(s)	-0.012	(0.022)	~	
Mood Disorder(s)	0.026	(0.034)	~	
Impulse Control Disorder(s)	0.045	(0.048)	~	
Multi-Category Disorders	-0.004	(0.021)	~	
Inpatient Treatment	-0.063	(0.049)	~	
Disorder Severity				
Mild Disorder	~		0.003	(0.020)
Moderate Severity	~		0.005	(0.024)
Severe Disorder	~		-0.015	(0.021)
Substance Abuse/Dependence	0.018	(0.031)	0.017	(0.030)
Mental Health Treatment	-0.095***	(0.018)	-0.097***	(0.018)
Dispositional Factors				
Angry Impulsivity	-0.060†	(0.032)	-0.056†	(0.032)
Criminogenic Disinhibition	0.058†	(0.029)	0.059*	(0.028)
Cultural Factors				
Religious Affiliation				
Catholic	-0.051*	(0.023)	-0.051*	(0.023)
Other Religion	-0.110***	(0.030)	-0.111***	(0.030)
Agnostic/Atheist/No Pref	-0.048*	(0.024)	-0.048*	(0.024)
Intraracial Marriage Preference				
Not Very Important	0.048*	(0.024)	0.048*	(0.023)
Somewhat Important	0.089***	(0.019)	0.089***	(0.019)
Very Important	0.111***	(0.025)	0.111***	(0.025)
Childhood Rurality				
Suburbs	0.061*	(0.028)	0.061*	(0.027)
Small City	0.065*	(0.025)	0.064*	(0.025)
Town/Village	0.111***	(0.023)	0.111***	(0.023)
Rural Area	0.243***	(0.035)	0.242***	(0.035)
Moved Around	0.159*	(0.061)	0.160*	(0.061)
Criminological Factors				
Alcohol Use Initiation				
Early (13-17)	0.022	(0.020)	0.022	(0.020)
Very Early (>13)	-0.029	(0.037)	-0.030	(0.037)
Early IPV Experiences				
Victim Only	0.114***	(0.020)	0.113***	(0.020)
Offender Only	0.109*	(0.054)	0.109†	(0.054)
Victim/Offender	0.078*	(0.029)	0.076*	(0.029)

Table 1.6 Continued.

	AME (SE)		AME (SE)	
Control Variables				
Gun-Related Job	0.109***	(0.028)	0.109***	(0.027)
Age	-0.002*	(0.001)	-0.002*	(0.001)
Male Sex	0.095***	(0.017)	0.096***	(0.017)
Race/Ethnicity				
Non-Hispanic Black	-0.073*	(0.033)	-0.073*	(0.033)
Hispanic	-0.158***	(0.044)	-0.159***	(0.044)
Other	-0.157***	(0.028)	-0.158***	(0.028)
Marital Status				
Div/Sep/Widowed	-0.124***	(0.029)	-0.125***	(0.029)
Never Married	-0.190***	(0.027)	-0.190***	(0.027)
Annual Household Income				
$20,000-$49,999	0.069***	(0.017)	0.068***	(0.017)
$50,000-$74,999	0.136***	(0.030)	0.135***	(0.030)
$75,000+	0.143***	(0.028)	0.143***	(0.028)
Children in the Home				
One	-0.025	(0.023)	-0.025	(0.023)
Two	-0.095**	(0.030)	-0.095**	(0.030)
Three+	-0.076*	(0.030)	-0.077*	(0.030)
Region of Residence				
Midwest	0.121*	(0.051)	0.121*	(0.050)
South	0.119*	(0.052)	0.119*	(0.052)
West	0.088†	(0.049)	0.089†	(0.049)

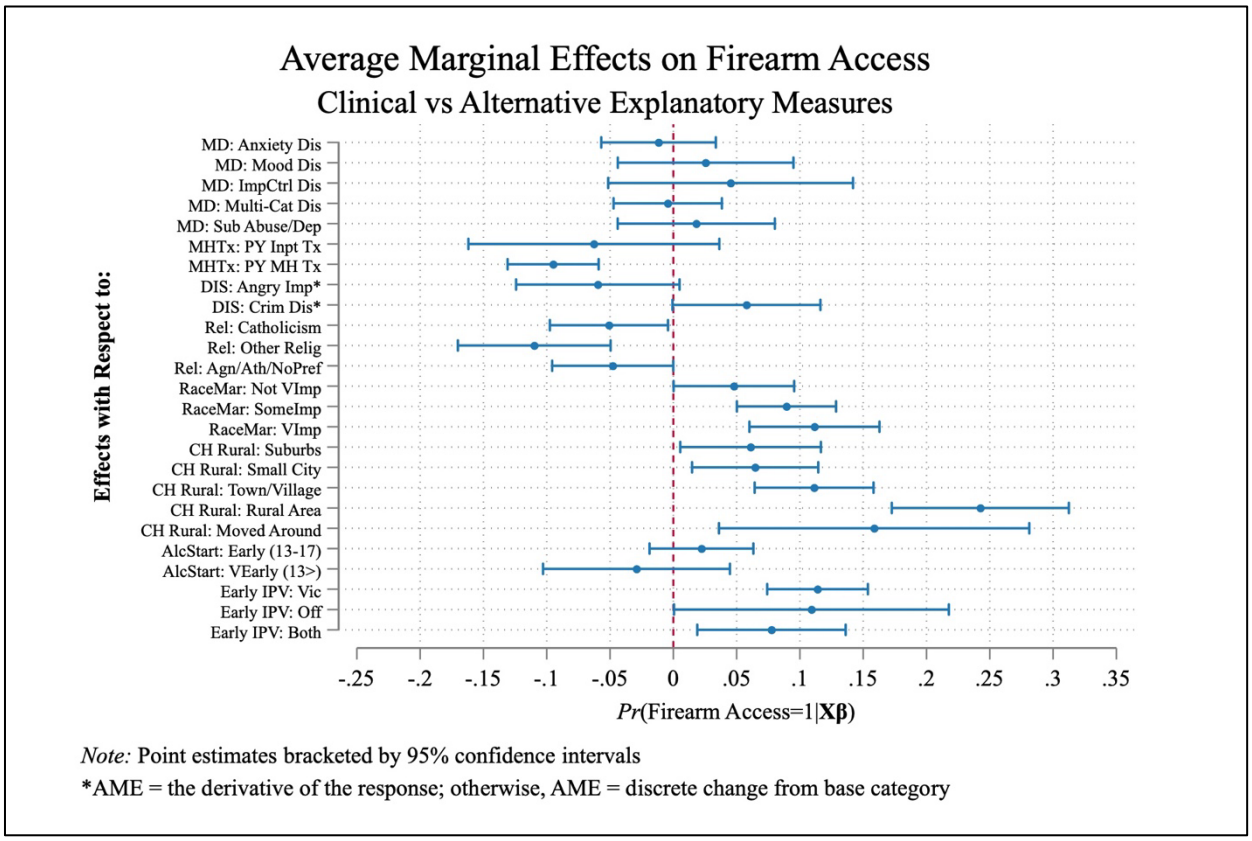
Notes: The average marginal effect (AME) of a continuous variable is the derivative of the response ($\partial y/\partial x$). The AME of a categorical or dichotomous variable is the discrete change from the base category; Linearized standard error estimators of the unconditional variances of parameter estimates reported.

Base Categories: Clinical Variables = No disorder or treatment; Cultural Variables = Protestant religion, not at all important (intraracial marriage), being raised in a large city; Criminological Variables: No early alcohol use or early IPV experiences; Control Variables: No gun-related job, female sex, non-Hispanic White race/ethnicity, married/cohabitating marital status, income under $20,000, no children in the home, and residence in the northeast census region.

*** p<.001, ** p<.01, * p<.05, † p<.1

Figure 1.2

Comparative Average Marginal Effects on Access



Base Categories: Clinical Variables = No disorder, no treatment; Cultural Variables = Protestant religion, not at all important (intraracial marriage), raised in large city; Criminological Variables: No early alcohol use or early IPV experiences.

higher probability). This may reflect growing up in a military family. Protestant affiliation is associated with an access probability that is between 5% and 11% higher than affiliation with other or no religions. As anticipated, the probability of firearm access increases as racial prejudice increases. People who feel same-race marriage is very important are over 10% more likely to have access to firearms than people who don't prefer same-race marriage at all.

The relationships observed between firearm access and the dispositional and criminological factors appear more nuanced than expected. While higher criminogenic disinhibition (i.e., disinhibition associated with being in trouble) raises the probability of access by about 6%, higher angry impulsivity (i.e., disinhibition associated with emotional dysregulation) is associated with a 5.6% reduction in probability ($p<.10$). Given the strong correlation between these constructs ($r = .5292$, $p<.001$), the different facets of disinhibition may offset one another, at least for some people. Also contrary to expectation, childhood initiation of alcohol use was not significantly associated with firearm access. In fact, the relationship with very early initiation (i.e., before age 13) trends negative. Experiencing IPV as a young adult is, as expected, positively related to access, although the relationship differs by type of experience. The effect of early IPV on probability of access is the largest for victims and offenders (11.4% and 10.9% increase compared to no early IPV experience, respectively). For individuals who have experienced early IPV as both victims and offenders, the effect is slightly smaller (7.8%).

The results were also as expected with respect to sociodemographic characteristics. When accounting for marital status, where access is more likely among individuals who are married or cohabitating, males are substantially more likely than females to report access (40.50% vs 31%). Access is also substantially more likely among non-Hispanic Whites (about 7-16% higher probability), individuals with higher annual household incomes (roughly 7-14% higher), and those with a history of gun-involved employment (11% higher). Access is less likely among individuals with two or more minor children in the home (7.6-9.5% lower) or who live in the Northeast Census region (about 9-12% lower).

Multivariate Models Predicting Carrying

While firearm access appears to be common (raw: n_{access} = 1,804 vs n_{no} = 3,677), past month carrying is comparatively rare (raw: n_{carry} = 215 vs n_{no} = 5,265), which *may* present a problem for analysis under conventional logistic regression (King & Zeng, 2001). Specifically, MLE suffers from small-sample bias when the ratio between events and nonevents is large, and this bias can lead to underestimation of conditional probabilities. In the extreme case, sparsity in the data can produce a model with a monotone likelihood (i.e., no MLE exists and one or more parameter estimates are infinite). Practically speaking, the amount of bias introduced into the estimates and conditional probabilities derived from conventional logistic regression is likely negligible in large samples (≈10,000 observations) with 200 or more events (Allison, 2012).

When the ratio of events to non-events is small enough to warrant concern, a method of penalized likelihood estimation—the Firth method—has been developed to produce consistent, unbiased regression parameters (Firth, 1993; Heinz et al., 2016). The Firth method corrects the log-likelihood function by tacking a penalty onto Equation 1.5. The penalty is the square root of the determinant of the Fisher Information Matrix (i.e., the reciprocal of the variance of the estimator). In the simple case of a logistic regression with a single binary regressor, the Firth correction is roughly equivalent to adding .5 to each cell of the 2x2 crosstab. This ensures that all estimates will be finite. These models can be estimated in Stata using the community-contributed `firthlogit` command (Coveney, 2021); however, survey design elements are not supported. As a result, the computed standard errors will be too small.

The number of past month carrying events in the NCS-R data is just over 200; however, the proportion of events to non-events is low, given the number of predictors being modeled. So I estimated both conventional, survey-adjusted regressions (Tables A.4-5) and Firth logits

(Tables A.6-7). The coefficients from the Firth-corrected models primarily served as a robustness check. I followed the same procedure to estimate the models predicting carrying that I used in the access analyses. Models were estimated for each version of mental illness (i.e., type and severity), building incrementally from the clinical models to the full models including the dispositional, cultural, and criminological explanatory variables. Model fit statistics for the sixteen estimated regressions are presented in Table 1.7.

Results from the conventional weighted regressions provide support for hypothesis H_{2a}, with a few caveats. First, when only the effects of the clinical and sociodemographic characteristics were modeled, the odds of carrying increased among people meeting criteria for multi-category disorders by a factor of 2.132 compared to people with no disorders. Similarly, people with mild and severe mental disorders had increased odds of carrying as compared to those with no disorders. The effect of severe disorder on carrying remained marginally significant when dispositional factors were added; however, the inclusion of the cultural characteristics reduced the effect of disorder severity and rendered it insignificant. Once again, criminogenic disinhibition was a significant predictor across all models. Conversely, none of the cultural factors were significantly associated with carrying. Catholic respondents had about 34% lower odds of carrying than Protestant respondents ($p<.10$), but the effect was washed out when the criminological variables were included. Of the criminological factors, only early IPV and childhood physical abuse were associated with carrying. One-to-one comparisons of the clinical variables and each group of alternative explanatory variables yielded the same pattern of results (see supplemental file). Inclusion of interactions between the clinical characteristics and other model variables also failed to produce meaningful improvements in any of the models. This provides support for hypothesis H_{2b}; none of the relationships between past month carrying and

Table 1.7

Fit Statistics for the Multivariate Models Predicting Past Month Carrying

		Disorder Type Models			
Conventional Models	Test Statistic	Clinical	Dispositional	Cultural	Criminological
	$p\mathcal{L}$	-717.545	-709.106	-697.876	-685.992
	AIC	1479.089	1466.211	1465.751	1459.983
	BIC	1624.424	1624.758	1696.965	1750.652
	McFadden's Adjusted R^2	0.268	0.275	0.275	0.278
		Disorder Severity Models			
	Test Statistic	Clinical	Dispositional	Cultural	Criminological
	$p\mathcal{L}$	-717.139	-708.355	-697.062	-685.139
	AIC	1476.279	1462.711	1462.124	1456.278
	BIC	1615.007	1614.652	1686.732	1740.341
	McFadden's Adjusted R^2	0.270	0.276	0.277	0.280
		Disorder Type Models			
Firth Models	Test Statistic	Clinical	Dispositional	Cultural	Criminological
	$p\mathcal{L}$	-656.132	-641.639	-616.955	-591.730
	AIC	1376.264	1351.277	1329.909	1307.460
	BIC	1588.217	1576.447	1647.379	1717.096
	McFadden's Adjusted R^2	0.219	0.228	0.220	0.218
		Disorder Severity Models			
	Test Statistic	Clinical	Dispositional	Cultural	Criminological
	$p\mathcal{L}$	-655.704	-640.956	-616.189	-590.882
	AIC	1373.409	1347.912	1326.379	1303.763
	BIC	1578.738	1566.459	1637.235	1706.792
	McFadden's Adjusted R^2	0.221	0.230	0.223	0.221

Note: From left to right, the models are additive with respect to the variables included.

the sociodemographic characteristics or alternative explanatory variables are contingent upon mental health status. With few exceptions, the Firth-corrected models confirm these findings, suggesting the models are robust against small sample bias.

As in the case of the access models, the BIC statistic was larger than the AIC in each model. But unlike the access models, BIC did not trend with the pseudo-R^2 in the models

predicting carrying. This is likely reflective of the poor explanatory power of the cultural and criminological variables in relation to the degrees of freedom they consume. Comparison of the fit statistics for both the conventional and penalized models indicates that the dispositional severity model provided the best model fit; however, few of the explanatory predictors were significantly associated with carrying. Similarly, examination of the marginal effects for the dispositional and full models revealed that few of the predictors were associated with substantial changes in the probability of carrying (Appendix Table A.8).

Next, I developed a reduced model by 1) removing all alternative explanatory variables whose confidence intervals include one (i.e., no effect) from the full model (leaving the clinical characteristics) and rerunning the analyses, and then 2) removing all remaining insignificant variables. This produced a more parsimonious model with no apparent change in model fit. Compared to the dispositional severity model, the reduced model produced a substantially smaller BIC statistic (36-point reduction). The model's AIC and pseudo log-likelihood were also smaller than the dispositional model, while there was no substantive change in the pseudo-R^2. Together, these fit statistics provide very strong support for retaining the reduced model. The reduced model regression results and AMEs are reported in Table 1.8. A graphical representation of the AMEs follows in Figure 1.3.

The model-based probability of carrying across the entire sample is 4.56% (95% CI: 3.81%, 5.31%). Compare that to the effect of the strongest predictor in the model, firearm access. All else equal, the estimated probability of past month carrying for an average respondent who has access to a firearm is 9.43% (95% CI: 7.94%, 10.92%), whereas the probability for an average respondent without firearm access is less than 1% (0.72%, 95% CI: 0.35%, 1.08%). Unsurprisingly, higher criminogenic disinhibition scores also result in an

Table 1.8

Regression Coefficients and AME for the Reduced Model Predicting Carrying

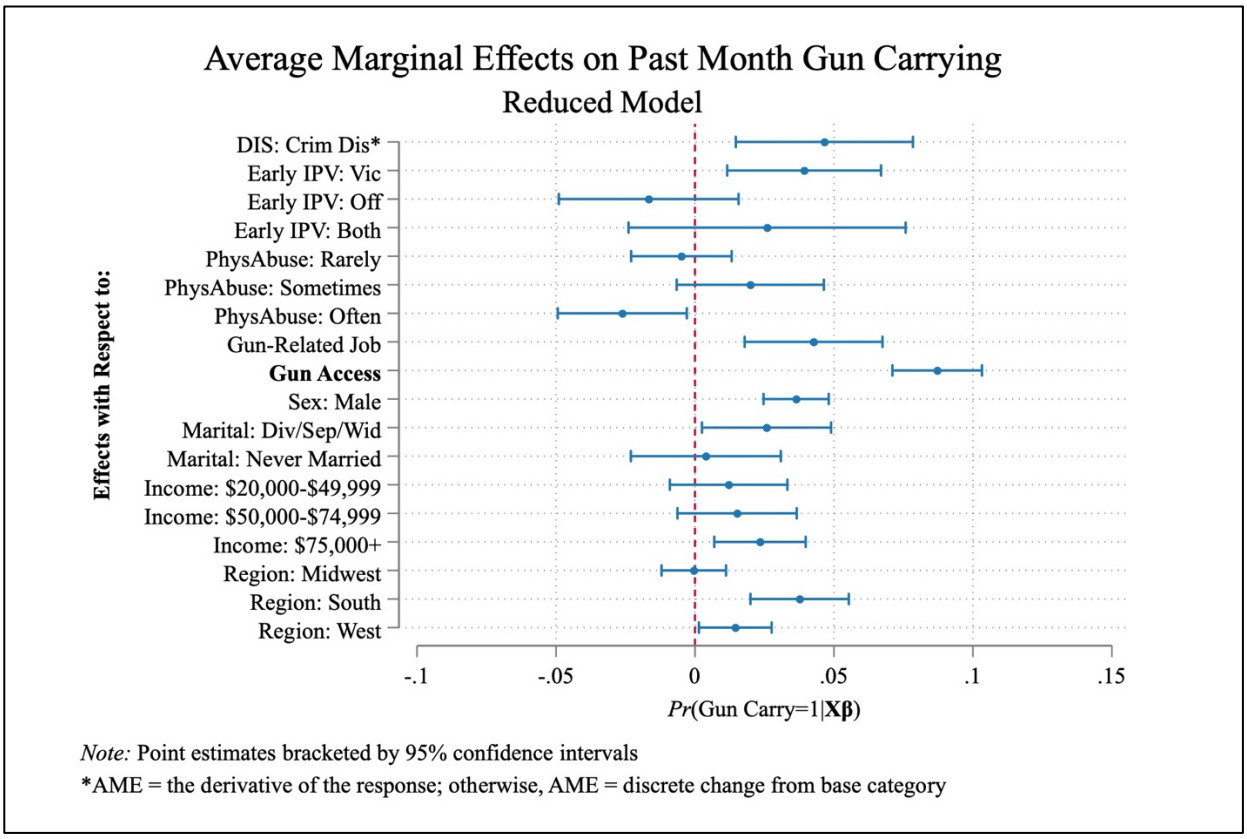
	Regression Model		Estimated Effects	
Predictors	**OR**	**95% CI**	**AME**	**SE**
Criminogenic Disinhibition	3.684**	(1.550, 8.754)	0.047**	(0.016)
Early IPV Experiences				
Victim Only	2.431**	(1.449, 4.080)	0.039**	(0.014)
Offender Only	0.539	(0.122, 2.386)	-0.017	(0.016)
Victim/Offender	1.887	(0.676, 5.265)	0.026	(0.025)
Childhood Physical Abuse				
Rarely	0.866	(0.503, 1.492)	-0.005	(0.009)
Sometimes	1.613	(0.898, 2.900)	0.020	(0.013)
Often	0.359	(0.101, 1.279)	-0.026*	(0.012)
Gun-Related Job	2.682***	(1.644, 4.376)	0.043**	(0.012)
Gun Access	17.015***	(9.208, 31.441)	0.087***	(0.008)
Male Sex	3.114***	(2.249, 4.311)	0.036***	(0.006)
Marital Status				
Div/Sep/Widowed	1.892*	(1.094, 3.270)	0.026*	(0.012)
Never Married	1.121	(0.513, 2.448)	0.004	(0.013)
Annual Household Income				
$20,000-$49,999	1.499	(0.715, 3.141)	0.012	(0.010)
$50,000-$74,999	1.634	(0.801, 3.334)	0.015	(0.011)
$75,000+	2.021*	(1.111, 3.679)	0.023**	(0.008)
Region of Residence				
Midwest	0.982	(0.609, 1.585)	-0.000	(0.006)
South	2.867***	(1.714, 4.795)	0.038***	(0.009)
West	1.640*	(1.020, 2.639)	0.014*	(0.006)
Intercept	0.000***	(0.000, 0.001)		
$p\mathcal{L}$	-707.467			
AIC	1452.933			
BIC	1578.450			
McFadden's Adjusted R^2	0.281			

*** p<.001, ** p<.01, * p<.05, † p<.1

increased probability of carrying a firearm. The effect is little more than half as large as that produced by firearm access but is roughly equivalent to the effect of having a history of employment requiring a firearm. Similarly, experiencing early adult IPV victimization increases the probability of carrying by about 4%. On the contrary, the probability of carrying is roughly

Figure 1.3

Comparative Average Marginal Effects on Carrying (Reduced Model)



Base Categories: No history of early IPV or child physical abuse, no gun access or history of a gun-related job, male sex, married/cohabitating, income below $20,000, and residence in northeast region.

cut in half for people with a history of frequent childhood physical abuse victimization compared to those with no abuse history (1.92% vs 4.54%, respectively). Among the sociodemographic characteristics, being divorced, separated, or widowed increases the probability of carrying by 2.6%, high income by 2.3%, and living in the South or West census regions by 3.8% and 1.4%, respectively.

Discussion

This study provides one of the first comprehensive pictures of firearm access and carrying among people with mental illnesses. Although other studies have previously explored this topic (e.g., Swanson, Sampson, et al., 2015; Weleff et al., 2022), this is the first study to provide generalizable insights into patterns of access and use that go beyond clinical correlates and, instead, also examine the applicability of general social and criminological explanations. My study also utilized a broader set of measures to evaluate the role of dispositional disinhibition than has been used previously. And to my knowledge, no other studies have explored whether mental illnesses or treatment histories condition the relationships between other factors and gun access or carrying (they do not).

Consistent with other studies utilizing the NCS-R (e.g., Miller et al., 2009), guns were present in the homes of approximately 33% of respondents, representing a national prevalence rate of 35%. In most instances, further comparisons with previous NCS-R studies were hard to make. For example, one study provided rates of access and carrying by lifetime instead of past year disorder (Ilgen et al., 2008). Another provided odds ratios but not rates for access and carrying by type of disorder (Swanson, Sampson, et al., 2015). Some comparisons can be drawn between the clinical models in the current study and the regression results from the study by Miller et al. (2009). They simultaneously modeled the effects of disorders, suicidality, and treatment characteristics on the likelihood of living in a home with a firearm. Their results are generally consistent with those reported in the clinical models here; none of the disorders were significantly associated with firearm access. Whereas their results indicated that prior hospitalization, but not general mental health treatment, significantly reduced the odds of firearm access, the results here were reversed. Seeking professional mental health treatment, but not

inpatient treatment, substantially reduced the likelihood of access. The discrepancy is likely due to differences in model parameters. Overall, their results are consistent with the findings here. People who seek treatment for mental health problems are substantially less likely to have access to firearms than people who do not, but mental illness is not associated with access. Surprisingly, neither were substance-related disorders. Instead, I found that firearm access was largely a function of culture and experience.

Every aspect of culture included in this study was significantly predictive of firearm access. Respondents who identified as Protestants were between 5% and 11% more likely to have access to firearms. This is consistent with decades of research indicating that religious affiliation, specifically Protestantism, is a strong predictor of firearm access and ownership among Americans (Dixon & Lizotte, 1987; Erskine, 1972; Kleck, 2017; Little & Vogel, 1992; O'Connor & Lizotte, 1978; Wright & Marston, 1975). The reason for this connection is not well understood (Yamane, 2016), but Young (1989) suggested that Protestants are more likely to own guns because they are more likely to grow up in the rural South, where hunting is an important aspect of the culture. Indeed, the dominance of Protestantism in the South is well-established and unwavering (Bauer, 2012; Hill, 1985). Living in the South was significantly associated with firearm access in this study; however, the same was true of living in any region other than the Northeast. My findings are also in line with previous research that has demonstrated the role of childhood rurality as a significant predictor of firearm access in adulthood (Cook & Ludwig, 1996; Diener & Kerber, 1979; O'Connor & Lizotte, 1978; Schutten et al., 2021). Growing up in a rural area had the largest effect of any predictor on the probability of firearm access (approximately 25%). The NCS-R did not assess why people owned guns but growing up near wildlife would certainly make hunting more convenient and protecting livestock and pets from

predators more necessary. I also found support for previous work connecting racial prejudice with gun ownership and attitudes toward gun reform (Cao et al., 1997; Kleck & Kovandzic, 2009; O'Brien et al., 2013; Young, 1985). The relationship was linear and increased the probability of access from about 5% for low prejudice to 11% for high prejudice. This study could not determine whether the association was suggestive of racialized fear of crime or racial resentment (Filindra & Kaplan, 2016; Filindra et al., 2021).

I also found some support for a criminological explanation for firearm access. Contrary to expectation, early alcohol use initiation was unrelated to access. Conversely, respondents who reported early IPV experiences were substantially more likely to report having access to firearms. This relationship when comparing victims to people with no early IPV experiences. Their probability increases by about 11%, *ceteris paribus*. People who reported being both victims and offenders also had elevated probabilities (7.6%). The effect for offenders, while only marginally significant, was similar to victims (about 11%). This is in line with previous research suggesting that victimization increases the likelihood of firearm ownership (e.g., Kleck et al., 2011). For the offenders, this may be indicative of continued or escalating behavior. It certainly reflects a high-risk type of firearm access; women are several times more likely to be shot to death by their intimate partners than they are to be murdered in any way by strangers (Kellermann & Mercy, 1992). More recent statistics reveal that more than half of intimate partner homicides are committed with firearms (Bronson, 2021).

Dispositional disinhibition was also a significant predictor of firearm access, but the relationship varied by facet. Criminogenic disinhibition—the inability to stay out of trouble—was associated with increased probability of having access to firearms, while angry impulsivity—angry or violent emotion dysregulation—resulted in a nearly equivalent reduction

in probability (at $p<.10$). These two facets are highly correlated, which implies that, at least for some people, the net effect may not be significantly different from others. These findings tell a different story than the one told by Swanson, Sampson, et al. (2015), but that may be due to substantial differences in study design. Whereas mental illnesses were significant predictors of angry impulsive gun ownership in their study, I did not find any significant interactions between mental illnesses and angry impulsivity in the models predicting firearm access. One caveat here being that these are not analytically equivalent models. That said, I believe my findings provide a more nuanced picture of the role of disinhibition in firearm outcomes.

Contrary to my expectations, none of the cultural variables and only two of the criminogenic measures were significantly associated with past month carrying. Whereas my findings suggest firearm access was largely a product of culture, past month carrying is overwhelmingly a function of access. Compared to the overall probability of past month carrying (roughly 4.5%), firearm access raised the probability to about 9.5%. In contrast, the effect of the next strongest predictor, high criminogenic disinhibition, was less than 5%. This finding is important because of its implications for how we look at gun violence. Concerns about firearm-involved violence during the 1950s and 1960s prompted federal legislators to commission the first major study to investigate the problem (see Paper III for an overview of Congressional action during this period; Newton & Zimring, 1969). One of that study's authors, Frank Zimring (1968, 1972), later theorized that the presence of firearms, by virtue of their lethality, were instrumental in elevating assaults that would otherwise be nonfatal to homicides. This *instrumentality* hypothesis found purchase among some researchers (Cook, 1991), although its validity has been sharply contested by others (Cagle & Martinez, 2004; Kleck, 2017). Nonetheless, there is some evidence to suggest that state legislative shifts from *may issue* to *shall*

issue concealed carry permits or *constitutional carry* laws may increase gun-related homicides (e.g., Ginwalla et al., 2014; Gius, 2019; but see Gius, 2020) and officer-involved shootings (Doucette et al., 2022).

Certainly, troubling patterns of access and carrying were apparent in the data. But these were not related to mental illness. Rather, firearm access was strongly and positively associated with criminogenic disinhibition and racial prejudice. Neither are circumstances that would seem to promote responsible gun ownership. It's hard to tell whether victimization experiences or personal beliefs are pathways through which people come to own guns (e.g., perhaps to avoid future victimization or out of fear of people who look different) or are consequences of access. But these experiences are consequential, irrespective of mental health problems. That said, carrying a firearm is strongly related to access. Perhaps in some ancillary way, the processes that encourage socialization into gun culture or result in gun ownership for self-protection influence later gun-related behaviors like carrying by increasing exposure and normalization. Perhaps there is a reciprocal relationship between risky behaviors (e.g., carrying) and the subsequent urge to be self-protective by carrying more. The role of disinhibition should not be discounted, even if it is not the strongest driver. Future research should seek to explore these questions.

Conclusion

This study, while novel and empirically robust, is not without its limitations. First, the gun-related measures were narrow in scope and self-reported. As a result, respondents may have misreported their access and carrying. Also, apart from past month carrying and past year mental illness, none of the variables included in the study were limited to a specific recall period, which makes it difficult to assess recency or causal order. For example, being divorced, separated, or widowed increases the likelihood of both gun access and carrying, but these data do

not specify how long prior to the study this occurred. Access and carrying in the context of a relationship recently ending may put former partners at higher risk of harm. More comprehensive questions about the recency of various life circumstances and other relevant related behaviors would help to clarify the role that these factors play in violence and self-harm. Data limitations also prevented me from assessing other explanations for firearm-related outcomes. For example, measures of criminal involvement or accounts of violent behavior could help to distinguish between normative and problematic access or carrying. More comprehensive probes into the timing and methods of firearm acquisition would provide insight into the ways in which people with mental illnesses come to have guns. Finally, while the NCS-R provides the most current, generalizable picture of firearm access and carrying among people with mental health problems, it is twenty years old and is in desperate need of an update. Despite these limitations, this study provides unique insights into firearm-related outcomes among people with mental illnesses that have, until now, been lacking.

That said, a comprehensive, federally supported research program is necessary to address outstanding questions about firearms in the lives of people with mental health problems. This is especially vital, given the current policy environment surrounding gun reform. Laws abrogating the Constitutional rights of people with mental illnesses to own firearms continue to proliferate in the near absence of empirical research exploring the issue and without consideration of the potential for further stigmatization (Pryal, 2014). Scholars should advocate for the creation of a robust, federal research program that supports psychiatric epidemiological and clinical data collection efforts that include comprehensive gun-related measures. Research should aim to identify a) patterns of personal and household ownership and storage practices; b) the sources and recency of firearm acquisition; c) the role of firearms across the lifecourse; d) firearm-related

behaviors during mental health crises (e.g., storage, relinquishment, use); e) social and psychological effects related to firearms during mental health crises; and f) the impact of mental health-focused firearm legislation on gun owners' willingness to seek treatment for mental health problems. Subsequent legislation should draw on the insights gained from this research program to prevent gun violence without unnecessarily denying people with mental illnesses their Constitutional rights or further legitimizing harmful stereotypes about them.

Paper II: Mental Illness, Gun Access, and Policy: A Simulation Study

The last decade has seen substantial increases in firearm-related mortality (Goldstick et al., 2021; Simon, 2022). During the same period, Gallop polls have shown growing dissatisfaction among Americans with the current state of gun laws (Brenan, 2023). This has translated into increased public pressure for gun reform, especially in the immediate aftermath of high-profile incidents (Brenan, 2022) As a result, Congressional activity has increased substantially since 2013. During the 117th Congressional term (2021-2022) alone, more than 300 firearm-related bills and resolutions were introduced (117th Congress, 2023). And yet, according to a recent RAND survey, there is little consensus among policymakers and experts as to what types of interventions are the most appropriate or would lead to the largest reductions in gun violence (Morral et al., 2018). The one exception is laws focusing on mental health, which receive bipartisan support, despite a lack of supporting evidence (Smart et al., 2020). In fact, of all the firearm-related bills introduced during the 117th Congress, the only one to pass was the "Bipartisan Safer Communities Act" (2022), which provided planning grants for the expansion of mental health services and Byrne grants for the implementation of crisis intervention programs.

Generally, mental health-based firearm laws (MHFLs) restrict lawful access to firearms among individuals who have been involuntarily civilly committed for inpatient psychiatric treatment, adjudicated incompetent to stand trial, or who have been found not guilty of a crime by reason of insanity. States vary with respect to what type of mental health treatment results in disqualification and what disqualification entails (Smart et al., 2020). But in many cases, prohibition under states' MHFLs results in *de facto* lifetime bans on the possession of firearms

(Gold & Vanderpool, 2018). For people with mental illnesses who have committed no crimes, the permanency of such laws is troubling (Devendorf, 2020).

There are no official statistics that provide a full and accurate accounting of the number of people who are impacted by MHFLs. Since 1998, the Federal Bureau of Investigation (2023) has denied approximately 72,000 federal background checks due to mental health adjudication (accounting for roughly 3% of all denials); however, this figure reflects only attempted purchases from federally licensed dealers. Moreover, the category encompasses both civil and criminal mental health adjudications, making it difficult to assess how many people are rights restricted without having committed any crimes. Further complicating impact assessment, we do not know how many people are subject to involuntary civil commitments (Morris, 2020) or how many people with mental illnesses have access to firearms.

Without knowing more about how many people are rights restricted by these MHFLs or how many of them have access to firearms to begin with, evaluating the effectiveness of these laws will be difficult. My primary aim is to shed light on this problem by estimating rates of firearm access among people with mental illnesses over time and then simulating the effect of various MHFLs on the overall prevalence of firearm access. Doing so offers an opportunity to define the bounds of the potential efficacy of these laws. I begin by exploring the history of MHFLs and involuntary civil commitment before introducing the study.

Historical Developments

The legislative connection between mental illness and gun violence in the U.S. has its roots in the late 1920s. Following the passage of Prohibition, increases in firearm-related crime spurred national calls for stricter gun laws (Kopel, 2011). In response, policymakers from the National Conference of Commissioners on Uniform State Laws (NCCUSL), the United States

Revolver Association, and the nation's myriad state crime commissions began to develop model firearm laws to restrict or prohibit firearm access to curb violent crime. Initially, prohibitions in these model laws were limited to criminals, minors, and noncitizens (NCCUSL, 1926); however, a provision prohibiting the sale of firearms to "insane persons" emerged in model legislation supported by the National Crime Commission as early as 1926 (NCCUSL, 1927, p. 882). While this provision was ultimately removed from the National Firearm Act of 1934 and most state firearm laws, Michigan and New Jersey passed legislation during this period that included provisions intended to prevent firearm access among individuals "adjudged insane" ("Act 372," 1927, p. 888) or of "unsound mind" ("Act of Mar. 30, 1927," p. 745), respectively. In the intervening period, a handful of states passed their own MHFLs, but it was only after passage of the Gun Control Act of 1968 ("GCA") that state enactment of mental health-based firearm prohibitions became common (Figure 1.1).

The GCA and its sister bill, Title VII of the Omnibus Crime Control Act of 1968 ("Title VII"),[7] marked the first time that individuals with mental illness were formally targeted by federal firearm prohibitions. This legislation was the culmination of more than fifty bills and numerous reports, hearings, and debates over several years. From the beginning of the drafting process, mental illness was proffered, without evidence, as a significant cause of gun-related

[7] Whereas the GCA prohibited the sale of firearms to, among others, anyone "adjudicated as a mental defective or … committed to any mental institution" (§ 922(d)(4)), Title VII prohibited the possession of firearms by certain categories of persons, including those adjudged "mentally incompetent" (Sec. 1202(a)(3), repealed 1986). The discrepancies in language between the two bills were later reconciled with the passage of the Firearm Owners' Protection Act of 1968 Firearm Owners' Protection Act, Pub. L. No. 99-308, 459 (1986). , which adopted the GCA's language.

The legislative history of Title VII and its relation to the GCA is complex and has been described elsewhere in the literature (e.g., Hardy, 1986; Vizzard, 1999; Zimring, 1975). In brief, Senator Russell Long (D-LA) introduced Title VII as Amendment 820 to Senate Bill 917 on May 23, 1968, and the Senate hurriedly adopted the draft through a voice vote (114 Cong. Rec. 14772, 1968). The failure of the Senate to consider the amendment in committee or to reconcile its language with that of the GCA created significant confusion among the regulatory agencies tasked with the law's enforcement and the courts (Vizzard, 1999), thus creating the need for reconciliation through FOPA.

violence. During an early hearing of the Subcommittee to Investigate Juvenile Delinquency, then Director of the Bureau of Prisons, James Bennett argued "[n]o responsible and thoughtful citizen can, in my opinion, seriously object to measures which would discourage youngsters, the mentally ill, and criminals from coming into possession of handguns," (*Interstate Traffic in Mail-Order Firearms*, 1963, p. 3377). The House Manager, Congressman Celler, stated during a floor debate that "[n]o one can dispute the need to prevent drug addicts, mental incompetents, [or] persons with a history of mental disturbances… from buying, owning, or possessing firearms," (114 Cong. Rec. 21784, 1968). That these sentiments were widely shared among members of Congress is evidenced by the speedy adoption of language that prohibited possession of firearms by individuals adjudicated as mentally incompetent or committed to mental institutions (114 Cong. Rec. 14772, 1968).[8]

Twenty-five years after the passage of the GCA, Congress passed the Brady Handgun Violence Prevention Act ("Brady Act," 1993). Named in honor of James Brady, Press Secretary for President Reagan and one of the victims seriously injured during an attempted assassination of the president, the Brady Act a) established temporary background check and waiting period requirements for handguns sold by federally licensed firearms dealers and b) mandated the Attorney General development and implement a national, automated background check system for point-of-sale screening (Hogan, 1993). While mental health records were not necessarily included in manual background checks conducted during the Act's initial interim period, these records would become a major focus of the permanent automated system and future legislation.

[8] In fact, the Supreme Court relied, in part, on the above quote from Congressman Celler as evidence that the principal purpose of the GCA was to keep firearms out of the hands of, among others, individuals who are mentally ill Huddleston v. United States, 415 US 814 (S. Ct. 1974). .

The National Instant Criminal Background Check System (NICS) went live in late 1998 under the management of the Federal Bureau of Investigation (FBI; Montgomery, 2002). State and federal agencies electronically report prohibiting records to one of three databases included in the NICS: the National Crime Information Center (NCIC), the Interstate Identification Index (III), and the NICS Index. Records for individuals found incompetent to stand trial or not guilty by reason of insanity are reported to the III, while involuntary commitment records are reported to the NICS Index (Goggins & Gallegos, 2016).

Despite initial optimism about the NICS, a series of high-profile shootings involving individuals with disqualifying mental health histories drew critical attention to the low rate of mental health-related NICS reporting across the country (Price & Norris, 2008). In response, Congress passed the NICS Improvement Amendments Act of 2007 ("NIAA"). NIAA was intended to encourage more complete and widespread reporting of disqualifying mental health records into NICS through financial incentives and grants to aid states in the improvement of their data sharing systems (S. Rep. No. 110-183, 2007). Record contributions to the NICS Index "Mental Defective File" increased by approximately 25% between year-end 2007 and year-end 2008 (FBI, 2009). As of December 31, 2019, the NICS Index contained over six million active mental health-related records, more than eight times the records active in 2008 (FBI, 2020).

Civil Commitment

Prior to the 1960s, states generally relied on psychiatrists or other medical professionals to make civil commitment decisions based on their assessments of patients' need for treatment (Grob, 1994; Ward, 2013). This authority to commit the mentally ill was primarily derived from the state's *parens patriae* powers (literally "parent of the country"), which obligated the state to intervene in the best interests of individuals who were unable to care for themselves (Harvard

Law Review, 1974). As a result of the wholesale delegation of decision-making authority to clinicians, nearly anyone with actual or suspected mental health problems could be subject to involuntary hospitalization (Bartol, 1981).

During the 1960s, a series of important historical developments fundamentally shifted the way mental illness and mental health treatment were viewed, marking the beginning of a "liberal era" of state and federal mental disability jurisprudence (Appelbaum, 1994; La Fond, 1994). The "anti-psychiatry" movement gained ground after several prominent scholars published works critical of the treatment of people institutionalized in the nation's asylums and of psychiatry, as a whole (e.g., Foucault, 2003; Goffman, 1961; Szasz, 1960). In their view, mental illness was little more than a convenient, socially constructed label used to target nonconformists and others; asylums were simply prisons by another name (Sedgwick, 1982). In addition, enthusiasm over recent civil rights victories encouraged activists to challenge the constitutionality of civil commitment criteria and practices in the courts (Ennis, 1971; Ennis & Emery, 1978). Also, newly developed psychotropic medications, such as Thorazine, also offered a promising pathway for patients to live and thrive in their own communities (Mechanic et al., 2013). Finally, the prospect of lowering costs through deinstitutionalization proved attractive to states whose budgets were dominated by mental health care expenditures (La Fond, 1994), further eroding support for the use of inpatient civil commitment. These events led to calls to transfer patients from institutions to community-based mental health centers, where treatment would be cheaper and less stigmatizing (Morris, 1985).

Around the same time, a series of landmark cases attempted to limit state civil commitment authority by providing the first procedural protections for individuals subject to such proceedings (La Fond & Durham, 1994). In the first major decision to articulate

constitutional limitations on civil commitment under the state's *parens patriae* powers, the federal district court in *Lessard v. Schmidt* (1972) found the imposition of involuntary commitment without due process constituted an unconstitutional deprivation of liberty. Rejecting the previously uncontested use of *parens patriae* justifications for commitment, the court went further and ruled that, regardless of purpose, the state could not deprive a prospective patient of his or her liberty unless the government proved, beyond a reasonable doubt, the person a) was mentally ill *and* treatable, and b) posed an imminent danger to him- or her- self or others. Following the ruling, several states amended their commitment statutes to follow the "dangerousness" standard outlined in *Lessard* (Anfang & Appelbaum, 2006).

Three years later in *O'Connor v. Donaldson* (1975), the U.S. Supreme Court addressed the liberty interests of non-justice involved prospective patients for the first time (G. M. Grant, 1975; Slate, 2016). While the Court explicitly declined to outline the timing, criteria, or procedures required to effectuate a constitutionally sound civil commitment, the Court did prohibit states' use of their *parens patriae* commitment powers unless the individuals subject to commitment were found to be dangerous to themselves or others. Echoing *Lessard*, the *O'Connor* Court held that "a State cannot constitutionally confine *without more* a nondangerous individual who is capable of surviving safely in freedom…" (emphasis added, p. 576). Ironically, the Court also held that "a person is literally 'dangerous to himself' if for physical or other reasons he is *helpless to avoid the hazards of freedom…*" (emphasis added, p. 574). The Court's equivocation about the definition of dangerousness left the criterion's definition open to interpretation (Dix, 1982), thus limiting the enervation of *parens patriae* commitment justifications. In fact, several state legislatures and lower courts would go on to interpret

O'Connor's dangerousness standard to include the inability to provide for one's own basic needs (Morris, 1985; Ward, 2013).

Following *O'Connor*, the Supreme Court did expand the due process rights of involuntarily committed persons in *Addington v. Texas* (1979). Here, the Court held that states must prove, by clear and convincing evidence, that subjects of civil commitment proceeding are clinically mentally ill and require hospitalization for their own safety or that of the public. While imposing some procedural safeguards on civil commitment practice, the *Addington* Court declined to confer the full panel of due process rights guaranteed to criminal defendants on involuntary patients. In the Court's view, the imposition of an intermediate burden of proof was sufficient to balance the liberty interests of prospective patients with the state's "legitimate interest under its *parens patriae* powers in providing care to its citizens who are unable because of emotional disorders to care for themselves" (Addington v. Texas, 1979, p. 426). While the *Addington* Court conceded that erroneous commitments should be avoided, it held that the state should not have to "employ a standard of proof that may completely undercut its efforts to further the legitimate interests of both the state and the patient that are served by civil commitments" (p. 430). Arguably, the *Addington* decision took a conservative approach to the civil liberties of the mentally ill; states would have to establish legitimate bases for commitment, but the ambiguity of the dangerousness standard and the Court's distinction between the due process rights inherent to criminal proceedings and civil commitments would still leave many individuals with mental illness vulnerable to state action (Morris, 1985; Stone, 2017). The political and cultural changes of the ensuing decades would do little to curtail this expansion of states' commitment powers.

Less than a decade after *Addington*, the political pendulum had swung the other way, ushering in an era of political conservatism that would reshape civil commitment once again (La Fond & Durham, 1994). Criticisms of previous administrations' progressive crime and social policies resonated with the public as crime rates rose steadily and the economy began to stagnate (La Fond, 1994). The economic consequences of the Vietnam War and increased competition from foreign markets precipitated this shift toward fiscal austerity, resulting in substantially underfunded key social safety nets (Thomas, 1998). Crime policy became more punitive; deregulation became the norm; and conservative appointments reshaped the judiciary (Goldman, 1988; Thomas, 1998). At the same time, critics of the deinstitutionalization movement pointed to its unforeseen collateral consequences—the deterioration, criminalization, and incarceration of the mentally ill (Appelbaum, 1994; Myers, 1984; Treffert, 1975)—to support calls for less restrictive commitment standards (La Fond, 1994; La Fond & Durham, 1992). While the due process reforms of the 1960s and 1970s were generally lauded, funding earmarked for community-based treatment rarely materialized, leaving people with mental health problems and their families without those much-needed resources (Scull, 1990). Moreover, there was growing concern among practitioners over the wellbeing of those patients who were "unwell but unwilling" to receive treatment voluntarily (Durham & La Fond, 1984; Myers, 1984; Rachlin, 1974). Darold Treffert, for example, made the oft-cited comment that the stricter guidelines left psychiatric patients "dying with their rights on" (1975, p. 94).

Mental health practitioners, frustrated family members, and fiscal conservatives formed a broad coalition to leverage substantial political capital advocating for less restrictive commitment criteria, an overwhelming success (La Fond & Durham, 1992; Thomas, 1998). As a result of these efforts, many states have expanded their criteria to authorize the commitment of

nonviolent patients through the addition of "grave disability" and "need to treat" statutes (Stone, 2012). These expanded criteria represent the view that involuntary commitment is constitutionally justifiable for severely disabled individuals deemed at risk of future harm without inpatient intervention (Dailey et al., 2020; Stone, 2017). Even in the absence of legislative reform, many states' dangerousness standards have been practically interpreted to mean anything from vague threats (Stone, 2017) to destruction of property (La Fond & Durham, 1994). For their part, the courts have been disinclined to invalidate the new laws or limit the expansive application of existing ones (La Fond & Durham, 1992; cf Suzuki v. Yuen, 1980: affirming the trial court's decision to invalidate part of Hawaii's civil commitment law authorizing commitment of individuals with mental illness who are dangerous to property). As a result, states vary considerably in their commitment criteria.

State MHFLs

Apart from federal law (see *Historical Developments*), the mechanisms through which civil commitments impact patients' Second Amendment rights are governed by a patchwork of ever-changing state laws, and barriers to their systematic evaluation abound. On the one hand, access to expensive legal databases housing state codes and their legislative histories is often limited to legal scholars and practitioners (Burris et al., 2016). On the other, publicly available information on state laws is often incomplete, inconsistent, and partisan (e.g., compare NRA-ILA vs Giffords sites; Burris, 2018; Siegel et al., 2017). Even in the context of empirical scholarship, the data utilized is often project-specific and is rarely updated after publication (e.g., Vernick & Hepburn, 2003). However, efforts have been made to address these data gaps.

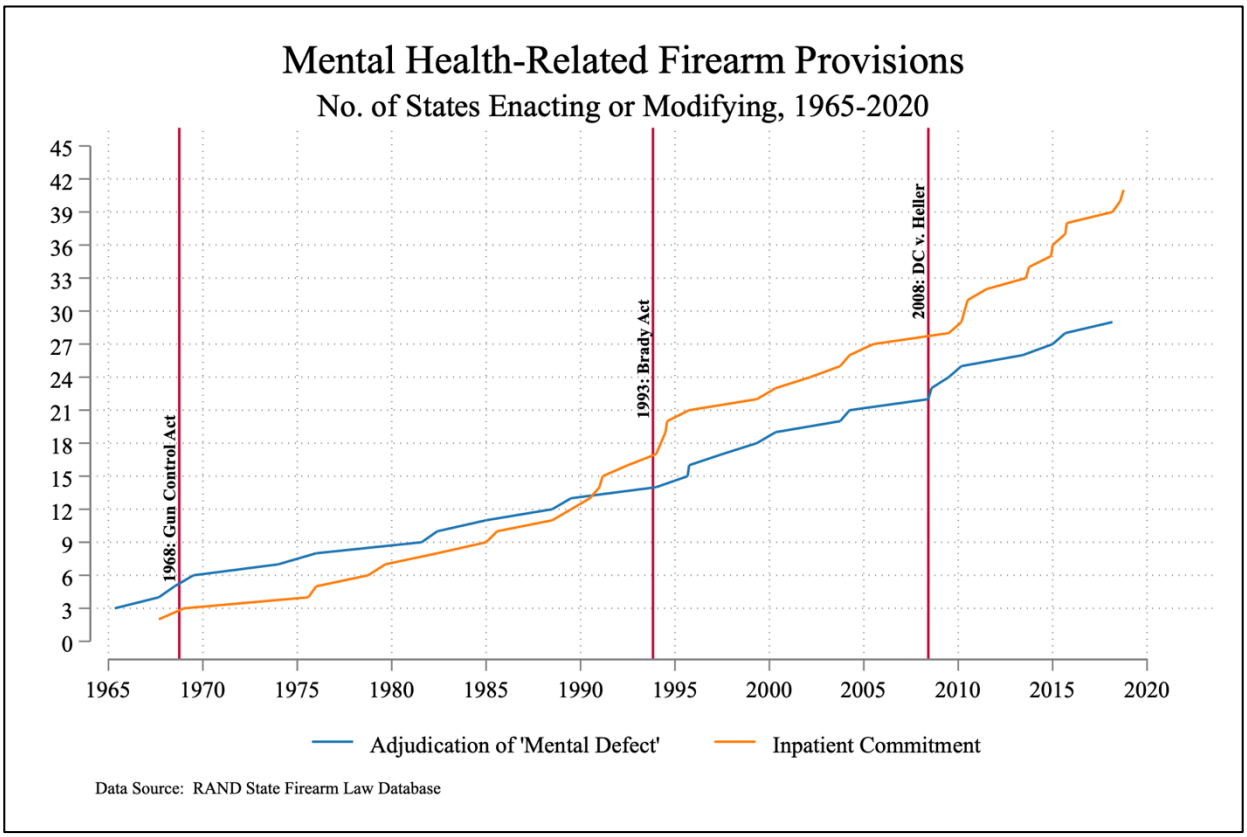
Several recent policy surveillance projects have attempted to map the legislative landscape at the nexus of mental health and firearm policy (Burris et al., 2016; Cherney et al.,

2022; Siegel et al., 2017). While varied in their approaches, these initiatives provide longitudinal data on numerous, well-defined categories of firearm- (Siegel et al., 2017) and mental health-related (Burris et al., 2016) statutes and legal provisions. The most comprehensive and current of these projects is the RAND State Firearm Law Database (Cherney et al., 2022). The current version of the database (4.0) includes legislation through early 2022. The RAND project mapped the legislative histories of 20 main categories and more than 60 subcategories of firearm laws from 1979 forward. MHFLs fall under the category of *Prohibited Possessors* and include statutes covering the following six areas: 1) adjudication of mental incompetency; 2) involuntary commitment to an inpatient mental health facility; 3) involuntary outpatient commitment; 4) voluntary commitment to an inpatient facility; 5) determination of mental incompetency by a police officer; and 6) significant behavioral, emotional, or mental disorder diagnosis. These data provide valuable insight into the temporal patterns of MHFL adoption across the country. I summarize these findings below.

As outlined in *Historical Developments*, no MHFLs existed before 1927. While Michigan and New Jersey were early adopters, legislative disinterest in regulating firearm access based on mental health continued until the passage of the GCA. During the 1970s and 1980s, a minority of states adopted MHFLs. These laws were generally consistent with the GCA's prohibitions outlined in Section 922(d)(4) (Figure 2.1). However, more expansive MHFLs were passed by the District of Columbia (DC; 1976) and Arizona (1983). DC's law extended firearm restrictions to individuals who voluntarily entered inpatient psychiatric treatment, while Arizona

Figure 2.1

Enactment of Mental Health-Based Firearm Provisions, 1965-2020



expanded its prohibition criteria to include commitment to outpatient treatment. In the period between the GCA and the Brady Act of 1993, MHFLs were adopted at a rate of about .875 per year (not including multiple provisions in single bills). Aside from a small bump of activity immediately following the Brady Act, the rate of adoption changed little over the next 15 years, averaging about .929 laws per year. However, since the Supreme Court's landmark decision in *DC v. Heller* (2008)[9], the annual rate of MHFL adoptions has risen to 1.75 per year—twice that

[9]In *Heller*, the Court simultaneously established the Second Amendment as a Constitutional right (later extended to the states in *McDonald v. City of Chicago* [2010]) and mused that states had a legitimate interest in prohibiting certain persons, such as people with mental illnesses, from having access to them.

of the post-GCA period and 1.88 times the post-Brady period.

Currently, most states have enacted laws related to the possession of firearms among people with mental illnesses. Several, including Georgia, Montana, and Kentucky, have not passed standalone legislation imposing restrictions. Instead, many have codified rules regarding NICS reporting of people who become ineligible under the GCA. Some states prohibit the sale or transfer of firearms to people with mental health problems but do not, per say, prohibit firearm access by those people (e.g., Oklahoma). On the other end of the spectrum, a few states have expanded the scope of their MHFLs to encompass a broader population than outlined by the GCA. As of 2022, three states (Michigan, Oregon, and Virginia) have joined Arizona in expanding the GCA prohibitions to include involuntary outpatient treatment. Four states (California, Connecticut, Illinois, and Maryland) and DC have passed legislation extending the prohibitions to all persons receiving inpatient psychiatric treatment, whether voluntary or not. The most expansive prohibition was passed by Hawaii in 1990. The law prohibits firearm access among people who are diagnosed with significant behavioral, emotional, or mental disorders, irrespective of their legal status or treatment history. That said, *most* standalone state laws limit their prohibitions to persons who have been involuntarily committed.

Estimating the Affected Population

Despite their proliferation, the scope and efficacy of MHFLs are difficult to evaluate. First, there are no state-level statistics on the numbers of people subject to MHFLs. Second, there are no current estimates of firearm ownership or access among individuals with mental illnesses. Consequently, there has never been a full accounting of the number of people who have lost their Second Amendment rights or how many firearms have been removed as a result. The assumption underlying these laws is that keeping firearms away from people who are too

mentally ill to safely possess them will reduce the burden of firearm violence, including homicide and suicide. Again, there is currently no evidence for or against these policies (Smart et al., 2020). A necessary first step to evaluating these MHFLs is to estimate their potential reach.

Risk Prediction Modeling

Risk prediction modeling provides a possible solution to this problem. Statistical prediction modeling is a general methodology used by a variety of disciplines to quantify the absolute risk of an outcome from a number of prognostic factors (Gerds et al., 2008), such as the prediction of disease from a constellation of symptoms. Prediction modeling can take many forms, but the basic goal is to estimate a high-quality model from a sample that produces valid risk probabilities useful for decision-making in the whole population (Steyerberg, 2019). Given adequate data, this methodology is useful for producing estimates of disease burden (i.e., outcome prevalence) among populations of interest, including firearm access among people with mental illnesses.

For example, the Substance Abuse and Mental Health Services Administration (SAMHSA) has used a risk prediction model to generate annual estimates of mental illness among the U.S. population since 2009. These estimates serve as the federal government's main source of information on the prevalence of serious mental illness among the noninstitutionalized, civilian population of the United States (Bagalman & Cornell, 2018).

SMI Estimation in NSDUH

In 1992, Congress passed legislation creating SAMHSA and establishing block grants to assist states in funding community-based mental health services for adults with serious mental illnesses (SMI; "ADAMHA Reorganization Act,"). The ADAMHA Reorganization Act requires

states to submit SMI incidence and prevalence rates as part of the annual block grant application process (Colpe et al., 2009). To assist the states, SAMHSA was required to oversee the development of a definition of SMI and a practical methodology for estimating its prevalence in the general population (Kessler et al., 1996). SAMHSA published its official rule defining the criteria for SMI among adults in 1993 (see Introduction Chapter). Five years later, SAMHSA published preliminary estimates of SMI in the general population using data from existing psychiatric epidemiology studies (Kessler et al., 1998).

Continued reliance on aging epidemiological data to project future incidence and prevalence rates was deemed problematic (Colpe et al., 2009). However, the time and expense involved in the administration of an annual mental health surveillance system as comprehensive as the prior psychiatric epidemiology studies was both prohibitive and impractical (Kessler et al., 2003; Novak et al., 2010). This prompted SAMHSA to convene a technical advisory group (TAG) to provide guidance on the development of a brief SMI indicator (Gfroerer, 2018). Following the group's recommendations, SAMHSA modified one of its existing data systems, NSDUH,[10] to include a few short psychological distress and functional impairment scales as proxies for SMI (Gfroerer et al., 2012). NSDUH was already an annually recurring, nationally representative survey on drug use among noninstitutionalized persons age 12 or older in the United States, making it an especially attractive candidate data system (Gfroerer, 2018).

Initial attempts to develop a valid indicator for use in NSDUH resulted in estimates with poor reliability, so a large-scale methodological study was embedded within NSDUH to develop a valid model-based indicator (Colpe et al., 2009). The Mental Health Surveillance Study (MHSS) was designed to calibrate scores from brief psychological distress and functional

[10] At that time, NSDUH was called the National Household Survey on Drug Abuse.

impairment scales to a "gold standard," semi-structured clinical diagnostic interview (Gfroerer et al., 2012). All NSDUH participants received modified versions of the World Health Organization Disability Assessment Schedule II[11] (WHODAS-II; Rehm et al., 1999) and the Kessler-6 psychological distress instrument (K6; Kessler, Abelson, et al., 2004). The K6 was a shortened, 6-item version of a longer nonspecific psychological distress inventory. The modified WHODAS-II assessed functional impairment related to psychological distress endorsed in the K6. Clinical diagnostic interviews were then administered to a stratified subsample of NSDUH participants for calibration. In total, a nationally representative sample of over 5,500 participants completed clinical assessments during the 2008-2012 study period (Kott et al., 2015).

Analysts coded MHSS participants positive or negative for SMI using data from their diagnostic interviews (Aldworth et al., 2010). Weighted logistic regression models predicting SMI status using various transformations of the K6 and WHODAS-II were then compared. Cut-points for the prediction models were optimized by balancing false positives and false negatives to minimize estimation bias (Aldworth et al., 2010). The models were compared to identify the prediction algorithm that had the least misclassification errors, resulted in the least bias across subpopulations, and was the most robust and parsimonious.

The chosen prediction model was applied to all adult NSDUH cases beginning in 2009 (Hedden et al., 2012). The model was extended to the current "2012 SMI prediction model" to include additional predictors and reflect receiver operating characteristic (ROC) statistics derived from the full MHSS sample (Office of Applied Studies, 2013). Since then, prevalence estimates

[11] During 2008 only, half the NSDUH sample received the WHODAS-II and half received a different instrument. The WHODAS-II was chosen and subsequently administered to all NSDUH participants beginning in 2009.

using the 2012 model have been released for every year, including revised estimates for 2008 through 2012 (CBHSQ, 2015; 2021).

To summarize, the introduction and expansion of MHFLs over the last half century belie our ignorance about the extent of gun access among people with mental health problems, let alone problematic access likely to lead to violence. An important first step in evaluating the effectiveness of these laws must be to estimate how many people may be affected by them. The current study aims to address this knowledge gap by 1) generating annual firearm access prevalence estimates among people with mental health problems, and 2) simulating the effect of laws restricting their 2nd Amendment rights on the overall prevalence of firearm access.

Methods

Data

This study uses publicly available data from the National Comorbidity Survey Replication (NCS-R; Kessler & Merikangas, 2004) and the 2009-2019 NSDUH (SAMHSA, 2014). For a description of the NCS-R, see the *Methods* section of Paper I. See above for a description of NSDUH.

Measures

The NCS-R and NSDUH have numerous measures in common that are useful for the current study. Most importantly, they both include measures that make up the SMI indicator in NSDUH: 1) the K6 instrument (see Table 2.1); 2) similar versions of the WHODAS-II functional impairment scale (see Table 1.1 of Paper I); 3) indicators of inpatient or other mental health treatment; and 4) several other variables potentially related to firearm access. The near-perfect overlap in the studies' clinical characteristics makes the estimation of firearm access among individuals with mental illnesses across NSDUH survey years possible.

Table 2.1

Comparison of K6 Items in the NCS-R and NSDUH

Survey	Question Text	Original Coding
NCS-R	*Thinking about the one month in the past 12 months when you were at your worst emotionally in terms of being anxious, depressed, or emotionally stressed. How often did you feel:*	
	…so depressed that nothing could cheer you up? … hopeless? …so restless that you could not sit still? …that everything was an effort? …worthless? …nervous?	All, Most, Some, or a Little of the Time; 1-5
NSDUH	*Think of one month in the past 12 months when you were the most depressed, anxious, or emotionally stressed. How often did you feel:*	
	…nervous? … hopeless? …restless or fidgety? …so sad or depressed that nothing could cheer you up? …that everything was an effort? …down on yourself, no good, or worthless?	All, Most, Some, or a Little of the Time; 1-5

Firearm Access. The NCS-R assessed the accessibility of firearm access by asking, "How many guns that are in working condition do you have in your house, including handguns, rifles, and shotguns?" For the current study, this measure was dichotomized to produce an indicator of any firearm access.

Mental Health Measures. Each year, NSDUH provides estimates of the severity of mental health problems using the prediction model discussed above. Based on the cut points derived from that model, severity of mental health problems is coded 0 ("No Disorder") for respondents who do not endorse any of the K6 items or whose prediction scores were below a threshold of around .0192, 1 ("Mild Mental Illness") for respondents with predicted SMI scores

were between the lower threshold and .066, 2 ("Moderate Mental Illness") for respondents whose scores were greater than .066 but below .236, and 3 ("Serious Mental Illness") for respondents with scores greater than .236. The NCS-R does not include the exact variables needed to replicate this indicator; however, I use a modified disorder severity index to distinguish mild, moderate, and severe disorders (see the Mental Disorders and Other Clinical Measures section of Paper I for a detailed description of this severity index). Both surveys provide comparable K6 items and indicators of past year inpatient treatment, other mental health treatment, and past year psychiatric medication use. The K6 items were reverse coded so that higher scores indicate higher psychological distress.

Additional Measures. In Paper I, criminogenic disinhibition was significantly associated with firearm access. Luckily, NSDUH includes risky and illegal behavior probes that can be used with a subset of the criminogenic disinhibition measure from NCS-R. NSDUH's items include: 1) "How often do you get a real kick out of doing things that are a little dangerous?;" 2) How often do you test yourself by doing something a little risky?;" 3) "During the past 12 months, how many times have you sold illegal drugs?;" and 4) "During the past 12 months, how many times have you stolen or tried to steal anything worth more than $50?"

The illegal selling of drugs and stealing measures were dichotomized and combined such that respondents were coded 0 ("No") if they reported never selling drugs or stealing, and 1 ("Yes") if they reported doing either one or more times. This measure is meant to be compatible with the NCS-R probe, "At times I have done things that could get a person arrested." A combination risky behavior item was dichotomized from NSDUH's risky and dangerous behavior probes, and respondents were coded 0 ("No") if they responded "Never" or "Seldom" to both items and were coded 1 ("Yes") if they responded "Sometimes" or "Always" to either

item. This item is comparable to the NCS-R probe, "I take chances and do reckless things." An additive measure of disinhibition—ranging from 0 to 2—was created in both datasets from these items.

Paper I also revealed the significant association between religious affiliation and firearm access. Unfortunately, NSDUH does not provide an affiliation probe. But there are comparable measures of religiosity in the two surveys. NCS-R respondents were asked: 1) "In general, how important are religious or spiritual beliefs in your daily life – very important, somewhat, not very, or not at all important?;" and 2) "When you have decisions to make in your daily life, how often do you think about what your religious or spiritual beliefs suggest you should do – often, sometimes, rarely, or never?" Similarly, NSDUH respondents were asked how much they agreed with the following statements (from strongly disagree to strongly agree): 1) "My religious beliefs are very important;" and 2) "My religious beliefs influence my decisions." I created additive measures of the two items in each dataset ranging from 0-6, with higher scores indicating higher religiosity.

Finally, several sociodemographic variables were included in the analyses. Across the two surveys, comparable measures were available for age, sex, race and ethnicity, marital status, education, annual household income, total number of household members, and number of minor children in the home. The coding for these variables was the same for both datasets. Age was recoded as an ordinal variable with the categories 18-25, 26-34, 35-49, 50-64, and 65+. Non-Hispanic white, Non-Hispanic black, Hispanic, Asian, and Other categories made up the race/ethnicity measure. Other refers to Native Americans, Alaskans, Hawaiians, and Pacific Islanders. Marital status included Married/Cohabitating, Divorced/Separated/Widowed, and Never Married. Education was ordinally coded Less than 12 Years, 12 Years, 13-15 Years, and

16+ Years. Household income was also ordinally coded Less than $20,000, $20,000-$49,999, $50,000-$74,999, and $75,000+. Finally, total number of household members and minor children were ordinally coded 1-6+ and 0-3+, respectively.

Estimation Strategy

All analyses reported here were conducted using Stata version 17.0 (StataCorp, 2019). First, I developed a prediction model for firearm access in the NCS-R using variables also available in NSDUH. This model was fit using logistic regression of the form:

$$\text{logit}\big(\pi(x)\big) = \log\big(\pi(x)\big) = \log\left(\frac{\pi(x)}{1-\pi(x)}\right) = \alpha + \boldsymbol{x\beta} \tag{2.1}$$

where $\pi(x)$ is the conditional probability of firearm access and $\boldsymbol{x\beta}$ is the vector of variable coefficients included in the model. This model included the individual composite weights to adjust for sampling characteristics and differential nonresponse. Predicted probabilities were then generated for gun access among the NCS-R sample. These predicted probabilities were evaluated against the direct gun access measure using the community contributed `diagt` command (Seed & Tobias, 2001) to determine the most appropriate cut point for positive access cases.

The best fitting model should be as parsimonious or robust as possible while also minimizing misclassification errors (orange-shaded cells in Table 2.2), and the subsequent prevalence estimates should be in line with other estimates (Aldworth et al., 2010). Let G denote the true state, firearm access = Yes, while ~G represents the true state, firearm access = No. If Y represents the results of a prediction model, these results can be classified according to their accuracy (Table 2.2). Following the methodology used to estimate SMI in NSDUH, the ideal cut

Table 2.2

Accuracy of Test Results by True Gun Access State

	G (1)	~G (0)
$Y = 1$	True Positive (TP)	False Positive (FP)
$Y = 0$	False Negative (FN)	True Negative (TN)

Note: Table adapted from Pepe (2003, p. 14).

point for the prediction model balances the false positives and false negatives, which has the effect of reducing bias in the estimator (CBHSQ, 2015). Once cut points were determined, I generated additional ROC statistics, including sensitivity $\left(\frac{TP}{P_{Y=1}}\right)$, specificity $\left(\frac{TN}{N_{Y=0}}\right)$, and area under the curve (AUC; the sum of sensitivity and specificity divided by 2).

Following the selection of a prediction model, further analyses can be conducted to simulate hypothetical changes in MHFLs. In these analyses, the cut point is treated as a proxy for the legal threshold distinguishing rights-disqualifying mental illness and rights-preserving mental illness or health. By shifting the cut point higher or lower, the size of the population affected by the hypothetical law(s) can be estimated. Due to NSDUH's public-use data restrictions, however, the simulation will only be able to model the potential effect of a law if every state were to adopt the change.

Results

Results from the prediction model estimations are presented in Table 2.3. The first super-column reports the results of the main effects model, and the model in the second super-column includes interaction effects between past year prescription medication and disinhibition, and sex and marital status. Modified model fit statistics, including the pseudo log-likelihood ($p\mathcal{L}$), Akaike's information criterion (AIC), Bayesian information criterion (BIC), and McFadden's

Table 2.3

Firearm Access Prediction Models

	Model			
	Main Effects		Interactions	
	Logit	SE	Logit	SE
Clinical Predictors				
K6 Score	-0.017*	(0.008)	-0.015†	(0.008)
Modified WHODAS-II Score	0.026	(0.020)	0.029	(0.019)
Inpatient Treatment	-0.409†	(0.231)	-0.357†	(0.203)
Mental Health Treatment	-0.588***	(0.118)	-0.580***	(0.118)
Psychiatric Medication	0.177†	(0.091)	0.627***	(0.116)
Additional Predictors				
Disinhibition	0.178**	(0.063)	0.268**	(0.077)
Religiosity	0.057*	(0.024)	0.063*	(0.025)
Sociodemographic Characteristics				
Age				
26-34	-0.014	(0.135)	0.013	(0.135)
35-49	0.084	(0.158)	0.097	(0.159)
50-64	0.140	(0.183)	0.187	(0.186)
65+	-0.293	(0.196)	-0.164	(0.203)
Male Sex	0.615***	(0.085)	0.306**	(0.095)
Marital Status				
Div/Sep/Widowed	-0.526**	(0.159)	-1.061***	(0.167)
Never Married	-1.026***	(0.129)	-1.310***	(0.193)
Race/Ethnicity				
Non-Hispanic Black	-0.495**	(0.174)	-0.483*	(0.183)
Hispanic	-1.203***	(0.304)	-1.208***	(0.301)
Asian	-1.508***	(0.370)	-1.467***	(0.378)
Other	-0.624*	(0.300)	-0.595†	(0.306)
Education				
12 Years	0.267*	(0.111)	0.261*	(0.119)
13-15 Years	0.111	(0.113)	0.105	(0.118)
16+ Years	-0.335*	(0.149)	-0.333*	(0.150)
Annual Household Income				
$20,000-$49,999	0.343***	(0.086)	0.301**	(0.089)
$50,000-$74,999	0.601***	(0.150)	0.585***	(0.153)
$75,000+	0.656***	(0.123)	0.649***	(0.122)
Total number of HH members				
2	0.324**	(0.110)	0.314**	(0.111)
3	0.289†	(0.162)	0.277	(0.166)
4	0.238	(0.219)	0.227	(0.220)
5	0.587*	(0.281)	0.537†	(0.285)
6+	0.068	(0.287)	0.015	(0.294)
Children in the Home				
One	-0.352*	(0.142)	-0.276†	(0.154)
Two	-0.588†	(0.302)	-0.512†	(0.301)
Three+	-0.671*	(0.321)	-0.573†	(0.336)

Table 2.3 Continued.

Interactions				
Psychiatric Medication x Disinhibition			-0.651***	(0.131)
Sex x Marital Status				
Div/Sep/Widowed			1.169***	(0.205)
Never Married			0.571*	(0.228)
Intercept	-1.208***	(0.229)	-1.177***	(0.217)
$p\mathcal{L}$	-3049.337		-3010.945	
AIC	6164.674		6093.890	
BIC	6381.894		6330.857	
McFadden's Adjusted R^2	0.109		0.120	

*** p<.001, ** p<.01, * p<.05, † p<.1

adjusted R^2 were generated using the community-contributed `fitstat` command (Long & Freese, 2014) to provide a comparison of the candidate prediction models. There is substantial agreement among the fit statistics indicating very strong support for the interaction model (reductions in $p\mathcal{L}$, AIC, and BIC, as well as increased adjusted R^2 statistics).

After calculating predicted probabilities for the interaction model, I conducted a series of classification analyses to determine the most appropriate cut point for firearm access. Predicted probabilities below the cut points were treated as non-events (i.e., guns = no) and those above the cut points were treated as events (i.e., guns = yes). ROC statistics are presented in Table 2.4 for two alternative cut points, .45 and .391. The smaller cut point was calibrated to minimize the differences in false positives and negatives. This method resulted in substantial overprediction of firearm access by disorder severity. For comparison, I also calibrated an alternative cut point using the disorder severity index. This yielded an optimal cut point of .45.

The two cut points demonstrate similar performance. Comparisons of their positive vs negative likelihood ratios and positive vs negative predictive values show that both are more accurately predictive of non-events than events. Both have marginal AUC statistics; however, AUC has been shown to be a poor measure of predictive accuracy, such as when subpopulation

Table 2.4

Final Probability Cutoffs from Classification Analysis

	Probability Cut Point			
	.45		.391	
Statistic	**Est.**	**95% CI**	**Est.**	**95% CI**
Prevalence [Pr(G)]	32.7%	(31.4%, 33.9%)	32.7%	(31.4%, 33.9%)
Sensitivity [Pr(+|G)]	54.4%	(52.1%, 56.8%)	66.6%	(64.3%, 68.8%)
Specificity [Pr(-|G)]	75.0%	(73.5%, 76.4%)	66.6%	(65.0%, 68.2%)
ROC Area [(Sens. + Spec.)/2]	0.65	(0.63, 0.66)	0.67	(0.65, 0.68)
Neg. Likelihood Ratio [Pr(+|G)/Pr(+|~G)]	2.18	(2.03, 2.34)	1.99	(1.88, 2.11)
Pos. Likelihood Ratio [Pr(-|G)/Pr(-|~G)]	0.61	(0.58, 0.64)	0.50	(0.47, 0.54)
Odds Ratio	3.58	(3.18, 4.04)	3.97	(3.52, 4.48)
Positive Predictive Value [Pr(G|+)]	51.4%	(49.0%, 53.7%)	49.2%	(47.1%, 51.2%)
Negative Predictive Value [Pr(~G|-)]	77.2%	(75.8%, 78.6%)	80.4%	(78.9%, 81.8%)
False Positive Rate [Pr(+|~D)]	**25.014%**		**33.389%**	
False Negative Rate [Pr(-|D)]	**45.554%**		**33.448%**	
Absolute Difference in False Rates	**20.540%**		**0.059%**	

Notes: Pr(G) = Probability of True Gun Access; P(~G) = Probability of True Non-HGO; Pr(+) = Probability of Estimated Gun Access; Pr(-) = Probability of Estimated Non-Access; Class analysis conducted on 5,336 observations, representing a population of 195,834,609 in weighted model.

estimates are of specific interest (i.e., when misclassification costs are unequal; Lobo et al., 2008) . The absolute difference in false rates between the two cut offs is substantial. The small absolute difference observed for a .391 cut off *should* result in an unbiased estimator for the whole sample; however, this is not the case.

Table 2.5 illustrates the comparative performance of the two candidate cut points and the direct measure. The cut point calibrated to false positives and negatives (.391) produces an estimate of firearm access for the total population that is roughly 10% higher than is observed in the data (45.86% vs 35.37%). Conversely, the cut point calibrated to the severity index (.45) produces an estimate that is within the standard error of the direct estimate (36.49%). Both cut points produce upwardly biased estimates of firearm access among people without any mental

Table 2.5

Prevalence of Firearm Access by Estimate

	Direct Estimate[a]	Prediction (.45)	Prediction (.391)
Measure	**% (SE)**	**% (SE)**	**% (SE)**
Disorder Severity			
No Disorder	25.52% (.0123)	28.16% (.0102)	33.98% (.0121)
Mild	4.73% (.0045)	4.61% (.0031)	6.01% (.0044)
Moderate	3.65% (.0025)	3.58% (.0029)	4.59% (.0026)
Severe	1.47% (.0013)	1.1% (.0012)	1.46% (.0140)
Total Access	35.37% (.0157)	36.49% (.0126)	45.86% (.0123)

[a] Weighted estimate based on a sample size of 5,562; Otherwise, weighted estimates based on sample size of 5,459.

health problems; however, the severity-calibrated estimator is much closer to the direct estimate (28.16% vs 25.52%) than the other estimator (33.98%). Overall, the severity-calibrated estimator outperforms the other estimator. That said, the .391 cut point provides a more accurate estimate of firearm access among individuals with severe mental illness; the .45 cut point underestimates access by .37% (which still falls within the direct estimate's standard error).

Estimation of Firearm Access Prevalence

To extrapolate the prevalence of firearm access among people with mental health problems, I applied the predicted probabilities generated from the prediction model directly to the NSDUH data (see Appendix Tables B.1-2 for descriptive statistics for each year of NSDUH). Next, I generated a gun access estimate for both candidate cut points. The annual prevalence estimates of firearm access by mental health status are reported in Table 2.6. Assuming no major change in the prevalence of firearm access across groups between the NCS-R study period (2001-2003) and 2009, the accuracy of the estimators appears to vary by

Table 2.6

Comparison of Firearm Access Prevalence by Cut Point Estimator

	Probability Cut Point = .45							
Year	**No Disorder**		**Mild Disorder**		**Moderate Disorder**		**Severe Disorder**	
2009	0.263	(0.004)	0.028	(0.001)	0.012	(0.001)	0.007	(0.001)
2010	0.255	(0.005)	0.025	(0.002)	0.010	(0.001)	0.009	(0.001)
2011	0.257	(0.004)	0.023	(0.002)	0.010	(0.001)	0.009	(0.001)
2012	0.243	(0.004)	0.023	(0.001)	0.013	(0.001)	0.009	(0.001)
2013	0.252	(0.005)	0.020	(0.001)	0.010	(0.001)	0.009	(0.001)
2014	0.253	(0.003)	0.021	(0.001)	0.010	(0.001)	0.008	(0.001)
2015	0.250	(0.004)	0.022	(0.001)	0.011	(0.001)	0.008	(0.001)
2016	0.246	(0.004)	0.021	(0.001)	0.011	(0.001)	0.008	(0.001)
2017	0.243	(0.003)	0.021	(0.001)	0.010	(0.001)	0.008	(0.001)
2018	0.240	(0.003)	0.020	(0.001)	0.011	(0.001)	0.008	(0.001)
2019	0.240	(0.005)	0.020	(0.001)	0.011	(0.001)	0.009	(0.001)
	Probability Cut Point = .391							
Year	**No Disorder**		**Mild Disorder**		**Moderate Disorder**		**Severe Disorder**	
2009	0.347	(0.004)	0.035	(0.002)	0.017	(0.001)	0.011	(0.001)
2010	0.341	(0.005)	0.034	(0.002)	0.014	(0.001)	0.012	(0.001)
2011	0.335	(0.004)	0.032	(0.002)	0.014	(0.001)	0.012	(0.001)
2012	0.325	(0.004)	0.031	(0.001)	0.017	(0.001)	0.012	(0.001)
2013	0.333	(0.005)	0.029	(0.002)	0.014	(0.001)	0.011	(0.001)
2014	0.332	(0.004)	0.029	(0.001)	0.014	(0.001)	0.011	(0.001)
2015	0.330	(0.004)	0.029	(0.001)	0.014	(0.001)	0.011	(0.001)
2016	0.325	(0.005)	0.029	(0.001)	0.014	(0.001)	0.012	(0.001)
2017	0.323	(0.004)	0.030	(0.001)	0.014	(0.001)	0.012	(0.001)
2018	0.319	(0.004)	0.028	(0.001)	0.014	(0.001)	0.011	(0.001)
2019	0.315	(0.005)	0.029	(0.001)	0.016	(0.001)	0.012	(0.001)

Note: Prevalence reported as % (SE); Estimates are weighted.

subpopulation. Interestingly, while the .45 estimator appears to provide more accurate estimates for the population of people with no disorders than the other estimator, the opposite appears to be true for the remaining groups. Prevalence estimates generated by the .391 estimator for the groups with mild, moderate, and severe disorders seem more in line with the NCS-R direct estimates. The differences over time may reflect changes in the composition of the population, such that the characteristics associated with firearm access are diminishing over time.

Alternatively, the underlying prediction model may not adequately account for the differences in firearm access by severity of disorder.

To rule out that possibility, I estimated an alternative prediction model adjusting for disorder severity. It is important to note that different inputs determine disorder severity in NSDUH than the index I created. That said, the alternative prediction model provided an additional robustness check for the .45 and .391 estimators. See *Supplemental Materials* for the regression results and resulting prevalence estimates. Overall, the alternative estimators produced similar patterns of results, suggesting that the estimated predicted probabilities are robust to different model specifications. That said, prevalence estimates derived from these models may still be biased. Luckily, the extent of the potential bias can be addressed during the policy simulations.

Simulations

To quantify the extent to which bias in the estimators could impact the results of the policy simulations, I re-estimated the total population prevalence of firearm access under extreme assumptions using data pooled across study years (Table 2.7). On the one extreme, I produced a series of prevalence estimates assuming 100% firearm access prevalence among each of the following populations: persons who 1) met criteria for moderate or severe mental disorders; 2) met criteria for any type of disorder and received any kind of mental health treatment in the past year; and 3) received inpatient psychiatric treatment in the past year, irrespective of mental health status. In other words, for each group, I set gun access to 1 ("Yes") and calculated the total prevalence. Next, I produced prevalence estimates assuming these populations had no access (i.e., gun access was set to 0 "No"). The far righthand column of

Table 2.7

Total Population Access Prevalence Under Different Assumptions

	Simulations		Observed
	Assuming 100% Group Access	Assuming No Group Access	Access Prevalence by Group
Effected Group	**% (SE)**	**% (SE)**	**% (SE)**
Disorder Severity			
Moderate	41.99% (.0014)	37.12% (.0015)	30.36% (.0053)
Severe	41.73% (.0014)	37.45% (.0014)	26.85% (.0048)
Any MH Treatment	44.64% (.0014)	36.10% (.0014)	27.87% (.0036)
Inpatient Treatment	39.41% (.0014)	38.36% (.0015)	12.17% (.0067)

Notes: Data pooled across observation years; Prevalence estimates obtained using the .391 estimator, which produces a total population prevalence of 38.60% (SE: .0015); Each observed prevalence is for the group, only.

Table 2.7 provides the observed prevalence estimates for each subpopulation. Using the .391 indicator, the total population prevalence observed in the pooled data is roughly 39%.

If we assume the true population prevalence of firearm access among people with moderate or severe mental disorders is 100%, the estimator can be said to underestimate access by almost 3.5%. Alternatively, if the true population prevalence is 0%, the estimator overestimates firearm access by between 1% and 1.5%. The potential effect of bias is most acute for community-based mental health treatment. To avoid being overinclusive, I restricted my mental health treatment simulation to people who also qualified for at least a mild disorder. Presumably, doing so limits the simulation to people with more substantial mental health problems, as opposed to including the *worrying well*.[12] Even still, overall access is sensitive to varying conditions among people seeking community-based treatment. Specifically, the .391 indicator may have underestimated the total firearm prevalence by 6% under the mental health

[12] This is not meant pejoratively; rather, this encompasses a group of mental health service clients who do not experience the significant distress or functional impairment aspects commonly associated with mental illness.

treatment total access condition. In contrast, manipulation of access conditions for people who received inpatient treatment did not reveal substantial differences. This is due to the low prevalence of inpatient treatment across study years (pooled proportion: 1.05%, SE: .0002).

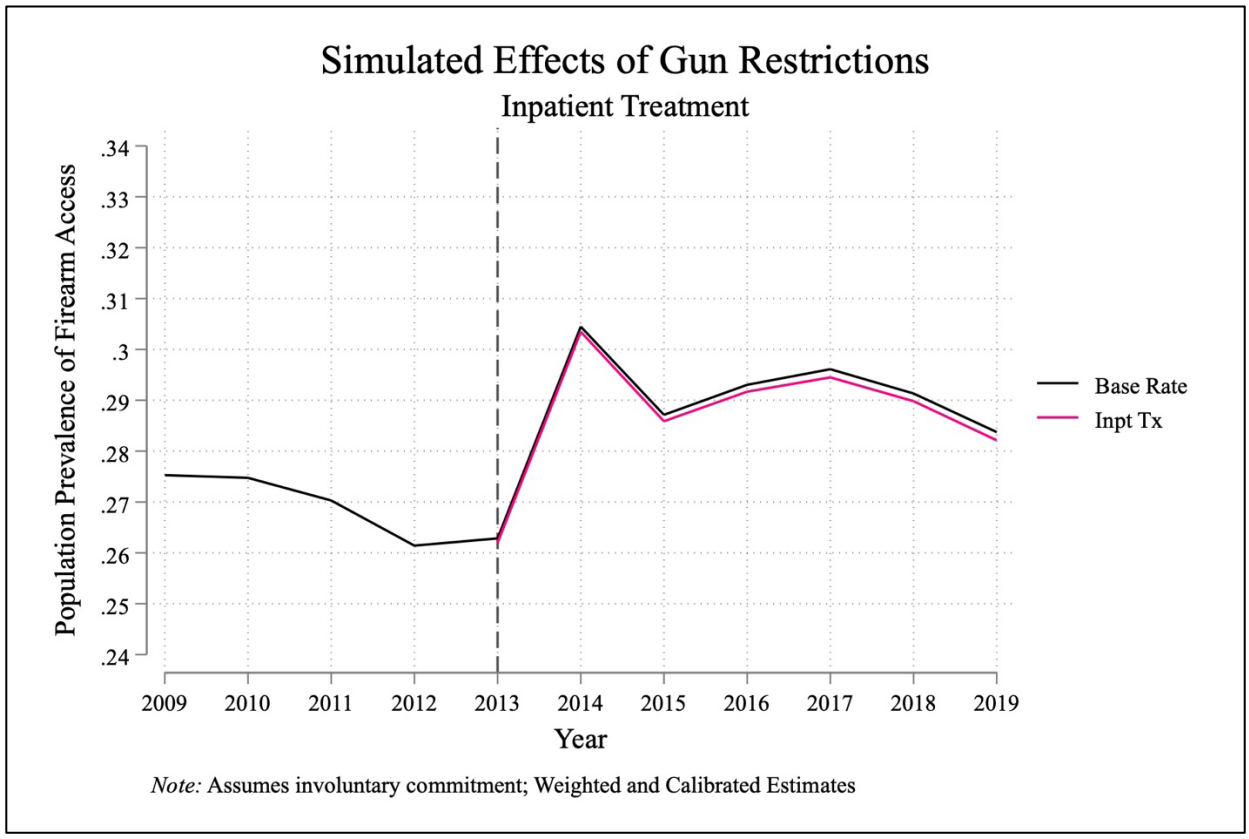
This comparison demonstrates that estimated policy effects produced by the .391 indicator will be robust for the subpopulation most targeted by existing MHFLs (i.e., people who receive inpatient treatment) and those for whom enhanced restrictions may be the most likely (i.e., people with moderate or severe disorders). The results with respect to community-based mental health treatment suggest that simulations involving people with mild to severe disorders may not be produce reasonably precise prevalence estimates. Therefore, the following policy simulations are limited to people who meet criteria for moderate or severe disorders and those with inpatient treatment histories. See *Supplemental Materials* for total and subpopulation prevalence point estimates under each condition. Finally, the simulations are generated using the .391 indicator. Doing so will generate larger estimated policy effects under more liberal conditions, which amounts to simulating the largest policy effects possible.

Current Policy Conditions

Despite some variability in their language, most existing MHFLs prohibit firearm access among people with serious mental illnesses only after some disqualifying treatment event or judicial finding. To illustrate the impact of these laws, I simulated the change in aggregate firearm access as a function of involuntary inpatient commitment. The simulation assumes that every instance of inpatient treatment is involuntary and, therefore, disqualifying. Figure 2.2 demonstrates the change in firearm access were the GCA's prohibitions to go into effect beginning in 2013. The base rate calculation accounts for predicted firearm access among people who received inpatient treatment. The "Inptx Tx" line estimates the total prevalence after

Figure 2.2

Simulation of Effect of Current Policy on Firearm Access



setting firearm access for this group to 0 ("No Access"). Note the prevalence scale ranges from .3-.38. Were the scale to range from 0-1 or even 0-.5, the lines would be indistinguishable. In other words, the reductions in total firearm access associated with civil commitment prohibitions appear to be negligible.

Alternative Policy Conditions

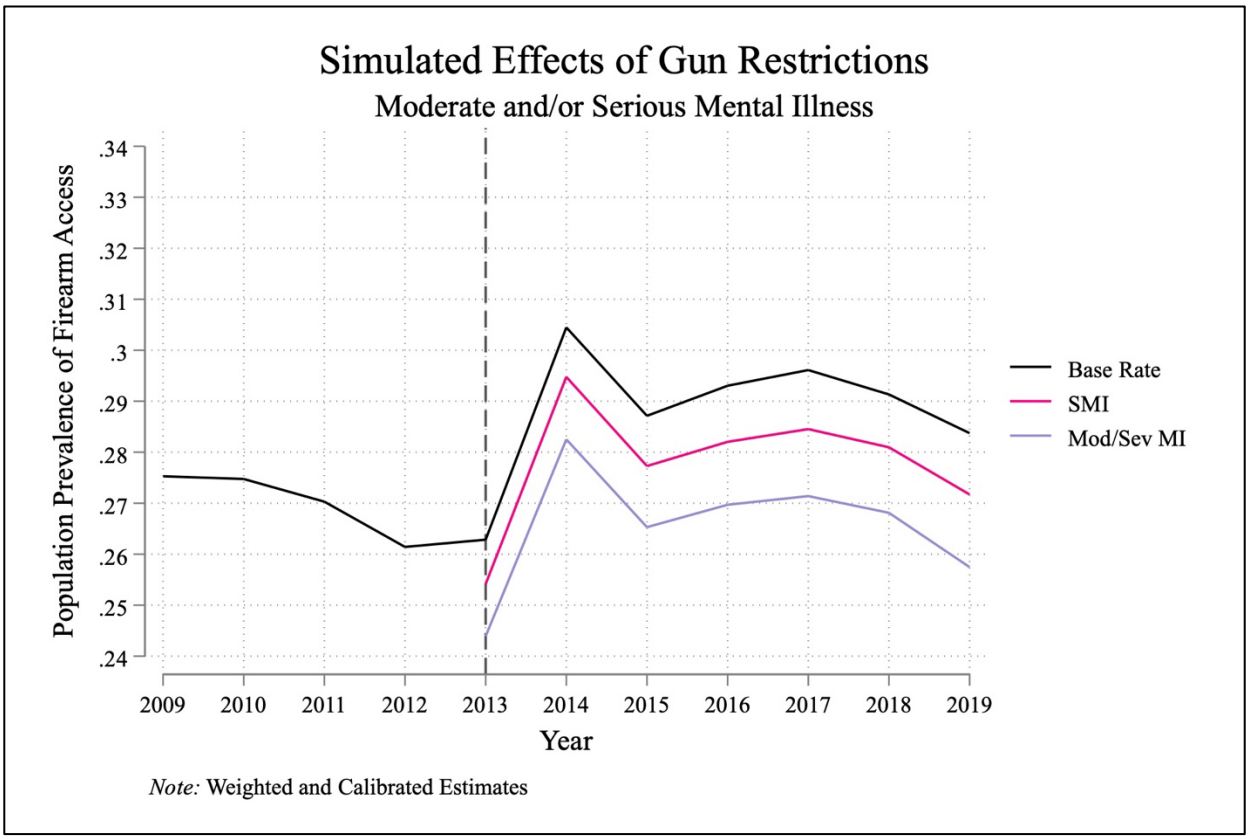
Perhaps more substantial reductions in firearm access could be realized by expanding the criteria for disqualification. Recall that Hawaii's MHFL prohibits firearm possession by anyone who has been diagnosed with a significant behavioral, emotional, or mental disorder "as defined

by the most current diagnostic manual of the American Psychiatric Association…," (subsection (3)(c) of "Haw. Rev. Stat. § 134-7," 1990). Let us assume this statute is applicable to anyone who meets NSDUH's criteria for a moderate or severe mental illness. As with the previous simulation, I estimated aggregate prevalence rates under three conditions: 1) the observed prevalence (i.e., the base rate); 2) the hypothetical population prevalence if everyone with a serious mental disorder was to become a prohibited possessor beginning in 2013 (i.e., setting their probability of access to 0 "No Access"); and 3) the hypothetical prevalence if the this prohibition were to include moderate mental illness as well.

Figure 2.3 illustrates the potential change in overall firearm access prevalence if every state were to implement MHFLs consistent with the Hawaii statute in 2013. Again, it is important to keep in mind that the entire prevalence scale is less than 10% wide. Even assuming perfect surveillance and implementation of this hypothetical law, its total possible effectiveness also appears limited. Any reduction in access stemming from this type of policy would also come at a price. Currently, a small minority of Americans are subject to MHFLs (recall that less than 3% of total NICS denials involve civil commitments). Widespread adoption of MHFLs like this would necessarily result in a substantially larger portion of the public becoming subject to rights restrictions at some point over the lifecourse. Estimates from the 2019 NSDUH reveal that, while only about 1.3% (SE: .0006) of the adult population experienced past year inpatient treatment, almost 11% met criteria for a current moderate or serious mental illness. Data from the NCS-R suggest roughly 8% of adults in the U.S. will receive inpatient psychiatric treatment at some point in their lives, and roughly 50% will meet criteria for one or more mental disorders (Kessler et al., 2005).

Figure 2.3

Simulation of Effect of Expanded Disqualifying Criteria on Firearm Access



Discussion

Very little is known about the prevalence of firearm access among people with mental illnesses (Ahonen et al., 2019), and even less is known about the extent to which they become subject to MHFLs. Given trends in the types of state laws passed since the GCA, it is reasonable to assume that *most* people who become prohibited for non-criminal mental health reasons do so following involuntary civil commitment. Because so few states provide statistics to the public, we also know very little about how many people are civilly committed (Morris, 2020). The near

total absence of data at the intersection of mental health and firearm policies is a barrier to the evaluation of MHFLs, and they *should* be evaluated.

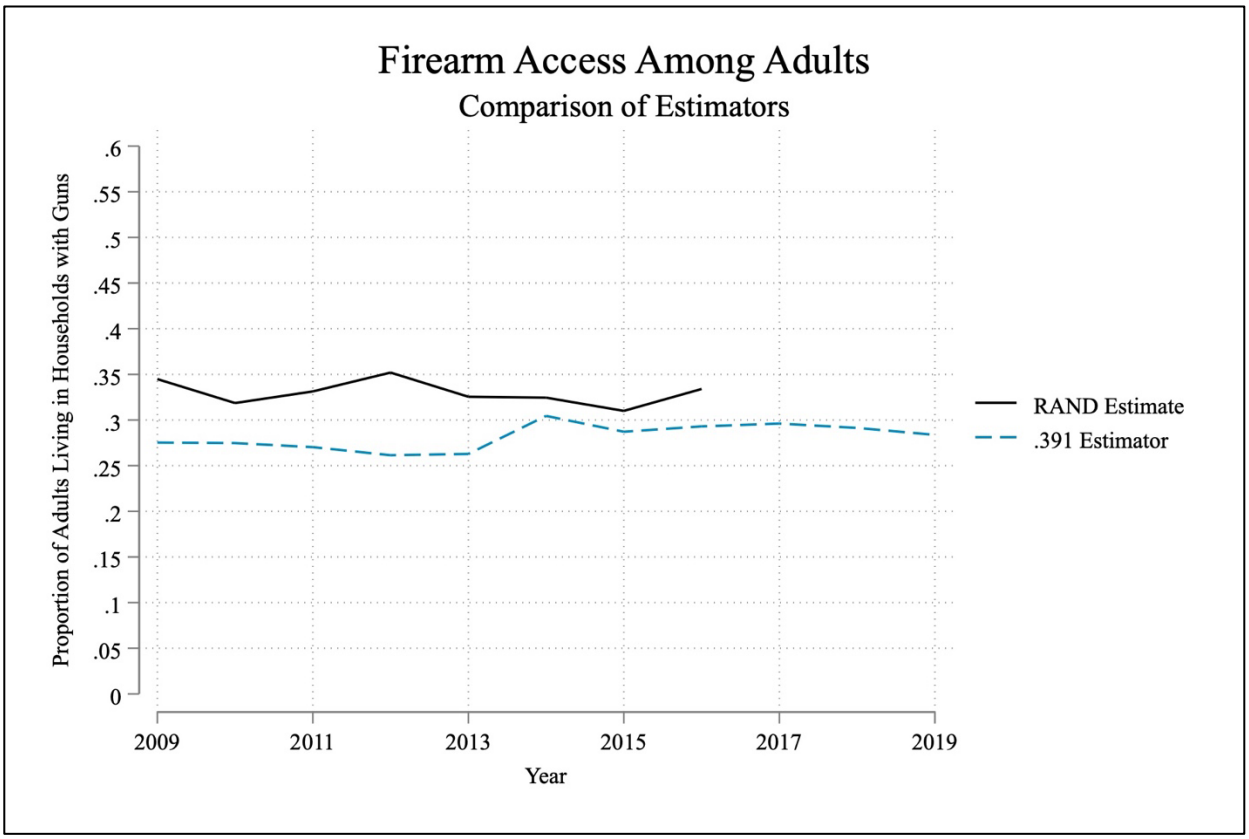
My dissertation was motivated by this problem and by the challenge to develop "creative linkages" between traditionally disparate data sources to advance firearm-related research (Powell & Sacks, 2020). To that end, I exploited similarities between the NCS-R and NSDUH to estimate how many people who have mental illnesses may also have access to firearms and, consequently, how many could be impacted by various MHFLs. General population estimates of firearm ownership have previously been developed by RAND Corporation (Schell et al., 2020), but to my knowledge, this is the first study to produce estimates for subpopulations with mental health problems. RAND's estimates for 2009-2016 (the last year estimated) range between 30% and 35%. Although there appear to be differences in the year-to-year prevalence fluctuations between the total population prevalence reported here and the RAND estimates (Figure 2.4), the estimates are generally similar.

Overall, results from the simulations suggest the potential of MHFLs to reduce firearm access are likely limited. The current trend of prohibiting firearm access following civil commitment does not appreciably impact the prevalence of access. The simulations point to limited effectiveness even when the restriction criteria are expanded such that a diagnosis (i.e., mental health *status*) triggers prohibition. What does change appreciably is the proportion of the population that would potentially be subject to rights restrictions under such a regime. It is hard to imagine another instance in which 1 in 10 Americans would be denied Constitutionally protected rights without ever having committed a crime.

The expansion of MHFLs to encompass more people with mental illnesses might be justified if there were evidence to suggest doing so could appreciably reduce firearm-related

Figure 2.4

Comparison of Firearm Access Estimates



homicides and suicides. But such evidence is elusive. One study examining the effects of Hawaii's firearm regime and geographic isolation on homicide and suicide rates is instructive. Peters et al. (2005) examined homicide and suicide rates in Hawaii during the two decades before and after passage of a mandatory waiting period law in 1981. Their study did not consider Haw. Rev. Stat. § 134-7 (i.e., Hawaii's MHFL); however, their findings hint at the comparative effectiveness of MHFLs. In the year immediately following passage of the mandatory waiting period law, there was a relatively sharp decline in the homicide rate (p. 78, Figure 1). If expansive MHFLs like the one passed by Hawaii in 1990 are similarly effective, we

should expect to see post-passage reductions in homicide and suicide rates similar to those observed for the waiting period law. If, on the other hand, the simulations presented here are indicative of the limited potential for such laws to appreciably impact the prevalence of access, we would not expect such a decrease. Consistent with my simulations, the data presented by Peters et al. (2005) do not show a drop in either homicide or suicide rates in the years immediately following passage of Haw. Rev. Stat. § 134-7 in 1990.

Conclusion

This study, while novel, is not without its limitations. First, the extrapolation of firearm access among people with mental illnesses from NCS-R to NSDUH assumes that the characteristics predictive of access in 2003 remained unchanged over the next 16 years. Unfortunately, data from NCS-R provide the most current, nationally representative picture of firearm access among this population. That said, some recent (pre-COVID) research on firearm ownership trends in the general population suggests that, when all firearms are considered, longstanding demographic trends persist (Azrael et al., 2017). Moreover, two underlying assumptions of MHFLs are: 1) mental illness is related to problematic firearm access; and 2) this relationship is static. Consequently, I believe the assumption that the prediction model remained valid throughout the study period is acceptable, if not warranted. Second, the data utilized in this study come from self-reports and, as such, may suffer from response bias. Reliability studies built into certain NSDUH studies suggest acceptable reliability among the mental health measures over the years analyzed here (Center for Behavioral Health Statistics and Quality, 2018b). The only criticisms regarding the reliability of NCS-R data relate to measures used to identify substance use and dependence disorders (e.g., Cottler, 2007), which were not used in this study. Finally, and perhaps most importantly, the prediction model was derived from data

collected after the enactment of the GCA and Brady Act. Consequently, the low observed prevalence of access among people with inpatient treatment histories may already reflect the effect of those laws. The NCS-R did not collect information on the legal circumstances surrounding inpatient treatment, so it is not possible to quantify the extent to which restrictions already in place reduced firearm access. However, during the study administration period (2001-2003), only a little over half of the states had adopted standalone MHFLs, and only 13 states reported mental health records or mental health-related prohibited person records to NICS (Federal Bureau of Investigation, 2004). Another possibility is that, while the prediction model may reflect relatively unfettered firearm access among prohibitable persons, state adoption of MHFLs and increased NICS reporting over the NSDUH study period reduced access among this population. Consequently, my estimates would be higher than the true subpopulation prevalence. If this were the case, the simulated effects reported here would represent overly optimistic assessments of the efficacy of MHFLs in reducing the overall prevalence of firearm access.

More (comprehensive) data is desperately needed. Given what data is currently available, this study has proffered the best possible estimations of firearm access in the context of mental illness and the potential reach of various MHFLs, but they are still shots in the dark. Updated, direct estimates of firearm access among the subpopulations impacted by these laws (i.e., those who experience civil commitments or have mental illnesses) are necessary to evaluate the stability of characteristics predictive of access. Measures of inpatient treatment currently captured by studies such as NSDUH should be expanded to distinguish between voluntary and involuntary civil commitments. Perhaps NSDUH's *Special Topics* section could be expanded to include questions about firearm access, acquisition, and use. This, coupled with more

comprehensive treatment measures, would go a long way to help us understand firearm-related experiences in the context of mental illness.

Paper III: Serious Mental Illness and the Consequences of Firearm Access

Reprinted from:

Baumann, M. L., & Teasdale, B. (2018). Severe mental illness and firearm access: Is violence really the danger? International Journal of Law and Psychiatry, 56, 44-49.

Introduction

In the aftermath of each of an increasing number of mass shootings in the United States, debate over the link between mental illness and gun violence continues to dominate American public discourse (Coverdale, Coverdale, & Nairn, 2013; McGinty, Webster, & Barry, 2014; Metzl & MacLeish, 2015; Rosenberg, 2014). In fact, some argue that stronger restrictions on firearm access by individuals with severe mental illness constitute effective and acceptable means of combatting America's gun violence epidemic that warrant more legislative focus (Kliff, 2012; Metzl & MacLeish, 2015; Slack, Singer, & Kelly, 2015). Contrary to these claims, there is little evidence to suggest that mental illness contributes to more than 3-5% of all violent crime (Fazel & Grann, 2006), and there is even less evidence to suggest that mental illness is a primary cause of gun-involved crime, including homicide (Knoll & Annas, 2015; McGinty & Webster, 2015). On the other hand, mental illness is a major contributing factor to suicide (Li, Page, Martin, & Taylor, 2011), which in the United States most often involves the use of a firearm (Curtin, Warner, & Hedegaard, 2016; Webster & Wintemute, 2015).

Despite the attention mass shooting incidents garner, the role of mental illness in interpersonal gun violence remains ambiguous. While violence among the mentally disordered appears to be rare in the absence of specific symptom clusters or other general criminogenic risk factors (Elbogen & Johnson, 2009; Link, Andrews, & Cullen, 1992), it is unclear whether these factors or disordered status, alone, impart increased risk for interpersonal gun violence perpetration. This empirical vacuum is partially due to a lack of data available to assess

similarities and differences between disordered individuals and non-disordered community-based comparison samples. Limited by a paucity of data to assess these questions empirically, the scholarly discourse has largely been editorial (e.g., Gold, 2013), descriptive (e.g., Steadman, Monahan, Pinals, Vesselinov, & Robbins, 2015), or indirect (e.g., Swanson, McGinty, Fazel, & Mays, 2015). That said, a slowly growing body of research is beginning to challenge the popular conception of the American gun violence epidemic as rooted in psychiatric problems.

This research indicates that gun violence perpetrated by the mentally ill is rare, is often associated with non-psychiatric risk factors, and is substantively different from gun violence perpetrated by the non-disordered (Matejkowski, Fairfax-Columbo, Cullen, Marcus, & Solomon, 2014; Steadman et al., 2015). For example, data from the MacArthur Violence Risk Assessment Study, a yearlong longitudinal analysis of individuals with severe mental illness recently discharged from inpatient psychiatric care facilities, revealed a two percent prevalence of violence involving the use of a firearm (Steadman et al., 2015). Furthermore, the researchers reported that gun violence against strangers was even more rare (1%), a finding contradictory to media portrayals of mental illness as the primary driving force behind mass shootings in America (Coverdale et al., 2013).

Overall, available research suggests that gun violence risk among individuals with severe mental illness, like their risk for violence more generally, is relatively concentrated among a small portion of the disordered population who exhibit various clinical and extra-clinical characteristics. Conversely, the greatest risk that individuals with severe mental illness who have firearm access face is suicide (Swanson et al., 2015). In fact, evidence suggests that mental illness may imbue a lifetime, increased risk of suicide (Dutta et al., 2010); however, the effect of

firearm access on disordered individuals outside the context of acute mental health crises is less understood.

Despite the lack of evidence upon which to base legislative responses to the problem of gun violence in America, several laws and executive orders have been implemented that directly impact firearm access among individuals with severe mental illness. Most notably, the federal Gun Control Act of 1968 (GCA; 18 U.S.C. § 922) prohibits access to firearms by specific classes of individuals, including those who have been adjudicated mentally unfit or who have been involuntarily committed to mental institutions. These restrictions are enforced, at least in theory, through the reporting and sale restriction mechanisms of the Brady Handgun Violence Prevention Act of 1993 (18 U.S.C. § 922(t)), which explicitly prohibits the sale or transfer of firearms by federally licensed dealers to disqualified persons and establishes a federal database of individuals who meet the disqualifying criteria outlined in the GCA. While many state and federal rules require a person to be adjudicated as "dangerous" to be disqualified from firearm access, federal rules under the Obama administration expanded disqualification criteria to include any individuals receiving Social Security benefits for mental health problems, so long as they required financial management assistance (Eilperin & Nakamura, 2016). The U.S. Congress has since overturned this rule, sparking renewed debate over the appropriateness of firearm access among individuals with severe mental illness, irrespective of dangerousness (Vitali, 2017).

In summary, limitations on gun violence research have largely stymied the development of empirical research devoted to clarifying the role of mental illness in gun violence perpetration. That said, recent studies indicate that interpersonal gun violence is exceptionally rare (Steadman et al., 2015; Swanson et al., 2016), while suicide risk is disproportionately high (Dutta et al.,

2010; Hiroeh, Appleby, Mortensen, & Dunn, 2001), among this population. Still, questions remain regarding how firearm access impacts this population as compared to others. In the face of this empirical uncertainty, state and federal lawmakers continue to pass legislation and implement guidelines that directly impact the ability of individuals with severe mental illness to access firearms in the United States. Without more robust research, stakeholders will be unable to effectively inform the legislative process. Thus, this study's aim is to assess: (a) whether firearm access increases the odds of interpersonal violence and/or suicidality among a sample of individuals with severe mental illness living in the community; and (b) whether the increased risk, if any, is disproportionate compared to a comparison group of non-disordered individuals from the same neighborhoods.

Methods

The current study uses data from the first follow-up wave of the MacArthur Violence Risk Assessment Study (MacRisk). This study provides data on numerous clinical, social, and behavioral characteristics of interest here, including firearm access, symptomatology, disorder-related functioning, violence perpetration, and suicidality. The inclusion of a census tract-matched, non-disordered community comparison sample at one site during the first follow-up period allows us to address the main question of interest here: does firearm access present a *greater* risk of violence perpetration and/or suicidality for disordered individuals than for others?

Samples

Using a stratified random sampling technique, eligible MacRisk study participants were recruited from the inpatient admissions rosters of mental health facilities in three cities, including Pittsburgh, Pennsylvania, between 1992 and 1994 (Steadman et al., 1998). Patients were considered eligible for study inclusion if they (a) were between the ages of 18 and 40 years old;

(b) spoke English; (c) were White or Black; (d) were civilly admitted; and (e) had received primary diagnoses of schizophrenia, schizoaffective or schizophreniform disorders, major depressive disorders, mania, psychotic or delusional disorders, substance use disorders or dependence, or personality disorders. A detailed description of the study design and methods may be found elsewhere (Monahan et al., 2001; Steadman et al., 1998).

At the Pittsburgh site, researchers recruited a community comparison group that provided data during the first follow-up period. This sample was matched to the Pittsburgh patient sample by distribution of census tracts. Like the patient sample, eligible subjects were between 18 and 40 years old and were either Black or White. Unlike the patient sample, community respondents who had been treated in psychiatric facilities in the prior ten weeks were excluded. The community comparison group received several of the same clinical instruments and questionnaires as the patient sample, making it possible to compare risk factors for violence across the two groups.

Thus, analyses in the current study were limited to data collected from the Pittsburgh participants during the first follow-up. Restricting data analysis by time and location allowed us to directly compare the impact of firearm access on both disordered and non-disordered individuals from the same community during the same time period. Of the 829 cases that provided data on the dependent variables of interest, 84 were missing data on one or more of the independent variables assessed in the analyses. To maintain a constant *n* across each of the analyses, subjects with missing data for any of the variables of interest were excluded, leaving 745 subjects (community sample, n=490; patient sample, n=255). Subsequent analyses did not reveal any significant differences on either of the outcome variables between the missing cases and the cases included in this study.

Measures

Interpersonal Violence. MacRisk utilized the Conflict Tactics Scale (Gelles & Straus, 1988) to determine whether and to what extent participants had engaged in a number of violent and aggressive acts (e.g., biting, choking, kicking) over the previous ten weeks. For the current study, we created a dichotomous indicator of any violent or aggressive behavior over the prior 10 weeks.

Suicidality. Suicidality was assessed using a number of questions about suicidal thoughts or behaviors over the prior ten weeks. A substantial body of research indicates that firearm access increases risk for completed suicide (Miller, Swanson, & Azrael, 2016); however, data limitations prevented us from examining either completed or attempted suicides involving firearms. Thus, we restrict our analysis to the following question: "[Over the last 10 weeks] have you ever thought of hurting yourself?"

Firearm Access. Respondents were asked a series of questions to determine their access to various weapons. If a respondent indicated access to a weapon, whether through ownership or availability, researchers probed to determine whether the type of weapon(s) accessible included a firearm. From these data, we created a dichotomous indicator of firearm access.

Clinical Variables. In each analysis, we include a dummy variable identifying patient status. Psychiatric symptom severity was assessed using the Brief Psychiatric Rating Scale (BPRS), an 18-item instrument with 7-point Likert scoring (Overall & Gorham, 1988). We use a total BPRS measure that was calculated as the sum of scores for all items. Additionally, MacRisk provided an indicator of overall functioning and disorder-related impairment using the Global Assessment of Functioning (GAF) scale (APA, 1981). The GAF is a 100-point, clinician-rated instrument assessing individuals' overall levels of psychological, social, and

occupational functioning. Clinicians assign participants scores between 1 and 100, with 1 indicating severe impairment and 100 indicating no impairment (Pederson & Karterud, 2012). Research indicates that inpatient populations generally score between 1 and 40 and outpatient populations typically score between 31 and 70 (Endicott, Spitzer, Fleiss, & Cohen, 1976).

Drug and Alcohol Use. During the study interview, patient and community respondents were given the Michigan Alcohol Screening Test (MAST; Selzer, 1971) and the Drug Abuse Screening Test (DAST; Skinner & Allen, 1982) inventories to determine the extent and severity of their drug and alcohol use over the previous 10 weeks. We utilize one dichotomous indicator from each inventory to identify the use of any alcohol or drugs during the past ten weeks. Specifically, the items we utilized asked respondents "Since (your last interview), have you had any alcoholic drinks?" and "Since (your last interview), have you used any street drugs, even if it was just one time?" We did not use any of the other items drawn from the MAST or DAST.

Control Variables. We included several sociodemographic controls that have been implicated as predictive of violence among disordered and non-disordered populations in previous research (Elbogen & Johnson, 2009; Eronen, Angermeyer, & Schulze, 1998), including age, sex, race, education, employment, and marital status. Dummy variables, "Black" and "Male," were used to represent race and sex, respectively. A dichotomous indicator of educational attainment was created to identify whether respondents had attained at least a high school diploma. The employment measure captured the number of days respondents worked over the previous 10 weeks. Finally, marital status was dichotomized to indicate whether or not respondents were married at the time of their interviews.

Data Analyses

We began by reporting descriptive statistics for the combined sample. To identify differences between the two groups, we then performed t-tests and χ^2 tests for each of the continuous and categorical variables included in the analyses, respectively. Next, we conducted a series of stepwise multivariate analyses to assess the impact of firearm access on interpersonal violence perpetration and suicidality. First, we ran a binomial logistic regression model predicting interpersonal violence with firearm access and patient status included as key independent variables. Next, we reran the model including an interaction term to assess the impact of firearm access by patient status on interpersonal violence. These steps were then repeated with suicidality as the dependent variable. To aid in the interpretation of each of the multivariate analyses, the BPRS, GAF, and age variables were mean centered. This is a common practice when examining variables that do not have meaningful zero values (for example, age). Centering does not change the interpretation of the variables' slope parameters; rather, it shifts the intercept parameters from uninterpretable "0's" to the study population's mean scores. Thus, the slope of a centered variable is said to be the incremental change over the mean value, rather than over zero. SPSS statistical software, version 21.0, was used to run all analyses.

Results

Descriptive and Bivariate Results

Table 3.1 provides the descriptive statistics for the entire sample (Column 1), as well as for the patient and community samples (Columns 2 and 3, respectively). As a whole, 15.3% of the study sample reported firearm access during the recall period. Twenty-three percent of respondents reported engaging in interpersonal violence, and 21.5% reported suicidality. The majority of the sample (69.5%) consumed alcohol over the preceding 10 weeks, and 25.6% took

Table 3.1

Descriptive Statistics

Variables	Overall Sample M or No. (%)	Patient Sample M or No. (%)	Community Sample M or No. (%)	Sig
No. of Observations	745	255	490	N/A
Outcome Variables				
Interpersonal Violence	175 (23.5)	87 (34.1)	88 (18.0)	<.001
Suicidality	160 (21.5)	112 (43.9)	48 (9.8)	<.001
Predictor Variables				
Firearm Access	114 (15.3)	26 (10.2)	88 (18.0)	<.01
BPRS	26.73	30.83	24.60	<.001
GAF	61.89	45.88	70.22	<.001
Alcohol Use	518 (69.5)	159 (62.4)	359 (73.3)	<.01
Drug Use	191 (25.6)	76 (29.8)	115 (23.5)	0.060
Control Variables				
Age	30.85	30.44	31.07	0.183
Male Sex	327 (43.9)	146 (57.3)	181 (36.9)	<.001
Black Race	291 (39.1)	92 (36.1)	199 (40.6)	0.229
Education	659 (88.5)	207 (81.2)	452 (92.2)	<.001
Employment	21.74	11.01	27.32	<.001
Marital Status	169 (22.7)	29 (11.0)	141 (28.8)	<.001

Abbreviations: BPRS = Brief Psychiatric Rating Scale; GAF = Global Assessment of Functioning Scale.

illegal drugs. With the exception of age, race, and drug use, the patient sample differed significantly from the community sample.

Patient respondents were significantly less likely to report firearm access (10.2% vs. 18%, p<.01) and alcohol use (62.4% vs. 73.3%, p<.01), whereas the community sample was less likely to report violence (18% vs. 34.1%, p<.001) and suicidality (9.8% vs. 43.9%, p<.001). The mean BPRS score was also significantly higher for the patient sample than for the community sample (30.83 vs. 24.6, p<.001), while their mean GAF score was lower (45.88 vs. 70.22, p<.001). In other words, patients experienced significantly higher levels of distressing symptomatology and significantly lower overall functioning. This distinction is important, because comparison of patient and community groups with similar symptomatology and

functioning scores could introduce misclassification bias and limit the utility of our results. Given the significant differences between the two groups on key mental health-related variables, the patient and community comparison groups appear sufficiently different to warrant subsequent comparative analysis.

The sociodemographic characteristics of the two samples also differed significantly. While both the patient and community groups were similar in age and race, the patients were more likely to be male (57.3% vs. 36.9%, p<.001) and were less likely to be married (11% vs. 28.8%, p<.001). Patients were less likely to report attaining a high school diploma (81.2% vs. 92.2%, p<.001); however, most respondents did complete high school (88.5% overall). Patients also averaged fewer days at work over the recall period than the community respondents (11.01 days vs. 27.32 days, p<.001).

Multivariate Analyses of Interpersonal Violence

Table 3.2 depicts the models examining the impact of firearm access on interpersonal violence perpetration. The main effects model (Model 1) reveals a marginally significant relationship between firearm access and violence (OR=1.628, p=.063). Additionally, drug use and higher BPRS scores were both significantly associated with increased odds of violence perpetration (OR=1.927, p=.002; OR=1.060, p<.001, respectively). For ease of interpretation, we calculated the standardized partial odds ratios (e^b*SD) and found that a one standard deviation increase above the average BPRS score was associated with a 55% increase in the odds of violence. Patient status, on the other hand, was not associated with violence in this model.

Further analysis of the possible relationship between patient status and firearm access shows no indication that firearm access among the patient sample was associated with an increase in odds of violence (Model 2). Rather, firearm access, drug use, increased

Table 3.2

Logistic Regressions Predicting Interpersonal Violence

	Model 1		Model 2	
Predictor Variables	OR	CI	OR	CI
Firearm Access	1.628 †	(0.973, 2.723)	1.937 *	(1.042, 3.599)
Patient Status	1.373	(0.836, 2.256)	1.470	(0.878, 2.462)
Suicidality	1.352	(0.839, 2.179)	1.383	(0.856, 2.233)
BPRS	1.060 **	(1.029, 1.091)	1.059 **	(1.028, 1.091)
GAF	.993	(0.979, 1.008)	.993	(0.979, 1.008)
Alcohol Use	1.338	(0.850, 2.107)	1.351	(0.857, 2.128)
Drug Use	1.927 **	(1.261, 2.942)	1.972 **	(1.288, 3.020)
Interaction Term				
Firearm Access by Patient Status	–		0.588	(0.196, 1.764)
Control Variables				
Age	.925 **	(0.897, 0.955)	.925 **	(0.896, 0.954)
Male	.869	(0.587, 1.288)	.875	(0.590, 1.297)
Black	1.717 *	(1.132, 2.603)	1.734 **	(1.143, 2.630)
Education	.829	(0.473, 1.455)	.842	(0.479, 1.481)
Employment	1.000	0.990 , 1.009)	.999	(0.990, 1.009)
Marital Status	.871	(0.501, 1.515)	.858	(0.196, 1.764)

Note: BPRS, GAF, and Age are mean centered.

**p<.01; *p<.05; †<.10.

symptomatology, younger age, and Black race were associated with increased odds of violence perpetration, holding constant patient status. Importantly, patient status was not a significant, independent predictor of violence perpetration in these analyses, even in the context of firearm access. Moreover, the interaction effect was not significant, indicating that the impact of access to a firearm on violence did not differ for patients and community respondents.

Multivariate Analyses of Suicidality

Analyses exploring the effect of firearm access on suicidality revealed a markedly different story (Table 3.3). In the main effects model (Model 1), firearm access was not

Table 3.3

Logistic Regressions Predicting Suicidality

	Model 1		Model 2	
Predictor Variables	OR	CI	OR	CI
Firearm Access	.989	(0.528, 1.851)	.492	(0.184, 1.320)
Patient Status	2.498 **	(1.460, 4.275)	2.104 **	(1.207, 3.668)
Interpersonal Violence	1.359	(0.834, 2.214)	1.376	(0.841, 2.249)
BPRS	1.034 *	(1.003, 1.067)	1.034 *	(1.003, 1.067)
GAF	.952 **	(0.937, 0.968)	.952 **	(0.937, 0.968)
Alcohol Use	1.220	(0.746, 1.995)	1.204	(0.736, 1.969)
Drug Use	.902	(0.539, 1.509)	.839	(0.497, 1.415)
Interaction Term				
Firearm Access by Patient Status	–		4.690 *	(1.147, 19.172)
Control Variables				
Age	.967 †	(0.933, 1.002)	.969 †	(0.934, 1.004)
Male	.628 *	(0.402, 0.979)	.617 *	(0.394, 0.967)
Black	.575 *	(0.354, 0.932)	.559 *	(0.344, 0.908)
Education	1.670	(0.858, 3.248)	1.584	(0.815, 3.076)
Employment	1.005	(0.994, 1.016)	1.006	(0.995, 1.016)
Marital Status	.884	(0.487, 1.604)	.901	(0.494, 1.640)

Note: BPRS, GAF, and Age are mean centered.

**p<.01; *p<.05; †<.10.

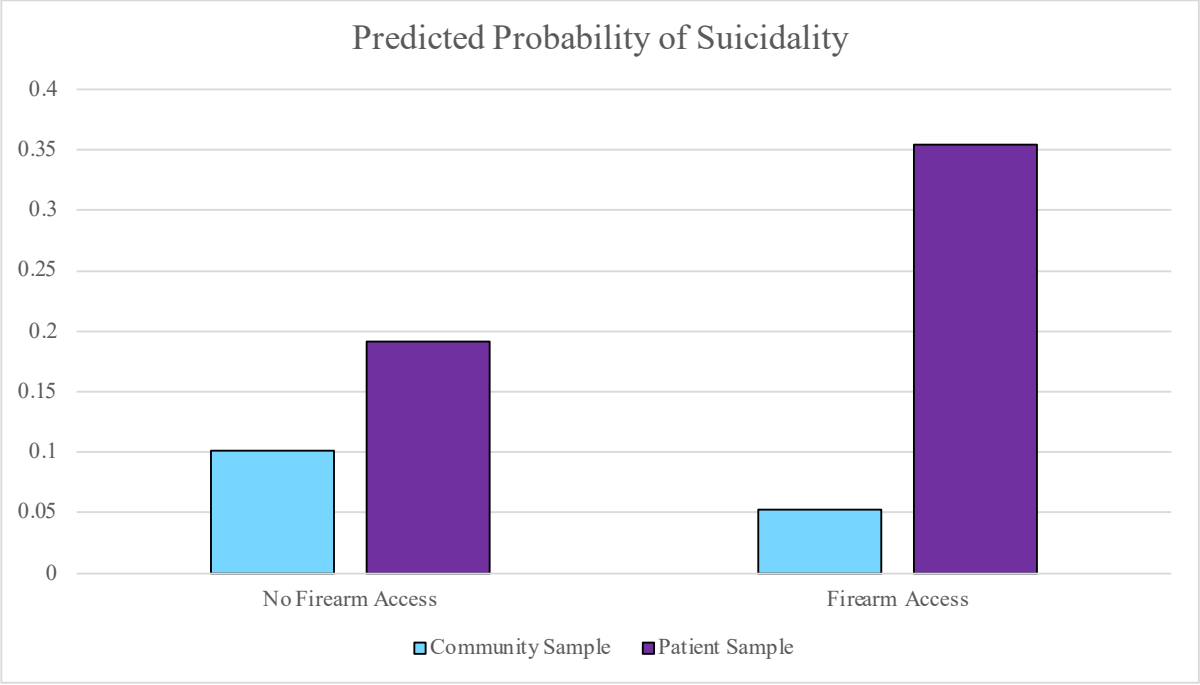
associated with increased odds of suicidality; however, several clinical variables were. Patient status was associated with roughly 2.5 times greater odds of suicidality (p<.001). Symptomatology was also a significant predictor of suicidality (OR=1.034, p=.034). In fact, a one standard deviation increase above the average BPRS score was associated with a 29% increase in the odds of suicidality, based on the standardized partial odds ratio. Increased psychosocial functioning, on the other hand, was associated with decreased odds of suicidality (OR=0.952, p<.001). In this case, a one standard deviation increase above the average GAF score was associated with an almost 61% decrease in the odds of suicidality.

Whereas firearm access was not a significant, independent predictor of suicidality among the entire sample, the inclusion of a firearm access by patient status cross-product term revealed a significant interaction effect (OR=4.690, p=.031). In other words, individuals from the patient sample experienced almost five times the odds of suicidality when firearms were available. It is important to note that patient status remained a significant, independent predictor of suicidality, even when firearms were not accessible (OR=2.104, p=.009). In addition, suicidality was significantly associated with female sex, White race, increased symptom severity, decreased psychosocial functioning, and, marginally, younger age.

To put these findings in perspective, we report the predicted probability of suicidality by patient status and firearm access (Figure 1). Patient status was consistently associated with

Figure 3.1

Predicted Probability of Suicidality



higher probabilities of suicidality, irrespective of firearm access; however, this differential probability was the most striking among those with firearm access. Among respondents without access to guns, the probability of suicidality was almost twice as high for patients than for community respondents (19% vs. 10%). With respect to those with access to guns, however, the increased probability of suicidality among the patient sample was seven times higher than that of the community sample (35% vs. 5%). Interestingly, the effect of firearm access differed dramatically across the two groups. For the patient sample, firearm access increased the probability of suicidality (from 19% to 35%); conversely, firearm access was associated with a decrease in the probability of suicidality among community respondents (from 10% to 5%). Effectively, firearm access had little to no impact of suicidality among the community sample.

Discussion

In the wake of major gun violence events in the United States, popular discourse inevitably implicates firearm access among individuals with severe mental illness as a major contributing factor to the nation's gun violence epidemic (Coverdale et al., 2013; Kliff, 2012; Metzl & MacLeish, 2015). We found no support for this claim. On the contrary, our analyses revealed that disordered individuals (even during high risk periods following hospitalization) were no more likely to be violent as a result of firearm access than their non-disordered counterparts. Our results support previous work indicating that violence among disordered individuals is rare outside the context of some of the same risk factors (e.g., age, race, and drug use) that predict violence among the general population (Elbogen & Johnson, 2009; Eronen et al., 1998; Swanson et al., 2015).

While respondents from the patient sample were not at increased risk of violence against others in the context of firearm access, they *were* significantly more likely to have suicidal

thoughts, especially when firearms were accessible. In fact, firearm access exponentially increased the (already elevated) probability of suicidality among the patient sample while having no effect on the community sample. These findings are consistent with previous research on suicide risk among individuals with mental illness (Dutta et al., 2010; Hiroeh et al., 2001) and in the context of firearm access (Lewiecki & Miller, 2013).

Despite the consistency of our findings with prior research, there are a number of study limitations that should be mentioned. First, our patient sample was not nationally representative; thus, our findings may not be generalizable to individuals with mental illness, as a whole. Despite this, because much of the public discourse centers around severe mental illness (McGinty, Webster, Jarlenski, & Barry, 2014), we believe our findings represent a strong refutation of the popular claim that America's gun violence problem is a mental health problem. Second, the age of our data may also impact the generalizability of our findings. That said, we find no reason to believe that the relationship between firearm access and mental illness has fundamentally changed in the last 20 years. Third, because a community comparison group was only interviewed at the Pittsburgh site during the first of the five follow-ups, our overall sample was limited to respondents from that site during that follow-up period. This prevented examination of whether risk factors varied between the patient and community samples over time. Finally, we were unable to directly measure gun-related violence and suicide. Our use of indirect measures may not accurately identify risk factors associated with gun violence (both interpersonal and self-directed) across the two groups; however, the similarities in our findings with prior research lead us to believe that our study represents an important addition to the literature. To further elaborate on these findings, future research should examine the relationship

between firearm access and firearm-involved suicide attempts (both failed and completed) among individuals with and without severe mental illness.

To our knowledge, this is the first empirical study to compare the impact of firearm access on both violence and suicidality among samples of disordered and non-disordered individuals from the same communities. While our findings support arguments made by many mental health researchers, they also draw attention to the serious lack of sound research informing mainstream policy discussions. Indeed, the dearth of available data needed to clarify the differential risk guns pose among these populations constitutes a serious problem for researchers and policymakers who wish to effectively and fairly address the gun violence epidemic in the United States. Thus, a joint effort between researchers and policymakers must be undertaken to make the collection and analysis of such data a priority going forward.

Conclusion

Our findings highlight the lack of utility in, and the potentially negative consequences of, focusing gun violence prevention efforts on the mentally ill (Appelbaum, 2013). Despite the growing body of evidence to the contrary, much of the mainstream debate over gun violence prevention continues to center on mental illness. This misguided attention, unless corrected, may present a significant barrier to mental health system utilization for gun owners with severe mental illness (Appelbaum, 2013). The heightened risk of suicide experienced by individuals with mental illness over the life-course, coupled with the risk that firearm access poses for suicide, underscores the need for further research to shift the mainstream narrative from one that stigmatizes those with mental illness and arbitrarily threatens their constitutionally protected right to bear arms to one of compassion and concern that increases education about (and acceptance of) mental illness within American society.

In sum, firearm access among individuals with severe mental illness constitutes a serious risk factor for suicide, not interpersonal violence. Thus, to effectively reduce gun violence in the United States, policymakers will have to look elsewhere for solutions. More importantly, media and political narratives identifying mental illness as the source of the problem must shift away from stigmatizing and inaccurate rhetoric if we are to effectively combat the most serious gun-related problem affecting individuals with mental illness: suicide.

Appendix A: Paper I Supplemental Tables

Table A.1

Correlation Matrix

	1	2	3	4	5	6	7	8	9	10	11	12
1. Gun Access	—											
2. Gun Carrying	0.644[c]	—										
3. Mental Disorders	-0.093[d]	0.038[d]	—									
4. Disorder Severity[a]	-0.110	0.023	0.929[c]	—								
5. Substance Abuse/Dependence	-0.041	0.116[e]	0.354[d]	0.496[c]	—							
6. Inpatient Treatment	-0.155[e]	0.079	0.460	-[b]	0.407[c]	—						
7. Mental Health Treatment	-0.193[c]	-0.075	0.440[f]	0.488[c]	0.224[c]	0.625[a]	—					
8. Angry Impulsivity	-0.033[e]	0.091[c]	0.325[c]	0.289[c]	0.291[c]	0.093[d]	0.112[c]	—				
9. Criminogenic Disinhibition	0.001	0.190[c]	0.317[c]	0.311[c]	0.425[c]	0.192[c]	0.133[c]	0.530[c]	—			
10. Religious Affiliation	-0.171[c]	-0.058[d]	0.047[f]	0.043	0.199	-0.061	0.081	0.075[c]	0.107[c]	—		
11. Intraracial Marriage	0.174	0.111	-0.066	-0.048[c]	-0.100	0.138	-0.052	-0.049[c]	-0.071[c]	-0.227[c]	—	
12. Childhood Rurality	0.232[c]	0.128	-0.036[f]	-0.045[e]	-0.024	-0.096	-0.061[d]	-0.020	-0.037[d]	-0.150[c]	0.102[c]	—
13. Childhood Alcohol Use	0.043[e]	0.092	0.143[c]	0.136[c]	0.446[c]	0.079	0.082	0.168[c]	0.288[c]	0.165[c]	-0.094[d]	-0.025[d]
14. Drug Use Before 18	-0.055[e]	0.055	0.232[c]	0.226[d]	0.531[c]	0.090	0.141[c]	0.232[c]	0.321[c]	0.233[c]	-0.159[f]	-0.123[c]
15. Early IPV	-0.002	0.070[c]	0.334	0.337	0.279	0.212	0.143	0.217[c]	0.237[c]	0.054[f]	-0.028	-0.026[f]
16. Childhood Physical Abuse	-0.011[d]	0.028[d]	0.232[d]	0.230[c]	0.206	0.105	0.155[e]	0.138[c]	0.170[c]	0.062	-0.056[d]	-0.017[c]
17. Parental Criminality	-0.117[e]	0.085	0.210	0.194[f]	0.242[c]	0.062	0.111[e]	0.103[c]	0.195[c]	0.008	-0.026	-0.114[c]
18. Parental Violence	0.003	0.086[f]	0.262	0.244	0.193[c]	0.114[f]	0.133[c]	0.158[c]	0.209[c]	0.017	-0.061	0.013[d]
19. Gun-Related Job	0.267[c]	0.370[c]	-0.120[d]	-0.126[d]	-0.088	0.028	-0.050	-0.009	0.092[c]	-0.012	0.060	0.021[d]
20. Age	0.138[c]	-0.032	-0.273[c]	-0.250[c]	-0.463[c]	-0.074	-0.162[c]	-0.243[c]	-0.224[c]	-0.189[c]	0.214[c]	0.117[c]
21. Male Sex	0.228[c]	0.386[c]	-0.142[c]	-0.153	0.272	-0.017	-0.088[c]	0.144[c]	0.261[c]	0.138[e]	0.000	-0.013
22. Race/Ethnicity	-0.247[c]	0.037	0.083	0.084[e]	0.064[d]	0.037	-0.110	0.093[c]	0.072[c]	-0.015[c]	-0.030[c]	-0.155[c]
23. Marital Status	-0.345[e]	-0.024	0.171[d]	0.186[c]	0.296[c]	0.144	0.161[d]	0.055[c]	0.135[c]	0.108[c]	-0.088[c]	-0.078[c]
24. Annual Household Income	0.238[c]	0.096	-0.141[c]	-0.170[c]	-0.104	-0.161	-0.069[d]	-0.050[c]	-0.067[c]	0.048	-0.072	-0.062[c]
25. Children in the Home	-0.091	0.002	0.118[f]	0.116	-0.014	-0.014[e]	0.017	0.108[c]	0.030[e]	-0.037	-0.041	-0.081[f]
26. Region of Residence	0.079[c]	0.127[c]	0.021	0.024	0.055[e]	0.025[f]	0.001[c]	0.003	0.037[e]	0.019[c]	0.015[c]	0.012[c]

Table A.1 Continued.

	13	14	15	16	17	18	19	20	21	22	23	24
13. Childhood Alcohol Use	—											
14. Drug Use Before 18	0.589[c]	—										
15. Early IPV	0.215[c]	0.362[e]	—									
16. Childhood Physical Abuse	0.133	0.161	0.266	—								
17. Parental Criminality	0.168	0.192[c]	0.244[f]	0.392[e]	—							
18. Parental Violence	0.149	0.204[c]	0.293[f]	0.501[c]	0.598[c]	—						
19. Gun-Related Job	0.045	-0.125[c]	-0.117[f]	0.103	0.104[f]	0.116[d]	—					
20. Age	-0.285[c]	-0.537[c]	-0.320[c]	-0.039[e]	-0.182[c]	-0.076[d]	0.291[c]	—				
21. Male Sex	0.332[c]	0.207[c]	-0.206[c]	-0.015[c]	-0.005	-0.036	0.680[c]	-0.050[e]	—			
22. Race/Ethnicity	-0.103[c]	-0.004[f]	0.148[c]	0.004[d]	0.056	0.084[e]	-0.054	-0.213[c]	-0.055[e]	—		
23. Marital Status	0.052[c]	0.108[c]	0.137[f]	-0.024[c]	0.092	-0.025[d]	-0.249[c]	-0.307[c]	-0.067[c]	0.154[c]	—	
24. Annual Household Income	0.033[e]	0.032	-0.142	0.004[c]	-0.081	-0.035	0.080	-0.061[c]	0.167	-0.186[c]	-0.446[c]	—
25. Children in the Home	0.077[d]	0.212[f]	0.146	0.021[e]	0.144	0.077[c]	-0.157	-0.387[c]	-0.104	0.182[c]	-0.215	0.091[c]
26. Region of Residence	-0.012[c]	0.006[c]	0.023[d]	0.008[c]	0.085[e]	0.073[e]	-0.018	-0.045[d]	-0.032	0.206[c]	0.015[c]	-0.048[c]

	25	26
25. Children in the Home	—	
26. Region of Residence	0.002	—

[a]Disorder severity modeled separately from disorder type.

[b]Inpatient treatment used in generation of disorder severity variable.

Note: Tetrachoric correlations generated for dichotomous by dichotomous combinations; Polychoric correlations generated for categorical by dichotomous/categorical combinations; Polyserial correlations generated for continuous by dichotomous/categorical combinations; All correlations conducted using pairwise deletion.

[c]p<.001, [d]p<.01, [e]p<.05, [f]p<.10

Table A.2

Logistic Regressions Predicting Access (Disorder Type Models)

	Model 1: Clinical Characteristics		Model 2: Dispositional Factors		Model 3: Cultural Factors		Model 4: Criminological Factors	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Clinical Characteristics								
Mental Disorders								
Anxiety Disorder(s)	0.966	(0.763,1.223)	0.958	(0.753,1.219)	0.984	(0.763,1.269)	0.937	(0.729,1.205)
Mood Disorder(s)	1.212	(0.830,1.770)	1.201	(0.822,1.754)	1.189	(0.830,1.704)	1.149	(0.792,1.667)
Impulse Control Disorder(s)	1.155	(0.717,1.858)	1.180	(0.726,1.919)	1.299	(0.776,2.173)	1.276	(0.762,2.136)
Multi-Category Disorders	1.081	(0.901,1.296)	1.088	(0.889,1.331)	1.058	(0.849,1.318)	0.976	(0.771,1.235)
Substance Abuse/Dependence	1.186	(0.851,1.652)	1.150	(0.821,1.611)	1.165	(0.836,1.623)	1.104	(0.789,1.546)
Inpatient Treatment	0.669	(0.392,1.142)	0.653	(0.383,1.115)	0.686	(0.382,1.231)	0.698	(0.386,1.262)
Mental Health Treatment	0.585***	(0.455,0.751)	0.583***	(0.454,0.750)	0.588***	(0.465,0.745)	0.577***	(0.460,0.723)
Dispositional Disinhibition								
Angry Impulsivity			0.752	(0.531,1.065)	0.720†	(0.504,1.027)	0.720†	(0.504,1.029)
Criminogenic Disinhibition			1.378*	(1.009,1.883)	1.507*	(1.079,2.104)	1.375†	(0.997,1.895)
Cultural Factors								
Religious Affiliation								
Catholic					0.757*	(0.592,0.969)	0.759*	(0.589,0.978)
Other Religion					0.539***	(0.379,0.766)	0.537**	(0.372,0.776)
Agnostic/Atheist/No Preference					0.781†	(0.602,1.012)	0.771†	(0.594,1.002)
Intraracial Marriage Preference								
Not Very Important					1.308*	(1.011,1.693)	1.308*	(1.005,1.703)
Somewhat Important					1.628***	(1.317,2.012)	1.633***	(1.315,2.028)
Very Important					1.836***	(1.398,2.411)	1.832***	(1.387,2.420)
Childhood Rurality								
Suburbs					1.413*	(1.029,1.938)	1.427*	(1.035,1.968)
Small City					1.441*	(1.076,1.931)	1.456*	(1.089,1.945)
Town/Village					1.862***	(1.437,2.412)	1.866***	(1.435,2.426)
Rural Area					3.576***	(2.489,5.137)	3.590***	(2.518,5.119)
Moved Around					2.509**	(1.329,4.740)	2.376**	(1.282,4.404)
Criminological Factors								
Alcohol Use Initiation								
Early (13-17)							1.129	(0.906,1.407)

Table A.2 Continued.

Alcohol Use Initiation								
Very Early (>13)							0.849	(0.555,1.298)
Early Intimate Partner Violence								
Victim Only							1.837***	(1.496,2.255)
Offender Only							1.792*	(1.020,3.150)
Victim/Offender							1.520**	(1.121,2.062)
Control Variables								
Gun-Related Job	1.607**	(1.202,2.149)	1.593**	(1.191,2.131)	1.799***	(1.351,2.396)	1.777***	(1.344,2.351)
Age	0.995	(0.988,1.002)	0.995	(0.988,1.002)	0.989**	(0.981,0.997)	0.991*	(0.984,0.999)
Male Sex	1.642***	(1.389,1.941)	1.618***	(1.368,1.915)	1.619***	(1.362,1.924)	1.672***	(1.390,2.011)
Race/Ethnicity								
Non-Hispanic Black	0.603**	(0.422,0.862)	0.604**	(0.425,0.858)	0.675*	(0.470,0.969)	0.674*	(0.464,0.977)
Hispanic	0.315***	(0.168,0.592)	0.316***	(0.169,0.591)	0.398**	(0.220,0.721)	0.400**	(0.222,0.721)
Other	0.369***	(0.239,0.571)	0.369***	(0.237,0.573)	0.393***	(0.269,0.574)	0.403***	(0.277,0.585)
Marital Status								
Divorced/Separated/Widowed	0.536***	(0.400,0.718)	0.531***	(0.396,0.710)	0.534***	(0.397,0.718)	0.523***	(0.389,0.703)
Never Married	0.333***	(0.249,0.446)	0.331***	(0.245,0.446)	0.348***	(0.256,0.474)	0.351***	(0.260,0.476)
Annual Household Income								
$20,000-$49,999	1.400**	(1.146,1.712)	1.398**	(1.146,1.706)	1.452**	(1.173,1.796)	1.489***	(1.197,1.852)
$50,000-$74,999	1.803***	(1.307,2.487)	1.813***	(1.318,2.493)	2.056***	(1.471,2.873)	2.124***	(1.504,3.000)
$75,000+	1.787**	(1.272,2.511)	1.788**	(1.277,2.504)	2.132***	(1.539,2.954)	2.208***	(1.570,3.104)
Children in the Home								
One	0.853	(0.688,1.058)	0.860	(0.693,1.067)	0.862	(0.673,1.105)	0.871	(0.677,1.122)
Two	0.610*	(0.413,0.902)	0.620*	(0.418,0.918)	0.598**	(0.410,0.873)	0.580**	(0.396,0.848)
Three+	0.658*	(0.474,0.913)	0.652*	(0.469,0.907)	0.666*	(0.469,0.946)	0.649*	(0.456,0.924)
Region of Residence								
Midwest	2.266*	(1.010,5.084)	2.267*	(1.015,5.063)	1.946*	(1.018,3.719)	1.981*	(1.063,3.692)
South	2.655*	(1.166,6.041)	2.652*	(1.172,6.005)	1.898†	(0.971,3.711)	1.959*	(1.033,3.716)
West	1.565	(0.703,3.485)	1.561	(0.703,3.463)	1.626	(0.858,3.084)	1.664	(0.898,3.085)
Intercept	0.347*	(0.123,0.982)	0.339*	(0.121,0.946)	0.214**	(0.082,0.561)	0.166***	(0.066,0.422)
McFadden's Adjusted R^2	0.114		0.115		0.154		0.158	
AIC	6285.812		6283.719		6006.159		5973.832	
BIC	6450.928		6462.044		6257.136		6257.832	

Notes: n = 5,457, representing a population of 200,353,337 people; Model fit statistics do not account for clustered sampling.
*** p<.001, ** p<.01, * p<.05, † p<.1

Table A.3

Logistic Regressions Predicting Access (Severity Models)

	Model 1: Clinical Characteristics		Model 2: Dispositional Factors		Model 3: Cultural Factors		Model 4: Criminological Factors	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Clinical Characteristics								
Disorder Severity								
Mild Disorder	1.055	(0.838,1.328)	1.045	(0.826,1.323)	1.065	(0.847,1.339)	1.015	(0.817,1.261)
Moderate Severity	1.077	(0.867,1.336)	1.072	(0.845,1.360)	1.084	(0.830,1.416)	1.030	(0.787,1.347)
Severe Disorder	0.966	(0.769,1.213)	0.951	(0.751,1.204)	1.007	(0.796,1.275)	0.920	(0.726,1.166)
Substance Abuse/Dependence	1.170	(0.850,1.610)	1.130	(0.814,1.568)	1.136	(0.827,1.561)	1.100	(0.795,1.521)
Mental Health Treatment	0.585***	(0.456,0.749)	0.584***	(0.455,0.749)	0.580***	(0.458,0.733)	0.571***	(0.455,0.716)
Dispositional Factors								
Angry Impulsivity			0.774	(0.545,1.098)	0.737†	(0.516,1.051)	0.736†	(0.515,1.052)
Criminogenic Disinhibition			1.392*	(1.025,1.891)	1.513*	(1.092,2.095)	1.385*	(1.011,1.896)
Cultural Factors								
Religious Affiliation								
Catholic					0.758*	(0.594,0.968)	0.760*	(0.591,0.977)
Other Religion					0.537***	(0.377,0.763)	0.535**	(0.371,0.773)
Agnostic/Atheist/No Pref					0.780†	(0.602,1.012)	0.771†	(0.593,1.003)
Intraracial Marriage Preference								
Not Very Important					1.312*	(1.015,1.695)	1.312*	(1.009,1.705)
Somewhat Important					1.625***	(1.316,2.006)	1.630***	(1.315,2.021)
Very Important					1.834***	(1.399,2.404)	1.831***	(1.389,2.413)
Childhood Rurality								
Suburbs					1.411*	(1.032,1.929)	1.423*	(1.036,1.954)
Small City					1.438*	(1.074,1.926)	1.450*	(1.085,1.938)
Town/Village					1.858***	(1.436,2.405)	1.860***	(1.431,2.416)
Rural Area					3.572***	(2.492,5.121)	3.577***	(2.514,5.089)
Moved Around					2.529**	(1.334,4.793)	2.395**	(1.288,4.453)
Criminological Factors								
Alcohol Use Initiation								
Early (13-17)							1.126	(0.905,1.402)
Very Early (>13)							0.847	(0.554,1.296)

Table A.3 Continued.

Early IPV Experiences								
Victim Only							1.832***	(1.495,2.245)
Offender Only							1.787*	(1.016,3.146)
Victim/Offender							1.509**	(1.118,2.036)
Control Variables								
Gun-Related Job	1.609**	(1.205,2.150)	1.594**	(1.193,2.131)	1.797***	(1.350,2.391)	1.774***	(1.342,2.346)
Age	0.995	(0.988,1.002)	0.995	(0.988,1.002)	0.989**	(0.981,0.997)	0.991*	(0.984,0.999)
Male Sex	1.651***	(1.400,1.948)	1.623***	(1.375,1.917)	1.630***	(1.376,1.931)	1.685***	(1.403,2.023)
Race/Ethnicity								
Non-Hispanic Black	0.603**	(0.422,0.863)	0.604**	(0.425,0.859)	0.676*	(0.471,0.970)	0.675*	(0.466,0.979)
Hispanic	0.315***	(0.168,0.591)	0.316***	(0.169,0.590)	0.397**	(0.219,0.717)	0.398**	(0.221,0.717)
Other	0.371***	(0.240,0.573)	0.370***	(0.238,0.574)	0.393***	(0.270,0.573)	0.402***	(0.277,0.583)
Marital Status								
Divorced/Separated/Widowed	0.535***	(0.400,0.716)	0.529***	(0.395,0.708)	0.531***	(0.395,0.714)	0.521***	(0.387,0.699)
Never Married	0.333***	(0.249,0.445)	0.331***	(0.246,0.445)	0.348***	(0.257,0.472)	0.351***	(0.260,0.474)
Annual Household Income								
$20,000-$49,999	1.395**	(1.142,1.705)	1.393**	(1.142,1.699)	1.448**	(1.170,1.792)	1.484***	(1.193,1.845)
$50,000-$74,999	1.795***	(1.303,2.473)	1.806***	(1.315,2.482)	2.053***	(1.472,2.865)	2.121***	(1.505,2.988)
$75,000+	1.782**	(1.269,2.501)	1.784**	(1.274,2.497)	2.134***	(1.542,2.955)	2.209***	(1.574,3.100)
Children in the Home								
One	0.854	(0.689,1.058)	0.861	(0.695,1.067)	0.864	(0.676,1.105)	0.873	(0.679,1.123)
Two	0.611*	(0.413,0.904)	0.621*	(0.419,0.921)	0.598**	(0.409,0.874)	0.581**	(0.397,0.849)
Three+	0.657*	(0.474,0.911)	0.652*	(0.469,0.906)	0.664*	(0.469,0.940)	0.648*	(0.456,0.921)
Region of Residence								
Midwest	2.267*	(1.012,5.077)	2.269*	(1.018,5.055)	1.949*	(1.023,3.713)	1.985*	(1.069,3.688)
South	2.650*	(1.164,6.034)	2.650*	(1.170,6.001)	1.898†	(0.972,3.703)	1.960*	(1.034,3.714)
West	1.567	(0.704,3.487)	1.563	(0.705,3.465)	1.631	(0.863,3.084)	1.669†	(0.903,3.085)
Intercept	0.346*	(0.123,0.974)	0.335*	(0.120,0.934)	0.211**	(0.081,0.552)	0.165***	(0.065,0.417)
McFadden's Adjusted R^2	0.115		0.115		0.154		0.158	
AIC	6284.169		6282.370		6004.627		5972.877	
BIC	6436.076		6447.486		6242.394		6243.668	

Notes: n = 5,457, representing a population of 200,353,337 people; Model fit statistics do not account for clustered sampling.

*** p<.001, ** p<.01, * p<.05, † p<.1

Table A.4

Logistic Regressions Predicting Past Month Carrying (Disorder Type Models)

	Model 1: Clinical Characteristics		Model 2: Dispositional Factors		Model 3: Cultural Factors		Model 4: Criminological Factors	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Clinical Characteristics								
Mental Disorders								
Anxiety Disorder(s)	1.401	(0.817, 2.403)	1.245	(0.734, 2.112)	1.253	(0.753, 2.084)	1.177	(0.695, 1.993)
Mood Disorder(s)	1.281	(0.469, 3.500)	1.156	(0.436, 3.067)	1.096	(0.379, 3.175)	1.061	(0.342, 3.291)
Impulse Control Disorder(s)	1.798	(0.846, 3.822)	1.353	(0.565, 3.239)	1.349	(0.576, 3.160)	1.284	(0.589, 2.799)
Multi-Category Disorders	2.132*	(1.171, 3.882)	1.598	(0.782, 3.266)	1.517	(0.751, 3.062)	1.411	(0.712, 2.796)
Substance Abuse/Dependence	0.999	(0.427, 2.340)	0.719	(0.321, 1.612)	0.680	(0.284, 1.629)	0.634	(0.260, 1.544)
Mental Health Treatment	0.557	(0.238, 1.299)	0.551	(0.244, 1.246)	0.528	(0.228, 1.223)	0.549	(0.227, 1.331)
Dispositional Factors								
Angry Impulsivity			0.817	(0.446, 1.495)	0.826	(0.422, 1.619)	0.783	(0.382, 1.605)
Criminogenic Disinhibition			3.502*	(1.213, 10.111)	3.829*	(1.261, 11.626)	3.873*	(1.249, 12.005)
Cultural Factors								
Religious Affiliation								
Catholic					0.656†	(0.399, 1.079)	0.703	(0.433, 1.140)
Other Religion					1.990	(0.850, 4.661)	1.980	(0.831, 4.716)
Agnostic/Atheist/No Pref					1.006	(0.631, 1.603)	1.044	(0.645, 1.691)
Intraracial Marriage Preference								
Not Very Important					1.051	(0.587, 1.882)	1.099	(0.615, 1.963)
Somewhat Important					0.836	(0.485, 1.440)	0.902	(0.534, 1.525)
Very Important					1.040	(0.614, 1.761)	1.116	(0.637, 1.957)
Childhood Rurality								
Suburbs					0.807	(0.411, 1.584)	0.797	(0.406, 1.567)
Small City					0.684	(0.335, 1.398)	0.704	(0.350, 1.415)
Town/Village					0.970	(0.498, 1.892)	0.968	(0.493, 1.899)
Rural Area					1.303	(0.671, 2.532)	1.330	(0.693, 2.555)
Moved Around					1.141	(0.364, 3.577)	1.115	(0.326, 3.814)
Criminological Factors								
Drugs before 18							1.085	(0.678, 1.735)
Early IPV Experiences								

Table A.4 Continued.

Early IPV Experiences								
Victim Only							1.914*	(1.075, 3.407)
Offender Only							0.576	(0.118, 2.821)
Victim/Offender							1.688	(0.574, 4.968)
Childhood Physical Abuse								
Rarely							0.871	(0.483, 1.570)
Sometimes							1.510	(0.812, 2.806)
Often							0.345*	(0.124, 0.962)
Parental Criminality							1.133	(0.409, 3.139)
Parental Violence							1.016	(0.534, 1.936)
Control Variables								
Gun-Related Job	3.292***	(1.913, 5.664)	3.157***	(1.790, 5.565)	3.122***	(1.864, 5.228)	3.209***	(1.970, 5.226)
Gun Access	18.718***	(10.200, 34.350)	18.726***	(10.126, 34.633)	18.146***	(9.742, 33.800)	17.444***	(9.172, 33.178)
Age	0.984	(0.965, 1.003)	0.987	(0.967, 1.007)	0.985	(0.965, 1.006)	0.988	(0.967, 1.011)
Male Sex	3.606***	(2.368, 5.491)	3.175***	(2.138, 4.717)	3.155***	(2.180, 4.567)	3.174***	(2.332, 4.319)
Marital Status								
Div/Sep/Widowed	2.084*	(1.198, 3.624)	2.088*	(1.178, 3.701)	2.122*	(1.170, 3.847)	2.184*	(1.206, 3.953)
Never Married	1.133	(0.538, 2.384)	1.101	(0.516, 2.346)	1.118	(0.526, 2.374)	1.113	(0.487, 2.545)
Annual Household Income								
$20, 000-$49, 999	1.324	(0.625, 2.807)	1.313	(0.620, 2.779)	1.305	(0.606, 2.808)	1.326	(0.619, 2.840)
$50, 000-$74, 999	1.242	(0.654, 2.357)	1.302	(0.686, 2.470)	1.281	(0.676, 2.427)	1.345	(0.706, 2.563)
$75, 000+	1.740†	(0.947, 3.196)	1.770†	(0.957, 3.276)	1.816†	(0.926, 3.561)	1.881†	(0.960, 3.687)
Children in the Home								
One	1.181	(0.622, 2.242)	1.223	(0.643, 2.325)	1.198	(0.637, 2.254)	1.198	(0.632, 2.271)
Two	1.719†	(0.918, 3.221)	1.769†	(0.907, 3.449)	1.757	(0.889, 3.475)	1.701	(0.822, 3.518)
Three+	2.455*	(1.206, 4.996)	2.386*	(1.106, 5.147)	2.433*	(1.190, 4.975)	2.204†	(0.973, 4.989)
Region of Residence								
Midwest	0.875	(0.513, 1.495)	0.937	(0.547, 1.606)	0.902	(0.520, 1.566)	0.914	(0.532, 1.569)
South	2.413**	(1.427, 4.080)	2.561***	(1.501, 4.367)	2.472**	(1.428, 4.280)	2.618***	(1.555, 4.408)
West	1.456	(0.888, 2.387)	1.492	(0.913, 2.436)	1.506	(0.893, 2.539)	1.579†	(0.954, 2.612)
Intercept	0.001***	(0.000, 0.005)	0.001***	(0.000, 0.003)	0.001***	(0.000, 0.005)	0.001***	(0.000, 0.004)
McFadden's Adjusted R2	0.268		0.275		0.275		0.278	
AIC	1479.089		1466.211		1465.751		1459.983	
BIC	1624.424		1624.758		1696.965		1750.652	

*** p<.001, ** p<.01, * p<.05, † p<.1

Table A.5

Logistic Regressions Predicting Past Month Carrying (Severity Models)

	Model 1: Clinical Characteristics		Model 2: Dispositional Factors		Model 3: Cultural Factors		Model 4: Criminological Factors	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Clinical Characteristics								
Disorder Severity								
Mild Disorder	1.647*	(1.036,2.617)	1.398	(0.841,2.324)	1.402	(0.862,2.283)	1.335	(0.843,2.114)
Moderate Severity	1.330	(0.852,2.076)	1.102	(0.683,1.778)	1.058	(0.640,1.749)	0.995	(0.607,1.631)
Severe Disorder	2.614*	(1.245,5.488)	1.907†	(0.916,3.971)	1.811	(0.883,3.715)	1.687	(0.783,3.633)
Substance Abuse/Dependence	0.840	(0.370,1.911)	0.640	(0.295,1.388)	0.608	(0.264,1.403)	0.578	(0.242,1.382)
Mental Health Treatment	0.534	(0.222,1.283)	0.529	(0.228,1.228)	0.506	(0.216,1.187)	0.526	(0.213,1.296)
Dispositional Factors								
Angry Impulsivity			0.856	(0.456,1.608)	0.868	(0.438,1.721)	0.823	(0.402,1.684)
Criminogenic Disinhibition			3.485*	(1.252,9.705)	3.816*	(1.301,11.195)	3.832*	(1.276,11.514)
Cultural Factors								
Religious Affiliation								
Catholic					0.663	(0.403,1.088)	0.712	(0.440,1.150)
Other Religion					1.995	(0.850,4.684)	1.986	(0.837,4.711)
Agnostic/Atheist/No Pref					1.004	(0.627,1.608)	1.041	(0.639,1.695)
Intraracial Marriage Preference								
Not Very Important					1.067	(0.602,1.890)	1.115	(0.631,1.971)
Somewhat Important					0.838	(0.493,1.427)	0.906	(0.544,1.509)
Very Important					1.040	(0.621,1.742)	1.120	(0.644,1.948)
Childhood Rurality								
Suburbs					0.812	(0.413,1.595)	0.802	(0.408,1.576)
Small City					0.679	(0.334,1.380)	0.698	(0.348,1.402)
Town/Village					0.972	(0.498,1.897)	0.969	(0.495,1.896)
Rural Area					1.313	(0.674,2.559)	1.340	(0.694,2.589)
Moved Around					1.134	(0.366,3.516)	1.112	(0.331,3.738)
Criminological Factors								
Drugs before 18							1.091	(0.676,1.761)

Table A.5 Continued.

Early IPV Experiences								
Victim Only							1.915*	(1.084,3.385)
Offender Only							0.573	(0.116,2.825)
Victim/Offender							1.675	(0.561,5.003)
Childhood Physical Abuse								
Rarely							0.864	(0.479,1.559)
Sometimes							1.519	(0.821,2.811)
Often							0.347*	(0.123,0.977)
Parental Criminality							1.111	(0.399,3.096)
Parental Violence							1.021	(0.529,1.973)
Control Variables								
Gun-Related Job	3.359***	(1.950,5.784)	3.197***	(1.806,5.658)	3.159***	(1.885,5.296)	3.252***	(1.990,5.314)
Gun Access	18.752***	(10.247,34.316)	18.807***	(10.198,34.684)	18.192***	(9.776,33.850)	17.509***	(9.256,33.123)
Age	0.983†	(0.964,1.003)	0.987	(0.967,1.007)	0.985	(0.964,1.007)	0.988	(0.966,1.011)
Male Sex	3.601***	(2.390,5.426)	3.154***	(2.134,4.661)	3.132***	(2.171,4.517)	3.145***	(2.316,4.271)
Marital Status								
Div/Sep/Widowed	2.049*	(1.181,3.554)	2.075*	(1.171,3.680)	2.111*	(1.165,3.825)	2.170*	(1.199,3.928)
Never Married	1.171	(0.561,2.444)	1.136	(0.535,2.412)	1.152	(0.540,2.455)	1.149	(0.498,2.653)
Annual Household Income								
$20,000-$49,999	1.340	(0.631,2.845)	1.331	(0.629,2.815)	1.323	(0.614,2.852)	1.343	(0.621,2.904)
$50,000-$74,999	1.257	(0.660,2.395)	1.322	(0.695,2.516)	1.307	(0.685,2.492)	1.371	(0.720,2.611)
$75,000+	1.780†	(0.962,3.295)	1.811†	(0.974,3.366)	1.852†	(0.941,3.646)	1.913†	(0.966,3.792)
Children in the Home								
One	1.192	(0.634,2.242)	1.229	(0.651,2.319)	1.197	(0.642,2.231)	1.197	(0.635,2.257)
Two	1.754†	(0.944,3.256)	1.789†	(0.923,3.466)	1.772†	(0.899,3.489)	1.719	(0.833,3.550)
Three+	2.476*	(1.253,4.893)	2.419*	(1.147,5.100)	2.456*	(1.228,4.910)	2.225*	(1.007,4.916)
Region of Residence								
Midwest	0.868	(0.508,1.485)	0.935	(0.546,1.600)	0.905	(0.520,1.573)	0.919	(0.535,1.578)
South	2.392**	(1.409,4.059)	2.550**	(1.495,4.351)	2.478**	(1.424,4.313)	2.629***	(1.553,4.451)
West	1.444	(0.882,2.366)	1.487	(0.909,2.433)	1.513	(0.887,2.581)	1.590†	(0.950,2.662)
Intercept	0.001***	(0.000,0.005)	0.001***	(0.000,0.003)	0.001***	(0.000,0.005)	0.001***	(0.000,0.003)
McFadden's Adjusted R^2	0.270		0.276		0.277		0.280	
AIC	1476.279		1462.711		1462.124		1456.278	
BIC	1615.007		1614.652		1686.732		1740.341	

Notes: n = 5,465, representing a population of 200,361,236 people; Model fit statistics do not account for clustered sampling.

*** p<.001, ** p<.01, * p<.05, † p<.1

Table A.6

Penalized Logistic Regressions Predicting Carrying (Disorder Type Models)

	Model 1: Clinical Characteristics		Model 2: Dispositional Factors		Model 3: Cultural Factors		Model 4: Criminological Factors	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Clinical Characteristics								
Mental Disorders								
Anxiety Disorder(s)	1.179	(0.793,1.754)	1.067	(0.714,1.594)	1.114	(0.744,1.668)	1.097	(0.728,1.653)
Mood Disorder(s)	1.485	(0.767,2.877)	1.389	(0.716,2.694)	1.362	(0.700,2.651)	1.342	(0.685,2.631)
Impulse Control Disorder(s)	1.741†	(0.925,3.277)	1.275	(0.654,2.486)	1.292	(0.660,2.529)	1.256	(0.637,2.479)
Multi-Category Disorders	1.548*	(1.004,2.388)	1.144	(0.714,1.832)	1.162	(0.724,1.867)	1.114	(0.688,1.804)
Substance Abuse/Dependence	1.196	(0.670,2.134)	0.836	(0.455,1.535)	0.841	(0.459,1.544)	0.828	(0.445,1.541)
Mental Health Treatment	0.894	(0.535,1.494)	0.867	(0.513,1.464)	0.845	(0.499,1.432)	0.895	(0.528,1.517)
Dispositional Factors								
Angry Impulsivity			0.944	(0.559,1.592)	0.958	(0.566,1.623)	0.980	(0.574,1.675)
Criminogenic Disinhibition			3.578***	(1.990,6.436)	3.564***	(1.974,6.435)	3.822***	(2.078,7.032)
Cultural Factors								
Religious Affiliation								
Catholic					0.721	(0.467,1.111)	0.764	(0.494,1.181)
Other Religion					1.078	(0.583,1.994)	1.087	(0.580,2.037)
Agnostic/Atheist/No Pref					0.982	(0.644,1.498)	1.031	(0.673,1.582)
Intraracial Marriage Preference								
Not Very Important					1.053	(0.698,1.587)	1.103	(0.728,1.673)
Somewhat Important					0.926	(0.611,1.405)	0.970	(0.636,1.478)
Very Important					1.271	(0.832,1.941)	1.383	(0.899,2.126)
Childhood Rurality								
Suburbs					0.959	(0.573,1.605)	0.960	(0.571,1.613)
Small City					0.898	(0.534,1.510)	0.902	(0.535,1.522)
Town/Village					1.255	(0.767,2.051)	1.219	(0.741,2.003)
Rural Area					1.214	(0.759,1.943)	1.165	(0.720,1.883)
Moved Around					1.691	(0.651,4.395)	1.519	(0.559,4.125)
Criminological Factors								
Drugs before 18							0.965	(0.670,1.391)

Table A.6 Continued.

Early IPV Experiences								
Victim Only							1.637*	(1.060,2.528)
Offender Only							0.693	(0.224,2.150)
Victim/Offender							0.894	(0.498,1.604)
Childhood Physical Abuse								
Rarely							0.981	(0.644,1.496)
Sometimes							1.426	(0.929,2.188)
Often							0.455†	(0.202,1.023)
Parental Criminality							1.422	(0.588,3.440)
Parental Violence							1.085	(0.650,1.811)
Control Variables								
Gun-Related Job	2.497***	(1.750,3.563)	2.345***	(1.638,3.358)	2.304***	(1.604,3.311)	2.293***	(1.586,3.315)
Gun Access	15.440***	(10.061,23.696)	15.460***	(10.059,23.760)	14.453***	(9.352,22.336)	13.728***	(8.877,21.232)
Age	0.986*	(0.975,0.998)	0.989†	(0.977,1.001)	0.988†	(0.976,1.001)	0.990	(0.978,1.004)
Male Sex	2.760***	(1.947,3.914)	2.398***	(1.679,3.424)	2.397***	(1.676,3.428)	2.364***	(1.641,3.408)
Marital Status								
Div/Sep/Widowed	1.989***	(1.346,2.940)	2.003***	(1.351,2.969)	2.063***	(1.387,3.070)	2.071***	(1.386,3.094)
Never Married	1.457	(0.912,2.330)	1.389	(0.861,2.239)	1.459	(0.903,2.359)	1.491	(0.914,2.432)
Annual Household Income								
$20, 000-$49, 999	1.010	(0.632,1.614)	1.051	(0.652,1.694)	1.038	(0.643,1.674)	1.075	(0.662,1.745)
$50, 000-$74, 999	0.983	(0.583,1.659)	1.080	(0.634,1.838)	1.067	(0.623,1.824)	1.115	(0.647,1.922)
$75, 000+	1.139	(0.701,1.851)	1.218	(0.743,1.997)	1.279	(0.776,2.108)	1.300	(0.783,2.159)
Children in the Home								
One	1.079	(0.681,1.710)	1.101	(0.693,1.748)	1.122	(0.706,1.785)	1.142	(0.715,1.824)
Two	1.334	(0.817,2.179)	1.318	(0.802,2.164)	1.273	(0.772,2.100)	1.303	(0.787,2.159)
Three+	1.742†	(0.962,3.153)	1.663†	(0.912,3.031)	1.681†	(0.918,3.079)	1.556	(0.831,2.911)
Region of Residence								
Midwest	0.682	(0.395,1.177)	0.700	(0.402,1.219)	0.682	(0.386,1.204)	0.715	(0.400,1.278)
South	1.981**	(1.224,3.205)	2.083**	(1.274,3.407)	1.898*	(1.133,3.180)	2.080**	(1.222,3.539)
West	1.438	(0.845,2.446)	1.465	(0.853,2.518)	1.473	(0.843,2.574)	1.583	(0.894,2.801)
Intercept	0.003***	(0.001,0.008)	0.002***	(0.001,0.006)	0.002***	(0.001,0.007)	0.002***	(0.001,0.005)
McFadden's Adjusted R^2	0.219		0.228		0.220		0.218	
AIC	1376.264		1351.277		1329.909		1307.460	
BIC	1588.217		1576.447		1647.379		1717.096	
Penalized LL	-656.132		-641.639		-616.955		-591.730	
N	5,490		5,485		5,447		5,410	

*** p<.001, ** p<.01, * p<.05, † p<.1

Table A.7

Penalized Logistic Regressions Predicting Carrying (Severity Models)

	Model 1: Clinical Characteristics		Model 2: Dispositional Factors		Model 3: Cultural Factors		Model 4: Criminological Factors	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Clinical Characteristics								
Severity of Mental Disorder								
Mild Disorder	1.523*	(1.036,2.238)	1.342	(0.908,1.985)	1.374	(0.929,2.033)	1.316	(0.884,1.958)
Moderate Severity	1.066	(0.690,1.646)	0.896	(0.572,1.404)	0.917	(0.583,1.441)	0.882	(0.555,1.400)
Severe Disorder	1.939*	(1.139,3.300)	1.386	(0.785,2.445)	1.406	(0.791,2.497)	1.443	(0.809,2.574)
Substance Abuse/Dep.	1.111	(0.616,2.004)	0.805	(0.436,1.485)	0.807	(0.438,1.487)	0.806	(0.431,1.507)
Mental Health Treatment	0.853	(0.507,1.436)	0.838	(0.492,1.427)	0.816	(0.478,1.395)	0.853	(0.499,1.458)
Dispositional Factors								
Angry Impulsivity			0.961	(0.575,1.607)	0.981	(0.585,1.645)	0.993	(0.587,1.681)
Criminogenic Disinhibition			3.541***	(1.976,6.347)	3.539***	(1.966,6.370)	3.773***	(2.055,6.927)
Cultural Factors								
Religious Affiliation								
Catholic					0.730	(0.473,1.126)	0.771	(0.498,1.193)
Other Religion					1.090	(0.589,2.016)	1.092	(0.584,2.042)
Agnostic/Atheist/No Pref					0.975	(0.639,1.488)	1.023	(0.666,1.570)
Intraracial Marriage Preference								
Not Very Important					1.071	(0.710,1.618)	1.128	(0.743,1.714)
Somewhat Important					0.933	(0.615,1.416)	0.980	(0.643,1.495)
Very Important					1.279	(0.837,1.953)	1.399	(0.909,2.152)
Childhood Rurality								
Suburbs					0.958	(0.573,1.604)	0.957	(0.569,1.608)
Small City					0.886	(0.527,1.490)	0.889	(0.527,1.500)
Town/Village					1.256	(0.768,2.055)	1.217	(0.740,2.002)
Rural Area					1.220	(0.762,1.952)	1.165	(0.720,1.884)
Moved Around					1.696	(0.652,4.410)	1.529	(0.565,4.134)
Criminological Factors								
Drugs before 18							0.963	(0.668,1.387)

Table A.7 Continued.

Early IPV Experiences								
Victim Only							1.614*	(1.044,2.494)
Offender Only							0.694	(0.223,2.154)
Victim/Offender							0.880	(0.490,1.581)
Childhood Physical Abuse								
Rarely							0.966	(0.633,1.474)
Sometimes							1.440†	(0.938,2.210)
Often							0.464†	(0.207,1.042)
Parental Criminality							1.377	(0.567,3.341)
Parental Violence							1.084	(0.649,1.810)
Control Variables								
Gun-Related Job	2.574***	(1.805,3.671)	2.392***	(1.672,3.424)	2.347***	(1.634,3.371)	2.339***	(1.618,3.382)
Gun Access	15.711***	(10.229,24.130)	15.732***	(10.227,24.201)	14.682***	(9.490,22.713)	13.987***	(9.036,21.653)
Age	0.986*	(0.974,0.998)	0.989†	(0.977,1.002)	0.988†	(0.976,1.001)	0.990	(0.978,1.003)
Male Sex	2.768***	(1.956,3.918)	2.402***	(1.685,3.424)	2.397***	(1.678,3.423)	2.359***	(1.639,3.394)
Marital Status								
Div/Sep/Widowed	1.963***	(1.327,2.905)	2.007***	(1.353,2.977)	2.076***	(1.393,3.093)	2.083***	(1.392,3.118)
Never Married	1.534†	(0.958,2.457)	1.461	(0.904,2.361)	1.534†	(0.947,2.486)	1.581†	(0.966,2.587)
Annual Household Income								
$20, 000-$49, 999	1.009	(0.630,1.615)	1.051	(0.651,1.695)	1.041	(0.644,1.682)	1.084	(0.667,1.762)
$50, 000-$74, 999	0.994	(0.588,1.681)	1.087	(0.637,1.855)	1.079	(0.629,1.851)	1.138	(0.659,1.966)
$75, 000+	1.151	(0.705,1.878)	1.224	(0.743,2.015)	1.294	(0.781,2.143)	1.326	(0.795,2.211)
Children in the Home								
One	1.079	(0.680,1.711)	1.099	(0.691,1.746)	1.122	(0.704,1.786)	1.144	(0.716,1.829)
Two	1.385	(0.849,2.261)	1.361	(0.829,2.233)	1.311	(0.796,2.161)	1.344	(0.812,2.226)
Three+	1.768†	(0.975,3.207)	1.700†	(0.932,3.101)	1.705†	(0.930,3.125)	1.591	(0.850,2.978)
Region of Residence								
Midwest	0.667	(0.386,1.152)	0.689	(0.395,1.200)	0.674	(0.381,1.190)	0.707	(0.395,1.264)
South	1.956**	(1.209,3.165)	2.053**	(1.255,3.358)	1.878*	(1.122,3.146)	2.055**	(1.208,3.496)
West	1.406	(0.826,2.391)	1.439	(0.838,2.473)	1.456	(0.834,2.543)	1.571	(0.888,2.779)
Intercept	0.003***	(0.001,0.008)	0.002***	(0.001,0.005)	0.002***	(0.001,0.006)	0.002***	(0.001,0.005)
McFadden's Adjusted R^2	0.221		0.230		0.223		0.221	
AIC	1373.409		1347.912		1326.379		1303.763	
BIC	1578.738		1566.459		1637.235		1706.792	
Penalized LL	-655.704		-640.956		-670.927		-590.882	
N	5,490		5,485		5,447		5,410	

*** p<.001, ** p<.01, * p<.05, † p<.1

Table A.8

Average Marginal Effects for Logistic Models Predicting Carrying

	Dispositional Models				Full Models			
	Conventional		Penalized		Conventional		Penalized	
	AME (SE)		AME (SE)		AME (SE)		AME (SE)	
Clinical Characteristics								
Mental Disorders								
Anxiety Disorder(s)	0.008	(0.010)	0.002	(0.007)	0.006	(0.009)	0.003	(0.007)
Mood Disorder(s)	0.005	(0.018)	0.012	(0.013)	0.002	(0.020)	0.011	(0.014)
Impulse Control Disorder(s)	0.011	(0.017)	0.009	(0.013)	0.009	(0.015)	0.008	(0.013)
Multi-Category Disorders	0.019	(0.016)	0.005	(0.008)	0.013	(0.014)	0.004	(0.009)
Disorder Severity								
Mild	0.013	(0.010)	0.013	(0.009)	0.011	(0.008)	0.013	(0.009)
Moderate	0.003	(0.008)	0.011	(0.010)	-0.000	(0.008)	0.004	(0.010)
Severe	0.027	(0.017)	0.030†	(0.018)	0.020	(0.016)	0.025	(0.017)
Substance Abuse/Dependence	-0.011	(0.012)	-0.006	(0.009)	-0.014	(0.012)	-0.006	(0.010)
Mental Health Treatment	-0.018†	(0.010)	-0.005	(0.008)	-0.018†	(0.010)	-0.004	(0.009)
Dispositional Factors								
Angry Impulsivity	-0.007	(0.011)	-0.002	(0.009)	-0.008	(0.012)	-0.001	(0.009)
Criminogenic Disinhibition	0.045*	(0.020)	0.043***	(0.010)	0.047*	(0.020)	0.046***	(0.011)
Cultural Factors								
Religious Affiliation								
Catholic					-0.011	(0.007)	-0.009	(0.007)
Other Religion					0.029	(0.021)	0.003	(0.012)
Agnostic/Atheist/No Pref					0.002	(0.009)	0.001	(0.008)
Intraracial Marriage Preference								
Not Very Important					0.003	(0.010)	0.003	(0.007)
Somewhat Important					-0.003	(0.009)	-0.001	(0.007)
Very Important					0.004	(0.010)	0.012	(0.008)
Childhood Rurality								
Suburbs					-0.007	(0.011)	-0.001	(0.009)
Small City					-0.011	(0.011)	-0.003	(0.008)
Town/Village					-0.001	(0.011)	0.007	(0.009)
Rural Area					0.011	(0.012)	0.005	(0.008)
Moved Around					0.004	(0.022)	0.016	(0.021)

Table A.8 Continued.

Criminological Factors								
Drugs before 18					0.003	(0.008)	-0.001	(0.006)
Early IPV Experiences								
Victim Only					0.026†	(0.013)	0.019*	(0.010)
Offender Only					-0.015	(0.018)	-0.011	(0.015)
Victim/Offender					0.020	(0.024)	-0.004	(0.009)
Childhood Physical Abuse								
Rarely					-0.005	(0.010)	-0.001	(0.007)
Sometimes					0.016	(0.013)	0.014	(0.009)
Often					-0.027**	(0.009)	-0.020*	(0.008)
Parental Criminality					0.005	(0.019)	0.013	(0.019)
Parental Violence					0.001	(0.011)	0.003	(0.009)
Control Variables								
Gun-Related Job	0.052**	(0.015)	0.049***	(0.010)	0.051***	(0.012)	0.034***	(0.009)
Gun Access	0.092***	(0.008)	0.091***	(0.007)	0.086***	(0.008)	0.089***	(0.008)
Age	-0.000	(0.000)	-0.000*	(0.000)	-0.000	(0.000)	-0.000	(0.000)
Male Sex	0.037***	(0.007)	0.040***	(0.006)	0.036***	(0.005)	0.028***	(0.006)
Marital Status								
Div/Sep/Widowed	0.031*	(0.013)	0.032**	(0.010)	0.032*	(0.012)	0.028**	(0.009)
Never Married	0.003	(0.013)	0.004	(0.009)	0.004	(0.014)	0.014	(0.009)
Annual Household Income								
$20,000-$49,999	0.009	(0.011)	0.007	(0.008)	0.008	(0.011)	0.002	(0.008)
$50,000-$74,999	0.008	(0.010)	0.010	(0.009)	0.009	(0.009)	0.004	(0.009)
$75,000+	0.020*	(0.009)	0.022*	(0.009)	0.021*	(0.010)	0.009	(0.009)
Children in the Home								
One	0.007	(0.012)	0.006	(0.009)	0.006	(0.011)	0.005	(0.008)
Two	0.023	(0.015)	0.031**	(0.011)	0.020	(0.015)	0.009	(0.010)
Three+	0.038†	(0.021)	0.040**	(0.015)	0.032	(0.020)	0.017	(0.014)
Region of Residence								
Midwest	-0.002	(0.007)	-0.003	(0.008)	-0.002	(0.006)	-0.008	(0.008)
South	0.034***	(0.009)	0.032***	(0.008)	0.034***	(0.009)	0.026**	(0.009)
West	0.012†	(0.007)	0.009	(0.009)	0.013†	(0.007)	0.015	(0.009)

Notes: The average marginal effect (AME) of a continuous variable is the derivative of the response (dy/dx). The AME of a categorical or dichotomous variable is the discrete change from the base category; Linearized standard error estimators of the unconditional variances of parameter estimates reported.

*** p<.001, ** p<.01, * p<.05, † p<.1

Appendix B: Paper II Supplemental Tables

Table B.1

Descriptive Statistics for NSDUH Sample, 2009-2013

	Survey Year										
	2009		2010		2011		2012		2013		
Predictor	M/%	SE	M/%	SE	M/%	SE	M/%	SE	M/%	SE	Range
Mental Illness											
None	81.63%	.003	81.79%	.004	81.85%	.003	81.21%	.003	81.21%	.003	0-1
Mild	9.94%	.002	9.83%	.003	9.54%	.003	9.55%	.002	9.55%	.002	0-1
Moderate	4.71%	.002	4.34%	.002	4.59%	.002	5.22%	.002	5.22%	.002	0-1
Severe	3.72%	.002	4.03%	.002	4.02%	.002	4.02%	.002	4.02%	.002	0-1
K6 Score	4.936	.045	4.923	.054	4.851	.041	4.943	.051	4.894	.053	0-24
Modified WHODAS-II Score	2.437	.027	2.423	.028	2.401	.023	2.459	.027	2.429	.031	0-15
Inpatient Treatment	0.81%	.001	0.76%	.001	0.82%	.001	0.77%	.001	0.77%	.001	0-1
Mental Health Treatment	13.82%	.003	13.59%	.002	13.72%	.003	14.74%	.003	14.74%	.003	0-1
Psychiatric Medication Use	11.77%	.003	11.46%	.002	11.54%	.003	12.49%	.003	12.49%	.003	0-1
Disinhibition	.224	.004	.224	.003	.225	.004	.222	.003	.219	.003	0-2
Religiosity	3.935	.020	3.876	.014	3.893	.020	3.872	.018	3.813	.021	0-6
Age											0-6
18-25	14.76%	.003	14.81%	.003	14.74%	.003	14.68%	.002	14.68%	.002	0-1
26-34	15.88%	.003	15.93%	.003	15.70%	.003	15.72%	.003	15.72%	.003	0-1
35-49	28.17%	.005	27.35%	.004	26.31%	.004	25.85%	.004	25.85%	.004	0-1
50-64	24.49%	.004	24.89%	.005	25.96%	.005	25.96%	.005	25.96%	.005	0-1
65+	16.71%	.005	17.02%	.005	17.28%	.004	17.78%	.004	17.78%	.004	0-1
Male Sex	48.18%	.005	48.37%	.005	48.07%	.004	47.99%	.004	47.99%	.004	0-1
Race/Ethnicity											
White	68.58%	.005	68.22%	.004	66.96%	.004	66.44%	.005	66.44%	.005	0-1
Black	11.57%	.003	11.59%	.003	11.46%	.003	11.55%	.004	11.55%	.004	0-1
Hispanic	13.61%	.004	13.85%	.003	14.52%	.004	14.76%	.004	14.76%	.004	0-1
Asian	4.36%	.003	4.43%	.002	4.78%	.003	4.86%	.002	4.86%	.002	0-1
Other	1.87%	.001	1.90%	.001	2.27%	.001	2.40%	.002	2.40%	.002	0-1

Table B.1 Continued.

	2009		2010		2011		2012		2013		
Predictor	M/%	SE	M/%	SE	M/%	SE	M/%	SE	M/%	SE	R
Marital Status											
Married/Cohabitating	54.64%	.006	52.70%	.005	52.95%	.005	52.72%	.005	52.72%	.005	0-1
Divorced/Separated/Widowed	18.80%	.004	20.64%	.004	20.45%	.004	20.25%	.004	20.25%	.004	0-1
Never Married	26.55%	.004	26.66%	.004	26.61%	.004	27.03%	.004	27.03%	.004	0-1
Education (Years)											
0-11	15.06%	.003	15.06%	.003	13.94%	.003	14.45%	.003	14.45%	.003	0-1
12	30.82%	.005	30.40%	.004	30.13%	.004	29.62%	.004	29.62%	.004	0-1
13-15	25.20%	.004	25.81%	.003	26.04%	.004	26.48%	.004	26.48%	.004	0-1
16+	28.93%	.005	28.73%	.005	29.89%	.004	29.45%	.004	29.45%	.004	0-1
Annual Household Income											
Less Than $20,000	17.55%	.004	18.66%	.004	19.16%	.004	18.80%	.004	18.80%	.004	0-1
$20,000-$49,000	32.81%	.004	33.44%	.005	32.45%	.004	32.94%	.005	32.94%	.005	0-1
$50,000-$74,999	17.19%	.003	16.93%	.003	17.14%	.003	16.59%	.004	16.59%	.004	0-1
$75,000+	32.46%	.006	30.98%	.006	31.25%	.005	31.68%	.006	31.68%	.006	0-1
Household Size	2.997	.016	2.986	.013	2.984	.015	3.043	.020	2.998	.015	1-6+
No. of Children in Home	0.696	.010	0.686	.008	0.675	.010	0.697	.011	0.668	.008	0-3+
Population Size	225,326,886		227,242,231		230,411,149		232,998,302		234,716,708		

Table B.2

Descriptive Statistics for NSDUH Sample, 2014-2019

	Survey Year												
	2014		2015		2016		2017		2018		2019		
Predictor	M/%	SE	M/%	SE	M/%	SE	M/%	SE	M/%	SE	M/%	SE	R
Mental Illness													
None	81.74%	.003	81.92%	.003	81.65%	.002	80.99%	.003	80.77%	.003	79.16%	.003	0-1
Mild	9.35%	.002	9.13%	.002	9.30%	.002	9.45%	.002	9.34%	.002	9.98%	.002	0-1
Moderate	4.76%	.001	4.86%	.001	4.71%	.001	4.90%	.001	5.27%	.002	5.54%	.002	0-1
Severe	4.16%	.001	4.10%	.001	4.34%	.001	4.66%	.001	4.62%	.002	5.32%	.002	0-1
K6 Score	4.862	.034	4.752	.037	4.812	.035	4.850	.041	4.923	.039	5.146	.049	0-24
Mod. WHODAS-II	2.424	.023	2.343	.025	2.392	.021	2.435	.023	2.442	.030	2.594	.030	0-15
Inpatient Treatment	0.91%	.000	1.18%	.001	1.27%	.001	1.31%	.001	1.28%	.001	1.25%	.001	0-1
MH Treatment	15.05%	.002	14.09%	.002	14.47%	.002	14.81%	.002	15.03%	.003	16.12%	.002	0-1
Psychiatric Meds	12.80%	.002	11.82%	.002	12.15%	.002	12.08%	.002	12.26%	.003	13.14%	.002	0-1
Disinhibition	.221	.003	.212	.003	.210	.003	.212	.003	.207	.003	.209	.003	0-3
Religiosity	3.759	.013	3.766	.017	3.712	.015	3.680	.018	3.648	.013	3.610	.016	0-6
Age													
18-25	14.50%	.002	14.36%	.002	14.12%	.002	13.84%	.003	13.63%	.002	13.44%	.002	0-1
26-34	15.78%	.002	15.81%	.003	15.87%	.002	16.00%	.002	16.05%	.003	16.07%	.003	0-1
35-49	25.13%	.004	24.94%	.003	24.85%	.003	24.69%	.003	24.59%	.002	24.26%	.003	0-1
50-64	25.93%	.004	25.78%	.004	25.54%	.004	25.24%	.003	25.02%	.003	25.07%	.004	0-1
65+	18.66%	.004	19.11%	.004	19.63%	.004	20.23%	.004	20.72%	.004	21.16%	.004	0-1
Male Sex	48.17%	.003	48.25%	.004	48.20%	.003	48.28%	.003	48.34%	.004	48.24%	.004	0-1
Race/Ethnicity													
White	65.62%	.005	65.07%	.005	64.82%	.005	64.21%	.004	63.83%	.005	63.48%	.005	0-1
Black	11.65%	.003	11.78%	.003	11.76%	.003	11.85%	.004	11.73%	.003	11.88%	.004	0-1
Hispanic	15.25%	.004	15.47%	.003	15.58%	.003	15.89%	.004	16.17%	.004	16.32%	.004	0-1
Asian	5.05%	.003	5.29%	.002	5.15%	.002	5.50%	.002	5.56%	.002	5.61%	.002	0-1
Other	2.43%	.001	2.38%	.001	2.69%	.001	2.56%	.001	2.71%	.001	2.71%	.001	0-1
Marital Status													
Married/Cohab.	51.96%	.004	52.73%	.004	51.75%	.004	51.95%	.005	51.65%	.005	50.98%	.004	0-1
Div./Sep./Wid.	20.11%	.003	20.16%	.004	19.84%	.003	19.23%	.003	19.50%	.003	20.04%	.003	0-1
Never Married	27.93%	.004	27.11%	.003	28.41%	.004	28.83%	.004	28.85%	.004	28.98%	.003	0-1

Table B.2 Continued.

	2014		2015		2016		2017		2018		2019		
Predictor	M/%	SE	M/%	SE	M/%	SE	M/%	SE	M/%	SE	M/%	SE	R
Education (Years)													
0-11	13.05%	.003	13.92%	.003	12.64%	.002	12.02%	.003	12.10%	.002	11.82%	.003	0-1
12	28.89%	.004	25.35%	.004	25.26%	.003	24.32%	.003	24.78%	.004	24.17%	.003	0-1
13-15	27.39%	.003	30.64%	.003	31.05%	.003	31.20%	.004	31.12%	.003	30.86%	.004	0-1
16+	30.67%	.004	30.08%	.004	31.05%	.004	32.46%	.005	31.99%	.005	33.15%	.004	0-1
Household Income													
< $20,000	18.08%	.003	17.69%	.003	16.82%	.003	16.02%	.003	15.56%	.003	14.64%	.002	0-1
$20,000-$49,000	30.94%	.005	29.95%	.004	29.92%	.004	29.40%	.004	29.27%	.003	28.39%	.005	0-1
$50,000-$74,999	16.74%	.003	16.73%	.003	16.00%	.003	15.86%	.003	15.57%	.003	15.94%	.003	0-1
$75,000+	34.23%	.005	35.63%	.005	37.25%	.005	38.72%	.005	39.59%	.005	41.03%	.005	0-1
Household Size	2.997	.010	3.010	.011	3.013	.012	2.989	.011	2.978	.013	2.977	.013	1-6+
No. of Children	0.670	.006	0.670	.007	0.662	.007	0.654	.007	0.647	.008	0.637	.007	0-3+
Population Size	237,108,063		239,256,806		240,955,953		243,561,040		245,033,981		246,558,143		

References

114 Cong. Rec. 14772. (1968). *(Omnibus Crime Control and Safe Streets Act of 1967: Amendment No. 820, Sen. Russell Long)*.

114 Cong. Rec. 21784. (1968). *(Amendment proposing registration of handguns)*.

117th Congress. (2023). *Quick search of proposed legislation including firearms*. Retrieved February 20 from https://www.congress.gov/quick-search/legislation

Act 372, Mich. Comp. Laws § 6 (1927).

Act of Mar. 30, 1927, N.J. Laws, ch. 321 § 7 (1927).

Adams, S. W., & Yanos, P. T. (2020). Pathways to aggression and violence in psychosis without longstanding antisocial behavior: A review and proposed psychosocial model for integrative clinical interventions. *Psychiatry research*, *293*, 113427. https://doi.org/10.1016/j.psychres.2020.113427

Agresti, A. (2012). *Categorical data analysis* (Vol. 792). John Wiley & Sons.

Ahonen, L., Loeber, R., & Brent, D. A. (2019). The association between serious mental health problems and violence: Some common assumptions and misconceptions. *Trauma, violence, & abuse*, *20*(5), 613-625.

Alcohol, Drug Abuse, and Mental Health Administration Reorganization Act, Pub. L. No. 102-321, 323 (1992). https://www.congress.gov/102/statute/STATUTE-106/STATUTE-106-Pg323.pdf

Aldworth, J., Colpe, L. J., Gfroerer, J. C., Novak, S. P., Chromy, J. R., Barker, P. R., Barnett-Walker, K., Karg, R. S., Morton, K. B., & Spagnola, K. (2010). The National survey on drug use and health mental health surveillance study: calibration analysis. *International journal of methods in psychiatric research*, *19*(S1), 61-87.

Allison, P. (2012, February 4). Logistic regression for rare events. *Statistical Horizons*. https://statisticalhorizons.com/logistic-regression-for-rare-events/

Almomen, Z. A., Alqahtani, A. H., Alafghani, L. A., Alfaraj, A. F., Alkhalifah, G. S., Jalalah, N. H. B., Alsuwailem, N. A., & Hilal, R. M. (2022). Homicide in relation to mental illness: stigma versus reality. *Cureus*, *14*(12).

Alper, M., & Glaze, L. (2019). *Source and use of firearms involved in crimes: Survey of prison inmates, 2016*. (NCJ 251776). Washington, DC: Department of Justice

American Psychiatric Association (1981). *Diagnostic and statistical manual of mental disorders, 3rd ed*. Washington, DC: American Psychiatric Association.

American Psychiatric Association. (1989). *Diagnostic and statistical manual of mental disorders* (3rd rev. ed.). American Psychiatric Association.

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). American Psychiatric Association.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Association

Andrés, A. R., & Hempstead, K. (2011). Gun control and suicide: The impact of state firearm regulations in the United States, 1995–2004. *Health Policy*, *101*(1), 95-103.

Anestis, J. C., Anestis, M. D., Preston, O. C., & Rodriguez, T. R. (2021). Dispositional characteristics in firearm ownership and purchasing behavior during the 2020 purchasing surge. *Social science & medicine*, *289*, 114408.

Appelbaum, P. S. (1994). *Almost a revolution: Mental health law and the limits of change*. Oxford University Press, USA.

Appelbaum, P. S. (2013). Public safety, mental disorders, and guns. *JAMA psychiatry, 70*(6), 565-566.

Arboleda-Florez, J., Holley, H., & Crisanti, A. (1998). Understanding causal paths between mental illness and violence. *Social psychiatry and psychiatric epidemiology*, *33*(1), S38-S46.

Azrael, D., Cook, P. J., & Miller, M. (2004). State and local prevalence of firearms ownership measurement, structure, and trends. *Journal of Quantitative Criminology*, *20*(1), 43-62.

Azrael, D., Hepburn, L., Hemenway, D., & Miller, M. (2017). The stock and flow of US firearms: results from the 2015 National Firearms Survey. *RSF: The Russell Sage Foundation Journal of the Social Sciences*, *3*(5), 38-57.

Bagalman, E., & Cornell, A. S. (2018). *Prevalence of mental illness in the united states: Data sources and estimates*. (CRS Report R43047).

Baiden, P., Jahan, N., Onyeaka, H. K., Thrasher, S., Tadeo, S., & Findley, E. (2021). Age at first alcohol use and weapon carrying among adolescents: Findings from the 2019 Youth Risk Behavior Survey. *SSM - Population Health*, *15*, 100820. https://doi.org/https://doi.org/10.1016/j.ssmph.2021.100820

Ballard, E., & Teasdale, B. (2016). Reconsidering the criminalization debate: An examination of the predictors of arrest among people with major mental disorders. *Criminal Justice Policy Review*, *27*(1), 22-45.

Banks, G., Hadenfeldt, K., Janoch, M., Manning, C., Ramos, K., & Wolf, D. A. P. S. (2017). Gun violence and substance abuse. *Aggression and violent behavior*, *34*, 113-116.

Baranyi, G., Di Marco, M. H., Russ, T. C., Dibben, C., & Pearce, J. (2021). The impact of neighbourhood crime on mental health: A systematic review and meta-analysis. *Social science & medicine*, *282*, 114106.

Bartol, C. R. (1981). Parens patriae: Poltergeist of mental health law. *Law & Policy*, *3*(2), 191-207.

Bauer, J. T. (2012). U.S. Religious Regions Revisited. *The Professional Geographer*, *64*(4), 521-539. https://doi.org/10.1080/00330124.2011.611429

Baumann, M. L., & Teasdale, B. (2018). Severe mental illness and firearm access: Is violence really the danger? *International Journal of Law and Psychiatry*, *56*, 44-49.

Bergstrøm, H., Larmour, S. R., & Farrington, D. P. (2018). The usefulness of psychopathy in explaining and predicting violence: Discussing the utility of competing perspectives. *Aggression and violent behavior*, *42*, 84-95. https://doi.org/10.1016/j.avb.2018.07.006

Binder, D. A. (1983). On the variances of asymptotically normal estimators from complex surveys. *International Statistical Review / Revue Internationale de Statistique*, *51*(3), 279-292. https://doi.org/10.2307/1402588

Bipartisan Safer Communities Act, Pub. L. No. 117-159, (2022).

Blumstein, A., & Cork, D. (1996). Linking gun availability to youth gun violence. *Law and Contemporary Problems*, *59*, 5-24.

Bottiani, J. H., Camacho, D. A., Lindstrom Johnson, S., & Bradshaw, C. P. (2021). Annual research review: Youth firearm violence disparities in the united states and implications for prevention. *Journal of child psychology and psychiatry*, *62*(5), 563-579. https://doi.org/https://doi.org/10.1111/jcpp.13392

Brady Handgun Violence Prevention Act, Pub. L. No. 103-159, 1536 (1993).

Branas, C. C., Han, S., & Wiebe, D. J. (2016). Alcohol Use and Firearm Violence. *Epidemiologic Reviews*, *38*(1), 32-45. https://doi.org/10.1093/epirev/mxv010

Brenan, M. (2022, June 23). *Public pressure for gun legislation up after shootings* https://news.gallup.com/poll/394022/public-pressure-gun-legislation-shootings.aspx

Brenan, M. (2023, February 15). *Dissatisfaction with U.S. gun laws hits new high* https://news.gallup.com/poll/470588/dissatisfaction-gun-laws-hits-new-high.aspx

Bronson, J. (2021). Intimate partner violence, firearm violence, and human rights in the United States. In M. Crandall, S. Bonne, J. Bronson, & W. Kessel (Eds.), *Why we are losing the war on gun violence in the United States* (pp. 49-61). Springer Nature.

Bryant, C. D., & Shoemaker, D. J. (1988). Gun ownership and carrying: Comparison of protective and subcultural correlates. *Psychological Reports*, *62*(1), 61-62.

Burris, S. (2018). Building the discipline of policy surveillance: report and next steps from an international convening. *Center for Public Health Law Research, January*.

Burris, S., Hitchcock, L., Ibrahim, J., Penn, M., & Ramanathan, T. (2016). Policy surveillance: a vital public health practice comes of age. *Journal of Health Politics, Policy and Law*, *41*(6), 1151-1173.

Burton, A. L., Logan, M. W., Pickett, J. T., Cullen, F. T., Jonson, C. L., & Burton Jr, V. S. (2021). Gun Owners and Gun Control: Shared Status, Divergent Opinions [https://doi.org/10.1111/soin.12413]. *Sociological Inquiry*, *n/a*(n/a). https://doi.org/https://doi.org/10.1111/soin.12413

Cagle, M. C., & Martinez, J. M. (2004). Have gun, will travel: The dispute between the CDC and the NRA on firearm violence as a public health problem. *Politics & Policy*, *32*(2), 278-310.

Cao, L., Cullen, F. T., & Link, B. G. (1997). The social determinants of gun ownership: Self-protection in an urban environment* [https://doi.org/10.1111/j.1745-9125.1997.tb01233.x]. *Criminology*, *35*(4), 629-658. https://doi.org/https://doi.org/10.1111/j.1745-9125.1997.tb01233.x

Carlson, J. (2020). Gun studies and the politics of evidence. *Annual review of law and social science*, *16*, 183-202.

Carlson, J., & James, R. (2021). Conspicuously concealed: Federal funding, knowledge production, and the criminalization of gun research. *Sociological Perspectives*, *65*(1), 196-215. https://doi.org/10.1177/07311214211012022

Carter, P. M., Mouch, C. A., Goldstick, J. E., Walton, M. A., Zimmerman, M. A., Resnicow, K., & Cunningham, R. M. (2020). Rates and correlates of risky firearm behaviors among adolescents and young adults treated in an urban emergency department. *Preventive medicine*, *130*, 105891. https://doi.org/https://doi.org/10.1016/j.ypmed.2019.105891

Caruso, G. (2017). Public health and safety: The social determinants of health and criminal behavior. *Gregg D. Caruso*.

Caspi, A., Houts, R. M., Belsky, D. W., Goldman-Mellor, S. J., Harrington, H., Israel, S., Meier, M. H., Ramrakha, S., Shalev, I., & Poulton, R. (2014). The p factor: One general psychopathology factor in the structure of psychiatric disorders? *Clinical Psychological Science*, *2*(2), 119-137.

Center for Behavioral Health Statistics and Quality. (2014). *2012 National Survey on Drug Use and Health: Methodological resource book (section 16a, Mental Health Surveillance Study: Design and estimation report)*. Rockville, MD: Substance Abuse and Mental Health Services Administration. Retrieved from https://www.samhsa.gov/data/

Center for Behavioral Health Statistics and Quality. (2015). *Estimating mental illness among adults in the United States:*

Revisions to the 2008 estimation procedures. Rockville, MD: Substance Abuse and Mental Health Services Administration. Retrieved from https://www.samhsa.gov/data/

Center for Behavioral Health Statistics and Quality. (2018a). *2008 National Survey on Drug Use and Health: Public use file codebook (revised)*. Substance Abuse and Mental Health Services Administration.

Center for Behavioral Health Statistics and Quality. (2018b). *2017 National Survey on Drug Use and Health: Methodological summary and definitions*. Substance Abuse and Mental Health Services Administration.

Center for Behavioral Health Statistics and Quality. (2021). *2020 National Survey on Drug Use and Health (NSDUH): Methodological summary and definitions*. Rockville, MD: Substance Abuse and Mental Health Services Administration Retrieved from https://www.samhsa.gov/data/

Chambers, R. L., & Skinner, C. J. (2003). *Analysis of survey data*. John Wiley & Sons.

Cherney, S., Morral, A. R., Schell, T. L., Smucker, S., & Hoch, E. (2022). *Development of the RAND State Firearm Law Database and Supporting Materials*. RAND Corporation. https://doi.org/10.7249/TL-A243-2

Coid, J., & Ullrich, S. (2010). Antisocial personality disorder is on a continuum with psychopathy. *Comprehensive psychiatry*, *51*(4), 426-433. https://doi.org/https://doi.org/10.1016/j.comppsych.2009.09.006

Coid, J., Yang, M., Ullrich, S., Roberts, A., & Hare, R. (2009). Prevalence and correlates of psychopathic traits in the household population of Great Britain. *International Journal of Law and Psychiatry*, *32*(2), 65-73.

Coid, J. W., Gonzalez, R., Igoumenou, A., Zhang, T., Yang, M., & Bebbington, P. (2017). Personality disorder and violence in the national household population of Britain. *The Journal of Forensic Psychiatry & Psychology*, *28*(5), 620-638. https://doi.org/10.1080/14789949.2016.1152590

Coid, J. W., Yang, M., Ullrich, S., Hickey, N., Kahtan, N., & Freestone, M. (2015). Psychiatric diagnosis and differential risks of offending following discharge. *International Journal of Law and Psychiatry*, *38*, 68-74. https://doi.org/https://doi.org/10.1016/j.ijlp.2015.01.009

Colpe, L. J., Epstein, J. F., Barker, P. R., & Gfroerer, J. C. (2009). Screening for serious mental illness in the National Survey on Drug Use and Health (NSDUH). *Annals of epidemiology*, *19*(3), 210-211. https://doi.org/https://doi.org/10.1016/j.annepidem.2008.09.005

Cook, P. J. (1991). The technology of personal violence. *Crime and justice*, *14*, 1-71.

Cook, P. J., & Ludwig, J. (1996). *Guns in America: results of a comprehensive national survey on firearms ownership and use*. Police Foundation Washington, DC.

Corrigan, P. W., Druss, B. G., & Perlick, D. A. (2014). The impact of mental illness stigma on seeking and participating in mental health care. *Psychological Science in the Public Interest*, *15*(2), 37-70.

Corrigan, P. W., & Kleinlein, P. (2005). The impact of mental illness stigma.

Cottler, L. B. (2007). Drug use disorders in the National Comorbidity Survey: have we come a long way? *Archives of General Psychiatry*, *64*(3), 380-381.

Coveney, J. (2021). *FIRTHLOGIT: Stata module to calculate bias reduction in logistic regression*. In https://EconPapers.repec.org/RePEc:boc:bocode:s456948

Coverdale, J. H., Coverdale, S. M., & Nairn, R. (2013). "Behind the mug shot grin": Uses of madness-talk in reports of Loughner's mass killing. *Journal of Communication Inquiry*, *37*(3), 200-216.

Cunningham, P. B., Henggeler, S. W., Limber, S. P., Melton, G. B., & Nation, M. A. (2000). Patterns and correlates of gun ownership among nonmetropolitan and rural middle school students. *Journal of clinical child psychology*, *29*(3), 432-442.

Curtin, S. C., Warner, M., & Hedegaard, H. (2016). Increase in suicide in the United States, 1999-2014. *NCHS data brief*(241), 1-8.

Dailey, L., Gray, M., Johnson, B., Muhammad, S., Sinclair, E., & Stettin, B. (2020). *Grading the states: An analysis of U.S. psychiatric treatment laws*.

Degli Esposti, M., Hsieh, H.-F., & Goldstick, J. E. (2022). Firearm injuries are a critical driver of health disparities in the united states. *JAMA network open*, *5*(11), e2244240-e2244240. https://doi.org/10.1001/jamanetworkopen.2022.44240

Dellazizzo, L., Dugre, J. R., Berwald, M., Stafford, M. C., Cote, G., Potvin, S., & Dumais, A. (2018). Distinct pathological profiles of inmates showcasing cluster B personality traits, mental disorders and substance use regarding violent behaviors. *Psychiatry research*, *260*, 371-378. https://doi.org/10.1016/j.psychres.2017.12.006

Devendorf, L. (2020). Second-class citizens under the second amendment: The case for applying strict scrutiny to lifetime firearm bans for individuals previously committed to mental institutions. *Cornell L. Rev.*, *106*, 501.

Diener, E., & Kerber, K. W. (1979). Personality characteristics of American gun-owners. *The Journal of Social Psychology*, *107*(2), 227-238.

District of Columbia v. Heller, 554 US US 570 (S. Ct. 2008).

Dixon, J., & Lizotte, A. J. (1987). Gun Ownership and the "Southern Subculture of Violence". *American Journal of Sociology*, *93*(2), 383-405. http://www.jstor.org/stable/2779589

Doucette, M. L., Ward, J. A., McCourt, A. D., Webster, D., & Crifasi, C. K. (2022). Officer-involved shootings and concealed carry weapons permitting laws: analysis of gun violence archive data, 2014–2020. *Journal of urban health*, *99*(3), 373-384.

Draine, J. (2002). Where is the 'illness' in the criminalization of mental illness? In *Community-based interventions for criminal offenders with severe mental illness*. Emerald Group Publishing Limited.

Drasgow, F. (2014). Polychoric and polyserial correlations. *Wiley StatsRef: Statistics Reference Online*.

DuRant, R. H., Kahn, J., Beckford, P. H., & Woods, E. R. (1997). The Association of Weapon Carrying and Fighting on School Property and Other Health Risk and Problem Behaviors Among High School Students. *Archives of Pediatrics & Adolescent Medicine*, *151*(4), 360-366. https://doi.org/10.1001/archpedi.1997.02170410034004

Durham, M. L., & La Fond, J. Q. (1984). The empirical consequences and policy implications of broadening the statutory criteria for civil commitment. *Yale L. & Pol'y Rev.*, *3*, 395.

Dutta, R., Murray, R. M., Hotopf, M., Allardyce, J., Jones, P. B., & Boydell, J. (2010). Reassessing long-term risk of suicide after a first episode of psychosis. *Arch Gen Psychiatry, 67*(12), 1230-1237.

Duxbury, S. W., Frizzell, L. C., & Lindsay, S. L. (2018). Mental illness, the media, and the moral politics of mass violence: The role of race in mass shootings coverage. *Journal of research in crime and delinquency*, *55*(6), 766-797.

Eilperin, J., & Nakamura, D. (2016, January 5). An emotional Obama flexes his executive muscle on gun control. *The Washington Post.* Retrieved from https://www.washingtonpost.com/politics/obama-moves-on-guns-with-executive-actions-that-circumvent-congress/2016/01/05/97f23336-b3bc-11e5-a76a-0b5145e8679a_story.html?utm_term=.9fba69d29e59.

Elbogen, E. B., & Johnson, S. C. (2009). The intricate link between violence and mental disorder: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Archives of General Psychiatry*, *66*(2), 152-161.

Ellison, C. G. (1991). Southern culture and firearms ownership. *Social Science Quarterly*.

English, W. (2021). 2021 National Firearms Survey. *Georgetown McDonough School of Business Research Paper*(3887145).

Endicott, J., Spitzer, R. L., Fleiss, J. L., & Cohen, J. (1976). The global assessment scale: A procedure for measuring overall severity of psychiatric disturbance. *Archives of general psychiatry, 33*(6), 766-771. doi:10.1001/archpsyc.1976.01770060086012

Ennis, B. J. (1971). Civil liberties and mental illness. *Crim. L. Bull.*, *7*, 101.

Ennis, B. J., & Emery, R. D. (1978). *The rights of mental patients: The revised edition of the basic ACLU guide to a mental patient's rights*. Avon Books.

Eronen, M., Angermeyer, M., & Schulze, B. (1998). The psychiatric epidemiology of violent behaviour. *Social Psychiatry and Psychiatric Epidemiology, 33*(1), S13-S23.

Erskine, H. (1972). The polls: Gun control. *The Public Opinion Quarterly*, *36*(3), 455-469.

Farrell, A. D., Danish, S. J., & Howard, C. W. (1992). Relationship between drug use and other problem behaviors in urban adolescents. *Journal of consulting and clinical psychology*, *60*(5), 705.

Fazel, S., & Grann, M. (2006). The population impact of severe mental illness on violent crime. *American Journal of Psychiatry*, *163*(8), 1397-1403.

Fazel, S., Långström, N., Hjern, A., Grann, M., & Lichtenstein, P. (2009). Schizophrenia, substance abuse, and violent crime. *Jama*, *301*(19), 2016-2023.

Fazel, S., Lichtenstein, P., Grann, M., Goodwin, G. M., & Långström, N. (2010). Bipolar disorder and violent crime: New evidence from population-based longitudinal studies and systematic review. *Archives of General Psychiatry*, *67*(9), 931-938. https://doi.org/10.1001/archgenpsychiatry.2010.97

Federal Bureau of Investigation. (2004). *National Instant Criminal Background Check System (NICS): Operational report 2003-2004*. https://www.fbi.gov/file-repository/ops_report2003-2004.pdf/view

Federal Bureau of Investigation. (2009). *National instant criminal background check system (NICS): Operations 2008*. https://www.fbi.gov/file-repository/2008-ops-report.pdf/view

Federal Bureau of Investigation. (2020). *National instant criminal background check system (NICS) section: 2019 operations report*. https://www.fbi.gov/file-repository/2019-nics-operations-report.pdf/view

Federal Bureau of Investigation. (2023). *Federal denials: Reasons why the NICS section denies November 30, 1998 - January 31, 2023*. https://www.fbi.gov/file-repository/federal_denials.pdf/view

Filindra, A., & Kaplan, N. J. (2016). Racial resentment and whites' gun policy preferences in contemporary America. *Political behavior*, *38*(2), 255-275.

Filindra, A., Kaplan, N. J., & Buyuker, B. E. (2021). Racial resentment or sexism? White Americans' outgroup attitudes as predictors of gun ownership and NRA membership. *Sociological Inquiry*, *91*(2), 253-286.

Firearm Owners' Protection Act, Pub. L. No. 99-308, 459 (1986).

Firth, D. (1993). Bias reduction of maximum likelihood estimates. *Biometrika*, *80*(1), 27-38.

Foucault, M. (2003). *Madness and civilization*. Routledge.

Fowler, K. A., Dahlberg, L. L., Haileyesus, T., & Annest, J. L. (2015). Firearm injuries in the United States. *Preventive medicine*, *79*, 5-14.

Frances, A. J., & Widiger, T. (2012). Psychiatric diagnosis: Lessons from the DSM-IV past and cautions for the DSM-5 future. *Annual review of clinical psychology*, *8*, 109-130.

Freedman, D., & Woods, G. W. (2013). Neighborhood effects, mental illness and criminal behavior: A review. *Journal of Politics and Law*, *6*(3), 1.

Friedman, R. A. (2006). Violence and mental illness—how strong is the link? *New England Journal of Medicine*, *355*(20), 2064-2066.

Gelles, R. J., & Straus, M. A. (1988). Intimate violence: the causes and consequences of abuse in the American family. *New York: Simon and Shuster*.

Gerds, T. A., Cai, T., & Schumacher, M. (2008). The performance of risk prediction models. *Biometrical Journal*, *50*(4), 457-479. https://doi.org/10.1002/bimj.200810443

Gfroerer, J. (2018). *War stories from the drug survey: How culture, politics, and statistics shaped the National Survey on Drug Use and Health*. Cambridge University Press.

Gfroerer, J., Hedden, S., Barker, P., Bose, J., & Aldworth, J. (2012). *Estimating mental illness in an ongoing national survey*. Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration.

Ginwalla, R., Rhee, P., Friese, R., Green, D. J., Gries, L., Joseph, B., Kulvatunyou, N., Lubin, D., O'Keeffe, T., & Vercruysse, G. (2014). Repeal of the concealed weapons law and its impact on gun-related injuries and deaths. *Journal of trauma and acute care surgery*, *76*(3), 569-575.

Gius, M. (2019). Using the synthetic control method to determine the effects of concealed carry laws on state-level murder rates. *International Review of Law and Economics*, *57*, 1-11.

Gius, M. (2020). Using the synthetic control method to determine the effects of firearm seizure laws on state-level murder rates. *Applied Economics Letters*, *27*(21), 1754-1758. https://doi.org/10.1080/13504851.2020.1720903

Goffman, E. (1961). *Asylums: Essays on the social situation of mental patients and other inmates*. AldineTransaction.

Goggins, B., & Gallegos, A. (2016). *State progress in record reporting for firearm-related background checks: Mental health submissions*. https://www.ojp.gov/pdffiles1/bjs/grants/249793.pdf

Gold, L. H. (2013). Gun violence: Psychiatry, risk assessment, and social policy. *Journal of the American Academy of Psychiatry and the Law Online, 41*(3), 337-343.

Gold, L. H., & Vanderpool, D. (2018). Legal Regulation of Restoration of Firearms Rights After Mental Health Prohibition. *Journal of the American Academy of Psychiatry and the Law Online*, *46*(3), 298-308. https://doi.org/10.29158/jaapl.003765-18

Goldman, S. (1988). Reagan's judicial legacy: Completing the puzzle and summing up. *Judicature*, *72*, 318.

Goldstick, J. E., Carter, P. M., & Cunningham, R. M. (2021). Current epidemiological trends in firearm mortality in the United States. *JAMA psychiatry*, *78*(3), 241-242. https://doi.org/10.1001/jamapsychiatry.2020.2986

Gottfredson, M. R., & Hirschi, T. (2022). A general theory of crime. In *A General Theory of Crime*. Stanford University Press.

Grant, B. F., & Dawson, D. A. (2006). Introduction to the National Epidemiologic Survey on Alcohol and Related Conditions. *Alcohol Research & Health*, *29*(2), 74.

Grasmick, H. G., Tittle, C. R., Bursik Jr, R. J., & Arneklev, B. J. (1993). Testing the core empirical implications of Gottfredson and Hirschi's general theory of crime. *Journal of research in crime and delinquency*, *30*(1), 5-29.

Grob, G. N. (1994). *The mad among us*. Simon and Schuster.

Gun Control Act, Pub. L. No. 90-618, 1220 (1968).

Hardy, D. T. (1986). The Firearms Owners' Protection Act: A historical and legal perspective. *Cumb. L. Rev.*, *17*, 585-682.

Harlow, C. W. (2001). *Firearm use by offenders*. (NCJ 189369). Washington, DC: Department of Justice

Harris, M. N., Baumann, M. L., Teasdale, B., & Link, B. G. (2022). Estimating the relationship between perceived stigma and victimization of people with mental illness. *Journal of interpersonal violence*, *37*(3-4), NP1226-NP1252.

Harvard Law Review. (1974). Developments in the law—civil commitment of the mentally ill. *Harvard Law Review*, *87*, 1190-1406.

Hasin, D. S., & Grant, B. F. (2015). The National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) Waves 1 and 2: Review and summary of findings. *Social psychiatry and psychiatric epidemiology*, *50*(11), 1609-1640.

Haw. Rev. Stat. § 134-7, Title 10, Part I § 7(c)(3) (1990).

Hedden, S., Gfroerer, J., Barker, P., Smith, S., Pemberton, M. R., Saavedra, L. M., Forman-Hoffman, V. L., Ringeisen, H., & Novak, S. P. (2012). Comparison of NSDUH mental health data and methods with other data sources. *CBHSQ Data Review*.

Heeringa, S. G., West, B. T., & Berglund, P. A. (2017). *Applied survey data analysis*. chapman and hall/CRC.

Heinz, A. J., Cohen, N. L., Holleran, L., Alvarez, J. A., & Bonn-Miller, M. O. (2016). Firearm Ownership Among Military Veterans With PTSD: A Profile of Demographic and Psychosocial Correlates. *Military medicine*, *181*(10), 1207-1211. https://doi.org/10.7205/MILMED-D-15-00552

Hiday, V. A., Swartz, M., Swanson, J. W., Borum, R., & Wagner, H. (1998). Male–female differences in the setting and construction of violence among people with severe mental illness. *Social psychiatry and psychiatric epidemiology*, *33*, S68-S74.

Hill, G. D., Howell, F. M., & Driver, E. T. (1985). Gender, fear, and protective handgun ownership. *Criminology*, *23*(3), 541-552.

Hill, S. S. (1985). Religion and Region in America. *The Annals of the American Academy of Political and Social Science*, *480*, 132-141. http://www.jstor.org/stable/1045340

Hiroeh, U., Appleby, L., Mortensen, P. B., & Dunn, G. (2001). Death by homicide, suicide, and other unnatural causes in people with mental illness: a population-based study. *The Lancet, 358*(9299), 2110-2112.

Hodgins, S., Cree, A., Alderton, J., & Mak, T. (2008). From conduct disorder to severe mental illness: Associations with aggressive behaviour, crime and victimization. *Psychological Medicine*, *38*(7), 975-987. https://doi.org/10.1017/S0033291707002164

Hogan, H. L. (1993). *Brady Handgun Violence Prevention Act: H.R. 1025/S.414, 103rd Congress*. (CRS Report No. 93-497). Retrieved from https://congressional.proquest.com/congressional/docview/t21.d22.crs-1993-gov-0045?accountid=11226

Howard, D. E., Wang, M. Q., & Yan, F. (2008). Psychosocial factors associated with reports of physical dating violence victimization among US adolescent males. *Adolescence*, *43*(171).

Huddleston v. United States, 415 US 814 (S. Ct. 1974).

Ilgen, M. A., Zivin, K., McCammon, R. J., & Valenstein, M. (2008). Mental illness, previous suicidality, and access to guns in the United States. *Psychiatric Services*, *59*(2), 198-200.

Junginger, J., Claypoole, K., Laygo, R., & Crisanti, A. (2006). Effects of serious mental illness and substance abuse on criminal offenses. *Psychiatric Services*, *57*(6), 879-882.

Junginger, J., & McGuire, L. (2004). Psychotic motivation and the paradox of current research on serious mental illness and rates of violence. *Schizophrenia Bulletin*, *30*(1), 21-30.

Juvenile delinquency, part 14: Interstate traffic in mail-order firearms: Hearing before the U.S. Senate Subcommittee to Investigate Juvenile Delinquency of the Committee on the Judiciary, 88th Congress, 88th Congress (1963).

Kagawa, R. M. C., Castillo-Carniglia, A., Vernick, J. S., Webster, D., Crifasi, C., Rudolph, K. E., Cerdá, M., Shev, A., & Wintemute, G. J. (2018). Repeal of comprehensive

background check policies and firearm homicide and suicide. *Epidemiology*, *29*(4), 494-502. https://doi.org/10.1097/ede.0000000000000838

Kalesan, B., Adhikarla, C., Pressley, J. C., Fagan, J. A., Xuan, Z., Siegel, M. B., & Galea, S. (2017). The hidden epidemic of firearm injury: Increasing firearm injury rates during 2001–2013. *American Journal of Epidemiology*, *185*(7), 546-553.

Kaplan, M. S., & Geling, O. (1998). Firearm suicides and homicides in the United States: Regional variations and patterns of gun ownership. *Social science & medicine*, *46*(9), 1227-1233. https://doi.org/https://doi.org/10.1016/S0277-9536(97)10051-X

Karp, A. (2018). *Estimating global civilian-held firearms numbers*.

Kaufman, E. J., & Delgado, M. K. (2022). The epidemiology of firearm injuries in the US: The need for comprehensive, real-time, actionable data. *Jama*, *328*(12), 1177-1178.

Kellermann, A. L., & Mercy, J. A. (1992). Men, women, and murder: Gender-specific differences in rates of fatal violence and victimization. *Journal of Trauma and Acute Care Surgery*, *33*(1), 1-5.

Kessler, R. C. (2007). Psychiatric epidemiology: Challenges and opportunities. *International Review of Psychiatry*, *19*(5), 509-521.

Kessler, R. C., Abelson, J., Demler, O., Escobar, J. I., Gibbon, M., Guyer, M. E., Howes, M. J., Jin, R., Vega, W. A., & Walters, E. E. (2004). Clinical calibration of DSM-IV diagnoses in the World Mental Health (WMH) version of the World Health Organization (WHO) Composite International Diagnostic Interview (WMH-CIDI). *International journal of methods in psychiatric research*, *13*(2), 122-139.

Kessler, R. C., Barker, P. R., Colpe, L. J., Epstein, J. F., Gfroerer, J. C., Hiripi, E., Howes, M. J., Normand, S.-L. T., Manderscheid, R. W., Walters, E. E., & Zaslavsky, A. M. (2003).

Screening for serious mental illness in the general population. *Archives of General Psychiatry*, *60*(2), 184-189. https://doi.org/10.1001/archpsyc.60.2.184

Kessler, R. C., Berglund, P., Chiu, W. T., Demler, O., Heeringa, S., Hiripi, E., Jin, R., Pennell, B. E., Walters, E. E., & Zaslavsky, A. (2004). The US National Comorbidity Survey Replication (NCS-R): Design and field procedures. *International journal of methods in psychiatric research*, *13*(2), 69-92.

Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry*, *62*(6), 593-602.

Kessler, R. C., Berglund, P. A., Walters, E. E., Leaf, P. J., Kouzis, A. C., Bruce, M. L., Friedman, R. M., Grosser, R. C., Kennedy, C., & Kuehnel, T. G. (1998). A methodology for estimating the 12-month prevalence of serious mental illness. In R. W. Manderscheid & M. J. Henderson (Eds.), *Mental Health, United States, 1998* (pp. 99-109).

Kessler, R. C., Berglund, P. A., Zhao, S., Leaf, P. J., Kouzis, A. C., Bruce, M. L., Friedman, R. M., Grosser, R. C., Kennedy, C., & Narrow, W. (1996). The 12-month prevalence and correlates of serious mental illness (SMI). In R. W. Manderscheid & M. A. Sonnenschein (Eds.), *Mental Health, United States, 1996* (pp. 59-70). Substance Abuse and Mental Health Administration.

Kessler, R. C., & Merikangas, K. R. (2004). The National Comorbidity Survey Replication (NCS-R): Background and aims. *International journal of methods in psychiatric research*, *13*(2), 60-68.

Kessler, R. C., & Üstün, T. B. (2004). The World Mental Health (WMH) survey initiative version of the World Health Organization (WHO) Composite International Diagnostic

Interview (CIDI). *International journal of methods in psychiatric research*, *13*(2), 93-121.

King, G., & Zeng, L. (2001). Logistic regression in rare events data. *Political Analysis*, *9*(2), 137-163.

Kingery, P. M., Mirzaee, E., Pruitt, B., & Hurley, R. S. (1990). Town and country violence. *School safety*, 22-25.

Kivisto, A. (2017). Gun violence following inpatient psychiatric treatment: Offense characteristics, sources of guns, and number of victims. *Psychiatric Services*, *68*(10), 1025-1031. https://doi.org/10.1176/appi.ps.201600385

Kleck, G. (2017). *Targeting guns: Firearms and their control*. Routledge.

Kleck, G., & Kovandzic, T. (2009). City-level characteristics and individual handgun ownership: Effects of collective security and homicide. *Journal of contemporary criminal justice*, *25*(1), 45-66.

Kleck, G., Kovandzic, T., Saber, M., & Hauser, W. (2011). The effect of perceived risk and victimization on plans to purchase a gun for self-protection. *Journal of Criminal Justice*, *39*(4), 312-319.

Kliff, S. (2012). The NRA wants an 'active' mental illness database. Thirty-eight states have that now. *The Washington Post,* (December 21st). Retrieved from https://www.washingtonpost.com/news/wonk/wp/2012/12/21/the-nra-wants-an-active-mental-illness-database-thirty-eight-states-have-that-now/

Knaak, S., Mantler, E., & Szeto, A. (2017). Mental illness-related stigma in healthcare: Barriers to access and care and evidence-based solutions. Healthcare management forum,

Knoll, J. L., & Annas, G. D. (2015). Mass shootings and mental illness. In L. H. Gold & R. I. Simon (Eds.), *Gun violence and mental illness* (pp. 81-104). Arlington, VA: American Psychiatric Association Publishing.

Kolla, B. P., O'Connor, S. S., & Lineberry, T. W. (2011). The base rates and factors associated with reported access to firearms in psychiatric inpatients. *General hospital psychiatry*, *33*(2), 191-196.

Kopel, D. B. (2011). The great gun control war of the twentieth century-and its lessons for gun laws today. *Fordham Urb. LJ*, *39*, 1527.

Kotov, R., Krueger, R. F., Watson, D., Achenbach, T. M., Althoff, R. R., Bagby, R. M., Brown, T. A., Carpenter, W. T., Caspi, A., & Clark, L. A. (2017). The Hierarchical Taxonomy of Psychopathology (HiTOP): A dimensional alternative to traditional nosologies. *Journal of abnormal psychology*, *126*(4), 454.

Kotov, R., Krueger, R. F., Watson, D., Cicero, D. C., Conway, C. C., DeYoung, C. G., Eaton, N. R., Forbes, M. K., Hallquist, M. N., & Latzman, R. D. (2021). The Hierarchical Taxonomy of Psychopathology (HiTOP): A quantitative nosology based on consensus of evidence. *Annual review of clinical psychology*, *17*, 83-108.

Kott, P., Hedden, S., Aldworth, J., Bose, J., Chromy, J., Gfroerer, J., & Liao, D. (2015). *Estimating mental illness among adults in the United States: Revisions to the 2008 estimation procedures*. Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration.

Krakowski, M. I., & Czobor, P. (2018). Distinctive profiles of traits predisposing to violence in schizophrenia and in the general population. *Schizophrenia research*, *202*, 267-273. https://doi.org/10.1016/j.schres.2018.07.008

Krueger, R. F., Markon, K. E., Patrick, C. J., Benning, S. D., & Kramer, M. D. (2007). Linking antisocial behavior, substance use, and personality: an integrative quantitative model of the adult externalizing spectrum. *Journal of abnormal psychology*, *116*(4), 645.

La Fond, J. Q. (1994). Law and the delivery of involuntary mental health services. *American Journal of Orthopsychiatry*, *64*(2), 209-222.

La Fond, J. Q., & Durham, M. L. (1992). *Back to the asylum: The future of mental health law and policy in the United States*. Oxford University Press.

La Fond, J. Q., & Durham, M. L. (1994). Cognitive dissonance: Have insanity defense and civil commitment reforms made a difference. *Vill. L. Rev.*, *39*, 71.

Langhinrichsen-Rohling, J., Hankla, M., & Stormberg, C. D. (2004). The relationship behavior networks of young adults: A test of the intergenerational transmission of violence hypothesis. *Journal of Family Violence*, *19*(3), 139-151.

Lanterman, J. L., & Blithe, S. J. (2018). Culture, Socialization, and Firearms Violence in the United States.

Lauritsen, J. L., & Lentz, T. S. (2019). National and local trends in serious violence, firearm victimization, and homicide. *Homicide studies*, *23*(3), 243-261. https://doi.org/https://doi.org/10.1177/1808786769719919884488665

Lee, L. K., Douglas, K., & Hemenway, D. (2022). Crossing lines — a change in the leading cause of death among U.S. Children. *New England Journal of Medicine*, *386*(16), 1485-1487. https://doi.org/10.1056/NEJMp2200169

Leon, A. C., Olfson, M., Portera, L., Farber, L., & Sheehan, D. V. (1997). Assessing psychiatric impairment in primary care with the Sheehan Disability Scale. *The international journal of psychiatry in medicine*, *27*(2), 93-105.

Lewiecki, E. M., & Miller, S. A. (2013). Suicide, guns, and public policy. *American journal of public health, 103*(1), 27-31.

Li, Z., Page, A., Martin, G., & Taylor, R. (2011). Attributable risk of psychiatric and socio-economic factors for suicide from individual-level, population-based studies: a systematic review. *Social Science & Medicine, 72*(4), 608-616.

Link, B. G., Andrews, H., & Cullen, F. T. (1992). The violent and illegal behavior of mental patients reconsidered. *American Sociological Review*, *57*(3), 275-292.

Link, B. G., Monahan, J., Stueve, A., & Cullen, F. T. (1999). Real in their consequences: A sociological approach to understanding the association between psychotic symptoms and violence. *American Sociological Review*, *64*(2), 316-332.

Link, B. G., & Stueve, A. (1998). New evidence on the violence risk posed by people with mental illness: On the importance of specifying the timing and the targets of violence. *Archives of General Psychiatry*, *55*(5), 403-404.

Link, B. G., Yang, L. H., Phelan, J. C., & Collins, P. Y. (2004). Measuring mental illness stigma. *Schizophrenia Bulletin*, *30*(3), 511-541.

Little, R. E., & Vogel, R. E. (1992). Handgun ownership and the religion factor. *Journal of Applied Social Psychology*, *22*(23), 1871-1877.

Lizotte, A. J., & Bordua, D. J. (1980). Firearms ownership for sport and protection: Two divergent models. *American Sociological Review*, 229-244.

Lizotte, A. J., Bordua, D. J., & White, C. S. (1981). Firearms ownership for sport and protection: Two not so divergent models. *American Sociological Review*, *46*(4), 499-503.

Lobo, J. M., Jiménez-Valverde, A., & Real, R. (2008). AUC: a misleading measure of the performance of predictive distribution models [https://doi.org/10.1111/j.1466-

8238.2007.00358.x]. *Global Ecology and Biogeography*, *17*(2), 145-151. https://doi.org/https://doi.org/10.1111/j.1466-8238.2007.00358.x

Logan, T., & Lynch, K. R. (2022). Increased risks or peace of mind? Exploring fear, victimization, and safety strategies among women planning to get a gun. *Journal of interpersonal violence*, *37*(19-20), NP18032-NP18059.

Long, J. S., & Freese, J. (2014). *Regression models for categorical dependent variables using Stata* (3rd ed.). Stata Press.

Lopez, S. R., & Guarnaccia, P. J. (2000). Cultural psychopathology: Uncovering the social world of mental illness. *Annual review of psychology*, *51*(1), 571-598.

Lu, Y., & Temple, J. R. (2019). Dangerous weapons or dangerous people? The temporal associations between gun violence and mental health. *Preventive medicine*, *121*, 1-6.

Luoma, J. B., Martin, C. E., & Pearson, J. L. (2002). Contact with mental health and primary care providers before suicide: A review of the evidence. *American Journal of Psychiatry*, *159*(6), 909-916.

Mansournia, M. A., Geroldinger, A., Greenland, S., & Heinze, G. (2018). Separation in logistic regression: causes, consequences, and control. *American Journal of Epidemiology*, *187*(4), 864-870.

Mansournia, M. A., Nazemipour, M., Naimi, A. I., Collins, G. S., & Campbell, M. J. (2021). Reflection on modern methods: demystifying robust standard errors for epidemiologists. *International Journal of Epidemiology*, *50*(1), 346-351.

Matejkowski, J., Fairfax-Columbo, J., Cullen, S. W., Marcus, S. C., & Solomon, P. L. (2014). Exploring the potential of stricter gun restrictions for people with serious mental illness

to reduce homicide in the United States. *The Journal of Forensic Psychiatry & Psychology*, *25*(3), 362-369.

McGinty, E. E., Kennedy-Hendricks, A., Choksy, S., & Barry, C. L. (2016). Trends in news media coverage of mental illness in the United States: 1995–2014. *Health Affairs*, *35*(6), 1121-1129.

McGinty, E. E., & Webster, D. W. (2015). Gun violence and serious mental illness. In L. H. Gold & R. I. Simon (Eds.), *Gun violence and mental illness* (pp. 3-30). Arlington, VA: American Psychiatric Association.

McGinty, E. E., Webster, D. W., & Barry, C. L. (2014). Gun policy and serious mental illness: priorities for future research and policy. *Psychiatr Serv*, *65*(1), 50-58. https://doi.org/10.1176/appi.ps.201300141

McGinty, E. E., Webster, D. W., Jarlenski, M., & Barry, C. L. (2014). News media framing of serious mental illness and gun violence in the United States, 1997-2012. *Am J Public Health*, *104*(3), 406-413. https://doi.org/10.2105/AJPH.2013.301557

McMahon, S. (2019). Gun laws and mental illness: Ridding the statutes of stigma. *University of Pennsylvania Journal of Law & Public Affairs*, *5*(2), 133-187.

McNiel, D. E., Eisner, J. P., & Binder, R. L. (2000). The relationship between command hallucinations and violence. *Psychiatric Services*, *51*(10), 1288-1292.

Mechanic, D., McAlpine, D. D., & Rochefort, D. A. (2013). *Mental health and social policy: Beyond managed care*. Pearson Higher Ed.

Mencken, F. C., & Froese, P. (2019). Gun Culture in Action. *Social Problems*, *66*(1), 3-27. https://doi.org/10.1093/socpro/spx040

Metzl, J. M., & MacLeish, K. T. (2015). Mental illness, mass shootings, and the politics of American firearms. *American Journal of Public Health*, *105*(2), 240-249. https://doi.org/10.2105/AJPH.2014.302242

Miller, M., Barber, C., Azrael, D., Hemenway, D., & Molnar, B. E. (2009). Recent psychopathology, suicidal thoughts and suicide attempts in households with and without firearms: findings from the National Comorbidity Study Replication. *Injury Prevention*, *15*(3), 183. https://doi.org/https://doi.org/10.1136/ip.2008.021352

Miller, M., Swanson, S. A., & Azrael, D. (2016). Are we missing something pertinent? A bias analysis of unmeasured confounding in the firearm-suicide literature. *Epidemiologic Reviews, 38*(1), 62-69. doi:10.1093/epirev/mxv011

Moeller, F. G., Barratt, E. S., Dougherty, D. M., Schmitz, J. M., & Swann, A. C. (2001). Psychiatric aspects of impulsivity. *American Journal of Psychiatry*, *158*(11), 1783-1793.

Monahan, J., & Steadman, H. J. (1983). Crime and mental disorder: An epidemiological approach. *Crime and justice*, *4*, 145-189.

Monahan, J., Steadman, H. J., Silver, E., Appelbaum, P. S., Robbins, P. C., Mulvey, E. P., . . . Banks, S. (2001). *Rethinking risk assessment: The MacArthur study of mental disorder and violence*. New York, NY: Oxford University Press.

Montgomery, J. (2002). National Instant Criminal Background Check System. *US Att'ys Bull.*, *50*, 50.

Moran, P. (1999). The epidemiology of antisocial personality disorder. *Social psychiatry and psychiatric epidemiology*, *34*, 231-242.

Morral, A. R., Schell, T. L., & Tankard, M. (2018). *The magnitude and sources of disagreement among gun policy experts* (RR2088z1). RAND Corporation.

Morris, G. H. (1985). Supreme Court examines civil commitment issues: A retrospective and prospective assessment. *Tul. L. Rev.*, *60*, 927.

Morris, N. P. (2020). Detention without data: public tracking of civil commitment. *Psychiatric Services*, *71*(7), 741-744.

Mueller, B. (2018, February 15). Limiting access to guns for mentally ill is complicated. *New York Times*. https://www.nytimes.com/2018/02/15/us/gun-access-mentally-ill.html

Murrell, A. R., Merwin, R. M., Christoff, K. A., & Henning, K. R. (2005). When parents model violence: The relationship between witnessing weapon use as a child and later use as an adult. *Behavior and Social Issues*, *14*(2), 128-134.

Muula, A. S., Rudatsikira, E., & Siziya, S. (2008). Correlates of weapon carrying among high school students in the United States. *Annals of General Psychiatry*, *7*(1), 1-8.

Myers, J. E. (1984). Involuntary civil commitment of the mentally ill: A system in need of change. *Vill. L. Rev.*, *29*, 367.

National Conference of Commissioners on Uniform State Laws. (1926, July 6-12). Handbook of the National Conference of Commissioners on Uniform State Laws and proceedings of the thirty-sixth annual meeting. Denver, CO.

National Conference of Commissioners on Uniform State Laws. (1927, August 23-29). Handbook of the National Conference of Commissioners on Uniform State Laws and proceedings of the thirty-seventh annual meeting. Buffalo, NY.

National Firearm Act, Pub. L. No. 73-474, (1934).

National Opinion Research Center. (2020). *The state of firearms data in 2019* (Expert Panel on Firearms Data Infrastructure, Issue.

Neumann, C. S., & Hare, R. D. (2008). Psychopathic traits in a large community sample: Links to violence, alcohol use, and intelligence. *Journal of Consulting and Clinical Psychology*, *76*(5), 893-899.

Newton, G. D., & Zimring, F. E. (1969). *Firearms & violence in American life*. National Commission on the Causes and Prevention of Violence Washington, DC.

NICS Improvement Amendments Act Pub. L. No. 110-180, 2559 (2007).

NORC. (2022, March 22). *One in five American households purchased a gun during the pandemic* https://www.norc.org/NewsEventsPublications/PressReleases/Pages/one-in-five-american-households-purchased-a-gun-during-the-pandemic.aspx

Novak, S. P., Colpe, L. J., Barker, P. R., & Gfroerer, J. C. (2010). Development of a brief mental health impairment scale using a nationally representative sample in the USA. *International journal of methods in psychiatric research*, *19*(S1), 49-60.

O'Connor, J. F., & Lizotte, A. (1978). The "Southern Subculture of Violence" Thesis and Patterns of Gun Ownership. *Social Problems*, *25*(4), 420-429. https://doi.org/10.2307/800494

O'Brien, K., Forrest, W., Lynott, D., & Daly, M. (2013). Racism, gun ownership and gun control: Biased attitudes in US whites may influence policy decisions. *PloS one*, *8*(10), e77552.

Office of Applied Studies. (2013). *2012 National Survey on Drug Use and Health: A revised strategy for estimating the prevalence of mental illness*. Rockville, MD: Substance Abuse and Mental Health Services Administration. Retrieved from https://www.samhsa.gov/data/

Ogloff, J. R. P. (2006). Psychopathy/antisocial personality disorder conundrum. *Australian and New Zealand Journal of Psychiatry*, *40*(6-7), 519-528. https://doi.org/https://doi.org/10.1111/j.1440-1614.2006.01834.x

Overall, J. E., & Gorham, D. R. (1988). The Brief Psychiatric Rating Scale (BPRS): Recent developments in ascertainment and scaling. *Psychopharmacology bulletin, 24*, 97-99.

Parker, K., Horowitz, J. M., Igielnik, R., Oliphant, J. B., & Brown, A. (2017). America's complex relationship with guns.

Patrick, C. J., Fowles, D. C., & Krueger, R. F. (2009). Triarchic conceptualization of psychopathy: Developmental origins of disinhibition, boldness, and meanness. *Development and Psychopathology*, *21*(3), 913-938.

Pederson, G., & Karterud, S. (2012). The symptom and function dimensions of the Global Assessment of Functioning (GAF) scale. *Comprehensive psychiatry, 53*(3), 292-298.

Pepe, M. S. (2003). *The statistical evaluation of medical tests for classification and prediction*. Oxford University Press, USA.

Peters, J. A., Cook, P. J., & Ludwig, J. (2005). Gun Crime and Gun Control: The Hawaiian Experience. *U. Chi. Legal F.*, 55.

Petrie, C. V., Pepper, J. V., & Wellford, C. F. (Eds.). (2004). *Firearms and violence: A critical review*. National Research Council of the National Academies.

Petrosky, E., Blair, J. M., Betz, C. J., Fowler, K. A., Jack, S. P., & Lyons, B. H. (2017). Racial and ethnic differences in homicides of adult women and the role of intimate partner violence—United States, 2003–2014. *MMWR*, *66*(28), 741-746.

Pfeffermann, D. (1993). The role of sampling weights when modeling survey data. *International Statistical Review/Revue Internationale de Statistique*, 317-337.

Pirkis, J., & Burgess, P. (1998). Suicide and recency of health care contacts: A systematic review. *The British Journal of Psychiatry*, *173*(6), 462-474.

Planty, M., & Truman, J. L. (2013). *Firearm violence, 1993-2011*. (NCJ 241730). Washington, DC: Department of Justice

Powell, R. E., & Sacks, C. A. (2020). A national research strategy to reduce firearm-related injury and death: Recommendations from the Health Policy Research Subcommittee of the Society of General Internal Medicine (SGIM). *Journal of general internal medicine*, *35*(7), 2182-2185.

Price, M., & Norris, D. M. (2008). National Instant Criminal Background Check Improvement Act: implications for persons with mental illness. *Journal of the American Academy of Psychiatry and the Law Online*, *36*(1), 123-130.

Pryal, K. R. G. (2013). Reframing Sanity: Scapegoating the Mentally Ill in the Case of Jared Loughner. *Re/Framing Identifications*, 159-168.

Pryal, K. R. G. (2014). Heller's scapegoats. *NCL Rev.*, *93*, 1439.

Rachlin, S. (1974). With liberty and psychosis for all. *Psychiatric Quarterly*, *48*(3), 410-420.

Raftery, A. E. (1995). Bayesian model selection in social research. *Sociological methodology*, 111-163.

Rajan, S., Branas, C. C., Hargarten, S., & Allegrante, J. P. (2018). Funding for gun violence research is key to the health and safety of the nation. In (Vol. 108, pp. 194-195): American Public Health Association.

Rees, C. A., Monuteaux, M. C., Steidley, I., Mannix, R., Lee, L. K., Barrett, J. T., & Fleegler, E. W. (2022). Trends and disparities in firearm fatalities in the United States, 1990-2021.

JAMA network open, *5*(11), e2244221-e2244221. https://doi.org/10.1001/jamanetworkopen.2022.44221

Rehm, J., Üstün, T. B., Saxena, S., Nelson, C. B., Chatterji, S., Ivis, F., & Adlaf, E. (1999). On the development and psychometric testing of the WHO screening instrument to assess disablement in the general population. *International journal of methods in psychiatric research*, *8*(2), 110-122.

Reising, K., Farrington, D. P., Ttofi, M. M., Piquero, A. R., & Coid, J. W. (2019). Childhood risk factors for personality disorder symptoms related to violence. *Aggression and violent behavior*, *49*, 101315. https://doi.org/https://doi.org/10.1016/j.avb.2019.07.010

Reynolds, B., Ortengren, A., Richards, J. B., & De Wit, H. (2006). Dimensions of impulsive behavior: Personality and behavioral measures. *Personality and Individual Differences*, *40*(2), 305-315.

Richards, J. E., Boggs, J. M., Rowhani-Rahbar, A., Kuo, E., Betz, M. E., Bobb, J. F., & Simon, G. E. (2022). Patient-reported firearm access prior to suicide death. *JAMA network open*, *5*(1), e2142204-e2142204.

Robbins, P. C., Monahan, J., & Silver, E. (2003). Mental disorder, violence, and gender. *Law and human behavior*, *27*(6), 561.

Roberts, A. D., & Coid, J. W. (2010). Personality disorder and offending behaviour: Findings from the national survey of male prisoners in England and Wales. *The Journal of Forensic Psychiatry & Psychology*, *21*(2), 221-237.

Roché, M. W., Boyle, D. J., Cheng, C.-C., Del Pozzo, J., Cherneski, L., Pascarella, J., Lukachko, A., & Silverstein, S. M. (2021). Prevalence and risk of violent ideation and behavior in

serious mental illnesses: An analysis of 63,572 patient records. *Journal of interpersonal violence*, *36*(5-6), 2732-2752.

Rosenberg, J. (2014). Mass shootings and mental health policy. *J. Soc. & Soc. Welfare, 41*, 107.

Royston, P., & Sauerbrei, W. (2008). *Multivariable model-building: a pragmatic approach to regression anaylsis based on fractional polynomials for modelling continuous variables*. John Wiley & Sons.

Rüsch, N., Angermeyer, M. C., & Corrigan, P. W. (2005). Mental illness stigma: Concepts, consequences, and initiatives to reduce stigma. *European psychiatry*, *20*(8), 529-539.

S. Rep. No. 110-183. (2007). https://www.congress.gov/110/crpt/srpt183/CRPT-110srpt183.pdf

Sadler, J. Z. (2008). Vice and the diagnostic classification of mental disorders: A philosophical case conference. *Philosophy, Psychiatry, & Psychology*, *15*(1), 1-17.

Schaeffer, K. (2021, September 13). *Key facts about Americans and guns*. Pew Research Center. https://www.pewresearch.org/fact-tank/2021/09/13/key-facts-about-americans-and-guns/

Schell, T. L., Peterson, S., Vegetabile, B. G., Scherling, A., Smart, R., & Morral, A. R. (2020). *State-level estimates of household firearm ownership*. RAND Corporation. https://doi.org/10.7249/TL354

Schildkraut, J. (2016). Mass murder and the mass media: Understanding the construction of the social problem of mass shootings in the US. *Journal of Qualitative Criminal Justice & Criminology*, *4*(1).

Schildkraut, J., & Elsass, H. J. (2016). *Mass shootings: Media, myths, and realities: Media, myths, and realities*. ABC-CLIO.

Schildkraut, J., & Hernandez, T. C. (2014). Laws that bit the bullet: A review of legislative responses to school shootings. *American Journal of Criminal Justice*, *39*(2), 358-374.

Schnittker, J., Larimore, S. H., & Lee, H. (2020). Neither mad nor bad? The classification of antisocial personality disorder among formerly incarcerated adults. *Social science & medicine*, *264*, 113288. https://doi.org/https://doi.org/10.1016/j.socscimed.2020.113288

Schutten, N. M., Pickett, J. T., Burton, A. L., Cullen, F. T., Jonson, C. L., & Burton Jr, V. S. (2021). Understanding Gun Ownership in the Twenty-First Century: Why Some Americans Own Guns, but Most Do Not. *Justice Quarterly*, 1-24.

Scull, A. (1990). Deinstitutionalization: Cycles of despair. *The Journal of mind and behavior*, 301-311.

Sedgwick, P. (1982). Psycho politics: Laing, Foucault, Goffman, Szasz, and the future of mass psychiatry.

Seed, P. T., & Tobias, A. (2001). sbe36.1: Summary statistics for diagnostic tests. *Stata Technical Bulletin*, *59*, 9-12. https://www.stata.com/products/stb/journals/stb59.pdf

Selzer, M. L. (1971). The Michigan Alcoholism Screening Test: The quest for a new diagnostic instrument. *American Journal of Psychiatry, 127*(12), 1653-1658.

Sharma, L., Markon, K. E., & Clark, L. A. (2014). Toward a theory of distinct types of "impulsive" behaviors: a meta-analysis of self-report and behavioral measures. *Psychological bulletin*, *140*(2), 374.

Sheley, J. F. (1994). Drugs and Guns among Inner-City High School Students. *Journal of Drug Education*, *24*(4), 303-321. https://doi.org/10.2190/2hla-ag7k-x2al-g9d5

Siegel, M., Pahn, M., Xuan, Z., Ross, C. S., Galea, S., Kalesan, B., Fleegler, E., & Goss, K. A. (2017). Firearm-Related Laws in All 50 US States, 1991–2016. *American Journal of Public Health*, *107*(7), 1122-1129. https://doi.org/10.2105/ajph.2017.303701

Sigel, E. J., Mattson, S. A., & Mercado, M. C. (2019). Increased violence involvement and other behavioral and mental health factors among youth with firearm access. *Journal of Adolescent Health*, *65*(1), 63-71. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7571454/pdf/nihms-1025542.pdf

Silver, E. (2000a). Extending social disorganization theory: A multilevel approach to the study of violence among persons with mental illnesses. *Criminology*, *38*(4), 1043-1074.

Silver, E. (2000b). Race, neighborhood disadvantage, and violence among persons with mental disorders: The importance of contextual measurement. *Law and human behavior*, *24*(4), 449-456.

Silver, E. (2002). Mental disorder and violent victimization: the mediating role of involvement in conflicted social relationships. *Criminology*, *40*(1), 191-212.

Silver, E. (2006). Understanding the relationship between mental disorder and violence: The need for a criminological perspective. *Law and human behavior*, *30*(6), 685-706.

Silver, E., Mulvey, E. P., & Swanson, J. W. (2002). Neighborhood structural characteristics and mental disorder: Faris and Dunham revisited. *Social science & medicine*, *55*(8), 1457-1470. https://doi.org/https://doi.org/10.1016/S0277-9536(01)00266-0

Silver, E., & Teasdale, B. (2005). Mental disorder and violence: An examination of stressful life events and impaired social support. *Social Problems*, *52*(1), 62-78.

Silver, J., Fisher, W., & Horgan, J. (2018). Public mass murderers and federal mental health background checks. *Law & Policy*, *40*(2), 133-147. https://doi.org/10.1111/lapo.12102

Simon, T. R. (2022). Notes from the field: Increases in firearm homicide and suicide rates—United States, 2020–2021. *MMWR*, *71*(40), 1286-1287.

Sirotich, F. (2008). Correlates of crime and violence among persons with mental disorder: An evidence-based review. *Brief Treatment and Crisis Intervention*, *8*(2), 171-194.

Skeem, J., Kennealy, P., Monahan, J., Peterson, J., & Appelbaum, P. (2016). Psychosis uncommonly and inconsistently precedes violence among high-risk individuals. *Clinical Psychological Science*, *4*(1), 40-49.

Skeem, J., & Mulvey, E. (2020). What role does serious mental illness play in mass shootings, and how should we address it? *Criminology & Public Policy*, *19*(1), 85-108. https://doi.org/10.1111/1745-9133.12473

Skinner, H. A., & Allen, B. A. (1982). Alcohol dependence syndrome: measurement and validation. *Journal of abnormal psychology, 91*(3), 199.

Slack, D., Singer, P., & Kelly, E. (2015, December 3, 2015). Republicans say no to new gun control legislation after San Bernardino. *USA Today*. Retrieved from http://www.usatoday.com/story/news/politics/2015/12/03/ryan-urges-caution-on-gun-legislation/76714608/

Slobogin, C. (2006). *Minding justice: Laws that deprive people with mental disability of life and liberty*. Harvard University Press.

Smart, R., Morral, A. R., Smucker, S., Cherney, S., Schell, T. L., Peterson, S., Ahluwalia, S. C., Cefalu, M., Xenakis, L., Ramchand, R., & Gresenz, C. R. (2020). *The science of gun policy: A critical synthesis of research evidence on the effects of gun policies in the United States, second edition* (RR2088-1). RAND Corporation. https://www.rand.org/pubs/research_reports/RR2088-1.html

Steadman, H. J., Monahan, J., Pinals, D. A., Vesselinov, R., & Robbins, P. C. (2015). Gun violence and victimization of strangers by persons with a mental illness: Data From the

MacArthur Violence Risk Assessment Study. *Psychiatric Services*, *66*(11), 1238-1241. https://doi.org/10.1176/appi.ps.201400512

Steadman, H. J., Mulvey, E. P., Monahan, J., Robbins, P. C., Appelbaum, P. S., Grisso, T., Roth, L. H., & Silver, E. (1998). Violence by people discharged from acute psychiatric inpatient facilities and by others in the same neighborhoods. *Archives of General Psychiatry*, *55*(5), 393-401.

Steadman, H. J., & Ribner, S. A. (1982). Life stress and violence among ex-mental patients. *Social science & medicine*, *16*(18), 1641-1647.

Steyerberg, E. W. (2019). *Clinical prediction models: A practical approach to development, validation, and updating* (2nd ed.). Springer Nature Switzerland AG. https://doi.org/https://doi.org/10.1007/978-3-030-16399-0

Stone, D. H. (2012). Confine is fine: Have the non-dangerous mentally ill lost their right to liberty: An empirical study to unravel the psychiatrist's crystal ball. *Va. J. Soc. Pol'y & L.*, *20*, 323.

Stone, D. H. (2017). Dangerous minds: Myths and realities behind the violent behavior of the mentally ill, public perceptions, and the judicial response through involuntary civil commitment. *Law & Psychol. Rev.*, *42*, 59.

Stuart, H. (2003). Violence and mental illness: An overview. *World Psychiatry*, *2*(2), 121-124.

Stueve, A., & Link, B. G. (1998). Gender differences in the relationship between mental illness and violence: Evidence from a community-based epidemiological study in Israel. *Social psychiatry and psychiatric epidemiology*, *33*(1), S61-S67. https://doi.org/10.1007/s001270050211

Substance Abuse and Mental Health Services Administration. (1993). *Final notice [Final definitions for: (1) Children with serious emotional disturbance, and (2) adults with serious mental illness]*. Washington, DC: Federal Register

Substance Abuse and Mental Health Services Administration. (2014). *National Survey on Drug Use and Health concatenated 2002-2019 public-use file* (NSDUH-2002-2019-DS0001; Version 1). https://www.datafiles.samhsa.gov/dataset/nsduh-2002-2019-ds0001-nsduh-2002-2019-ds0001

Sudak, H., Maxim, K., & Carpenter, M. (2008). Suicide and stigma: a review of the literature and personal reflections. *Academic Psychiatry*, *32*(2), 136-142.

Summers, J. (2021, March 11). House passes bills to strengthen gun laws, including expanding background checks. *NPR*. https://www.npr.org/2021/03/11/976000003/house-passes-bills-to-strengthen-gun-laws-including-expanding-background-checks

Suzuki v. Yuen, 617 F. 2d 173 (Court of Appeals, 9th Circuit 1980).

Swanson, J. W. (1994). Mental disorder, substance abuse, and community violence: An epidemiological approach. In J. Monahan & H. J. Steadman (Eds.), *Violence and mental disorder: Developments in risk assessment* (pp. 101-136). The University of Chicago Press.

Swanson, J. W. (2021). Introduction: Violence and mental illness. *Harvard Review of Psychiatry*, *29*(1), 1-5.

Swanson, J. W., Easter, M. M., Alanis-Hirsch, K., Belden, C. M., Norko, M. A., Robertson, A. G., Frisman, L. K., Lin, H.-J., Swartz, M. S., & Parker, G. F. (2019). Criminal justice and suicide outcomes with Indiana's risk-based gun seizure law. *Journal of the American Academy of Psychiatry and the Law Online*, *47*(2), 188-197.

Swanson, J. W., Easter, M. M., Robertson, A. G., Swartz, M. S., Alanis-Hirsch, K., Moseley, D., Dion, C., & Petrila, J. (2016). Gun violence, mental illness, and laws that prohibit gun possession: Evidence from two Florida counties. *Health Affairs*, *35*(6), 1067-1075. https://doi.org/10.1377/hlthaff.2016.0017

Swanson, J. W., Guangyu, T., Robertson, A. G., & Swartz, M. S. (2020). Gun-related and other violent crime after involuntary commitment and short-term emergency holds [Article]. *Journal of the American Academy of Psychiatry & the Law*, *48*(4), 454-467. https://doi.org/10.29158/JAAPL.200082-20

Swanson, J. W., Holzer, C. E., Ganju, V. K., & Jono, R. T. (1990). Violence and psychiatric disorder in the community: Evidence from the Epidemiologic Catchment Area surveys. *Hospital & Community Psychiatry*, *41*(7), 761-770.

Swanson, J. W., McGinty, E. E., Fazel, S., & Mays, V. M. (2015). Mental illness and reduction of gun violence and suicide: Bringing epidemiologic research to policy. *Annals of epidemiology*, *25*(5), 366-376.

Swanson, J. W., Norko, M. A., Lin, H.-J., Alanis-Hirsch, K., Frisman, L. K., Baranoski, M. V., Easter, M. M., Robertson, A. G., Swartz, M. S., & Bonnie, R. J. (2017). Implementation and effectiveness of Connecticut's risk-based gun removal law: does it prevent suicides. *Law & Contemporary Problems*, *80*, 179.

Swanson, J. W., Sampson, N. A., Petukhova, M. V., Zaslavsky, A. M., Appelbaum, P. S., Swartz, M. S., & Kessler, R. C. (2015). Guns, impulsive angry behavior, and mental disorders: Results from the National Comorbidity Survey Replication (NCS-R). *Behavioral Sciences & the Law*, *33*(2-3), 199-212.

Swanson, J. W., Swartz, M. S., Essock, S. M., Osher, F. C., Wagner, H. R., Goodman, L. A., Rosenberg, S. D., & Meador, K. G. (2002). The social-environmental context of violent behavior in persons treated for severe mental illness. *American Journal of Public Health*, *92*(9), 1523-1531.

Szasz, T. S. (1960). The myth of mental illness. *American Psychologist*, *15*(2), 113.

Tasigiorgos, S., Economopoulos, K. P., Winfield, R. D., & Sakran, J. V. (2015). Firearm injury in the United States: An overview of an evolving public health problem. *Journal of the American College of Surgeons*, *221*(6), 1005-1014.

Taylor, P. J., Garety, P., Buchanan, A., Reed, A., Wessely, S., Ray, K., Dunn, G., & Grubin, D. (1994). Delusions and violence. In J. Monahan & H. J. Steadman (Eds.), *Violence and mental disorder: Developments in risk assessment*. The University of Chicago Press.

Taylor, P. J., & Gunn, J. (1999). Homicides by people with mental illness: Myth and reality. *The British Journal of Psychiatry*, *174*(1), 9-14.

Teasdale, B. (2009). Mental disorder and violent victimization. *Criminal Justice and Behavior*, *36*(5), 513-535.

Teasdale, B., Daigle, L. E., & Ballard, E. (2014). Trajectories of recurring victimization among people with major mental disorders. *Journal of interpersonal violence*, *29*(6), 987-1005.

Teasdale, B., Silver, E., & Monahan, J. (2006). Gender, threat/control-override delusions and violence. *Law and human behavior*, *30*(6), 649-658.

Thomas, A. R. (1998). Ronald Reagan and the commitment of the mentally ill: Capital, interest groups, and the eclipse of social policy. *Electronic Journal of Sociology*, *3*(4), 1-13. https://sociology.lightningpath.org/ejs-archives/vol003.004/thomas.html

Title VII of the Omnibus Crime Control and Safe Streets Act, Pub. L. No. 90-351, 236 § 1202(a)(3) (1968).

Tracy, M., Braga, A. A., & Papachristos, A. V. (2016). The Transmission of Gun and Other Weapon-Involved Violence Within Social Networks. *Epidemiologic Reviews*, *38*(1), 70-86. https://doi.org/10.1093/epirev/mxv009

Treffert, D. A. M. D. (1975). The practical limits of patients' rights. *Psychiatric Annals*, *5*(4), 91-93,96.

Uebersax, J. (2000). Estimating a latent trait model by factor analysis of tetrachoric correlations. *Statistical Methods for Rater Agreement web site*.

Van Dorn, R., Volavka, J., & Johnson, N. (2012). Mental disorder and violence: is there a relationship beyond substance use? *Social Psychiatry & Psychiatric Epidemiology*, *47*(3), 487-503. https://doi.org/10.1007/s00127-011-0356-x

Vegter, A., & den Dulk, K. R. (2021). Clinging to guns and religion? A research note testing the role of protestantism in shaping gun identity in the united states. *Politics and Religion*, *14*(4), 809-824.

Venables, N. C., Foell, J., Yancey, J. R., Beaver, K. M., Iacono, W. G., & Patrick, C. J. (2018). Integrating criminological and mental health perspectives on low self-control: A multi-domain analysis. *Journal of Criminal Justice*, *56*, 2-10.

Vernick, J. S., & Hepburn, L. M. (2003). State and federal gun laws: Trends for 1970-99. In J. Ludwig & P. J. Cook (Eds.), *Evaluating gun policy: Effects on crime and violence* (pp. 345-411). Brookings Institution.

Vitali, A. (2017, February 28). Trump signs bill revoking Obama-era gun checks for people with mental illnesses. *NBC News.* Retrieved from https://www.nbcnews.com/news/us-news/trump-signs-bill-revoking-obama-era-gun-checks-people-mental-n727221.

Vizzard, W. J. (1999). The Gun Control Act of 1968. . *Louis U. Pub. L. Rev.*, *18*, 79.

Von Korff, M., Crane, P. K., Alonso, J., Vilagut, G., Angermeyer, M. C., Bruffaerts, R., de Girolamo, G., Gureje, O., de Graaf, R., & Huang, Y. (2008). Modified WHODAS-II provides valid measure of global disability but filter items increased skewness. *Journal of clinical epidemiology*, *61*(11), 1132-1143.

Walby, F. A., Myhre, M. Ø., & Kildahl, A. T. (2018). Contact with mental health services prior to suicide: A systematic review and meta-analysis. *Psychiatric Services*, *69*(7), 751-759.

Wallace, L. N. (2022). Female gun owners: Differences by household and personal gun ownership. *The Social Science Journal*, *59*(4), 601-615. https://doi.org/10.1080/03623319.2020.1727246

Walvisch, J. (2017). Defining 'mental disorder' in legal contexts. *International Journal of Law and Psychiatry*, *52*, 7-18.

Wamser-Nanney, R., Nanney, J. T., Conrad, E., & Constans, J. I. (2019). Childhood trauma exposure and gun violence risk factors among victims of gun violence. *Psychological Trauma: Theory, Research, Practice, and Policy*, *11*(1), 99.

Wang, P. S., Demler, O., Olfson, M., Pincus, H. A., Wells, K. B., & Kessler, R. C. (2006). Changing profiles of service sectors used for mental health care in the United States. *American Journal of Psychiatry*, *163*(7), 1187-1198.

Ward, C. V. (2013). Mental illness and danger to self. *Mental Health L. & Pol'y J.*, *3*, 253.

Webster, D. W., & Wintemute, G. J. (2015). Effects of policies designed to keep firearms from high-risk individuals. *Annual review of public health, 36*, 21-37.

Weleff, J., Butler, R. S., Streem, D., & Barnett, B. S. (2022). Reported firearm access among patients admitted to a dual diagnosis medically-assisted withdrawal unit over five years. *Drug and alcohol dependence reports*, *2*, 100034.

Whiting, D., Lichtenstein, P., & Fazel, S. (2020). Violence and mental disorders: a structured review of associations by individual diagnoses, risk factors, and risk assessment. *The Lancet Psychiatry*.

Whiting, D., Lichtenstein, P., & Fazel, S. (2021). Violence and mental disorders: A structured review of associations by individual diagnoses, risk factors, and risk assessment. *The Lancet Psychiatry*, *8*(2), 150-161. https://doi.org/https://doi.org/10.1016/S2215-0366(20)30262-5

Winick, B. J. (1995). Ambiguities in the legal meaning and significance of mental illness. *Psychology, Public Policy, and Law*, *1*(3), 534-611.

Wintemute, G. J. (2015). The epidemiology of firearm violence in the twenty-first century United States. *Annual review of public health*, *36*, 5-19.

Wooldridge, J. M. (2015). *Introductory econometrics: A modern approach*. Cengage learning.

World Health Organization. (1992). *The ICD-10 Classification of Mental and Behavioural Disorders: Clinical Descriptions and Diagnostic Guidelines*. World Health Organization.

Wright, J. D., & Marston, L. L. (1975). The ownership of the means of destruction: Weapons in the United States. *Social Problems*, *23*(1), 93-107.

Yamane, D. (2016). Awash in a sea of faith and firearms: Rediscovering the connection between religion and gun ownership in America. *Journal for the scientific study of religion*, *55*(3), 622-636.

Yamane, D. (2017). The sociology of US gun culture. *Sociology compass*, *11*(7), e12497.

Yamane, D., Ivory, S. L., & Yamane, P. (2018). The rise of self-defense in gun advertising: the American Rifleman, 1918–2017. In *Gun Studies* (pp. 9-27). Routledge.

Young, R. L. (1985). Perceptions of crime, racial attitudes, and firearms ownership. *Social Forces*, *64*(2), 473-486.

Young, R. L. (1989). The Protestant heritage and the spirit of gun ownership. *Journal for the scientific study of religion*, 300-309.

Yu, R., Geddes, J. R., & Fazel, S. (2012). Personality disorders, violence, and antisocial behavior: A systematic review and meta-regression analysis. *Journal of personality disorders*, *26*(5), 775-792.

Zimring, F. E. (1968). Is gun control likely to reduce violent killings. *University of Chicago Law Review*, *35*, 721-737.

Zimring, F. E. (1972). The medium is the message: Firearm caliber as a determinant of death from assault. *The Journal of Legal Studies*, *1*(1), 97-123.

Zimring, F. E. (1975). Firearms and federal law: the Gun Control Act of 1968. *The Journal of Legal Studies*, *4*(1), 133-198.

VITA

Dr. Miranda Baumann was born in Phoenix, Arizona in 1983. In 2004, she embarked on a nearly 20-year academic journey at Georgia State University, earning a BA in Political Science and a BS in Criminal Justice in 2011 before going on to earn an MS in Criminal Justice and Criminology in 2015. She completed this dissertation in 2023 and will graduate with a PhD in Criminal Justice and Criminology in May 2023.

Dr. Baumann's primary research interest centers on the justice-related experiences of people with mental illness. Her research has examined risk and protective factors for violence among people with comorbid mental health and substance abuse problems, the impact of mental illness on violence in the context of gun access, and the role of victim disability on initial police actions. Her research has been published in several journals, including *International Journal of Law and Psychiatry, Annual Review of Criminology, American Journal of Criminal Justice,* and *Journal of Interpersonal Violence.*

Dr. Baumann's current research agenda is principally focused on criminal justice policy analysis. During her doctoral studies, Miranda participated in the design and implementation of multiple agency-based program evaluations, including a BJA-funded diversion program for high-risk probationers. Upon graduation, Dr. Baumann will begin a postdoctoral fellowship under the supervision of her Dissertation Chair, Dr. William Sabol, where she will serve as a co-Principal Investigator on current and forthcoming evaluation projects.

Miranda can be reached at mirandabaumann@gmail.com