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**Mass shootings in the United States:
Understanding the importance of mental health
and firearm considerations**

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Mass Shootings in the United States: Why Mental Health and Access to Firearms Are Important

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Abstract

The purpose of this study was to examine whether mass shooters' media-reported mental health history and firearm access relate to mass shooting severity. The current analysis included a total of 102 mass shooters in the U.S. between 1982 and 2018 described in media reports. Negative binomial regression analysis was used to assess if a shooter's media-reported mental health history and firearm access were related to mass shooting severity while controlling for age, race, location, weapon attainment legality, and assault rifle use. Results suggest that reported mental health histories, number of weapons brought to the scene of the crime, weapon attainment legality, the use of an assault-style weapon, and location were significantly related to mass shooting severity. Understanding the relationships between gun access, mental health, and mass shooting severity might provide a better foundation for policy development aimed at minimizing mass shootings. Unaddressed mental health issues might increase violence; therefore, reducing mental health stigma might enable more individuals to seek formal evaluations, which could assist violence prevention efforts. Similarly, increased firearm responsibility and safety, whether at the social or legal level, might reduce violence and prevent casualties of mass shootings.

Keywords: mass shooting; violence; gun control; mental illness; policy

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Mass Shootings in the United States: Why Mental Health and Access to Firearms Are Important

The three deadliest mass shootings in the U.S. occurred in the last decade. On April 16, 2007, Virginia Tech University experienced the third most fatal school shooting to date, sparking debates of campus safety and gun control nationwide (Kaminski, Koons-Witt, Thompson, & Weiss, 2010; Virginia Tech Review Panel [VTR], 2009). Seung-Hui Cho shot himself after he killed 32 students and faculty, injured 17, and caused psychological trauma for many others. After this event, information surfaced that Cho had a history of mental health issues since childhood, directly linking mental illness to this particular mass shooting (VTR, 2009). The second deadliest recorded mass shooting in the U.S. occurred nine years later on July 12, 2016, when Omar Mateen shot and killed 49 patrons and injured 53 patrons at the Pulse nightclub in Orlando, Florida (Murray, 2017). Again, the news linked the shooting to mental illness, particularly after Mateen's ex-wife reported he had a history of mental health issues (Safi, 2016). Most recently, Stephen Paddock killed 58 people and injured over 500 others at a country music festival in Las Vegas, Nevada in the deadliest mass shooting in the U.S. to date (Bui, Zapotosky, Barrett, & Berman, 2017; Gomez & White, 2017). Similar to the other cases, reporters, law enforcement, and public media representatives scrambled to name a motive, suggested a probable association with mental illness, and used mental health terms, such as *psychopath*, to describe the shooter. Consistent across all of these cases is the attempt to attribute the shooter's behavior to mental illness, as well as subsequent discussions of gun control legislation (e.g., see The New York Times, 2017).

Past research suggests mass shootings

increase stigma associated with mental health, reinforcing the negative stereotype that people with mental illness are more dangerous and prone to violence than people without a mental illness (McGinity, Webster & Barry, 2013; Metzl & MacLeish, 2015; Rosenberg, 2014). However, previous literature has not examined if mass shooters with prior mental health histories are more dangerous than mass shooters without mental health histories; thus, there is no empirical evidence to determine the role of mental illness in contributing to harm. Also, mass shooting events can engender the adoption of public policies associated with gun control, which are based on the presupposition that mass shooters are to blame for high firearm homicide rates (McGinty et al., 2013; Pescosolido, Monahan, Link, Stueve, & Kikuzawa, 1999; Rosenberg, Rosenberg, Ellefson & Corrigan, 2015). Such assumptions might lead to hastily adopting policies and using financial resources to address issues, potentially without regard to social costs, while failing to provide resolve to problems of high homicide crime rates (e.g., Swanson, 2013). Public policies discussed in the context of mass shootings espouse themes of safety from individuals with mental illness and restricted access to firearms as if mental illness and access to firearms have been demonstrated to equate to a person becoming a mass shooter (Barry, McGinty, Vernick, & Webster, 2015; Fox & Delateur, 2014b; McGinty et al., 2013; Metzl & MacLeish, 2015; Rosenberg et al., 2015). In this study, we examine how mass shooters' media-reported mental health histories and weapon access relate to mass shooting severity (i.e., the total number of victims killed or injured in a single mass shooting event).

Mass Shootings, Media, and Moral Panic

In the United States, mass shootings have

become common in public discourse and media coverage. Though numerous mass shooters do not suffer from any mental disorders and their attacks are often thoroughly planned, the belief that mass shootings are random and perpetrated by mentally ill individuals is pervasive in the public (Fox & DeLateur, 2014a; Rocque & Duwe, 2018). Media reports identifying violent mass shooters as mentally ill might cause widespread moral panic and incite public fear and uncertainty toward individuals with mental illness (Garland, 2008; Schildkraut, Elsass, & Stafford, 2015). Such reports might also lead to public support for gun and crime control, potentially through mental health interventions supported by legislators, political figures, or interest groups (Barry et al., 2013; McCorkle & Miethe, 1998; McGinty et al., 2013a; Schildkraut & Muschert, 2014; Wilson, Ballman & Buczek, 2016). Most recently, a heavy investigative focus has been placed on the types of weapons used by mass shooters as a starting point for discussions regarding bans on specific types of weapons (i.e., assault weapons). Integrating the two common themes of mental illness and gun control that arise after mass shootings, it is possible that legislation concerning firearm ownership and mental illness is a potential consequence of moral panic. However, moral panic does not necessarily mean that the public response is misguided (Cohen, 1972). Calls for stricter gun legislation after mass shootings might even put pressure on gun manufacturers to enact gun safety reforms (see Vernick, Rutkow & Salmon, 2007). Public panic, though potentially exaggerated, might be a response to a real threat, but such claims need empirical support.

Firearm Safety, Firearm Legislation, and Firearm Violence

Firearm legislation varies widely across the

U.S., including (but not limited to) policies on firearm purchasing and selling, firearm ownership, firearm storage, and firearm carrying (Siegel, Pahn et al., 2017). Research has addressed the effectiveness of some of these laws with the common goal of reducing violent crime and suicides. Firearm purchase legislation has included several attempts to reduce violence by placing requirements or restrictions on the purchasing process. Lower firearm homicide rates were reported in jurisdictions with stricter dealer regulations and stricter purchasing regulations, such as permit to purchase laws (Irvin, Rhodes, Cheney, & Wiebe, 2014; Rudolph, Stuart, Vernick, & Webster, 2015). Similar patterns in suicide were reported in jurisdictions with stricter purchasing and ownership regulations (Anestis & Anestis, 2015; Anestis, Anestis, & Butterworth, 2017). However, not all restrictive legislation prevents individuals who do not meet the purchasing criteria from purchasing firearms (e.g., Vites & Sorenson, 2008). Nonetheless, gun control policies beyond ownership and purchasing have been passed to attempt to regulate gun safety among gun owners.

One target of legislative efforts in reducing firearm violence involves gun safety laws. For example, preventing children from accessing firearms through legislation might reduce the likelihood that families with young children own and store guns in the home (Prickett, Martin-Storey, & Crosnoe, 2014). Also, simply having an available safe storage space can increase gun safety practices (Grossman et al., 2012). Though gun safety might increase when storage spaces are available or when legislation criminalizes unauthorized possession by children, many families do not engage in gun safety practices. Scott, Azrael & Miller (2018) found little to no difference in gun safety practices between homes with children who are at risk for self-harm behaviors

compared to homes with children who are not at risk, suggesting that mental health factors might not play a role in gun safety practices.

Firearm carrying laws also attempt to reduce violence through strict permit acquisition policies. For example, increased discretion in permit issuance of concealed firearms was associated with reduced homicide rates (Siegel, Xuan et al., 2017), suggesting that wider law enforcement discretion in who should own firearms might increase public safety. Moreover, gun owners with carrying permits commit fewer crimes than those without permits, and workplaces with no-carry policies reported fewer homicides (Loomis, Marshall, & Ta, 2005; Phillips, Nwaiwu, Moudouni, Edwards, & Lin, 2013). Policies restricting the access and use of firearms are based on the simple logic of more guns equating to more firearm related deaths (i.e., Siegel et al., 2014; Siegel, Ross, & King, 2013; Siegel & Rothman, 2016). However, data regarding responsible carrying policies and discretionary permit issuance might not follow this simple logic, but community sentiment seems to reflect the notion of more firearms equating to more danger. Although gun owners who frequently carry firearms often do so for protection (Rowhani-Rahbar, Azrael, Lyons, Simonetti, & Miller, 2017), many university students and members of the public are concerned about individuals' abilities to carry firearms on college campuses, in schools, and at sporting events, suggesting it might encourage firearm-related violence (Cavanaugh, Bouffard, Wells, & Nobles, 2012; Wolfson, Teret, Azrael, & Miller, 2017).

While generally applied firearm legislation likely impacts mass shootings, targeted legislation, specifically targeting mass shootings, might aid in reducing mass shooting violence along with other firearm-

related violence. To develop such policies, novel and innovative research is needed to inform courts and policy-makers as to who might be a risk, which regulations reduce gun violence, which policies are effective, and where to focus policy efforts (Harris & Harris, 2012; Vernick, Rutkow, Webster, & Teret, 2011; see also Ashe, Jernigan, Kline, & Galaz).

Mental Illness, Violence, and Firearm Legislation

Mental illness is quite prevalent throughout the United States. Nearly 20% (43 million) of Americans are coping or diagnosed with a mental illness, and 4% (10 million) have a severe mental illness (National Alliance on Mental Health [NAMI], 2015). Among those diagnosed with severe mental illness, approximately 3-5% engage in violent behavior (NAMI, 2015). Despite such low rates, the public belief that mental illness is associated with violence is pervasive (see Jorm & Reavley, 2014). This perception may be, in part, influenced by research associating mental illness with intimate partner violence, violent victimization, and general violent perpetration (Choe, Teplin, Abram, 2008; Elbogen & Johnson, 2009; Orcutt, King, & King, 2003). There is substantial literature suggesting severe mental illness is not a direct cause of violence, but this research has been largely neglected in the development and support for firearm legislation (McReynolds & Wasserman, 2008; Skeem & Monohan, 2011; Varshney, Mahapatra, Krishnan, Gupta, & Deb, 2016; Walters & Crawford, 2013; Witt, Van Dorn, & Fazel, 2013).

In the U.S., firearm legislation concerning the mentally ill appears to be fueled by moral panic and selective references to evidence linking mental illness and violence. Numerous gun laws include restrictions for

individuals with mental health histories or issues (e.g., The Brady Act). The “NICS [National Instant Criminal Background Check System] Improvement Amendment Act” (NIAA) was passed following the mass shooting at Virginia Tech. It provided incentives for states to report individuals denied firearms because of non-criminal reasons (e.g., mental illness). Since the inception of NIAA legislation, increased reporting has occurred nationally; denial of gun ownership based on mental illness has become the second largest category (Appelbaum & Swanson, 2010; Rosenberg, 2014). Also, these policies imply mental illness as an aggravating factor in firearm access, ownership, and violence. Passage of these laws likely perpetuates negative stereotypes associated with mental illness, leads to over-identification of at risk individuals (disqualification from firearm purchases), and discourages individuals from seeking mental health assistance. However, the link between mental illness and violence does not necessarily directly affect people’s behaviors regarding firearm access, though it might affect their attitudes and emotions surrounding the issue (e.g., Scott et al., 2018). Considering the mixed findings regarding mental illness and violence, the potential for moral panic to overemphasize the dangerousness of mass shooters, and the unintended consequences of firearm legislation, the need to empirically evaluate the relationship between mass shooters’ mental health histories, weapon access, and mass shooting severity is paramount.

Current Study

The current study examined the relationships between firearm access, mass shooters’ mental health histories, and the total number of mass shooting victims using a data set of mass shooting events between 1982 and 2018 compiled from media reports. The present

research addressed the assumptions that mental illness and firearm access are related to violence among mass shooters. Additionally, the present research examined the belief that increased access to firearms by mass shooters would be associated with more severe mass shootings when the shooters had mental health histories than when they did not. Pertinent to this study, as it relates to the general discussion of mass shooters, is that this study did not attempt to predict who will become a mass shooter. Instead, the current study sought to provide evidence regarding the relationship between mental health and weapon access of *known* mass shooters as it related to mass shooting victim totals. Though the mass media and general public might desire the predictability of such crimes, analyses of known mass shooters might provide information to assist with such an inquiry.

Research Questions

We oriented our research through a series of research questions. These research questions reflected common narratives about mass shooters and mass shootings, were based on logical inference, and were derived from implications of prior literature. The first research question for the current study was, “do mass shooters who have access to more firearms at the time of the crime shoot more victims?” In this instance, firearm access is described as the number of firearms brought to the scene of the crime. This research question was based on both logic and theories of intentionality (McIntyre & Woodruff Smith, 1989), such that individuals who bring more weapons to the scene of the crime are likely able to shoot more victims and similarly intend to do so.

The second research question was, “do mass shooters with formally diagnosed mental illnesses or recognized mental health issues

victimize more people than those without mental illnesses or mental health histories?” This research question aligned with the public perception and assumption that mental health equates to increased violence, especially in homicide crimes. This research question also added to the literature’s mixed results in which some studies find no association between mental health and violence. This research question is often discussed in terms of predicting mass shootings, but it should also be evident in describing an association between mental health and violence among known mass shooters if this association is robust.

The third research questions was, “do mass shooters with access to firearms and have mental health issues victimize more people than mass shooters with no mental health histories?” This research question was based on the notion that mental illness acts as an aggravating factor when numerous guns are accessible to mass shooters. The justification for this research question was based on the assumption that mental illness increases violence in mass shooters, such that mass shooters with prior signs of mental illness are more likely to commit more violent mass shootings when more guns are available compared to individuals without histories of mental illness. Current policies suggest that mental illness is an aggravating factor especially when weapon accessibility is increased.

The fourth question was, “do mass shooters who use assault weapons victimize more people than mass shooters without assault weapons?” This question was directly tied to the current political and social debate about whether or not assault weapons should be banned. The current data did not allow for conclusions to be made about the typical use of assault weapons or if assault weapons can prevent harm in any way. The current data

only allowed for comparisons between mass shooters who brought an assault weapon to the scene of the crime or not.

The fifth and final research question was, “do mass shooters who obtain weapons illegally victimize more people than those who obtain them legally?” Although the current data were not the best to assess gun violence as it pertains to illegal purchases of firearms, the current data did allow us to simply compare mass shooters who obtain their weapons legally with those who obtain them illegally to see if how one acquires a weapon is related to victimization.

Method

Data

The current research utilized data collected by Mother Jones on mass shootings between August of 1982 and June of 2018 (Follman, Aronsen, & Pan, 2017). This particular data source had been previously used in published research (e.g., Gius, 2015; Lowe & Galea, 2017; Wallace, 2015), theoretical and methodological reviews (Rocque & Duwe, 2018), and policy analysis (e.g., Fox & DeLateur, 2014b). Mother Jones’s dataset was compiled of details and information for each mass shooting case made available through news reports. Although many scholars utilize other datasets to examine mass shootings, the dataset used in the present research included mass shootings defined by strict and clear criteria and includes critical variables necessary to assess relationships between mental health, firearm access, and mass shooting severity. Criteria used to qualify an event as a mass shooting for the purposes of the current research included number of deaths (e.g., 3-4 or

more)², crime committed by a lone shooter or pair of shooters (i.e., Columbine, Jonesboro, and San Bernardino), the crimes occurred in a public location (e.g., school, work, or religious institution), the mental health of the shooter was found to be present (by the researcher) in media reports, details of the weapons used in the shooting were available, and demographic characteristics of the shooter(s) were known.

The Mother Jones data were also chosen because they included shootings that occurred in places violence typically does not occur but appears random, senseless, and openly public (see Wallace, 2015). These shootings included cases that were covered extensively in the media, caused the most fear in individuals, were discussed by policy advocates and Whitehouse officials (including the president), and were representative of what most Americans think of when thinking about mass shootings (see Duwe, 2000; Fox & DeLateur, 2014; Metzl & MacLeish, 2015). Although mass shootings often include shootings related to gang activity, additional criminal activity, or family slayings, the current research excluded these cases and focuses on seemingly random public shootings, or rampage shootings (see Rocque & Duwe, 2018).

Sample and Descriptive Analysis

Initially, a total of 101 mass shootings were identified. In three cases, two mass shooters perpetrated the crime together. These cases were separated into two entries, representing the shooter as the unit of analysis. All demographics and mental health variables were specific to the shooter and all weapons, victims, and location variables were specific to the overall mass shooting event. Two cases

included individuals who had some sort of diagnosis but the particular diagnosis and whether it was related to mental health was unclear or not reported (though a mental health diagnosis was implied). These two cases were removed prior to final analyses. The final sample for analyses included 102 cases of mass shooters between 1982 and 2018 (see Table 1 for descriptives).

Ninety-nine perpetrators were male (only three females) and most were white; however, a substantial portion were non-white (40.2%), challenging the notion that mass shooters are strictly a white phenomenon. Most shooters obtained guns legally (82.4%) and used or had handguns (81.4% used handguns only or in combination with other weapons), and a little under a quarter (23.5%) of mass shooters used or had an assault weapon.

Overall, mass shootings resulted in approximately 22 victims on average (*Mdn* = 11), and occurred mostly in workplaces (28.4%) or schools (19.6%). About 52.0% of mass shootings occurred in places such as religious institutions, malls, restaurants, or military bases. Shooters were about 34 years old on average (*Mdn* = 34.0), brought 2-3 guns to the scene on average (*Mdn* = 2.0), and were likely to have a reported diagnosed mental illness (41.2%) or undiagnosed mental health issue (13.7%). In 86.3% of the cases, mental illness was reported to some extent, and 26.5% of mass shooters spent time in a mental health facility or program. Among all mass shooters in the sample, some of the most prevalent reported mental illness diagnoses included depression, (18.6%), schizophrenia (11.8%), and anxiety (10.8%) with many shooters having multiple diagnoses (25.5%). Although suicide was not a variable of interest, it was considered a

² Until 2013, mass shootings required four or more deaths. In 2013, this was lowered to three or more

deaths by President Barack Obama (Public Law 112–265 112th Congress, 2013).

valid inquiry to assess, and analyses revealed just under half of the shooters committed suicide (47.1%). Moreover, 20.6% of mass shooters were killed by police. Thus, mass shooters rarely survived to face prosecution (only 32.4% in the current sample), which might leave the public with an urgency to

understand motives in hopes of gaining some sort of rationalization or justification for such horrific crimes. This might also explain the gap in understanding antecedents to mass shootings.

Table 1. Descriptives.

Variable	%	Mean	Standard Deviation	<i>n</i>
Victims	--	^a 22.0	60.2	102
Age	--	34.1	12.3	102
Number of Firearms	--	^a 2.0	2.6	102
Disorder/Diagnosis Category	--	--	--	102
<i>Disorder Identified with Formal Diagnosis</i>	41.2	--	--	--
<i>Disorder Identified without Formal Diagnosis</i>	13.7	--	--	--
<i>None</i>	45.1	--	--	--
Assault Rifle Used	--	--	--	102
<i>Yes</i>	23.5	--	--	--
<i>No</i>	76.5	--	--	--
Location	--	--	--	102
<i>School (reference)</i>	19.6	--	--	--
<i>Workplace</i>	28.4	--	--	--
<i>Other location</i>	52.0	--	--	--
Race	--	--	--	102
<i>White</i>	59.8	--	--	--
<i>Black</i>	15.7	--	--	--
<i>Other</i>	24.5	--	--	--
Weapons Obtained Legally	--	--	--	102
<i>Yes</i>	82.4	--	--	--
<i>No</i>	17.6	--	--	--

Notes. All percentages are valid percentages. ^aMeans were rounded to nearest integer.

Dependent Variable

Victims. The sole dependent variable in this study was the total number of victims in a mass shooting event, which included fatalities and injuries as a result of the shooter’s actions. The shooter was not counted as a victim in cases the shooter committed suicide or was killed by police. Although mass shootings were defined by the number of deaths in a single shooting event, the total number of victims was used as a dependent variable instead of fatalities

because 1) all victims are important in mass shooting analyses intending to assess overall violence/harm, 2) many shooters shot indiscriminately into crowds injuring and killing victims at chance, and 3) motive to injure or kill was often indiscernible due to mass shooters’ suicides and being killed by police officers.

Predictor Variables

Mental health history. Mental health history was measured by dividing each shooter’s

available mental health information into three distinct categories. For each case, up to three separate reports were analyzed to make categorical determinations. The first category included cases in which there was no reported mental health history. The second category included cases in which a mental disorder or mental health history was mentioned but was no formal diagnosis was reported. For example, Omar Mateen's ex-wife said he was bipolar and mentally unstable, but he was not reportedly diagnosed with any specific condition. Similarly, Kevin Neal's sister said he dealt with mental problems and had delusions and hallucinations, but she never mentioned he was formally diagnosed with a mental illness. The third category included cases that involved a formal diagnosis with a specified illness or disorder. Acceptable diagnoses were those based on psychiatrists' claims, psychologists' claims, or family members' claims. Two cases mentioned a diagnosis but did not specify what it was; those cases were removed.³ All diagnoses were substantiated by two separate news reports (not duplicate news reports) when possible. Some cases were only covered by a few news outlets or only local news outlets. In these cases, single reports were used to make a determination. Two reviewers evaluated all cases that mentioned mental health in the reports in order to converge on an agreed upon categorization for each case as either mentioning mental health or not when possible.⁴

Number of firearms. This was a count variable of the number of firearms a shooter brought to the scene. This was considered to be an adequate and valid measure of access to firearms because the shooters could only use weapons that were accessible, despite the

legality of access. Firearms found at the shooter's home at a later time/date were not included in the dataset, nor were these data available in most of the articles and reports—only firearms brought to the scene of the crime at the time of the crime were counted.

Control Variables

Age and race. Shooters' age was included as a control variable. Age was measured as a continuous variable. Race was also included as a control variable. Race was categorized as white or minority because media portrayals depict mass shootings as a white male phenomenon, suggesting a white or not comparison, and because all but two race categories had cell sizes that were too small for meaningful comparisons (cell $ns < 10$).

Assault weapons. Firearms brought to the scene were coded regarding whether or not they included assault weapons. This dichotomous variable represents shooters who used or brought an assault weapons compared to shooters who did not use or bring an assault weapon. Also, access to firearms more generally was the focus of the current research; however, it was considered important to account for the use of assault weapons to inform current debates on the issue. Many policies pertain to the regulation of assault weapons, and much of the public blames mass shooting on the availability of firearms and assault weapons (Smith, 2018; Sullum, 2018). Therefore, it was important to assess the difference in victims between mass shootings in which an assault weapon was involved and those in which an assault weapon was not involved.

Assault weapons were defined under the

³ Analytical comparisons reveal no changes in outcomes when removing these cases. Removal was based on the goal of reducing ambiguity that

prohibited clear conclusions and accurate representation of constructs.

⁴ Preliminary analyses of separate disorders revealed no significant differences between specific diagnoses.

Assault Weapons Ban of 2013 proposed by Dianne Feinstein (S.150 113th Congress, 2013-2014). Under this proposed legislation, a firearm was considered an assault weapon if it was a semi-automatic rifle that had detachable magazine and either a pistol or forward grip, barrel shroud or threaded barrel, grenade or rocket launcher, or folding, telescoping, or detachable stock. Also, a weapon was considered an assault weapon if it was a semiautomatic pistol with a threaded or shrouded barrel, additional pistol grip, detachable magazine outside of the pistol grip, or was a semi-automatic variant of an automatic weapon. Belt-fed firearms and shotguns with revolving cylinders or semi-automatic shotguns with a pistol grip, fixed magazine with five or more rounds, folding, telescoping, or detachable stocks, forward grip, or mounted grenade or rocket launcher also qualified as assault weapons. Though other firearms were covered under the ban, these particular restrictions provide a good representation of the applicable aspects of the ban used to operationalize an assault weapon in the current study.

Location of mass shooting. The locations of mass shootings were diverse including schools, workplaces, military posts, restaurants, religious institutions, malls or shopping centers, apartment complexes, streets or neighborhoods, nightclubs, government buildings, and other locations (e.g., concert, Wal-Mart, and a car wash). Mass shooting location was dummy coded and included as a control variable. Schools and workplaces were coded as primary categories and all other locations were coded as a third category labeled, “other.” All locations in the “other” category did not significantly differ from each other across the DV and were used as the reference category.

Legal obtainment of weapons. Whether the weapons were obtained legally or not was

included in the dataset. This was coded and used as a control variable to identify whether or not the legality of accessing firearms was related to more violent mass shootings. This particular variable was included because of the national debate about the legal and illegal accessibility of firearms as a potential cause or contributor to mass shootings. Though many people think mass shooters illegally obtained their weapons, many of the most notorious cases involved legal purchases and legal access (See Sisak, 2018).

Results

To examine potential answers to the research questions, data were analyzed using a generalized linear model (McCullagh & Nelder, 1989; Nelder & Wedderburn, 1972). More specifically, a negative binomial regression model was estimated because the dependent variable (total victims) was a count variable, it was overdispersed ($M = 21.7$, $SD = 61.9$), and the negative binomial model was the best fitting model based on Akaike Information Criteria (AIC) and Bayesian Information Criteria (BIC) comparisons with other models (e.g., a poisson model and an ordinary-least-squares regression model). A Vuong (1989) test further confirmed the negative binomial model was a significantly better fit than the poisson model (Cohen, Cohen, Aiken, & West, 2003; Park & Fisher, 2015; Vuong, 1989; all results are available from authors upon request). The final model included number of firearms, reported prior mental health history, age, race, assault weapon use, location, and whether or not the weapons were obtained legally predicting the total number of mass shooting victims. Full Information Maximum Likelihood (FIML) was used to address missing data (see Schafer & Graham, 2002) and robust standard errors were estimated.

Table 2. Negative binomial regression model estimates.

<i>n</i> = 102	Total Victims			
	<i>B</i>	<i>SE</i>	<i>p</i>	<i>IRR</i>
Mental Health				
Disorder, No Diagnosis	0.641	0.287	0.026	1.898
Disorder and Diagnosis	0.237	0.151	0.116	1.267
Firearms				
Weapon(s) Legally Obtained	0.468	0.139	0.001	1.597
# of firearms	0.153	0.016	< 0.001	1.175
Semi-Automatic Rifle	0.523	0.160	0.001	1.590
Demographics				
White	-0.085	0.146	0.560	0.919
Age	-0.004	0.006	0.426	0.996
Location				
Workplace	-0.420	0.164	0.011	0.657
School	0.237	0.187	0.204	1.267
Dispersion	0.322	0.057	< 0.001	
AIC	826.227			
BIC	860.352			
Loglikelihood _{H0}	-400.114			
<i>c</i>	1.084			

Notes. Analysis conducted in *Mplus*, version 8.0 (Muthén & Muthén, 1998-2017). IRR = Incident Rate Ratio = $e^{(B)}$. AIC = Akaike Information Criterion. BIC = Bayesian Information Criterion. *C* = Scaling Correction Factor. Full Information Maximum Likelihood Estimation (FIML) with Monte Carlo integration was used to estimate parameters and robust standard errors. The reference category for mental health categories was no disorder and no diagnosis. The reference category for racial categories is “other” race (e.g., Asian, Native American). The reference category for location categories was “other” location (e.g., restaurants, government buildings). Two cases coded as diagnosis with no reported disorder were excluded from analysis.

Table 2 displays the final model estimates. To address the first research question, the number of weapons was positively related to total victims ($p < .001$), with an estimated 17% increase in log victim count for each additional weapon. To address the second research questions, reported mental health history was positively related to total victims. Specifically, shooters with a reported disorder but without a reported formal

diagnosis had more victims than shooters without a reported disorder or formal diagnosis ($p = .026$). However, shooters with a reported formal diagnosis were not significantly different from shooters without a reported disorder or formal diagnosis in terms of total victim count. Although inquired about an interaction between the number of firearms and mental health history, the interaction terms were not significant and

decreased overall model fit. Thus, the interaction terms were dropped from the final model.

Some of the control variables were related to total victim account. When the shooter obtained the weapons legally, there was an estimated increase in log victim count of about 60% compared to when the shooter obtained the weapons illegally ($p = .001$). Assault rifle use was positively related to total victims ($p = .001$), with an estimated 59% increase in the log victim count if the shooter used an assault rifle compared to if the shooter did not. In addition, shootings at a workplace were associated with a 34% decrease in the log victim count ($p < .001$) compared to shootings at “other” locations. Shootings at schools were not significantly different from shootings at “other” locations in terms of victim count. Age and race were unrelated to total victim count.

Discussion

The purpose of this research was to better understand the extent to which shooters’ access to firearms and mental health histories were related to the number of victims in mass shootings. The key finding from this study is that reported mental health history was associated with increased violence among mass shooters when a disorder was identified but no specific formal diagnosis was reported. These findings were relationships reflected in media portrayals of mass shootings and were not based on formal independent assessments. Because formal assessments of mass shooters were often difficult to obtain (e.g., not released by mental health professionals) or impossible to obtain (e.g., assessments could not be obtained because of the shooter’s suicide after the shooting), journalistic representations of these facts were relied upon. Additionally, shootings considered

more violent as a result of more total victims were associated with shooters who used legally purchased weapons, brought more weapons to the shooting, and used an “assault weapon.”

Crime Control and Public Perceptions

The results of the present study illuminate the complex relationship between firearm access, mass shooters, and mental illness. Several studies report that citizens are likely to perceive individuals with a history of mental illness as more dangerous and prone to perpetrating mass shootings (Wilson et al., 2016; McGinty et al., 2013). While the current research does not address whether or not mental illness predicts the likelihood of becoming a mass shooter, it does suggest that mass shooters with undiagnosed and potentially unaddressed mental illness might victimize more people if they decide to commit mass shootings. Based on these results, it is quite understandable why public moral panic in response to mass shootings might involve discussions of mental illness. It is possible that the public is intuitively detecting these same themes demonstrated in the current data. However, mass shooters’ mental health cannot be viewed from a myopic perspective assuming all mental health histories are the same. The current research demonstrates that there might be something fundamentally different between mass shooters with formally diagnosed mental illness compared to those with potentially undiagnosed mental illness.

The data in the current research come from media and law enforcement reports; therefore, it is possible that this relationship is reciprocal with the media emphasizing the public’s expectations and the public rewarding the media with attention to stories that cover issues on mental health. However, the national impact of mass shootings on

American lives might better explain why media covers these stories, promoting national empathy, support for those in mourning, and a general call to action against such violence.

Another implication of these results is that they might hint at a targeting effect of the public interest on law enforcement investigations. Specifically, local and federal law enforcement might feel as if they are expected to investigate evidence pertaining to mental health backgrounds of mass shooters. Law enforcement's expectation to pursue these investigative avenues likely originates in the pressure from local communities and an attentive public surrounding the shooting. Many of the police chiefs' briefings after these mass shootings discussed the offender in terms of motive and ability, which essentially referred to mental health and access to firearms, potentially satisfying the public's and media's interests. Therefore, mass shooting investigations might operate under officers' lay theories of why mass shootings occur (reinforced by attitudes and concerns of the public and mass media) or under expectations to prioritize investigating whether or not the shooting was a result of mental illness. In both instances, law enforcement might be more likely to seek out and find evidence consistent with confirmation biases, supporting the lay hypothesis that mental illness is to blame.

In terms of weapons, the more weapons brought to the scene of the crime, the more people the mass shooter victimized. Also, mass shooters who used an assault weapon victimized more people on average. There are two explanations for these trends. First, it is possible that it is essentially a law of numbers effect. There are more victims in mass shootings where the mass shooter has more firearms and ammunition because the number of possible rounds a shooter can fire

increases. In essence, the number of victims in a mass shooting is directly related to the number of people a mass shooter *can* victimize. Second, it is possible that the first explanation is true but that the number of weapons brought to a mass shooting is indicative of motive and intention. The more weapons a mass shooter brings, the more victims he intends to hurt. Therefore, the number of victims in a mass shooting is directly related to the number of people a mass shooter *intends* to victimize. In the first explanation, weapon access precedes and predicts victimization, whereas in the second explanation, weapon access is a result or victimization intentions and planning. Though similar, both have different policy implications.

Purchasing weapons illegally did not reduce mass shooting violence; in fact, most mass shooters used guns that were purchased legally. It is quite difficult to assess if and how legally, compared to illegally, purchased weapons were related to more victims in mass shootings. Though legally purchased weapons were associated with more violent mass shootings, assault weapons were more likely to be purchased legally, suggesting the possibility that assault weapon use drives this relationship. Also, numerous mass shootings were violent with illegally purchased weapons so more research should look into how and why legally purchased firearms are associated with more violent mass shootings. At the very least, these findings dispute the notion that mass shooters are people who illegally acquire firearms to enact violence.

Policy Implications

The results have numerous implications for policy and legislation. A possible conclusion based on these results is that decreasing access to firearms would reduce the number of mass shooting victims overall (see

Bauchner et al., 2017; Jehan et al., 2018 for discussion). More specifically, targeting assault weapons, through an assault weapons ban or similar policy, might appear to be a plausible policy because mass shootings involving assault weapons made up only 23.5% of the total mass shootings yet accounted for 52.3% of the total mass shooting victims in this particular study (See also Gius, 2015). One might be tempted to conclude that this means the worst shootings occur with assault weapons; however, upon inspection of the worst cases recorded, only four of the top eight worst cases (cases with the most victims) included an assault weapon. To assume that banning assault weapons will prevent the worst mass shootings is slightly misleading, according to the current data. However, the increased violence among mass shooters who use an assault weapon is undeniable, which is why an assault weapons ban might appear to be a plausible route of action though it might face difficulties in the U.S. Just recently, New Zealand proposed the Arms (Prohibited Firearms, Magazines, and Parts) Amendment Bill, Government Bill 125-1, banning assault and semi-automatic weapons within a month after a mass shooting occurred, resulting in 50 people killed, in which the shooters used military style semi-automatic assault weapons (Paris, 2019; Schmitz, 2019). Rather than banning assault weapons, an assault weapon ownership cap or purchase limitation policy might be more effective. Outright bans would likely face stark opposition and not garner enough support, but caps or limitations might be a more widely acceptable way to curb mass shooting violence. This would also allow such weapons to still be used in defense of mass shootings, as in the Sutherland Spring mass shooting in Texas (Jenkins, 2017), whereas outright bans would not.

Another potential policy that one might infer

from this data would be stricter gun ownership and purchase policies. The current data do not support these types of policies. First, some mass shooters acquired their firearms illegally despite barriers to purchase. Second, most mass shooters legally owned their weapons or acquired their weapons from someone else who purchased them legally, thus not purchasing them illegally or stealing them (see Cook, Parker, & Pollack, 2015 for a discussion on firearm acquisition). These were likely people with no red flags that would have precluded them from owning weapons. Stricter policies would likely prevent many people from owning firearms, but probably not most future mass shooters.

In most cases, firearms used in mass shootings were *purchased* legally (82.4%), but they were not *used* legally. Other than the obvious harmful use, many mass shooters illegally concealed and carried their weapons without appropriate permits, and they carried them into places where firearms were not allowed, such as schools, government buildings, bars and clubs, etc. Moreover, many family members took the firearms they used from other family members without them knowing. Because of this, it is difficult to be confident in the conclusion that the way to reduce (or even prevent) mass shooting violence is to regulate purchases or acquisition but not address firearm responsibility and firearm culture. Policies that address social responsibility and firearm culture might curb firearm violence, particularly mass shooting violence, and reduce firearm irresponsibility with more precision. It is policies like purchase bans for ex-felons and the mentally ill that come close to exemplifying the more accurate notion that people's psychology is the basis for firearm violence, not access by itself.

If some sort of cap or limitation policy was

enacted, it is critical to understand that policy *implementation*, of course, is arguably equally important as the policy itself (Ludwig & Cook, 2000). Providing clear and direct guidelines for implementing the policy is critical in order to address shortcomings of earlier policies that result in discrepant outcomes. Along these lines, one benefit of a firearm cap or limitation policy is that it could still serve a crime control objective even if the policy was difficult to widely and consistently enforce.⁵ Law enforcement could investigate or arrest individuals and/or confiscate firearms when they felt it necessary to prevent, or reduce the number of potential victims of a potential mass shooting incident.

A third conclusion one might make from the current data is the need to implement stricter mental health policies associated with firearm purchases, ownership, and carrying in public. Mass shooters with reported mental health histories but no reports of formal diagnoses were more violent, according to the current study. In many of these cases, acquaintances and those close to the shooters were unsurprised by the shooters' actions or recalled red flags in hindsight. Without a formal diagnosis, it is unclear whether these shooters ever had contact with a psychologist or psychiatrist. Without formal contact, mental health screens and background checks would not identify these individuals as high risk or prevent them from purchasing or acquiring firearms. Stricter mental health screens and purchase policies might be inadequate in addressing mass shooting

violence, similar to assault weapon bans, though it is possible they could be effective in reducing overall gun violence.

Firearm regulation policies and mental illness are often discussed in high frequency after most mass shootings occur, but the post-shooting narrative does not always follow this logic. Most responses to mass shootings characterize a sense of failure by somebody, often blaming mental health professionals and law enforcement. This blame directly points to a sense of social responsibility, but it is often biased toward those in professional roles. This places a large, and quite unreasonable, burden on these individuals. Such discussions also involve the inability of legislation to prevent mass shootings. The percentage of individuals with mental illness who are mass shooters is negligible compared to the total number of individuals with mental illnesses in the U.S. The expectation that a therapist or police officer *could* detect these cases is unrealistic, and the expectation that they *should* be able to detect these cases is equally or even more unrealistic. Instead, a community-level strategy of supervising violent or potentially violent individuals and intervening when necessary is a more plausible and likely more effective approach to reducing mass shootings. This emphasizes the role of parents, friends, co-workers, and other observers in identifying and addressing risk at the interpersonal interaction level. However, societal violence and mental illness stigma creates a situation in which society isolates and excludes mentally ill

⁵ Voters in Nevada recently approved a ballot measure to require background checks for private firearm sales, but it was deemed unenforceable by the attorney general essentially due to logistical constraints (Robison, 2016). A gun cap policy could similarly be deemed unenforceable for logistical reasons. Our purpose here is to argue that police would not need to systematically monitor each and every household as part of the policy's enforcement,

but rather that a gun cap policy would serve as an instrument to intervene in situations with a potential risk of escalation. The "rational exercise of discretion" would be essential, of course (cf. Gottfredson & Gottfredson, 1988), as the unequal application of law is inherently at odds with the Constitution and philosophical stances on justice, such as Rawls' (1971) difference principle.

individuals, embittering them, while simultaneously providing them with violent social scripts and legitimate means to acquire the necessary tools to engage in violence.

Although this research suggests that mental health and firearm responsibility are important considerations for state and federal policy development and future research, they are also important for community discussions, violence awareness campaigns, and local public health interventions. Rather than interpreting mass shootings as a mental health or law enforcement failure, it might be better if mass shootings were understood as a symptom of a societal issue regarding mental health attitudes, gun ownership, and perceptions of violence. Increased social cohesion, social accountability, mental health stigma abolition, and empathy taught through local programs and interventions will most likely reduce mass shooting violence compared to federal legislation.

Mental Health Implications

The current study provides evidence that completely discounting mental health as a risk factor in mass shootings is ill-considered and might mislead future discussions on mass shooting prevention and firearm violence reduction. In a federal report on active shooters, mental health was the top stressor identified as leading up to the attack in the prior year (Silver, Simons, & Craun, 2018). However, the results of this study also emphasize the importance of understanding the context in which mental health relates to mass shooting violence. Using a blanket approach, suggesting that all individuals with mental illness are more violent is indeed incorrect. According to the current data, mental illness in general is not a risk factor in mass shooting violence, but specifically mental illness that is acknowledged or reported but not formally diagnosed.

Although the specific role of a formal diagnosis is unclear, there are two possible explanations for an associated reduction in mass shooting violence.

First, it is possible that mass shooters who have had formal diagnoses have also received formal treatment to some extent, whether in the form of medication or therapy. This treatment might then have translated into more control and less likelihood to devolve during a mass shooting event. However, without specific information about toxicology at the time of the shooting and treatment history, this explanation is purely speculative. Second, and perhaps more likely, a formal diagnosis might be representative of a formal acknowledgement of a person's mental illness and overall mental health. Any formal acknowledgement of one's diagnosis might be accompanied by enhanced access to care and treatment, increased awareness among close relatives and acquaintances of a person's potential mental illness episodes, an increased sense of accountability and responsibility among family and friends, and increased social support. Often concerning behavior is recognized the most by others in one's immediate social network (Silver et al., 2018). Although the specific mode of mitigation might be unclear at this point, it is worth noting to encourage future research to pursue some of these possible explanations. Coming into contact with or seeking mental health services likely has some mitigating quality to it that is critical to examine more closely, especially if victims' lives are at stake.

Study Limitations

The current research addressed empirical questions related to access to firearms and mental illness in mass shootings. Although the current research provides unique insight

into the mental illness and access to firearms debate regarding mass shootings, there are several notable limitations. First, this study uses secondary data compiled by the Mother Jones news organization and does not include all mass shootings. Specifically, it does not include mass shootings associated with other crimes or gang activity, and it does not include family slayings with numerous victims (e.g., see Fox & DeLateur, 2014b). The current dataset might only represent a select group of mass shootings because we focused on mass shootings that seemed to be random and public.

Second, mental health information was only assessed when made available. It is possible that some cases might have involved shooters with mental health histories that were never reported to the public. Although it seems unlikely for cases that occurred in the last decade, it could be the case for mass shootings happening before the internet and advanced technology aided in record retention and record availability.

Third, some cases included multiple shooters. In these cases, shooters were split into two separate independent cases; however, it is impossible to know who was responsible for which victims.

Fourth, the mental health assessments were based on media accounts of mental health assessments and not formal assessments by clinical professionals under the direction of the researchers. Also, though rigorous methods were used to evaluate these reports, the specific mental health assessments were unable to be evaluated directly. Thus, the reporting of mental health assessments might be influenced, at least in part, by journalistic preference and style.

Lastly, one of the reports used in the analysis of mental health histories was family

reported mental health. Family reported mental health likely varies more compared to reports by psychologists or psychiatrists. Thus, a reliance on reports only generated and indicated by professionals might yield different results.

Despite these limitations, the current research makes a substantial contribution to the field by identifying and examining the relationships between mental illness, firearm access, assault weapon use, and mass shootings. These results still have the potential to help shape legislation development and mental health, firearm access, and mass shooting education.

Future Research

The current study analyzed a dataset of mass shooters over several decades and found several interesting findings related to mental health, firearm access, shooter demographics, and venue characteristics. However, this study was not comprehensive and prompted several questions that could be addressed in subsequent studies. Future research should examine the extent to which mental illness and access to firearms relate to other mass shootings that did not fit the criteria utilized in the current study and other types of firearm violence. Environmental and social variables should also be identified and included in predictive models to explore the extent to which social isolation and exclusion relate to increased violence among mass shooters. Investigating why formal diagnosis plays a role in mass shooting violence seems important to pursue based on the current research. Though difficult, it would be interesting to measure more nuanced individual differences (e.g., personality characteristics) among mass shooters and how they relate to mass shooting violence. Lastly, future research should assess mass shooting facts in official and formal reports

rather than media portrayals as this might improve validity and replicate findings in this study. Overall, the current study adds a unique contribution to the literature and addresses important issues worthy of consideration in future research.

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