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Psychosis and Mass Shootings: A Systematic Examination Using Publicly Available Data

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Mass shootings are often blamed on serious mental illness. This study assesses the role of psychosis in contributing to mass shootings along a continuum. The role of psychosis is compared with other motivations for mass shootings including employment issues, interpersonal conflict, relationship issues, hate, and fame-seeking. Perpetrators motivated by psychosis are also compared with other perpetrators on several well-established risk factors for violence. It is hypothesized that a mental health history is common among mass shooters, but symptoms of psychosis only directly motivate mass shootings for a minority of cases. A dataset of 172 mass shooters was created, coded on 166 life history variables using publicly available data. The entire dataset and codebook are publicly available. The findings show that symptoms of psychosis played no role in 69% of cases, but psychosis may have played a minor role in 11% of cases, a moderate role in 9% of cases, and a major role in 11% of cases. Perpetrators motivated by psychosis were similar to mass shooters with other motivations in terms of demographics and common risk factors for violence. The role of serious mental illness in mass shootings is complex. The data indicate that access to mental health care may help prevent mass shootings in a minority of cases, but this is far from the only solution to mass shootings.

Keywords: gun violence, mass shooting, mental illness, psychosis

That serious mental illness causes gun violence, especially mass shootings, is a popular claim in the media and by politicians (Duxbury et al., 2018; Metzl & MacLeish, 2015; Metzl et al., 2021). After the mass shootings in El Paso, Texas, and Dayton, Ohio, which killed 31 people in August of 2019, President Donald J. Trump proclaimed, "Mental illness and hatred pull the trigger. Not the gun" (Abutaleb & Wan, 2019). The President then proposed broad institutionalization of people with mental health disorders as a possible solution to mass shootings. Studies have found that the implicit association between mental illness and mass shootings has a deleterious effect on attitudes toward people with serious mental illness (McGinty et al., 2013; Wilson et al., 2016). This is especially worrisome when population studies show the majority of people with a serious mental illness are not violent (Glied & Frank, 2014), and less than 5% of violent crimes in the United States are committed by people with serious mental illness (Appelbaum, 2006; Fazel & Grann, 2006).

There is little systematic research to date that examines the role that mental health symptoms play in motivating perpetrators to commit mass shootings (Skeem & Mulvey, 2020). The current study fills this gap, focusing specifically on symptoms of psychosis, which have been found in as many as one in five mass murderers (Stone, 2015) and are easier to detect in public records and reporting on mass shootings versus other symptoms of mental illness. Psychosis describes delusions (i.e., a fixed false belief system), hallucinations (i.e., perceiving something that is not there), and cognitive symptoms (i.e., confused, disturbed, or disrupted patterns of thought). Psychosis is a feature of a number of mental health disorders such as schizophrenia spectrum disorders, mood disorders, dementia, substance induced, or traumatic brain injuries. Drawing on findings from a comprehensive dataset of mass shooters, the current study examines to what extent psychosis may have partially or completely motivated mass public shootings that claimed the lives of four or more people.

Mass Shootings in the United States

Mass shootings are statistically rare, insomuch that they account for fewer than 1% of all firearm homicides in the United States (Peterson & Densley, 2019), yet they are an almost constant fixture of the news cycle (Murray, 2017). Surprisingly, there is no universally accepted definition of a mass shooting (see Huff-

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Corzine & Corzine, 2020). The concept itself is relatively new and is really a subset of "mass killing," which since the 1980s has been used by researchers and the U.S. Federal Bureau of Investigation (FBI) to mean four or more people killed—not including the perpetrator—by the same offender(s) in a 24-hr period (Krouse & Richardson, 2015, p. 4). Mass killings include deaths by all means (fist, fire, knife, firearm), all motives (including violence as means to an end, such as robbery or terrorism), in all contexts (public or private).

A mass shooting is any mass killing perpetrated with a firearm. To differentiate between mass shootings that occur in domestic settings versus relatively public places, and to separate offenders who only target family members or intimate friends from those who indiscriminately select their victims, researchers have developed the concept of "mass public shooting" (Duwe, 2018). Gang, drug, or organized crime-related shootings typically are excluded from mass public shooting figures because felony-homicide offenders have different profiles and motivations. Domestic mass shootings that occur in private homes and are perpetrated by "family annihilators" are separated out for the same reasons (Duwe, 2007). Mass public shootings are incidents occurring in public places, like schools, workplaces, and places of worship. Such is the focus of the current study, which follows the Congressional Research Service definition of a mass public shooting as

> a multiple homicide incident in which four or more victims are murdered with firearms—not including the offender(s)—within one event, and at least some of the murders occurred in a public location or locations in close geographical proximity (e.g., a workplace, school, restaurant, or other public settings), and the murders are not attributable to any other underlying criminal activity or commonplace circumstance (armed robbery, criminal competition, insurance fraud, argument, or romantic triangle). (Krouse & Richardson, 2015, p. 10)

Like all definitions, this one has limitations (Silva, 2020a). Many factors influence whether a threshold of four or more people killed is reached, for example the accuracy of the shooter, the type and caliber of weapon used, the number of rounds fired, proximity to the nearest hospital, and the actions of first responders. For this reason, the FBI tend now to focus on "active shooters" (Blair & Schweit, 2014), defined as any individual actively engaged in killing or intending to kill people in a confined space or other populated area. However, the number of shooting deaths remains the strongest predictor of media coverage (Duwe, 2000), which is necessary to accurately track and examine mass public shootings.

Evidence suggests that mass public shootings are getting more frequent and more deadly (Densley & Peterson, 2019; Duwe, 2020; Lankford & Silver, 2020). Lankford and Silver (2020) argue that the rise of celebrity culture in the age of mass media and social media has led to more mass public shooters who are motivated to kill large numbers of victims for fame or attention (see, Bushman, 2018; Langman, 2018; Lankford, 2016), as well as to more shooters who have been directly influenced by past mass shooters (for research on mass shooting "contagion" and "copycat" killings, see Meindl & Ivy, 2018; Towers et al., 2015). The role of serious mental illness in motivating mass shootings, however, remains an open question (Skeem & Mulvey, 2020). In their review of the literature, Huff-Corzine and Corzine (2020, p. 330) argue it is also one of the most "pressing," adding, "We need to understand how the role of mental health, or the lack thereof, is associated with mass killing."

Serious Mental Illness and Mass Shootings

There are several challenges when assessing the role of serious mental illness in mass shootings (for an overview, see Skeem & Mulvey, 2020). There is a low base rate problem, meaning existing studies tend to focus on high profile select cases that may or may not be typical of all mass shooters (Dowden, 2005; Langman, 2009, 2020). Defining serious mental illness also is a challenge, because the diagnostic categories change over time, there are hundreds of mental illnesses, and approximately half of the population in the United States will meet a criteria for one in the course of their lifetime (Schaefer et al., 2017). Without official medical records, moreover, accounts of serious mental illness from interviews and the news media may be exaggerated or unconfirmed. An examination of 400 randomly selected news articles about mental illness, for example, found the most frequently mentioned topic was violence (McGinty et al., 2016), even though the scientific evidence shows little correlation between serious mental illness and violence (Swanson et al., 1990; Nestor, 2002). In fact, people with serious mental illness are more likely to be victims than offenders (Brekke et al., 2001; Monahan et al., 2001).

A small number of empirical analyses to date have examined the role of serious mental illness in mass violence (Dutton et al., 2013; Meloy et al., 2001; Stone, 2015). Rocque and Duwe (2018) found that 59% of 185 perpetrators in their analysis of mass killings over the last century had either been diagnosed with a serious mental illness or had "demonstrated serious signs of a mental illness prior to the shooting." Taylor (2018) examined 152 mass murders, finding that 30% of the perpetrators had either a confirmed or suspected serious mental illness. The presence of mental health issues was coded as a binary yes/no, based on media accounts, interviews with family and friends, and law enforcement records. However, Taylor's study used an arbitrary five-year sample interval (2007–2011) and did not exclusively focus on public mass shooters. Cases of arson, stabbing, choking, and so forth were included, as were domestic homicides and gang-related killings. A recent study also examined psychotic symptoms in a sample of 1,315 mass murderers since 1900 and found psychotic symptoms among 11% of perpetrators (Brucato et al., 2021).

Whereas these studies looked at the prevalence of mental health diagnoses or signs of a mental disorder among perpetrators of mass shootings, no study has systematically examined the *role* of psychosis in motivating a mass shooting. If a perpetrator has a diagnosed serious mental illness, even if they have psychosis, it does not mean that every action they do is related to that diagnosis or that their mental health symptoms directly caused them to perpetrate a mass shooting. Symptoms of serious mental illnesses like psychosis wax and wane over time depending on factors like treatment and stress (Douglas & Skeem, 2005). For an in-depth understanding of the role of mental health symptoms in mass shootings, a history of treatment or even a formal diagnosis will not suffice. Instead, the degree to which the perpetrator was experiencing symptoms when planning and committing the shooting and how those symptoms may have influenced their decision to act must be examined.

Dangerous People or Dangerous Weapons?

Americans increasingly see people with psychosis as "dangerous" not only to themselves but to others (Pescosolido et al., 2019). The idea that *all* people with psychosis are dangerous is not founded in the evidence, although a meta-analysis of 204 studies of psychosis as a risk factor for violence found that "compared with individuals with no mental disorders, people with psychosis seem to be at a substantially elevated risk for violence" (Douglas et al., 2009). Gostin and Record (2011) argue that owing to the ineffectiveness of current restrictions on access to firearms for "dangerous people," the government must instead improve safeguards against the "dangerous weapons" implicated in mass violence. The Gun Control Act of 1968 (*18 U.S.C. § 922*) generally restricts "prohibited persons" from purchasing firearms, including those involuntarily committed to mental health or substance abuse treatment, people adjudicated as incompetent or dangerous, or those who receive a verdict of not guilty by reason of insanity. Currently, these broad restrictions are not equally implemented.

For example, in *Printz v United States, 521 US 898*, the U.S. Supreme Court ruled that Congress could not compel states to report prohibited persons to the National Instant Criminal Background Check System (NICS); therefore, reporting is uneven, and in some states, inpatients with serious mental illness are never even entered. Some states overreport, including outpatients with serious mental illness, whereas others underreport, including only those individuals who are involuntarily committed for 90 days or only people committed to public hospitals. Not to mention, a privately owned gun can be transferred legally in ways that bypass background checks entirely.

Because there is no evidence that people with serious mental illness per se are more dangerous than others, even basic federal restrictions are likely too broad, and banning ownership for life after hospitalization can increase stigma and reduce reporting (Skeem & Mulvey, 2020; Swanson et al., 2015). Still, curtailing access to dangerous weapons for individuals who truly are a danger to others or themselves is one of the key policy recommendations for countering mass shootings in the United States (Nagin et al., 2020). Other studies have examined the relation between gun laws and the incidence and severity of mass public shootings in the United States (Siegel et al., 2020). This study examines precisely how mass shooters with serious mental illness obtained their guns, when in relation to the shooting, and the types of firearms they used.

Motivations of Mass Shooters

Mass shooter motivation is rarely systematically examined, in part because many mass public shooters die at the scene (Lankford, 2015). Where motive has been studied, it is commonly in the context of mass murderer typologies, which conceptualize motivation broadly and prioritize sociological over psychological explanations (Fox & Levin, 1985). The most well cited typology of mass murderers, for example, was developed by Fox and Levin (2011) and includes the motivating factors of power, revenge, loyalty, profit, and terror. Taylor (2018) focused more closely on emotional triggers such as job or relationship loss, domestic issues, financial issues, mental health issues, criminal gain, and political motivations (e.g., terrorism), because nearly all mass shootings were a form of revenge, but the triggering event differed by perpetrator.

It is difficult to assess the role of symptoms of certain serious mental illnesses in motivating mass shootings because some symptoms are traits that motivate violence for individuals both with and without serious mental illness (Peterson et al., 2014; Skeem & Mulvey, 2020). For example, irritability and hopelessness are symptoms of depression that may contribute to mass shootings for perpetrators with or without a diagnosed serious mental illness. Impulsivity is a symptom of bipolar disorder, a trait that influences violence among people both with and without a mental health diagnosis (Krueger et al., 2007). It is easier to examine the role of psychosis because delusions and hallucinations tend to be specific to a serious mental illness, and it is easier to conceptualize how these symptoms can directly motivate violence (Douglas et al., 2009; McNiel et al., 2000; Peterson et al., 2014). This study focuses solely on psychosis as a motiving factor, because it is often covered in the public discourse about mass shootings and it is possible to assess the role of psychosis using public records.

Previous studies have assessed the role of psychosis in directly causing crime or violence. Peterson et al. (2014) used a continuum to assess the causal role of mental health symptoms in 429 crimes committed by justice-involved individuals with a diagnosed serious mental illness. Of the crimes committed by participants with schizophrenia spectrum disorders, 23% were completely or mostly related to symptoms of psychosis, whereas 77% of crimes committed by this group were unrelated to psychotic symptoms. Overall, 65% of crimes were completely unrelated to any mental health symptoms, 7.5% of crimes were committed in direct response to mental health symptoms, and 28% fell somewhere in between. A study by Skeem et al. (2016) used data from the MacArthur Violence Risk Assessment study to examine 305 incidents of violence among high-risk individuals with a previous inpatient hospital stay, finding that symptoms of psychosis immediately preceded the violent incident in just 12% of cases.

For individuals who are at a higher risk for violence, symptoms of serious mental illness may hold less influence than other risk factors, such as previous antisocial behavior, poverty, or substance use. There is evidence that symptoms of serious mental illness play a larger role in influencing violence among people who are at a lower risk (Swanson et al., 2008; see Skeem & Mulvey, 2020 for a review). The current study examines the degree to which this finding applies to perpetrators of mass shootings. It also examines the role of psychosis in relation to other common motivations for mass public shootings, such as employment issues, interpersonal conflict, racial or religious hate, and fame-seeking.

The Current Study

This study first examines detailed mental health histories of 172 perpetrators of 168 mass public shootings since 1966 using publicly available data. Second, this study uses the methodology developed by Peterson et al. (2014) to assess the role of psychosis in mass shootings committed by 172 mass shooters since 1966 using publicly available records. The psychosis motivation then is compared with other mass shooting motivations, including employment issues, interpersonal issues, relationship issues, fame-seeking, and hate (i.e., racism, religious hatred, and misogyny). Based on the previous literature outline above, it is hypothesized

that a mental health history would be common among mass shooters, but symptoms of psychosis would only directly motivate mass shootings for a minority of cases.

Third, perpetrators motivated by psychosis are compared with other perpetrators on several well-established risk factors for violence (Andrews et al., 2006). Based on the previous literature, it is hypothesized that perpetrators motivated by psychosis will have fewer criminogenic needs compared with perpetrators motivated by factors like interpersonal issues, financial issues, or hate.

Finally, the current study examines when and how mass shooters motivated by psychosis obtained the firearm(s) they used in the commission of their crimes, what type of firearm(s) they used, and whether shooters motivated by psychosis get or use guns differently from other shooters. Assuming existing gun laws and social norms would make it difficult for people with psychosis to access lethal weapons, we hypothesize that perpetrators motivated by psychosis would use fewer guns total, guns more commonly used in everyday life, like rifles and shotguns, or guns obtained illegally.

Method

This study draws on one of the largest and most comprehensive databases of mass shootings in the United States. Built over three years using public records and open-source data with funding from the National Institute of Justice, The Violence Project Database of Mass Shootings in the United States captures all public mass shootings with four or more victims killed from 1966 to 2020 (Peterson & Densley, 2019). A total of 168 mass shootings were identified involving 172 mass shooters. The database starts with the University of Texas tower shooting in 1966. There were mass shootings before then, but what set the Texas shooting apart was that it unfolded live over the radio and TV. Mass shootings since then have received sufficient news coverage to be able to reconstruct and study them (Duwe, 2000).

Another database of mass shootings, funded under the same request for proposals, captures the incidence and severity of mass public shootings from 1976 through 2018 (see Siegel et al., 2020). What sets the present database apart is both the longer timeframe, but more importantly the inclusion of 166 independent variables for analysis. The full database and detailed methodology and codebook are publicly available at www.theviolenceproject.org. Informed by existing data sets, the research literature, and frequently asked questions about mass shooters, the authors generated a list of variables to be coded and created a codebook to define and detail how to code them. The codebook was then piloted on a small random sample of test cases and refined based on user-experience. This study was approved by the Institutional Review Board at Hamline University.

Data Sources

The database was constructed using open-source data, and cases were initially identified by combining all existing mass shooting databases and extensively examining each identified case (e.g., Siegel et al., 2020). Open-source lists of mass shootings from *The Washington Post*, *Mother Jones*, and other news outlets were the starting point. To code the variables of interest, the research team drew on first person accounts, such as the perpetrators' diaries, "manifestos" (i.e., public declaration of the motivations of the mass shooting by the perpetrator), suicide notes, social media and blog posts, audio and video recordings, interview transcripts, and personal correspondence. Secondary sources such as existing mass shooter databases, media coverage, documentary films and podcasts, biographies, monographs and academic journal articles, court transcripts, federal, state, and local law enforcement records, medical records, school records, and autopsy reports were also consulted. Each cell in the database is linked to the source used for coding.

Newspaper and online media stories are commonly employed as data sources in this type of work (Duwe, 2007; Huff-Corzine & Corzine, 2020; Petee et al., 1997; Taylor, 2018) and have been found to be an accurate source of information on mass killings (Huff-Corzine et al., 2014), in part because public mass shootings receive such intense media coverage (Lankford & Madfis, 2018b; Schildkraut et al., 2018). The team purchased subscriptions to newspapers.com, the archives of leading national papers (e.g., *The New York Times*, *The Washington Post*, *Los Angeles Times*, *Chicago Tribune*), plus the local newspaper of record in proximity to any given shooting. Within the publicly available database, every cell in the database is hyperlinked to the source where the information was found for full transparency. The team took every possible step to find and verify sources and to rigorously fact-check the data with the resources available.

Coding

All coders were advanced undergraduate students studying psychology or criminal justice. Ten coders were trained on the codebook and the definition of variables, and each case and variable were coded four separate times by at least three different, independent coders to ensure reliability before being checked again by a designated Database Manager, who had final document control. Coders had frequent check-ins with the principal investigators (the first and second authors) and regular meetings to discuss coding questions. The entire process of building the database took 2 years to complete. In the final, fourth review of the database, changes were made in 2.0% of cells. This was often attributable to new information that became available during the course of the study because some cases were still being litigated.

Once the codebook was finalized and coders were trained in its use, the database was populated as follows; (a) each mass shooter meeting the inclusion criteria (see Congressional Research Service definition above) was investigated twice by two separate coders, working independently from each other; (b) the two resulting data sets were then merged and compared; (c) any discrepancies were flagged and reconciled by consensus of the principal investigators, who did their own fact-checking and weighed the quality and quantity of the evidence, typically giving precedence to primary source material; (d) the database was then divided up among the original coders and independently checked again (coders never checked their own work); (e) the database manager conducted a full and final check of every cell; (f) the principal investigators answered any queries resulting from the final check before approving publication.

Measures

For the purpose of this analysis, only a subset of the 166 variables in the full database were utilized, all coded using the procedures described above.

Demographics

Each perpetrator was coded on the following demographic variables: location of the shooting, gender, race, age, criminal history (yes/no), history of physical violence (yes/no), military involvement, and on scene outcome (killed self, killed on scene, apprehended).

Mental Health

The following mental health related variables were coded (all as binary yes vs. no/no information available) based on the available sources: history of psychiatric hospitalization, history of counseling, history of psychiatric medication usage, evidence of a mood disorder diagnosis, evidence of a psychotic disorder diagnosis, history of substance use, and evidence of an autism spectrum disorder diagnosis. Perpetrators were coded in a diagnostic category if they were reported as being diagnosed before or soon after the shooting took place, which was most common for psychotic disorders that had not been previously diagnosed. These codes are based on all publicly available sources and should not be interpreted as formal diagnoses. Because the media do not report specifically that a perpetrator does not have a mental illness, if no evidence of a diagnosis or prior treatment could be identified they were coded as no/no information available.

Motivation

To assess motivation, coders examined all available news sources for each shooting, paying attention to the precipitating event, the words of the shooters themselves, court transcripts and investigative interviews, and interviews with those close to the perpetrator. Initially, each perpetrator's motivation was briefly qualitatively described. The following motivation categories were developed based on both the literature and the qualitative descriptions: employment issue, interpersonal issue, domestic or relationship issue, fame-seeking, hate (defined as racism, religious hatred, and/or misogyny), other/unknown, and psychosis. Note, perpetrators could fall into more than one category.

Shootings motivated by psychosis were examined more closely. Rather than a dichotomous yes/no distinction for psychosis, a continuum was utilized that better reflected the data and the complex role of psychosis in contributing to mass violence. The continuum categories, based the continuum previously developed by Peterson et al. (2014), were as follows:

> 0: Symptoms of psychosis played *no role* in the crime (i.e., the perpetrator did not experience any symptoms of psychosis while planning or committing the crime);
>
> 1: Symptoms of psychosis played a may have played a *minor role* in the crime (i.e., the perpetrator experienced delusions or hallucinations while planning and/or committing the crime which may have influenced their thinking and decision-making, but the perpetrator had another primary motivation or precipitating event);
>
> 2: Symptoms of psychosis played a *moderate role* in the crime (i.e., the perpetrator experienced delusions and/or hallucinations while planning and/or committing the crime, was responding to delusions or hallucinations in planning and/or committing this crime, but also had additional motive[s]);
>
> 3: Symptoms of psychosis played a *major role* in the crime (i.e., the perpetrator experienced delusions or hallucinations while planning *and* committing the crime, was responding to delusions or hallucinations in planning and committing the crime and had no other discernible motive).

Using the study coding procedures, each perpetrator was initially assessed on the psychosis continuum by two separate coders. During this first stage, Cohen's κ was .68, which is considered "substantial" agreement (Cohen, 1960). The principal investigators discussed and resolved any and all discrepancies after reviewing all source material.

Guns

Every firearm used in a mass shooting was separately coded (N = 377) on the following variables: type of firearm (handgun, shotgun, rifle, assault rifle), when the gun was obtained (one month prior to the shooting vs. more than one month prior), and how it was obtained (legal or illegal purchase, based on analysis of applicable federal and state gun laws at the time of purchase). A handgun has a short barrel; a shotgun has a long barrel and usually has a smooth bore; a rifle has a long barrel with rifling, which puts spin on the bullet, increasing accuracy and distance; and an assault rifle is any semiautomatic rifle that can accept a detachable ammunition magazine and has one or more additional features considered useful in military and criminal applications but unnecessary for sports or self-defense, like a folding rifle stock.

Risk Factors for Violence

Several variables were identified as risk factors for violence using the framework of the central eight criminogenic risk factors (Andrews et al., 2006), as follows: under the age of 25, prior criminal record, history of violence, unemployed, single, less than a high school education, problem with drugs and/or alcohol. These risk factors have been shown to influence criminal activity among people both with and without serious mental illness (Skeem et al., 2011). Each of the risk factors were recoded as dichotomous variables (present or absent) and added together for a total risk score.

Results

Mass Shooter Demographics

In this study, 97.7% of the perpetrators (N = 172) were male (there were four female perpetrators). Their ages ranged from 11 to 70 years old with a mean of 34.1 (SD = 12.2). Perpetrators were 52.3% White, 20.9% Black, 8.1% Latinx, 6.4% Asian, 4.2% Middle Eastern, and 1.8% Native American. The most common location of mass shooting was a workplace (30.8%), followed by a retail establishment (16.9%), bar or restaurant (13.4%), residential location (8.1%), outdoors (8.1%), K–12 school (7.6%), place of worship (6.4%), college or university (5.2%), and government or place of civic importance (3.5%). Most perpetrators had a prior

criminal record (64.5%) and history of violence (62.8%), including domestic violence (27.9%), and 28.5% had a military history. The majority of perpetrators died on scene, either by their own hand (38.4%) or they were killed by law enforcement (20.3%).

Mental Health Variables

Mental health variables are not mutually exclusive, and many perpetrators fell into multiple categories. Among perpetrators in the database, sources indicate that 19.8% had a history of previous hospitalization for psychiatric reasons, 29.1% had a history of counseling, and 23.3% had a known history of taking psychiatric medication (comparable to rates among the U.S. general population; Moore & Mattison, 2017). In terms of diagnosis (see Table 1), 15.7% showed evidence of a mood disorder diagnosis, 6.4% showed evidence of an autism spectrum disorder diagnosis, and 26.7% showed evidence of a psychotic disorder diagnosis (compared with 1% of the general population). If hospitalization, counseling, psychiatric medication, and previous diagnosis are combined, 58.7% of perpetrators had a mental health history, which is somewhat higher than general population levels (Kessler et al., 2005). Using available records, 6.4% of perpetrators had a history of marijuana use, 9.9% used other drugs, 15.0% used both drugs and alcohol, and 12.8% had a problem with alcohol. Combining these categories together 43.0% of perpetrators had problems with drugs or alcohol.

The Role of Psychosis in Mass Shootings

In the majority of cases, psychotic symptoms played no role in the shooting (69.8% of cases). In 11.0% of cases, psychosis may have played a *minor* role in the shooting, meaning the perpetrator had experienced delusions or hallucinations when planning or perpetrating the shooting which may have influenced their thinking or decision-making, but it was not the main motivating factor. For example, the 2019 Midland-Odessa shooter was fired from work before his shooting spree, but he had been repeatedly hospitalized throughout his life for delusional beliefs about government conspiracies which contributed to his actions.

In 8.7% of mass shootings, psychosis played a *moderate* role in the shooting, but was not the only factor. Meaning, the perpetrator experienced psychosis when planning or committing the crime, was responding to delusions or hallucinations in either planning or committing the crime, but the perpetrator also had another motive. For example, the 2012 Oikos University shooter was failing out of school and on the day of the shooting he planned to request a $6,000 tuition refund for the semester. After a university administrator did not meet with him, the shooter got angry and shot his fellow students at the Korean Christian college in Oakland, California. However, the shooter was also diagnosed with paranoid schizophrenia and believed that the staff at the university were conspiring against him, alienating him from classmates, and surveilling him. He started living in his car when he thought the university had wiretapped his home, then abandoned the car because he believed the university had put a GPS tracker on it. A psychiatrist who examined the shooter before trial said he had auditory and visual hallucinations as well as delusions.

For another 10.5% of shootings, psychotic symptoms appeared to play a *major* role in the shooting, meaning the shooter experienced psychosis both prior and during the crime, was responding to delusions or hallucinations in planning and committing this crime, and had no other motive. For example, the perpetrator of the Waffle House shooting in Tennessee in 2018 had been experiencing psychotic symptoms for years prior to the shooting. He believed that pop star Taylor Swift was stalking him, that they had met at a Dairy Queen and she had scaled a building to get away, and that she and police were hacking into his phone and bank accounts. A year before the shooting, he was arrested trying to break into the White House to meet with President Donald Trump. After his arrest for the shooting, forensic psychologists diagnosed him with severe untreated schizophrenia and found him incompetent to stand trial.

The motivations of mass shooters were further examined as a percentage of total mass shooters per year and per decade for the 1970s, 1980s, 1990s, 2000s, and 2010s (the five mass shooters from the 1960s and one from 2020 were excluded from the decade analysis to create equal ten-year intervals and consistent comparisons). Perpetrators were dichotomously coded as motivated by psychosis if they were coded as a 2 or 3 (moderately or majorly

Table 1
Psychosis Motivation and Mental Health History Variables

Variable	No role	Minor role	Moderate role	Major role	Total	χ^2
Previous hospitalization						
Yes	17 (50.0%)	7 (20.6%)	5 (14.7%)	5 (14.7%)	34	$\chi^2(3) = 8.02$, $p = 0.05$ $\phi = 0.22$
No	101 (74.3%)	12 (8.8%)	10 (7.4%)	13 (9.6%)	136	
Previous counseling						
Yes	32 (64.0%)	5 (10.0%)	6 (12.0%)	7 (14.0%)	50	$\chi^2(3) = 1.98$, $p = 0.58$
No	86 (71.7%)	14 (11.7%)	9 (7.5%)	11 (9.2%)	120	
Psychiatric medication						
Yes	24 (60.0%)	6 (15.0%)	4 (10.0%)	6 (15.0%)	40	$\chi^2(3) = 2.57$, $p = 0.48$
No	93 (72.7%)	12 (9.4%)	11 (8.6%)	12 (9.4%)	128	
Diagnosed mood disorder						
Yes	25 (92.6%)	2 (7.4%)	0 (0.0%)	0 (0.0%)	27	$\chi^2(3) = 8.92$, $p = 0.03$ $\phi = 0.23$
No	95 (65.5%)	17 (11.7%)	15 (10.3%)	18 (12.4%)	145	
Diagnosed psychotic disorder						
Yes	10 (21.7%)	11 (23.9%)	11 (23.9%)	14 (30.4%)	46	$\chi^2(3) = 70.72$, $p < 0.01$ $\phi = 0.64$
No	110 (87.306%)	8 (6.4%)	4 (3.2%)	4 (3.2%)	126	

Note. Missing cases have been excluded.

Table 2
Psychosis Motivation and Other Motivating Factors in Mass Shootings

Variable	No role	Minor role	Moderate role	Major role	Total	χ^2
Employment						
Yes	33 (82.5%)	5 (12.5%)	2 (5.0%)	0 (0.0%)	40	$\chi^2(3) = 7.59$, $p = 0.06$
No	87 (65.9%)	14 (10.6%)	13 (9.9%)	18 (13.6%)	132	
Interpersonal conflict						
Yes	24 (68.6%)	5 (14.3%)	4 (11.4%)	2 (5.7%)	35	$\chi^2(3) = 1.74$, $p = 0.63$
No	96 (70.1%)	14 (10.2%)	11 (8.0%)	16 (11.7%)	137	
Fame-seeking						
Yes	11 (91.7)	0 (0.0%)	1 (8.3%)	0 (0.0%)	12	$\chi^2(3) = 3.66$, $p = 0.30$
No	109 (68.1%)	19 (11.9%)	14 (8.8%)	18 (11.3%)	160	
Hate						
Yes	21 (70.0%)	3 (10.0%)	4 (13.3%)	2 (6.7%)	30	$\chi^2(3) = 1.42$, $p = 0.70$
No	99 (69.7%)	16 (11.3%)	11 (7.8%)	16 (11.3%)	142	
Relationship issue						
Yes	26 (81.3%)	3 (8.4%)	2 (6.3%)	1 (3.1%)	32	$\chi^2(3) = 3.14$, $p = 0.37$
No	94 (67.1%)	16 (11.4%)	13 (9.3%)	17 (12.1%)	140	

motivated by psychosis), because the role of psychosis for the "minor role" group is less clear. The data showed that psychosis remained relatively stable over time, although it peaked in the 2000s by featuring in ten (27%) mass shootings in that decade. An ANOVA test showed the only statistically significant difference in motivations by decade was a decline in shootings motivated by employment issues (generally workplace shootings) since the 1990s, $F(4, 162) = 4.35$, $p = .002$.

Comparing Perpetrators Motivated by Psychosis With Other Mass Shooters

Table 1 shows the relationship between mental health variables and psychosis motivation. Perpetrators who committed crimes motivated by psychosis were more likely to have a diagnosis of a psychotic disorder and to have been previously hospitalized. They were less likely to have a diagnosed mood disorder. There were no differences in previous counseling or psychiatric medication use. The total number of motivations for the sample ranged from 1 to 5 (41.9% had one motivating factor, 39.0% had two, 19.3% had three or more). Table 2 shows the relationships between psychosis motivation and other motivating factors. There were no significant differences between psychosis groups.

There were no differences between the psychosis motivation groups on any demographic variables including age, gender, race, or military history. There were also no differences in their history of substance use. Perpetrators with and without psychosis were also compared on seven identified known risk factors for violence (see Table 3). The only statistically significant difference was on education—perpetrators motivated by psychosis were significantly more likely to have attended college than perpetrators who were not motivated by psychosis, $\chi^2(1) = 5.34$, $p = .02$, $\phi = .18$. There were no other significant differences between the two groups on the other violence risk factors, indicating that perpetrators motivated by psychosis have a similar violence risk profile to perpetrators motivated by other factors.

Guns

The 52 perpetrators who committed a shooting motivated by psychosis in any way used 101 guns during their crimes. Most perpetrators motivated by psychosis used one gun (48.1%), whereas 26.9% used two guns, 11.5% used three guns, and 13.5% used four. Of the 101 guns used, 64.5% were handguns, 12.9% were rifles, 11.9% were shotguns, and 11.9% were assault rifles. Most guns were obtained longer than a month before the shooting (59.4%), and 18.8% were obtained in the month prior to the shooting (21.8% unknown). Most guns used in these shootings were purchased legally (61.4%), whereas 18.8% were obtained illegally and in 19.9% of cases the purchase information was unknown. Comparing perpetrators who were and were not motivated by psychosis, there were no differences in the number of guns brought to the scene, the number of victims killed or injured, the type of gun

Table 3
Psychosis Motivation and Criminogenic Risk Factors for Violence

Risk factor	Total ($n = 172$)	Psychosis ($n = 52$)	Nonpsychosis ($n = 120$)	Significance testing
Age < 25	55 (32.0%)	12 (23.1%)	43 (35.8%)	$\chi^2(1) = 2.71$ $p = 0.10$
Criminal record	111 (65.7%)	36 (69.2%)	75 (62.5%)	$\chi^2(1) = 0.72$ $p = 0.40$
Violence history	108 (62.8%)	37 (71.1%)	71 (59.2%)	$\chi^2(1) = 2.23$ $p = 0.14$
Single	105 (61.0%)	34 (65.4%)	71 (59.2%)	$\chi^2(1) = 0.59$ $p = 0.44$
High school or less	102 (59.3%)	24 (46.2%)	78 (65.0%)	$\chi^2(1) = 5.34$ $p = 0.02$
Unemployed	65 (37.8%)	16 (30.8%)	49 (40.8%)	$\chi^2(1) = 2.64$ $p = 0.10$
Substance use	74 (43.0%)	26 (50.0%)	48 (40.0%)	$\chi^2(1) = 1.48$ $p = 0.22$
Total	$M = 3.6$	$M = 3.6$	$M = 3.6$	$t(161) = 0.77$, $p = 0.71$

brought to the scene, when it was obtained, and how it was obtained (legally or illegally). Of the 34 people previously hospitalized, 58.7% of their 62 guns used were legally purchased and 30.6% were known to have been obtained illegally.

Discussion

The data indicate that the role of psychosis in mass shootings has been relatively stable over the past 50 years. Symptoms of psychosis played no motivating role in 69% of mass public shootings since 1966. Using available sources, psychosis may have played a minor role in 11% of cases, played a moderate role in 8.7% of cases, and played a major role in another 10.5% of cases. This pattern maps onto the findings of Peterson et al. (2014), who used a similar continuum to assess the role of symptoms in motivating general criminal behavior among individuals with a diagnosed serious mental illness (no role 65%, minor role 17%, moderate role 11%, major role 8%). Likewise, the findings show that approximately 60% of the perpetrators of mass shootings had a mental health history, which was consistent with levels reported by Rocque and Duwe (2018) in their study of mass murderers. However, it is important to note that there are only so many mass shooters to study, which means that studies like this are based roughly on a single overlapping nonrandom sample (e.g., Dutton et al., 2013; Meloy et al., 2001; Rocque & Duwe, 2018; Taylor, 2018).

Contrary to our hypothesis, there was no difference between mass shooters motivated by psychosis and other mass shooters in terms of how many and what type of firearms they used in their crimes and how they accessed weapons in the first place. It seems psychosis is a poor proxy for "dangerous people," and "dangerous weapons" stay dangerous no matter who is holding them (Gostin, & Record, 2011). Also contrary to our hypothesis, the only difference between perpetrators who were and were not motivated by psychosis on violence risk factors was on education level (perpetrators motivated by psychosis were more educated). This adds minimal support to previous findings that serious mental health symptoms play a more significant role among perpetrators who are lower risk (Winsper et al., 2013) and is more consistent with studies that find the same risk factors motivate crime and violence for people with and without serious mental illness (Skeem et al., 2011). Psychiatric medication usage among perpetrators of mass shootings was similar to rates among the general population (Moore & Mattison, 2017).

Limitations

The database was built using publicly available information which was necessary but leaves room for bias and misinformation because the source data were originally gathered for purposes different from our own (Metzl et al., 2021). Media outlets have their own agendas (Schildkraut et al., 2018). Some cases are well reported on, whereas others are not (Lankford & Madfis, 2018b). There is also variability in how the media assign blame to mass shooters (Silva, 2020b). A recent study found that holding all aspects of the crime equal, the media tend to be more sympathetic toward White mass shooters and inclined to describe them as mentally ill or a victim of society and circumstance compared with their Black counterparts, which the authors took as evidence of inherent racial bias (Duxbury et al., 2018).

However, the presence (or not) of serious mental illness is not the only factor dictating the nature and extent of media coverage of mass shootings. The victim profile also matters, to the extent that the shooting of Representative Gabrielle Giffords in Tucson, Arizona in 2011 received a lot of press coverage because of who the victim was, not because the perpetrator was motivated by serious mental illness. Generally speaking, mass shootings in K–12 schools and military bases, mass shootings with higher body counts or younger victims, shootings perpetrated with assault rifles, and shootings clustered with other shootings tend to receive more attention (Duwe, 2000; Lankford & Madfis, 2018b; Towers et al., 2015). The news cycle also matters. In August 2019; there were three high profile shootings in a week, first in Gilroy, California, then back-to-back shootings in El Paso, Texas, and Dayton, Ohio. Then, 27 days later, in Midland-Odessa, Texas, a 36-year-old went on a shooting spree from his vehicle, killing seven and injuring 23. Of all these shootings, El Paso received the most media attention because, just hours before he opened fire at Walmart, the shooter published a short screed disparaging immigrants and warning of an "invasion" of Hispanics. That term is one that President Donald Trump himself used to describe migrants seeking entry to the United States from Mexico, and the media's focus was on whether the President's angry rhetoric was responsible for fomenting a rise in hate and, in this case, violence.

Still, we tend to know more about recent cases, which reflects better reporting over time and more advocacy and awareness around the topic of mass shootings. The period of time at issue (1966–2020) spans enormous evolution in the nature of mass media, including the invention of the Internet and social media, and associated changes in the nature of journalism; not to mention critical developments in politics, Second Amendment jurisprudence (e.g., a federal ban on assault weapons from 1994 and 2004), firearm technology, "routine activities" in public spaces (Silva & Greene-Colozzi, 2020), armed security (Peterson et al., 2021), and so on. News coverage spans changes in diagnostic nomenclature, treatment practices, access to care, and other major changes in health care, law enforcement, and criminal justice. For these reasons, readers should interpret trends over time with caution.

Mental illness was coded based on diagnoses made before the shooting or shortly afterward. It is possible that diagnoses made shortly after the shooting may not have been present prior to the shooting. It is also possible for a perpetrator to have a serious mental illness that was undiagnosed or unreported. Ideally, we would use medical records for diagnostic coding; however, the Health Insurance Portability and Accountability Act of 1996 and other data privacy laws limit full access to official records for validation purposes. Only the role of psychosis was analyzed as a motivating factor in mass shootings, owing to available data and records. There were no substantive differences between cases where the psychosis determination was derived from media reports only versus those that were substantiated with more reliable records like law enforcement records and trail transcripts.

It is important to note that although the database was built on public data and public data are imperfect, many different sources were consulted for each case and the data were triangulated where possible; this is what allowed for the separation of a background mental illness diagnosis from psychosis actually motivating the shooter's action. The role of symptoms of depression, bipolar

disorder, posttraumatic stress disorder, anxiety disorders, or other personality disorders were not taken into account because of the inability to distinguish symptoms from normative traits of mass shooters, which is an important area for future research. This study has no direct comparison group. Future research could try matching mass shooters with perpetrators of other forms of homicide to compare mental health histories and the role of psychosis (e.g., Brucato et al., 2021). Guns were coded as obtained legally or illegally based on the time they were purchased. Future research could examine whether these purchases would have been legal or illegal using current gun laws.

Implications

Often in our public discourse, mass shootings are blamed on serious mental illness (Craighill & Clement, 2015). Our findings indicate that the role of psychosis in motivating mass shootings is not a black or white issue but a complicated and complex one. The data presented are descriptive but present a systematic examination of this issue using a continuum. Although mental health histories were common, the data indicate that psychosis played some role in approximately one third of mass shootings, but a major role only 10% of the time. For the other 90% of mass shootings committed since 1966 where four or more people were killed, perpetrators had other motivations.

Future research could focus on the barriers to treatment among perpetrators experiencing psychosis and examine the clinical implications for this group (i.e., if and how perpetrators experiencing psychosis fell through the cracks of the mental health care system). For people experiencing psychosis for the first time, the biggest barriers to seeking treatment are generally a lack of knowledge or difficulty recognizing mental illness and not knowing where to seek help (Scholten et al., 2003). It is possible that access to affordable, community-based, mental health treatment and assistance services may help prevent mass shootings in a minority of cases. However, the fact that approximately half of the mass shooters who were motivated by psychosis in any way had received previous treatment may indicate that the quality of treatment also matters in addition to access. Furthermore, the role of mental health practitioners in assessing risk of mass violence is an area for future research (Meloy, 2018).

The data do not support blaming mass shootings *exclusively* on serious mental illness. Doing so not only risks stigmatizing the millions of Americans who are affected by serious mental illness each year but misses other explanations and motiving factors (Metzl et al., 2021). For example, many mass shootings are motivated by hate and fame-seeking, which has different implications for prevention. For example, the "no notoriety" protocol asks the media to minimize the use of the perpetrators' name, especially in headlines, to avoid contributing to the fame that may drive certain perpetrators (Lankford & Madfis, 2018a).

The data show that of the 101 guns used by shooters where psychosis played a role, 64.5% were handguns and 11.9% were assault rifles. By way of comparison, firearms were used to commit 73% of all murders in 2017, FBI (2018) data show. And in at least 64% of those cases, the firearm was a handgun, so the data are in line. However, only about 1% of general firearm homicides are perpetrated with an assault rifle, which means assault rifles are overrepresented in mass public shootings. As others have argued (Koper, 2020), an assault rifle ban might be one way to curb this type of gun violence.

Our data do not tell us which shooters were *involuntarily* hospitalized, but of the 34 people previously hospitalized at all, 58.7% of the 62 guns they used were legally purchased. This is notable because the federal Gun Control Act of 1968 generally prohibits the sale to, and possession of firearms by, a person who has been involuntarily hospitalized or committed to a mental health or substance abuse treatment facility by a court, board, commission, or other lawful authority. For example, the 2007 Virginia Tech shooter had been court ordered to receive mental treatment, meaning he should have been ineligible to buy a gun under federal law. However, the Virginia state statute was worded in such a way that it did not apply to the shooter's situation and he was able to pass a background check. The 2018 Nashville Waffle House shooter legally bought his guns, then they were taken away by police after the Secret Service arrested him trying to break into the White House. The guns were given to the shooter's father for safekeeping, but the father just gave them right back to his son.

Universal background checks, consistently performed by a licensed firearm dealer, law enforcement agency, or other neutral third-party arbiter could have prevented these errors. But rather than limiting someone's access to firearms for life based on their mental health history, states could adopt systems to identify and disarm gun possessors who are particularly high risk for violence. The California Armed and Prohibited Persons System, for example, uses state gun sale records to identify prior gun buyers who have since become disqualified possessors (Laqueur & Wintemute, 2020). This is especially important given that mass shooters with serious mental illness, even psychosis, share many of the same risk factors for violence as mass shooters without mental illness (Skeem & Mulvey, 2020; Swanson et al., 2015).

Allowing for temporary removal (and reinstatement) of a firearm based on a wider range of factors might also encourage reporting from family and friends and incentivize treatment. Red flag laws, properly known as extreme risk protection orders, or ERPOs, allow family members to petition a court to temporarily remove a person's access to firearms if they pose a threat to themselves or others. Evidence suggests they are an effective suicide and domestic violence prevention tool (Kivisto & Phalen, 2018; Swanson et al., 2017; Zeoli & Paruk, 2020); it would appear they might help reduce mass shootings as well (see Laqueur & Wintemute, 2020).

Behavioral intervention teams in schools and workplaces may also help identify individuals who are at risk for violence against self or others and determine appropriate intervention strategies (Borum et al., 1999). In the wake of several post office shootings in the 1980s and early 1990s, for example, the United States Postal Service (1997) implemented a workplace threat assessment program, using district-level threat assessment teams, as part of its broader workplace violence prevention initiative. To avoid disciplinary outcomes that may exacerbate risk factors for violence and increase criminal justice involvement (Crepeau-Hobson & Leech, 2021), these programs could extend beyond the usual notion of "threat assessment" and instead use a "crisis response" team model to provide nonpunitive supports for anyone experiencing a mental health crisis (Peterson & Densley, 2021).

Conclusion

This study systematically examined the role of psychosis in mass shootings, moving beyond individual case studies. A mental health history was common among mass shooters and psychotic disorders were overrepresented among mass shooters compared with the general population, but symptoms of psychosis only directly motivated mass shootings for a minority of cases. The findings highlight that the role of psychosis in motivating violent behavior is complex and, in turn, lawmakers must not fixate on someone's diagnosable psychopathology if they are to craft holistic public policy solutions to the mass shooting phenomenon.

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