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Has the Role of Mental Health Problems in Mass Shootings Been Significantly Underestimated?

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Prior research suggests that approximately two-thirds of public mass shooters exhibit signs of mental illness. This study analyzed whether that means there are 2 psychological types of perpetrators (some mentally ill, some mentally healthy), or whether almost all perpetrators are likely to have mental health problems. Using a database of 171 public mass shooters who attacked in the United States from 1966 to 2019, we tested for statistically significant differences between perpetrators with and without diagnoses or signs of mental illness. We also closely examined the most lethal perpetrators since 2012, and the most "mentally healthy" perpetrators according to prior coding. Correlates of mental illness were approximately equally common among perpetrators, whether they were believed to be mentally ill or not. Of the variables we examined, data availability provided the best explanation for coding of mental illness, not any trait or life experience. Further evidence suggested that even the most "mentally healthy" perpetrators could be recoded as having signs of mental illness or suicidality, or were clear outliers, or may not qualify as public mass shooters. The most lethal perpetrators exhibited signs of mental illness or suicidal intent (or both) in all cases. When people engage in concerning behaviors that suggest a mass shooting risk, their mental health should be carefully assessed alongside other warning signs. However, it is important to avoid treating people with mental illness like criminals, because social stigma reduces the likelihood that they will ask for, and receive, the psychological help they need.

Public Significance Statement

The role of mental illness in mass shootings is sometimes underestimated, due to a range of public health concerns and methodological nuances. This study closely analyzed public mass shooters who attacked in the United States from 1966 to 2019 and found that correlates of mental illness were approximately equally common among perpetrators, whether they had been coded as mentally ill or not. Further evidence suggests that almost all public mass shooters may have mental health problems, but that social stigmas, which reduce the likelihood that perpetrators will seek psychological treatment, may help explain popular underestimates.

Keywords: mass shootings, mental illness, suicide, stigma, treatment

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Prior research has found that less than half of public mass shooters were directly diagnosed with a mental illness (National Threat Assessment Center, 2018, 2019; Peterson & Densley, 2019b; Silver, Simons, et al., 2018; Yelderman et al., 2019). And more broadly, research which includes diagnoses, self-report, and symptoms suggests that

approximately two-thirds (67%) of perpetrators exhibited signs of mental illness prior to their attacks (Duwe, 2020; National Threat Assessment Center, 2018, 2019; Peterson & Densley, 2019b; Silver, Simons, et al., 2018; Vossekuil et al., 2004).[1]

However, this raises several questions. What about the other perpetrators? Are approximately one-third of public mass shootings committed by people who did not have a history of mental illness? Or do almost all public mass shooters have a history of mental health problems, with the signs going undetected by retrospective research in approximately one-third of cases?

The answers to these questions have important implications. First, at a basic level, it is crucial that researchers do not misunderstand the psychology of approximately one-third of public mass shooters. If the role of mental illness in these attacks is significantly underestimated, then the influence of other factors may be overestimated. Second, threat assessment should be more effective if the population from which most threats come can be narrowed (Lankford, 2018; Meloy et al., 2012; O'Toole, 2000). For instance, knowing that 98% of public mass shooters are male is valuable (Madfis, 2014b; Peterson & Densley, 2019b), even though most males will never kill anyone and this only reduces the population of potential attackers by approximately half.[2] Similarly, although the vast majority of people with mental health problems are not violent and will never shoot anyone (Glied & Frank, 2014; National Council of Behavioral Health, 2019; Skeem & Mulvey, 2020), threat assessment would be more precise if almost all shooters are found within the portion of the U.S. population who experiences mental illness in a given year. Third, mass shooting prevention depends on effective intervention, treatment, and response for people who are identified as high-risk (Allwinn et al., 2019; Borum et al., 1999; Meloy et al., 2012; O'Toole, 2000). If almost all public mass shooters have mental health problems, then mental health treatment should be required of all high-risk individuals who are preemptively identified as having expressed interest in attacking.

This study will investigate the possibility that mental illness has been significantly underestimated among public mass shooters using The Violence Project's Mass Shooter database (2019b) of perpetrators who attacked in the United States from 1966 to 2019, which coded the mental illness variable for all offenders.

The Role of Mental Illness in Mass Shootings

Some people clearly overestimate the role of mental illness in mass shootings. For instance, outside the scientific community, some people suggest that anyone who commits a mass shooting *must* be mentally ill, because the crime itself is so abnormal (Rocque & Duwe, 2018). This is tautological and lacks a research basis. Not all so-called "crazy" behaviors are the product of "crazy" or mentally ill people, and the National Council for Behavioral Health (2019) wisely warns against the flawed assumption that all "acts that seem incomprehensible to the average person are due to mental illness" (pp. v–vi). Many deviant acts are instead the result of some combination of individual, social, and situational factors, without mental illness playing a role.

Others overestimate the role of mental illness in mass shootings by claiming it is the sole cause of these crimes. For instance, one high profile commentator has suggested that "Guns don't kill people—the mentally ill do," and the same sentiment was echoed by the President of the United States in August 2019 (Abutaleb & Wan, 2019; Metzl & MacLeish, 2015). That is also clearly inaccurate. Most homicide in the United States is associated with criminal behavior (such as gang conflict, drug trafficking, or robbery) or with interpersonal conflicts (Federal Bureau of Investigation [FBI], 2018; Wilson & Petersilia, 2002), rather than mental illness. And although the Federal Bureau of Investigation (FBI) (2017) and National Council of Behavioral Health (2019) have both suggested that mental illness is more common among perpetrators of mass violence than in the general population, they both also emphasize that it is not the sole characteristic which distinguishes these attackers from everyone else. Previous research has shown that

[1] Estimates of mental illness found in previous research include: Duwe's (2020) study of public mass shooters (61.4% with signs of mental illness); the National Threat Assessment Center's (2018, 2019) reports on public mass attackers (64% and 67% with symptoms of mental health problems in consecutive years); Peterson and Densley's (2019b) dataset of public mass shooters (65.5% with diagnosis or signs of mental illness); Silver, Simons, & Craun's report on active shooters (62% with signs of mental health problems in preceding year); and Vossekuil et al. (2004) study of school shooters (61% with a history of feeling extremely depressed or desperate).

[2] Of course, all high-risk individuals who pose a threat should be taken seriously.

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public mass shootings are often multifaceted and influenced by the interaction of many different factors, such as access to firearms, insecure masculinity, social marginalization, perceived victimization, unhealthy desires for fame or attention, and/or personal crises (Fox & Levin, 1994; Langman, 2009; Lankford, 2012, 2018; Levin & Madfis, 2009; Newman et al., 2004; Schildkraut & Muschert, 2013; Silver, Simons, et al., 2018).

On the other side of this debate, however, the role of mental illness in mass shootings is sometimes underestimated. For instance, consider the following titles and headlines, all of which come from academic studies or reputable media publications:

- "Most Mass Shooters Aren't Mentally Ill. So Why Push Better Treatment as The Answer?" (Rosenwald, 2016)
- "The Tenuous Connections Involving Mass Shootings, Mental Illness, and Gun Laws" (Fox & Fridel, 2016)
- "Connecting Mental Illness and Mass Shootings Misses the Point, Experts Say" (McCausland, 2017)
- "FBI Study: Most Mass Shooters Are Not Mentally Ill" (Farivar, 2018)
- "Debunking The Myth of a Link Between Mass Shootings and Mental Illness" (Woodbury, 2019)

Based on these assertions, it would be easy to assume that most public mass shooters are not mentally ill, that mental illness plays almost no role in the psychology of these perpetrators, and that mental illness is largely irrelevant to their behavior. That would also be inaccurate.

Underestimates appear common for several different reasons. First, there are legitimate concerns about stereotypes which depict people with mental disorders as inherently dangerous, so it is important for scholars to push back. As the President of the American Psychological Association (2019) has emphasized, "Routinely blaming mass shootings on mental illness is unfounded and stigmatizing. Research has shown that only a very small percentage of violent acts are committed by people who are diagnosed with, or in treatment for, mental illness." In turn, the National Council of Behavioral Health (2019) has warned that if mass shootings are primarily attributed to mental illness, this could result in "millions of harmless, nonviolent individuals [who are] recovering from treatable mental health conditions being subjected to stigma, rejection, discrimination and even unwarranted legal restrictions and social control" (p. vi). These are valid concerns, but may contribute to underestimates of mental illness out of an abundance of caution about broader public health consequences.

Second, mental illness among mass shooters is sometimes underestimated because of inaccurate stereotypes about mental illness itself. Many people believe that having a mental disorder is equivalent to being "crazy" or insane, as if all mental illnesses leave afflicted individuals with constant delusions or hallucinations, which is not remotely accurate (Lankford, 2013). Because of these misconceptions, they would not expect anyone with mental illness to be able to attend school, hold a job, or have a lucid conversation. This sometimes leads to false assumptions that a mass shooter could not have had mental health problems. As just one example, a friend of the 2015 Chattanooga shooter insisted that "Everything seemed fine. He was normal," and officials reported that the "general consensus from people that interacted with him [was] that he was just your average citizen" (Associated Press, 2015). However, it was eventually discovered that the shooter had experienced depression since childhood, was struggling with drug and alcohol addiction, and had considered suicide for years (Farberov, 2015).[3] Sometimes additional information like this never surfaces and mental health problems go uncounted.[4]

Third, mental illness among these perpetrators is sometimes underestimated by those who cite research which used broad definitions of "mass violence" or "mass shootings," instead of focusing on public mass shooters specifically.

[3] With the exception of the perpetrators identified by their first initial and last name in Table 2 and briefly mentioned in the text (most of whom are relatively unknown), this article does not use mass shooters' names, in accordance with the "No Notoriety" campaign and Lankford and Madfis's (2018) proposal to deny offenders the attention they often seek.

[4] People often do not disclose their mental illness to family, friends, teachers, coworkers, or even doctors (Lankford, 2016; Martin, 2010; Rüsch et al., 2014; Wheat et al., 2010). Therefore, we do not think observations about someone else's mental health problems and observations about their absence should cancel each other out. For example, if a mass shooter told one family member that he was "hearing voices," and told another family member he "felt fine," the latter statement would not invalidate the former.

Public mass shooters are traditionally defined as perpetrators who killed four or more victims, unrelated to other criminal activity or "commonplace circumstance" (Krouse & Richardson, 2015, p. 10; Peterson & Densley, 2019a, p. 5).[5] This refers to a rare and extreme type of killer who appears more likely to have mental health problems than other violent criminals (National Council of Behavioral Health, 2019). Of course, it is fine for researchers to focus on whatever they want, but studies that include terrorists who attacked with explosives, hostage-takers, gang members, drug traffickers, or criminals who killed fewer victims often find less evidence of mental illness (Corner & Gill, 2015; Corner et al., 2016; National Council of Behavioral Health, 2019; Tuason & Güss, 2020; Vestal, 2019).

A fourth reason for these underestimates is because some researchers examine only a narrow subset of mental disorders, and then are inaccurately cited as having analyzed the overall prevalence of mental illness. Again, it is fine for researchers to establish their own research agendas, and examining subcategories of mental illness can yield valuable insights. However, the finding from Silver, Fisher, et al. (2018) that only 4.7% of perpetrators had gun-disqualifying mental health records prior to their attack, the assertion from Stone (2015) that only 17% of perpetrators had psychosis, or the hypothesis from Skeem and Mulvey (2020) that only 20% of perpetrators had "serious mental illness" such as schizophrenia, bipolar disorder, or major depression, are not comprehensive estimates. Many mental disorders listed in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) (American Psychiatric Association [APA], 2013)—including developmental disorders that can cause unhealthy obsessions, fixations, paranoia, or lack of empathy—were not counted.

A fifth reason for underestimates of mental illness is because some sources rely solely on formal diagnoses. Many shooters have never been formally evaluated—and others intentionally avoid doctors or conceal their mental health problems due to shame or stigma—so there is often a large discrepancy between the proportion of perpetrators who are diagnosed and the proportion who exhibit signs or symptoms (Lankford, 2013, 2016). For example, the United States Secret Service found that only 17% of rampage school shooters from 1974 to 2000 had been diagnosed with a mental or behavior disorder, but 61% had a documented history of feeling extremely depressed or desperate and 78% had a history of suicidal thoughts or suicide attempts (Vossekuil et al., 2004). Similarly, the FBI found that only 25% of active shooters from 2000 to 2013 had ever been diagnosed with a mental illness, but 62% exhibited mental health problems in the year prior to their attack (Silver, Simons, et al., 2018). When only formal diagnoses are considered, mental illness appears far less common than in-depth analyses suggest.

Lessons from suicide research are applicable here, because estimates for how often suicidal people are mentally ill also depend on which types of evidence are counted. As with mass shootings, there are many people who die by suicide who were not formally diagnosed with a mental disorder (Milner et al., 2013; Yeh et al., 2019). Data from the Centers for Disease Control and Prevention (CDC) also produce substantial underestimates, perhaps because they are based on reports from law enforcement, medical examiners, and coroners who are more focused on establishing the cause of death (homicide, suicide, or natural causes) than investigating precipitating factors such as mental illness (Stone et al., 2018).[6] More comprehensive estimates come from psychological autopsies, which suggest that approximately 90% of suicide decedents had a mental health problem (Cavanagh et al., 2003). If these estimates are correct, there may only be a few scenarios (e.g., suicide due to terminal disease, expectations of imminent death, or severe coercion or punishment) where suicidal people typically lack a history of mental illness. Even then, these individuals may have been experiencing acute depression, anxiety, stress, or trauma that they could not cope with—which could explain why they chose to die, unlike most people in the same circumstances (Joiner et al., 2017; Lankford, 2016).

A particularly encouraging approach for improving estimates of mental illness was developed by Joiner et al. (2017). In their study of suicide decedents, they hypothesized that if

[5] Some sources have considered perpetrators who killed less than four victims to be "mass" shooters (see Fox & Levin, 2015; Silva & Capellan, 2019).

[6] As an example of the limits of the CDC's information on precipitating factors in suicide cases, they report that only 32% of people who die by suicide had previously engaged in suicide ideation (i.e., had suicidal thoughts) (Stone et al., 2018), even though by definition, 100% of people who die by suicide engaged in suicide ideation prior to their deaths.

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individuals who were not found to have mental disorders in prior research actually did have them, three conditions would hold. First, there would be significantly more known about those who were coded as mentally ill than those coded as mentally healthy, suggesting that the difference in coding was the product of data availability. Second, if further information were obtained about those who were coded as mentally healthy, some of them would be reassigned to the mentally ill category. Third, those who were coded as mentally ill and those who were coded as mentally healthy would appear similar across other factors associated with mental illness.

The Current Study

Goals and Hypotheses

To investigate the possibility that mental illness has been significantly underestimated among public mass shooters, we followed the approach of Joiner et al. (2017) to answering similar questions about the frequency of mental disorders among suicide decedents. As a starting point, we relied on The Violence Project's Mass Shooter database (Peterson & Densley, 2019b) and its coding of mental illness among public mass shooters.

Our first hypothesis was that if public mass shooters truly fall in two distinct categories—two-thirds who were mentally ill, and one-third who were mentally healthy—then more correlates of mental illness should be found among the mentally ill group than among the mentally healthy group. In particular, given that suicide is highly associated with mental illness (Brådvik, 2018); Cavanagh et al., 2003; Goldney, 2015; Haw & Hawton, 2015; Joiner et al., 2017; Too et al., 2019), we would expect significantly more public mass shooters who were found to be mentally ill to have committed suicide or been killed as a result of their attacks (which is often the deliberate strategy of "suicide by cop"). In addition, given previous research on the association between experiencing mental illness as an adult and being raised by a single parent (Moilanen & Rantakallio, 1988; The Guardian, 2006), being bullied (Lereya et al., 2015; Ttofi et al., 2011), experiencing childhood trauma (Sara & Lappin, 2017), having a parent commit suicide (Tyrka et al., 2008), and having a criminal record/arrest record (Gottfried & Christopher, 2017), these factors should all be more common among the public mass shooters who were found to be mentally ill.[7] By contrast, if public mass shooters do not significantly differ across these variables whether they were coded as mentally ill or not, that would support the null hypothesis and suggest that these may not be two distinct groups.

Our second hypothesis was that if public mass shooters truly fall in two distinct categories—two-thirds who were mentally ill, and one-third who were mentally healthy—and the assignment to these categories is not a product of data availability, then there should not be a significant difference in the amount of missing information for each group. However, if there is significantly more missing information for public mass shooters who were coded as not being mentally ill, that would suggest the difference in these findings may largely be a result of data availability, rather than a substantive difference in the psychology of these perpetrators.

Our third hypothesis was that if a significant proportion of public mass shooters are truly mentally healthy, then this fact should stand up to scrutiny, even after a close examination of the cases where no evidence of mental illness or suicidality has been found. On the other hand, if almost all public mass shooters have mental health problems, then despite the very real challenges of data availability, a close examination of a subset of cases would suggest that mental health problems among public mass shooters have been underestimated.

Dataset and Procedures

First and foremost, data for this study came from The Violence Project's Mass Shooter database (Peterson & Densley, 2019b), which attempted to identify all public mass shooters (n = 171) in the United States from January 1,

[7] These factors have been found to be correlates of mental illness, but they cannot be used as diagnostic criteria. Additionally, although previous research indicates these are correlates of mental illness in general, it is possible that mass shooters differ from the general population in some way that renders these correlates inapplicable. However, unless mass shooters are far more abnormal in their psychology and functioning than we believe, it seems likely that the same correlates of mental illness would apply to them. For example, mass shooters would have to be profoundly different from the general population for childhood trauma to affect them differently than it does everyone else, and we have no reason to suspect that is the case.

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1966 to October 1, 2019, based on the definition put forth by the Congressional Research Service (Krouse & Richardson, 2015). According to this definition, mass shooters who murdered four or more victims in a single public incident would meet the inclusion criteria, while domestic mass shootings and shootings due to "underlying criminal activity or commonplace circumstance (armed robbery, criminal competition, insurance fraud, argument, or romantic triangle)" should be excluded (Krouse & Richardson, 2015, p. 10; Peterson & Densley, 2019a, p. 5).

Although The Violence Project's overall estimates for the prevalence of mental illness among these perpetrators are similar to those from other researchers (e.g., Duwe, 2020; National Threat Assessment Center, 2018, 2019; Silver, Simons, et al., 2018; Vossekuil et al., 2004), its dataset is open-access, which is a key advantage that facilitated our study's analyses. Public mass shooters who were coded as having been diagnosed with mental illness had thought disorders, mood disorders, and/or other psychiatric disorders (e.g., developmental disorders, personality disorders, conduct disorders, etc.). Public mass shooters who were coded as having "signs of mental illness" but no formal diagnosis included those who displayed symptoms of mental illness (e.g., delusions or hallucinations), or who had received mental health treatment where diagnostic information was not publicly known (due to patient confidentiality, etc.). The remainder were coded as having "no signs" of mental illness, which indicates that evidence was not found of diagnoses or symptoms of mental illness. This is not equivalent to an affirmative confirmation of good mental health. Differentiating between perpetrators who had formal diagnoses, signs of mental illness, or no signs of mental illness has scholarly precedent (Corner & Gill, 2015; Yelderman et al., 2019). Primary sources (e.g., medical records, autopsy reports, and perpetrators' statements) and secondary sources (e.g., official investigation reports and media reports) were used by Peterson and Densley (2019b) to identify formal diagnoses and symptoms of mental illness.

It should be emphasized that normal emotional highs and lows were not counted as evidence of mental health problems. This concern has been raised by some scholars in the past (e.g., Skeem & Mulvey, 2020), because if the presence of anger or sadness alone were considered mental illness, that definition of mental illness would be so diluted that it would apply to everyone on a regular basis. We firmly believe that much like it would not be reasonable to assume that anyone who experiences physical pain must have a physical illness, it is not reasonable to assume that anyone who experiences anger, sadness, or other powerful emotions must have a mental illness.

In addition to using The Violent Project's data on public mass shooters' mental health status, we also examined the following variables: sex, age, race, being raised by a single parent, being bullied, experiencing childhood trauma, having a parent commit suicide, having a criminal record/arrest record, the attack outcome for the perpetrator, and the extent of missing information. For our analyses, race was collapsed into one binary variable (White vs. minority), and childhood trauma was collapsed into one binary variable (yes vs. no). We also wanted to test for cross-group differences in suicidal behavior, so we used data on attack outcomes, which are straightforward and a matter of the historical record, rather than data on suicide ideation, which may be limited by some of the same data availability challenges that affect coding of mental illness. These attack outcomes reflected whether perpetrators lived or died, and if they died, whether it was because they committed suicide by their own hand or were killed following their attack (which often constitutes "suicide by cop"). There were two perpetrators who committed suicide after being arrested but before going to trial; they were included in the suicide category. In turn, the "missing information" variable reflects the total number of missing cells in the dataset for each mass shooter, across all variables.[8] As examples, there were zero missing cells for the 2015 Charleston church shooter (who committed one of the highest profile attacks of that year), but 17 missing cells for the perpetrator of a 2010 shooting in Buffalo, NY which left four victims dead.

In addition to our analysis of all 171 public mass shooters in this dataset, we also closely examined two subsets of cases. First, we identified all perpetrators in the entire dataset who were coded as (a) not having a diagnosis or signs of mental illness, (b) not exhibiting suicide ideation (or the intention of dying) before their attack, (c) not having committed suicide, and (d) not having been killed following their attack (which

[8] Missing information values were recalculated by this study's authors to confirm their accuracy.

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often constitutes "suicide by cop"). Less than 10% of the entire dataset met this description (17/171 shooters). Presumably, these should be the most "mentally healthy" public mass shooters, so we studied the details of their cases. Second, we identified the 17 public mass shooters who committed the most lethal attacks since 2012 (all of whom killed eight or more victims during this period). These are some of the perpetrators we know the most about, given the recency and high profile nature of their attacks, so we studied their case details as well. Open-source data, including official investigation reports, law enforcement records, medical records, manifestos, video recordings, and the perpetrators' journals and personal writings, were evaluated for additional indicators of psychopathology and suicidality.

Statistical Analysis

Descriptive and inferential data analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 25 (IBM Corp Released, 2017). For each binary variable, frequencies and proportions were calculated based on the number of cases coded "yes" among the total number of cases for which information on that variable was available. Fisher's exact tests (Fisher, 1922) were then used to determine whether there were any significant differences between public mass shooters with and without diagnoses or signs of mental illness.[9] Odds ratios and confidence intervals were also computed for all 2 × 2 contingency tables (Field, 2009).

For each continuous variable (age and missing information), means were calculated and then analysis of variance (ANOVA) tests was run to explore the relationship between public mass shooters with and without diagnoses or signs of mental illness. The age variable was found to be normally distributed and there was homogeneity of variances, as assessed by Levene's test for equality of variances ($p = .487$). For the missing information variable, Levene's test revealed that there was not homogeneity of variance between the two mental illness groups (diagnosis/signs of mental illness vs. no diagnosis/signs) ($p = .005$) or the three mental illness groups (diagnosis vs. signs of mental illness vs. no diagnosis/signs) ($p = .007$), so the Welch ANOVA was used and the Games–Howell post hoc was performed to identify differences between the three groups (Field, 2009). The missing information variable was not normally distributed, as assessed by Shapiro–Wilk's test ($p < .001$) so we ran nonparametric analyses (Kruskal–Wallis H tests) to confirm our findings. Effect sizes were determined using omega squared (Field, 2009).

Results

As shown in Table 1, the vast majority of public mass shooters in this dataset were male (98.2%), with an average age of 33.7 ($SD = 12.1$; median = 33) at the time of the shooting, and 55.3% were coded as White.[10] Mental illness diagnoses were reported in 46.2% of cases, signs of mental illness (without a known diagnosis) were reported in 19.3% of cases, and no signs of mental illness were known to be reported in 34.5% of cases. Public mass shooters died in 58.5% of cases, with the most common cause of death being suicide. More than 95% of shooters attacked alone.

Overall, the quantitative analysis showed very few statistically significant differences between the comparison groups. Public mass shooters with a diagnosis or signs of mental illness did not significantly differ from public mass shooters without a diagnosis or signs of mental illness according to age, sex, or correlates of mental illness such as frequency of being raised by a single parent, being bullied, experiencing childhood trauma, having a parent commit suicide, or having a criminal record/arrest record. The analysis of attack outcomes similarly showed that perpetrators with a diagnosis or signs of mental illness were not significantly more likely to die, to commit suicide, or to be killed following their attacks than perpetrators without these diagnoses or signs. In fact, the likelihood of death was almost identical for the two groups. In Table 2, we report all relevant frequencies, proportions, means, p values, odds ratios, effect sizes, and confidence intervals and they show that none of these differences were close to significant at the $p < .05$ level.

[9] We used Fisher's exact tests because they are appropriate for both small and large sample sizes. However, to make sure our results were not a product of that decision, we also ran Pearson's chi-square tests for all variables in which cell sizes were not too small, and there was no change in levels of significance (i.e., $p < .05$, $p < .01$, $p < .001$).

[10] For race, the United States Census Bureau (2018) defines "White" as "A person having origins in any of the original peoples of Europe, the Middle East, or North Africa," but in this dataset, White and Middle Eastern were not combined. This may explain why a lower proportion of perpetrators in this dataset were coded as White than in other research.

Table 1
Descriptive Statistics for Public Mass Shooters in the United States, 1966–2019

Variable	*N*	Mean/%	*SD*	Minimum	Maximum
Demographics					
Age	171	33.7	12.1	11	70
Sex = male	168	98.2%			
Race = white	89	55.3%[a]			
Mental illness					
Diagnosed	79	46.2%			
Signs of mental illness	33	19.3%			
No diagnosis/signs	59	34.5%			
Preattack background					
Raised by single parent	26	22.8%			
Bullied (victim)	28	17.8%			
Childhood trauma	53	52.0%			
Parental suicide	5	4.3%			
Criminal/police contact	109	64.9%			
Attack outcome					
Died	100	58.5%			
Suicide	67	39.2%			
Killed following the attack	33	19.3%			
Lived (arrested)	71	41.5%			
Attacked alone	163	95.3%			
Missing information	171	5.2	6.2	0	32

Source: The Violence Project (Peterson & Densley, 2019b).
Notes: For binary variables, frequencies and proportions are based on the number of cases coded "yes" among all cases for which data were available. For continuous variables, frequencies and means are based on the number of cases for which data were available. Missing information values were recalculated by this study's authors to confirm their accuracy.
[a] For race, the United States Census Bureau (2018) defines "White" as "A person having origins in any of the original peoples of Europe, the Middle East, or North Africa," but in this dataset, White and Middle Eastern were not combined. This may explain why a lower proportion of perpetrators in this dataset were coded as White than in other research.

Only two statistically significant differences were found. First, among cases for which race/ethnicity was known, 61.7% of public mass shooters with a diagnosis or signs of mental illness were coded as White, compared to 42.6% of shooters without these diagnoses or signs (Fisher's exact test, $p = .029$). Second, perpetrators with a diagnosis or signs of mental illness averaged 3.9 missing information values, compared to 7.7 missing information values for perpetrators without these diagnoses or signs, Welch's $F(1, 85.99) = 12.61$, $p = .001$. A Kruskal–Wallis H test (Kruskal & Wallis, 1952) confirmed these findings, $H(1) = 15.25$, $p < .001$.

Further investigations showed a strong inverse relationship between the level of evidence of mental illness and the amount of missing information. The highest levels of evidence of mental illness were found for perpetrators with the least missing information, which makes sense. Public mass shooters with a formal diagnosis of mental illness averaged 3.5 missing information values, while perpetrators with signs of mental illness (but no formal diagnosis) averaged 4.8 missing information values, and perpetrators with no diagnosis/signs averaged 7.7 missing information values. Welch's F test showed that the amount of missing information was significantly different across these groups, $F(2, 74.95) = 7.46$, $p = .001$. A Games–Howell post hoc analysis revealed that the diagnosed group differed significantly from the no diagnosis/signs group ($p = .001$). A Kruskal–Wallis H test (Kruskal & Wallis, 1952) confirmed these findings, $H(2) = 16.28$, $p < .001$.

Our close examination of what should presumably be the most "mentally healthy" perpetrators also generated interesting results (see Table 3). As a reminder, less than 10% of all public mass shooters in the entire dataset (17/171) had been coded as (a) not having a diagnosis or signs of mental illness, (b) not exhibiting suicide ideation before their attack, (c) not having committed suicide, and (d) not having been killed following their attacks (which often constitutes "suicide by cop"). However, on review, several major

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Table 2
Comparison Between Public Mass Shooters With and Without Diagnosis or Signs of Mental Illness (N = 171)

Variable	Public mass shooters with diagnosis or signs of mental illness		Public mass shooters without diagnosis or signs of mental illness		p value	Odds ratio/ω^2	95% CI
	Freq.	%/mean	Freq.	%/mean			
Demographics							
Age	112	33.2	59	34.7	.449	0.00	—
Sex (% male)	111	99.1%	57	96.6%	.274	3.90	[.35, 43.87]
Race (% white)	66	61.7%	23	42.6%	.029*	2.17	[1.12, 4.22]
Preattack background							
Raised by single parent	19	22.6%	7	23.3%	1.000	0.96	[.36, 2.58]
Bullied (victim)	20	18.7%	8	16.0%	.824	1.21	[.49, 2.97]
Childhood trauma	42	52.5%	11	50.0%	1.000	1.11	[.43, 2.84]
Parental suicide	3	3.4%	2	6.7%	.601	0.50	[.08, 3.15]
Criminal/police contact	77	69.4%	32	56.1%	.124	1.77	[.91, 3.43]
Attack outcome							
Died	65	58.0%	35	59.3%	1.000	0.95	[.50, 1.80]
Suicide[a]	46	41.1%	21	35.6%	.514	1.26	[.66, 2.42]
Killed following the attack	19	17.0%	14	23.7%	.312	0.66	[.30, 1.43]
Lived (arrested)	47	42.0%	24	40.7%	1.000	1.05	[.56, 2.00]
Missing information	112	3.9	59	7.7	.001***	0.08	—

Note. $N = 171$ public mass shooters.
For binary variables, frequencies and proportions are based on the number of cases coded "yes" among all cases for which data were available. For continuous variables, frequencies and means are based on the number of cases for which data were available. The "missing information" variable reflects the total number of other variables in the dataset that were coded as unknown or missing for each perpetrator.
[a] In both groups there was one perpetrator who committed suicide after being arrested but before his trial.
* $p < .05$. ** $p < .01$. *** $p < .001$. p values are from Fisher's exact tests for binary variables and from ANOVA tests for continuous variables ("age" and "missing information"). Omega squared was used to measure effect sizes for continuous variables. Confidence intervals are for the odds ratios.

findings emerged. First, there was even more missing information ($M = 12.71$) for these perpetrators than for other shooters in the dataset. Second, for at least seven of these perpetrators, there is evidence which provides reason to question their mental health, even if that information is not equivalent to diagnostic criteria for all cases. If more details were known about these shooters, they might be recoded as having signs/symptoms of mental illness or suicidality. Third, many of these shooters were clear outliers compared to typical public mass shooters. For instance, this subset included both the youngest and oldest shooters in the entire dataset, a female shooter (unlike 98% of the dataset), a former gang member (unlike 98% of the dataset), several shooters who did not attack alone (unlike 95% of the dataset), and a shooter for whom there was more missing information than for 98% of the dataset. It also included shooters whose attack circumstances were very different from most public mass shootings, because they claimed self-defense, killed victims who were armed, primarily killed victims in private homes (instead of in public), committed a shooting that may have been related to other criminal activity, etc. Overall, these perpetrators do not appear representative of the typical public mass shooter.

Fourth, after further investigation, it appears that many of these cases might not technically qualify as public mass shootings at all.[11] After

[11] This was an unexpected finding that did not arise until after our close investigation of these cases. For transparency, it seems better to report this finding as it occurred, rather than go back and remove these cases from the dataset before conducting our analyses, which could make it appear as if we were preemptively altering The Violence Project's dataset to influence the study's results. In the future, however, if researchers are testing hypotheses where a small margin of error in case inclusion (e.g., 6% of all cases) could yield misleading results, they might consider closely examining all cases prior to conducting their analyses to confirm they meet inclusion criteria.

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consulting the Federal Bureau of Investigation (FBI)'s (2019) list of qualifying incidents from 2000 to 2018 and the list of qualifying incidents from Berkowitz et al. (2019) for the earlier period (1966–1999), we found that 8 of these 17 shooters were not counted by those sources, and a few others may not belong either.[12] As noted earlier, most definitions of public mass shootings, including the Congressional Research Service's (Krouse & Richardson, 2015, p. 10) and Peterson and Densley's (2019a, p. 5), specifically exclude shootings that stemmed from "underlying criminal activity or commonplace circumstance (armed robbery, criminal competition, insurance fraud, argument, or romantic triangle)." This can be difficult to determine, but our review suggests that the following perpetrators may therefore have questionable relevance to the overall public mass shooting problem: W. Bevins (he had committed statutory rape for years and was illegally paying one of his eventual victims to have sex with his wife) (Justia, 1986); N. Serrano (he claimed his former business partners had been stealing funds) (Supreme Court of Florida, 2017); C. Rhoades (her conflict involved misappropriation of funds and potential embezzlement charges) (McDonald, 2014); N. Galstyan (his conflict involved one victim allegedly pressuring his brother to deal drugs and threatening him) (City News Service, 2016); C. Shelton and R. Thomas (one of their victims is suspected of having murdered Shelton's best friend) (WTAE, 2016); and B. Barber (one of his victims was related to a victim from another shooting Barber had recently committed) (Anderson, 2017). Because many of these individuals may have actually committed different types of mass murder, their mental state may not be indicative of those of public mass shooters.

We also closely examined the most lethal public mass shooters since 2012, and found that evidence of mental health problems or suicidality (or both) was present for every single perpetrator in this group (see Table 4). In addition to Peterson and Densley's (2019b) findings, we found reason to question the mental health or suicidality of the 2015 San Bernardino male shooter (who grew up in a home full of violence, substance abuse, and mental illness, and whose father is severely mentally ill and suicidal) (Farook v. Farook, 2008); the 2017 Sutherland Springs shooter (who expressed suicide ideation and suicide intent on multiple occasions) (U.S. Department of Defense, 2018); the 2018 Santa Fe shooter (who was declared mentally incompetent to stand trial and committed to an inpatient psychiatric facility for long-term treatment) (Martin, 2019); the 2018 Pittsburgh synagogue shooter (who previously threatened suicide and agreed to voluntarily commit himself to an inpatient psychiatric facility but never followed through) (KDKA-TV, 2018); the 2019 Virginia Beach shooter (who was described by his ex-wife and coworkers as "schizophrenic," "crazy," "paranoid," and "obsessive–compulsive," and whose personal writings and behavior suggest extreme paranoia) (Hillard-Hientze, 2019); and the 2019 El Paso shooter (who was receiving psychiatric treatment before his attack) (Montes & Smith, 2019).

Limitations

This study has several important limitations. First, although the highest standard of evidence for a mental disorder is a formal diagnosis, many perpetrators have never been formally evaluated by a psychiatrist or mental health practitioner (Vossekuil et al., 2004), and others deliberately avoid doctors, conceal their mental health problems, or lie about their symptoms due to shame, stigma, or fear of other consequences (Lankford, 2013, 2016). As a result, this study had the challenge of attempting to accurately estimate the prevalence of mental illness among people who may not have wanted to be accurately counted. In addition, the ideal measure would be of perpetrators' mental health status immediately before their attacks, but sometimes the most reliable information comes from months or years earlier. To a large degree, this mirrors the challenge of threat assessment: law enforcement officials, behavioral intervention teams, and others concerned parties are often dealing with partial records and incomplete information, and they may be overtly lied to by the individuals they are attempting to help. More complete information about some of the individuals for whom less

[12] Public mass shootings and active shootings refer to an overlapping crime type, with the primary distinction being that "public mass shootings" are traditionally defined as incidents in which four or more victims are killed, while "active shootings" have no minimum threshold (Fox & Levin, 2015). As a result, all public mass shootings are also active shootings (and should theoretically appear on the Federal Bureau of Investigation (FBI)'s (2019) list if they occurred in the United States from 2000 to 2018).

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Table 3

Close Examination of the Most "Mentally Healthy" Perpetrators Who Were Not Coded as Mentally Ill or Suicidal and Did Not Commit Suicide or "Suicide by Cop" (N = 17)

Perpetrator (year)	Reason to question mental health	Counted by FBI	Outlier characteristic/circumstance
B. Chvarak (1980)	Signs of substance abuse disorder (Barer & Hinkle, 2019).	n/a (pre-2000)	
W. Bevins (1981)	Claimed to be emotionally disturbed during trial sentencing (Justia, 1986).	n/a (pre-2000)	Age 71 when he attacked (oldest in entire dataset) (Peterson & Densley, 2019b); shooting may have been related to other criminal activity/commonplace circumstances; some victims were killed only because he wanted to eliminate witnesses (Justia, 1986).
K. French (1993)	Signs of suicidality and substance abuse disorder; family history of suicide (Associated Press, 1993; Death Penalty Information Center, 2012).	n/a (pre-2000)	
W. Woods (1995)	Was receiving counseling days before attack (Peterson & Densley, 2019b).	n/a (pre-2000)	
A. Golden (1998)	Signs of suicidality, depression/desperation, and psychopathy (Newman et al., 2004; Langman, 2009).	n/a (pre-2000)	Age 11 when he attacked (youngest in entire dataset); did not attack alone (unlike 95% of shooters in the dataset) (Peterson & Densley, 2019b).
C. Rhoades (2014)	Was diagnosed as having a paranoid personality disorder (Layden, 2020).	Yes	Female perpetrator (unlike 98% of shooters in the dataset) (Peterson & Densley, 2019b); shooting seems more like a family killing (three of four victims killed were relatives) and may have been related to other criminal activity/commonplace circumstances (McDonald, 2014).
R. Bowers (2018)	Signs of suicidality and extreme paranoia; family history of suicide (Commonwealth of Pennsylvania v. Randall George Bowers, 1979; KDKA-TV, 2018; Lord, 2018).	Yes	
E. Pearson (1968)		n/a (pre-2000)	Shooting seems mostly private/domestic: five victims were killed in homes, followed by one killed at a service station and one at a tavern (Bryan Times, 1968).
E. Moreno (1983)		n/a (pre-2000) [a]	Shooting seems more like a spree killing (Associated Press, 1987).
N. Serrano (1997)		n/a (pre-2000)[a]	Shooting may have been related to other criminal activity/commonplace circumstances and seems more like an execution-style hit. There were no eyewitnesses, and the shooter disputed his involvement (Supreme Court of Florida, 2017).
C. Vang (2004)		Yes	Shooter claimed he feared for his life and acted in self defense; the victims were all hunters and armed with firearms (Robinson, 2006).
M. Gonzalez (2009)		No	More missing information on this shooter than in 98% of cases in the dataset (Peterson & Densley, 2019b).
R. McCray (2010)		No	Former gang member (unlike 98% of shooters in the dataset) (Peterson & Densley, 2019b).

(*table continues*)

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Table 3 (*continued*)

Perpetrator (year)	Reason to question mental health	Counted by FBI	Outlier characteristic/circumstance
N. Galstyan (2010)		No	Shooting may have been related to other criminal activity/commonplace circumstances; shooter claimed self defense (City News Service, 2016).
C. Shelton (2016)		No	Did not attack alone (unlike 95% of shooters in the dataset); shooting occurred at a backyard party (not a public location), and may have been related to other criminal activity/commonplace circumstances (WTAE, 2016).
R. Thomas (2016)		No	Did not attack alone (unlike 95% of shooters in the dataset); shooting occurred at a backyard party (not a public location), and may have been related to other criminal activity/commonplace circumstances (WTAE, 2016).
B. Barber (2017)		No	He was out on $100,000 bond for another shooting when attack occurred, and it may have been related to other criminal activity/commonplace circumstances (Anderson, 2017).

Summary.
7 perpetrators = reason to question their mental health.
2 perpetrators = not counted in the list from Berkowitz et al. (2019) of qualifying incidents from 1966 to 1999.
6 perpetrators = not counted in the list from the Federal Bureau of Investigation (FBI) (2019) of qualifying incidents from 2000 to 2018.
13 perpetrators = outliers based on their personal characteristics or attack circumstances.
The following shootings may have been related to other criminal activity or commonplace circumstances: W. Bevins (he had committed statutory rape for years and was illegally paying one of his eventual victims to have sex with his wife) (Justia, 1986); N. Serrano (he claimed his former business partners had been stealing funds) (Supreme Court of Florida, 2017); C. Rhoades (her conflict involved misappropriation of funds and potential embezzlement charges) (McDonald, 2014); N. Galstyan (his conflict involved one victim allegedly pressuring his brother to deal drugs and threatening him) (City News Service, 2016); C. Shelton and R. Thomas (one of their victims is suspected of having murdered Shelton's best friend) (WTAE, 2016); and B. Barber (one of his victims was related to a victim from another shooting Barber had recently committed) (Anderson, 2017).
[a] Not counted by Berkowitz et al. (2019) as of January 1, 2020.

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Table 4
Close Examination of Mental Illness and Suicidality Among the Most Lethal Perpetrators Since 2012 (N = *17*)

Perpetrator	Coded as having diagnosis or signs of mental illness	Coded as having preattack signs of suicidality	Committed suicide	Was killed following attack	If coded "no" for mental illness or suicidality, additional reasons to question perpetrator's mental health
2012 Aurora shooter	Yes	Yes	No	No	n/a
2012 Sandy Hook shooter	Yes	Yes	Yes	No	n/a
2013 Washington, DC Navy Yard shooter	Yes	Yes	No	Yes	n/a
2015 Charleston church shooter	Yes	Yes	No	No	n/a
2015 UCC shooter	Yes	Yes	Yes	No	n/a
2015 San Bernardino shooter (female)	No	Yes	No	Yes	Much remains unknown about her background because, unlike most perpetrators in the dataset, she grew up in Pakistan and Saudi Arabia and did not arrive in the United States until the year before her attack.
2015 San Bernardino shooter (male)	No	Yes	No	Yes	he grew up in a home full of violence, substance abuse, and mental illness; his mother filed for restraining orders several times due to his father's physical and verbal abuse as well as threatening "to kill himself on a daily basis"; his father was diagnosed with an unspecified psychiatric illness and was prescribed medication (Farook v. Farook, 2008)
2016 Orlando Pulse shooter	Yes	Yes	No	Yes	n/a
2017 Las Vegas shooter	Yes	Yes	Yes	No	n/a
2017 Sutherland Springs shooter	Yes	No	Yes	No	He discussed suicidal ideation in a video recording (Conger & Avila, 2018) and informed special agents from the Air Force Office of Special Investigations that he was planning to commit suicide; he was diagnosed with major depressive disorder, panic disorder with agoraphobia, attention-deficit disorder, and more (U.S. Department of Defense, 2018).
2018 Parkland shooter	Yes	Yes	No	No	n/a
2018 Santa Fe shooter	No	Yes	No	No	He was declared mentally incompetent to stand trial and was transferred to an inpatient psychiatric facility (Martin, 2019); his personal journal indicated that he planned to commit suicide after the attack (Emily, 2018).
2018 Thousand Oaks shooter	Yes	Yes	Yes	No	n/a

(*table continues*)

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Table 4 (*continued*)

Perpetrator	Coded as having diagnosis or signs of mental illness	Coded as having preattack signs of suicidality	Committed suicide	Was killed following attack	If coded "no" for mental illness or suicidality, additional reasons to question perpetrator's mental health
2018 Pittsburgh synagogue shooter	No	No	No	No	Police responded to his home after he threatened to commit suicide years earlier; he agreed to voluntarily commit himself into an inpatient psychiatric facility but never followed through (KDKA-TV, 2018); neighbors report that he had paranoid theories and violent thoughts (Lord, 2018); his father committed suicide when facing multiple criminal charges including rape, indecent assault, involuntary deviate sexual intercourse, simple assault, and resisting arrest (Commonwealth of Pennsylvania v. Randall George Bowers, 1979).
2019 Virginia Beach shooter	No	Yes	No	Yes	His ex-wife described him as "schizophrenic" and "crazy" (Eberly et al., 2019); co-workers described him as "paranoid" and "obsessive-compulsive"; draft emails found on his work computer reflected irrational and suspicious beliefs; he installed three closed-circuit television cameras at his residence facing outwards and disclosed to his mother that he was only getting three to four hours of sleep per night and had been prescribed sleep medication (Hillard-Hientze, 2019).
2019 El Paso shooter	No	Yes	No	No	He was receiving psychiatric treatment from a psychologist before the attack (Montes & Smith, 2019); a classmate described him as "depressed," "antisocial," and "withdrawn" (Chason et al., 2019); his father had a history of severe polysubstance abuse, which resulted in significant family turmoil and divorce (Eustachewish, 2019).
2019 Dayton shooter	Yes	Yes	No	Yes	n/a

Note. Peterson and Densley's (2019b) dataset was used to determine which perpetrators have been coded as having a diagnosis or signs of mental illness and/or preattack signs of suicidality (including intentions of dying). Their overall estimates for the prevalence of mental illness among perpetrators are similar to those from other researchers (e.g., Duwe, 2020; National Threat Assessment Center, 2018, 2019; Silver, Simons, et al., 2018; Vossekuil et al., 2004), but their dataset is open-access, which is a key advantage that facilitated this study's analyses. For cases where there are additional reasons to question the perpetrator's mental health, those reasons are not necessarily equivalent to formal diagnostic criteria.

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is known would certainly be valuable. Another limitation is that public mass shootings are fortunately quite rare, but this study's results might be different if more incidents were analyzed and its tests had more statistical power. To account for this limitation, readers should not only pay attention to the *p* values from quantitative comparisons, but also to the means and proportions. Finally, it should be emphasized that disagreement sometimes arises about which perpetrators should be considered public mass shooters. Like many datasets, The Violence Project's list may be imperfect, but vetting every perpetrator—especially those for whom details are difficult to find—would be a highly labor intensive process, so we did not make any exclusions before conducting our analyses. Naturally, if some perpetrators were added or removed, this study's results might be different.

Discussion

It is possible that some behaviors are so extreme—and run so counter to our hardwired programming—that they are usually influenced by mental health problems. One example may be suicide. Of course, the vast majority of mentally ill people do not commit suicide, and mental health problems are not the sole cause of suicidal behavior. And there may be a few rare types of suicide (e.g., suicide due to terminal disease, expectations of imminent death, or severe coercion or punishment), where mental illness plays a minimal role. Overall, however, as Dawkins (1976) summarizes, due to millions of years of natural selection, we became "survival machines" with deep-seated drives for self-preservation, because survival almost always serves the best interest of our genes (Lankford, 2015). If suicide is therefore not an evolved tendency, it may typically be a consequence of mental health problems (much like the body evolved for fitness and function, but nevertheless experiences physical health problems).

The Role of Mental Illness in Public Mass Shootings

The same may be true of public mass shootings, which often involve a suicidal or self-destructive motive. Common symptoms of mental illness, such as hopelessness, paranoia, obsession, narcissism, and anxiety, appear quite common in these attackers' own statements (Langman, 2009; Lankford, 2018; Meloy & Knoll, 2014; Newman et al., 2004; Wills & Lankford, 2019). However, these acts seem even more extreme and more diametrically opposed to our evolved tendencies than suicide, as evidenced by their comparative infrequency, occurring approximately 10,000 times less often on an annual basis in the United States (National Institute of Mental Health, 2017; Peterson & Densley, 2019b).

Public mass shooters often have both suicidal intent and an extremely rare form of homicidal intent, in which they plan to kill some random victims or strangers with whom they have no interpersonal conflict or grudge (Lankford, 2018; Silver, Simons, et al., 2018; Peterson & Densley, 2019b).[13] Although Skeem and Mulvey (2020) hypothesize that public mass shootings might be committed by a mentally healthy but "disgruntled employee who is fired and becomes so enraged he seeks revenge" (p. 87), even angry, fired employees who wish they could kill their bosses almost never do so—because of the consequences. Even in the extremely rare scenarios where conflict at work escalates to homicide, it is far more likely to be classified as standard interpersonal violence due to "commonplace circumstance" (Krouse & Richardson, 2015, p. 10) than to qualify as a public mass shooting (Bureau of Labor Statistics, 2017). On the other hand, if the former employee becomes obsessed and fixated over his firing for a period of weeks, months, or years, fantasizes about mass slaughter, plans an attack in which his own death or life imprisonment is assured, and then kills his boss and starts shooting random people with whom he has no interpersonal conflict—perhaps that behavior is almost always associated with mental illness.

It can simultaneously be true that the vast majority of males, people with access to firearms, and people with mental illnesses would never commit a public mass shooting—and that public mass shootings are almost always committed by mentally ill males with access to firearms.

Imperfect information or measurement challenges should not confuse this. Even if 100% of public mass shooters experience mental health problems, we would not expect any large study to

[13] Peterson and Densley (2019b) found that 70% of public mass shooters harmed unknown victims or a combination of unknown and known victims.

find that information for 100% of perpetrators, due to the aforementioned frequency of shame, stigma, doctor avoidance, underdiagnosis, and missing data (Lankford, 2016).

However, this study's results confirm what we would expect if almost all public mass shooters have mental health problems. First, there do not appear to be two psychological types of public mass shooters (some mentally ill, some mentally healthy), but rather one type. Correlates of mental illness were approximately equally common among perpetrators whether information on their mental health problems had been found or not. Second, White perpetrators were more likely to be coded as mentally ill than non-White shooters, which fits with data showing that White people visit doctors more often than members of minority races, making detection of their mental health problems more likely (O'Hara & Caswell, 2013), and White shooters receive more media attention than Black or Latinx shooters, making it more likely that their mental illness would be reported (Silva & Capellan, 2019). Third, the factor we found that best explained whether public mass shooters were coded as mentally ill or not was information availability, not a psychological trait or life experience. Fourth, less than 10% of all public mass shooters in the entire dataset (17/171) had been coded as (a) not having a diagnosis or signs of mental illness, (b) not exhibiting suicide ideation before their attack, (c) not having committed suicide, and (d) not having been killed following their attack (which often constitutes "suicide by cop"). A close examination of these individuals showed that almost all of them could be recoded as having signs of mental illness or suicidality, or were clear outliers, or may not qualify as public mass shooters at all. Finally, a close examination of the most lethal perpetrators since 2012—for whom far more information was available—revealed that without exception, there was evidence of mental illness or suicidal intent (or both) in all cases.

Recommendations for Threat Assessment

Alone, the presence of mental illness is never sufficient grounds to assume someone poses a serious threat. As noted earlier, the vast majority of people with mental health problems are not violent and will never shoot anyone (Glied & Frank, 2014; National Council of Behavioral Health, 2019; Skeem & Mulvey, 2020). And individuals with mental illness are actually more likely to be victims of violent crime than offenders (Monahan et al., 2001). Community members are often told, "If you see something, say something," but that does not mean they should call the FBI simply because they know someone is taking psychiatric medications or experiencing mental health issues.

However, when people make concerning statements about harming themselves or others—or engage in other concerning behaviors—that should be reported to the authorities, at which point mental health should be considered alongside other risk factors and warning signs. It is possible that people who do not have a mental disorder or are not suicidal or self-destructive will not commit public mass shootings, no matter what inappropriate things they may have said. But people who have exhibited key warning behaviors (Hoffmann, 2017; Lankford, 2018; Meloy & O'Toole, 2011; Meloy et al., 2012; O'Toole, 2000) and are also experiencing mental health problems pose a much more credible threat.

Law enforcement officers, behavioral intervention teams, and other threat assessment professionals should pay particular attention to whether the individual's mental health problems seem to align with their concerning behavior. Different mental disorders have different effects, so it may be possible to determine whether someone's hopelessness, paranoia, obsession, narcissism, or anxiety is largely the product of that individual's mental illness, and thus more susceptible to extreme exacerbation (Douglas et al., 2009; Norko & Baranoski, 2005; Scott & Resnick, 2006). And beyond considering individual factors, threat assessors should also examine social and situational factors that could trigger someone to act dangerously, such as changing family dynamics, unstable relationships, insecure work conditions, conflict-prone school environments, or poor social support networks (Lankford, 2018; Levin & Madfis, 2009; Silver, Simons, et al., 2018). Everyone experiences adversity in life, but not everyone is equally suited to cope with it.

At the same time, it is important not to treat people with mental health problems like criminals due to their illness. Some have argued that mass shootings could be stopped by involuntarily committing people with mental health problems to psychiatric institutions, but there is no

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scientific evidence which supports that claim (Perera & Sisti, 2019), and institutionalizing tens of millions of Americans on an annual basis would be absurd. Preventing firearm purchases for all people with mental illness also seems unrealistic and unhelpful (Kivisto, 2017). Again, this would affect a huge portion of the population, almost all of whom are not violent. If mental illness is caricatured and stereotyped as some sort of raving or dangerous "madness," that will only increase the power of social stigmas, and incentivize more people who need treatment to avoid doctors and conceal the signs (Joiner et al., 2017; Lankford, 2016; National Council for Behavioral Health, 2019).

Ultimately, we want to foster a culture in which more people with mental health problems feel comfortable speaking up and asking for help. Threat assessment is most effective when it is not adversarial: when everyone—friends, family, teachers, coworkers, mental health clinicians, law enforcement officers, and the at-risk individuals themselves—shares the same goal of preventing suffering and harm (Madfis, 2014a).

This is particularly important because, although in many cases, there are observable warning signs prior to public mass shootings that could be used to prevent them (Lankford et al., 2019; National Threat Assessment Center, 2018, 2019; Silver, Simons, et al., 2018; Vossekuil et al., 2004), in others, a perpetrator's intent may be a mystery to those around him, until it is too late. The 2017 Las Vegas shooter provides an interesting example. After his attack, initial reports suggested that everyone around him thought he was mentally healthy and not suicidal. And his behavior clearly involved careful planning and calculation, which contrary to flawed caricatures and stereotypes, mentally ill people are often capable of. It was only after formal investigations into the shooter's life that a more complete picture of his mental illness emerged: his primary care physician believed he may have had bipolar disorder (Las Vegas Metropolitan Police Department, 2018), which is characterized by symptoms such as depression, mania, and psychosis and can increase risk of suicide by as much as 15 times that of the general population (APA, 2013). However, the Las Vegas shooter refused to discuss this possibility with his physician and declined treatment. His physician offered him an antidepressant in an attempt to help manage his depressive symptoms, but this individual was only willing to accept a prescription for anti-anxiety medication (valium, also known as diazepam) (Las Vegas Metropolitan Police Department, 2018).

On reflection, it seems obvious that mental health problems played a major role in the Las Vegas shooter's decision to commit the worst mass shooting in U.S. history and then commit suicide. However, it might only be in a social context with less shame and stigma surrounding mental illness that more people like the Las Vegas shooter ask for, and receive, the psychological help they need. The National Council for Behavioral Health (2019) has emphasized that even when it is clear that perpetrators are mentally ill, they "usually are receiving no or inadequate treatment" (p. 16). If the United States is going to reduce the prevalence of these tragic attacks, this desperately needs to change.

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