



## Youth firearm suicide: Precipitating/risk factors and gun access



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### ABSTRACT

Using 2005–2014 National Violent Death Reporting System data, we examined firearm suicides among youth (age < 21 years; N = 3116). Rates of firearm versus other suicide means were consistent during the study period. Young firearm suicide decedents were less likely than those who used other means to have been identified as having mental health problems, and in the case of males, to have had a history of suicide attempt or suicide intent disclosure. The odds of firearm use versus other means were higher in the Midwest, South, and West than in the Northeast Census region. Firearm ownership information was missing for two-thirds of the cases. Among those cases with ownership information, nearly two-thirds used guns that belonged to parents or other family members. Coroner/medical examiner or law enforcement reports described how easily these victims accessed the gun used.

### 1. Introduction

Between 1999 and 2014, youth suicide rates increased from 0.5 to 1.5 (per 100,000 population) for females and from 1.9 to 2.6 for males aged 10–14 years and from 3.0 to 4.6 for females and from 16.8 to 18.2 for males aged 15–24 in the United States (Curtin, Warner, & Hedegaard, 2016). Suicide was the third leading cause of death among the 10–14 age group, and the second leading cause among the 15–24 (and 25–34) age group in 2015 (Centers for Disease Control and Prevention [CDC], 2015a). CDC data also show that in 2015, firearms were the most frequently used suicide method among youth aged 15–24 (and 25–34), followed by suffocation or poisoning, while among youth aged 10–14, suffocation (mostly hanging) was the most frequent suicide method, followed by firearms and poisoning (CDC, 2015a).

A study of 1218 suicide decedents under age 26 between 2000 and 2014 in Utah found that 31% had a mental disorder in their medical records and 17% were prescribed psychotropic medication prior to their death (Keesin, Gray, Zhang, Presson, & Coon, 2017). The rate of mental disorders among youth suicide decedents is likely to be higher than these figures indicate given that youth with greater depressive symptoms are less likely to disclose their symptoms to parents (Hamza & Willoughby, 2011) and, as a result, less likely to be seen by a health or mental health professional. An earlier review of psychological autopsy studies of youth and young adult suicide decedents showed that nearly 90% met criteria for at least one mental disorder, most frequently mood disorders, followed by substance use disorders and

disruptive behavior disorders (Fleischmann, Bertolote, Belfer, & Beautrais, 2005). This is similar to National Comorbidity Survey Replication findings that the vast majority of adolescents (aged 13–18) who had suicidal behaviors met the criteria for at least one *DSM-IV* mental disorder, and that among the 4.1% of adolescents who had attempted suicide, 13 of the 15 lifetime *DSM-IV* disorders were associated with elevated risk of suicide attempt (Nock et al., 2013). Other psychological autopsy studies have also found that youth suicide victims suffered from relationship problems, other stressful conflicts, substance misuse, peer victimization, and cyber bullying (Houston, Hawton, & Shepperd, 2001; Portzky, Audenaert, & van Heeringen, 2009; van Geel, Vedder, & Tanilon, 2014). One study also found that almost a quarter of suicide attempts among teenagers and young adults (ages 15–34) were impulsive (i.e., < 5 min passed between the decision to commit suicide and the actual suicide attempt), and that male gender, fighting, and hopelessness distinguished impulsive cases, while depression did not (Simon et al., 2001). Drexler (2017) cautions that youth with mental health problems and impulsive behavioral tendency should not be allowed to access lethal means, as use of lethal means reduces chances for rescue from a suicidal attempt that may be an impulsive response to a passing crisis.

The relationship between firearm availability/ownership and firearm suicides is well established. One study found that suicide rates, both overall and by firearms, were higher, in general, in places where household firearm ownership was more common, while suicide rates by methods other than firearms were not significantly correlated with rates of household firearm ownership (Miller, Warren, Hemenway, & Azrael,

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2015). A systematic review and meta-analysis also found that firearm access is associated with more than three times the risk of death by suicide (and twice the risk of homicide victimization) (Anglemeyer, Horvath, & Rutherford, 2014). Other studies have found that state-level gun control measures (e.g., permit and licensing requirements) that make firearm purchase more difficult are inversely related to suicide rates, especially among males (Crifasi, Meyers, Vernick, & Webster, 2015; Rodríguez Andrés & Hempstead, 2011).

Youth firearm access is mostly through guns available at home. A study based on a nationally representative sample of youth (13–18 years in 2001–2004) found that 29% reported living in a home with a firearm, and 41% of these youth reported easy access to the firearm and the ability to use it (Simonetti, Mackelprang, Rowhani-Rahbar, Zatzick, & Rivara, 2015). The study also found that compared to those without access, those with access tend to be older (15.6 vs. 15.1 years), male, and non-Hispanic white, and had a higher lifetime prevalence of alcohol and drug abuse; however, the two groups of youth did not differ on their history of mental illness or suicidality (Simonetti et al., 2015). A recent study by Simonetti, Theis, Rowhani-Rahbar, Ludman, and Grossman (2017) also found that household firearm storage practices did not differ based adolescents' mental illness status. These findings suggest that youth with suicide risk factors of mental illness/suicidality did not differ from their peers without these risk factors on firearm access.

A majority of gun-owning parents do not practice safe gun storage despite reporting they believe it is important (Howard, 2005). One study showed that family members (mostly parents) owned more than half of the firearms used by youth (< 18 years) suicide decedents ( $n = 63$ ) (Johnson, Barber, Azrael, Clark, & Hemenway, 2010). Parents often believe their guns are stored out of their children's reach and underestimate their children's experience handling guns at home (Baxley & Miller, 2006). Another study also found that parents suggest removing or securing firearms away from an adolescent who is known to be suicidal, though they and their adolescent children generally did not perceive adolescent suicide to be a problem in their community (Schwartz, Pyle, Dowd, & Sheehan, 2010).

Despite extensive research on risk factors for youth suicide and suicide means, we found few studies of youth suicide decedents' firearm use that were multi-state or national in scale. Given increasing youth suicide rates and firearm use in many of these suicides, we used 2005–2014 United States National Violent Death Reporting System (NVDRS) data to examine the following research questions in this study: (1) Has firearm use decreased/increased relative to other means among youth suicide victims over time?; (2) Do youth who died from firearm suicides differ from those who used other means on sociodemographic characteristics, precipitating factors (i.e., a factor believed to have caused/led to suicide), or other risk factors?; and (3) What types of guns did youth use, who owned the guns, and how did youth access the guns?

## 2. Methods

### 2.1. Data and sample

The NVDRS is an incident-based violent death reporting system that provides detailed data on all individual victims and/or suspects of suicide, homicide, death from legal intervention (i.e., victims killed by law enforcement acting in the line of duty), death of undetermined intent, and unintentional firearm death in participating states since 2003 (Blair, Fowler, Jack, & Crosby, 2016; CDC, 2016a). In 2003 and 2004, seven and 13 states, respectively, participated in the NVDRS. In 2005 through 2014, 16 states (Alaska, Colorado, Georgia, Kentucky, Maryland, Massachusetts, New Jersey, New Mexico, North Carolina, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Virginia, and Wisconsin) provided data; Ohio joined in 2011 and Michigan in 2014 (CDC, 2016a). Thus, we excluded data from 2003 and 2004 to minimize

potential state by time confounding effects and focused on suicide decedents under age 21 at the time of injury ( $n = 7489$ ) between 2005 and 2014. (We excluded 52 cases where a single or multiple homicide preceded the suicide and 8 cases for which accidental vs. intentional self-harm was not clear from law enforcement reports.) Although federal law prohibits handgun ownership by any person under age 18 (with some exceptions including employment, ranching, farming, target practice, and hunting), we included youth up to age 20 because some (mostly Northeastern) state laws stipulate 21 years as the minimum age for handgun purchase and possession (Law Center to Prevent Gun Violence, 2017). There is no federal minimum age for long gun (i.e., rifle and shotgun) ownership, but a few states (none of which participate in NVDRS) have also established a minimum age of 21 years.

NVDRS links data from death certificates and includes summaries of coroner/medical examiner and law enforcement (CME/LE) reports from the injury/death scene, ongoing investigations, or family/friend accounts, and, when available, abstracts from crime lab and toxicology reports. In addition, the NVDRS includes variables on the circumstances of death that were “calculated” (“Yes/Present” or “No/Not Present/Unknown”) from these multiple original data sources (CDC, 2016a). Some of these variables (e.g., relationship, school, and health problems) are coded “Yes” only when they were believed or appeared to have caused/led to death (i.e., were precipitating factors), while others (e.g., mental health problem, depressed mood, alcohol/substance problem, job/financial problems) are coded “Yes” whether or not there is any indication that they directly contributed to the death (i.e., were precipitating/risk factors) (CDC, 2016b).

### 2.2. Measures

Suicide means were identified from ICD-10 codes for underlying cause of death and CME reports and included firearms, hanging/suffocation, poisoning due to any type of alcohol/drug/medicine overdose or with gas (e.g., carbon monoxide, nitrogen), and others (e.g., laceration/sharp instruments, blunt injury from jumping from heights, contact with moving objects [train/other vehicles], drowning, fire). Given the small proportions of means other than firearms, hanging/suffocation, and poisoning, they were combined into an “other” category.

Incident year is defined as the year (2005–2014) in which the youth died by suicide.

Sociodemographic variables included age at time of the suicide, gender, race/ethnicity, active duty military service status, and census region of injury (Northeast, Midwest, South, and West).

Precipitating/risk factors (presence = 1; absence/unknown = 0) examined in this study were (1) mental health problem (i.e., disorders and syndromes listed in the *DSM-IV* or *DSM-5*); (2) recent (i.e., at the time of injury) depressed mood (perceived by self or others); (3) alcohol problem; (4) other substance abuse problem; (5) recent suicide attempt or disclosure of suicide intent (i.e., within past month); (6) relationship problem (e.g., girl/boyfriend problem, arguments with parents); (7) school-related problem (e.g., falling grades, bullying); (8) job/finance/housing problem; (9) criminal/other legal problem; (10) recent death of family/friends; (11) recent suicide of family/friend; and (12) physical health problem (e.g., terminal disease, debilitating condition, chronic pain). In addition to these precipitating/risk factors, we examined a summary measure of “any crisis” (within two weeks prior to death), whether or not the youth left a suicide note, and a previous and recent history of mental health or substance abuse treatment for descriptive purposes only.

### 2.3. Analysis

All statistical analyses were performed using Stata/MP 14. We used  $\chi^2$  tests to examine research question 1 (proportions of youth suicide victims who used firearms vs. other means over time). We examined

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