



Original article

## Firearm Storage Practices in Households of Adolescents With and Without Mental Illness

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### ABSTRACT

**Purpose:** Safe firearm storage practices are associated with a lower risk of self-inflicted injury and death. Whether such practices and relevant beliefs differ between households of adolescents with and without mental illness is unknown.

**Methods:** We used survey and administrative data to perform a two-stage cross-sectional study of parents/guardians of adolescents who were 11–17 years, enrolled in a managed care plan in 2004 and living in a household with a firearm. Multivariable Poisson models compared the prevalence of three firearm storage practices between households of adolescents with (depression or bipolar disorder) and without mental illness (no psychiatric or substance use disorder), including whether all firearms were locked, any firearms were loaded, and all firearms were locked and unloaded. We used chi-square tests to compare responses to Likert items assessing beliefs relevant to storage practices between households.

**Results:** Adolescents with mental illness were present in 141 (50.5%) of 279 study households. Their mean age was 14.5 years, and 54.8% were male. The mean age of parent/guardian respondents was 47.0 years, and 17.9% were male. Respondents from nearly 70% of households reported that all household firearms were stored locked and unloaded. In unadjusted and adjusted analyses, there were no significant differences in the prevalence of three firearm storage practices or in beliefs relevant to those practices between households of adolescents with and without mental illness.

**Conclusions:** These findings add to a growing body of evidence suggesting that firearm storage practices do not differ based on household mental health risk factors for self-harm.

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### IMPLICATIONS AND CONTRIBUTION

This study shows that one in three households with adolescents contain a firearm that is stored unlocked and/or loaded, and firearm storage practices and firearm injury prevention beliefs do not differ between households of adolescents with and without mental illness.

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Suicide is the second leading cause of death among adolescents aged 11–17 years in the United States [1]. The suicide rate among this age group increased from 1999 to 2014 by 13% among males (5.6–6.3 per 100,000 person-years) and doubled among females (1.4–2.8 per 100,000 person-years). Firearm-related injuries accounted for 48.3% of male and 20.4% of female suicide deaths in this age group in 2014 [1].

Studies have consistently shown that the presence of a household firearm is associated with an increased risk of suicide among adolescents [2–9]. Studies have also shown that the manner in which those firearms are stored matters, as adolescent suicide victims are more likely to have had access to an unlocked or loaded firearm than uninjured controls also living in households with firearms [3–8]. Firearm suicide victims are also more likely to have had access to an unlocked or loaded firearm than suicide victims who die by other mechanisms [10]. This latter finding is relevant given the importance of specifically preventing firearm-related suicide attempts given their high case fatality (85%) relative to other means (e.g., suffocation 69%, poisoning 2%) [11].

These findings, along with the broader literature on restricting access to lethal means by those at risk of self-harm [12], have formed the basis for recommendations by professional societies to limit firearm access by adolescents with suicide risk factors [13,14]. These recommendations include either removing firearms from the household or storing them in a manner that makes them inaccessible to those likely to harm themselves (e.g., keeping them locked, unloaded, and separate from locked ammunition).

Despite these recommendations and the well-established risk of self-harm associated with mental health disorders such as depression and bipolar disorder [15], little is known on how firearm storage practices differ between households of adolescents with and without mental health risk factors for self-harm. One study using data from a nationally representative sample of adolescents found that, among adolescents who reported living in a home with a firearm, those with recent or lifetime suicide risk factors (with or without a history of suicide attempt) were just as likely to report easy access to the firearm as those without suicide risk factors [16]. However, that study relied on adolescent self-report of household firearm ownership and assessed only those adolescents' perceptions of firearm accessibility rather than actual storage practices.

The aims of this study were to compare practices of, and beliefs about, firearm storage between households of adolescents with and without mental illness. We hypothesized that parents of adolescents with mental health disorders would be more likely to safely store firearms.

## Methods

### Study design

We performed a cross-sectional study using health plan administrative and survey data collected from guardians or parents living in households of adolescents who were 11–17 years of age on December 31, 2003, and were enrolled in a large managed care health plan in Washington and Idaho in 2004. The study was conducted in two stages with two surveys. The Group Health Research Institute Institutional Review Board approved this study.

### Identification of study sample

In the first stage of the study, we randomly sampled 2,150 households of adolescents aged 11–17 years with a history of mental illness (see below for definition of mental illness) and 2,150 households of adolescents without mental illness who were enrolled in the health plan continuously for the 2 years preceding the study. If households included more than 1 sampled adolescent, only one was randomly identified for study inclusion. All sampled households were mailed voluntary surveys that included 14 questions assessing various safety issues in the household and in relationship to the sampled child (e.g., bicycle helmet wearing), including a single question assessing whether a firearm was present in the home. The survey included an invitation and written consent request for a parent or guardian to participate in a follow-up telephone survey.

Households were eligible for inclusion in the second stage of the study if the parent or guardian: (1) responded to the mailed survey in the first stage; (2) consented to participate in the follow-up telephone survey; (3) was English-speaking; (4) reported living with the enrolled adolescent at least 14 days of each year; and (5) reported the presence of a firearm in or around the household.

### Definition of mental illness

Adolescents were classified as either having a “history of mental illness” or “no history.” We defined a history of mental illness by evidence of either a diagnosis of depression or bipolar disorder in the 2 years preceding the study index date using the following criteria: (1) a paid claim related to an outpatient or inpatient encounter with an administrative International Classification of Diseases, Version 9 (ICD-9) or billing code associated with a major depressive episode (ICD-9 codes 296.2–296.3, 300.4, 311) or bipolar disorder (ICD-9 codes 296.0, 296.4–296.9) or (2) a paid claim for a prescription for an antidepressant medication provided by any provider, a prescription for lithium by any provider, or a prescription for another bipolar disorder medication (carbamazepine, gabapentin, lamotrigine, valproate, and topiramate) provided by a psychiatrist because the latter medications may also be prescribed by other providers for seizure disorders [17].

We defined the absence of a history of mental illness as having no evidence of diagnosis or treatment by a contracted provider for any psychiatric or substance use disorder (ICD-9 codes 290.0–316.0) in the 2 years preceding the study.

### Survey design and assessment of firearm storage practices

The telephone survey was conducted as part of the second stage 4–6 weeks after the stage 1 mail survey and lasted approximately 20 minutes in duration. The specific parent or guardian who responded to the mail survey was contacted up to 10 times to complete the telephone interview and those who completed it were reimbursed \$5 for their participation. Interviews were conducted by trained survey research staff and were assisted by computer-assisted telephone interviewing software (WinCati). Question development was guided by the transtheoretical model of health behavior change (also known as the stages of change model) and the Decisional Balance Questionnaire [18]. Questions for both surveys were pilot tested for readability and comprehension before fielding.

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