Suicidal Behavior and Firearm Access: Results from the Second Injury Control and Risk Survey

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The association between home firearms and the likelihood and nature of suicidal thoughts and plans was examined using the Second Injury Control and Risk Survey, a 2001–2003 representative telephone survey of U.S. households. Of 9,483 respondents, 7.4% reported past-year suicidal thoughts, 21.3% with a plan. Similar proportions of those with and without a home firearm reported suicidal thoughts, plans, and attempts. Among respondents with suicidal plans, the odds of reporting a plan involving a firearm were over seven times greater among those with firearms at home, compared with those without firearms at home. The results suggest people with home firearms may not be more likely to be suicidal, but when suicidal they may be more likely to plan suicide by firearm.

Case-control studies have consistently found the presence of a firearm in the home to be a strong risk factor for suicide (Bailey et al., 1997; Brent et al., 1991; Brent et al., 1988; Brent, Perper, Moritz, Allman et al., 1993; Brent, Perper, Moritz, Baugher, & Allman, 1993; Brent, Perper, Moritz, Baugher, Schweers, & Roth, 1993, 1994; Bukstein et al., 1993; Conwell et al., 2002; Dahlberg, Ikeda, & Kresnow, 2004; Kellermann et al., 1992; Kung, Pearson, & Liu, 2003; Kung, Pearson, & Wei, 2005; Wiebe, 2003), not only for the gun owner but for all members of the household (Brent, 2001; Miller & Hemenway, 1999). An elevated risk of suicide due to a gun in the home could result from the high lethality of firearms compared with most other methods commonly used in suicide attempts, whether those attempts are impulsive or planned. In 2005, the National Research Council (NRC) reviewed the literature linking firearms and suicide and noted the theoretical possibility that the strong association between firearms and suicide observed in all U.S. case-control studies might be due in whole or in part to unmeasured differences in underlying suicide risk for which the presence of firearms at home serves as a proxy (NRC, 2005). Since then, two nationally representative surveys have been used to address this issue: the General Social Survey (GSS) and the National Comorbidity Survey Replication (NCS-R). In 2008, using the GSS, researchers found that no measure of mental health was related to gun ownership or living in a household with a firearm (Sorenson & Vittes, 2008). Two subsequent studies used the NCS-R, a well-vetted mental health assessment battery (Ilgen, Zivin, McCammon, & Valenstein, 2008; Miller, Barber, Azrael, Hemenway, & Molnar, 2009). Both studies found that...
people currently living in homes with firearms were no more or less likely to report lifetime (Ilgen et al., 2008) or recent (Miller et al., 2009) psychiatric disorders or suicidal ideation, compared with those living in homes without guns. A curious finding from both NCS-R studies was that people with a history of lifetime (Ilgen et al., 2008) or recent (Miller et al., 2009) suicide attempts were “less” likely to live in a home with firearms. The evidence to date, therefore, suggests that household firearm access does not serve as a marker for an unmeasured variable that increases suicide risk.

The current study extends prior work in two ways. First, we used a nationally representative survey distinct from both the GSS and the NCS-R to examine whether a history of suicidal ideation, plans, or attempts is more or less common among people who live in homes with firearms, compared to people who live in homes without firearms. Second, we examined whether the nature of suicidal plans differs among persons living in homes with and without firearms, with a focus on whether a firearm in the home is associated with an increased likelihood of a suicide plan involving a firearm. We pursued these questions using data from the Second Injury Control and Risk Survey (ICARIS-2).

**METHODS**

**Survey Design**

The ICARIS-2 was conducted by the Centers for Disease Control and Prevention from July 23, 2001, through February 7, 2003 (U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2007). The survey was a cross-sectional, list-assisted, random-digit-dial telephone survey of households in all 50 states and the District of Columbia, with coverage of approximately 96% of private residences with a telephone. English- and Spanish-speaking adults aged 18 years or older were eligible. The database includes weighting variables to account for selection probabilities, nonresponses, and poststratification to generate national estimates at the individual or household level. A total of 113,476 telephone numbers were sampled. Full details of the survey methodology, including calculation of response rate and weighting variables, are available in the supporting documentation (U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2007).

**Variables**

Basic demographic characteristics of respondents were gender, self-described races (White; African American; Asian or Pacific Islander; Native American), Hispanic ethnicity, and age. We collapsed race and ethnicity into one variable that classified respondents as White non-Hispanic or as all other. Additional demographic variables included county of residence, which we classified as metropolitan versus nonmetropolitan based on the Department of Agriculture rural–urban continuum codes (Economic Research Service, U.S. Department of Agriculture, 2004); current employment status (part- or full-time employment vs. full-time student, retired, homemaker, or unemployed); highest level of education achieved (high school diploma or above vs. less than high school); and current relationship status (married or unmarried couple vs. single). Participants were also asked about their annual household income, with a survey variable indicating whether that income was below the 2000 U.S. Census poverty level, given the size of family unit and number of related children.

The ICARIS-2 contains a number of injury-specific modules; for this study, we examined the responses to the 19 questions about firearms and the 14 questions about suicide. Regarding firearms, participants were asked if any firearms were kept in or around the home and, if so, whether any of those firearms belonged to the respondent. For suicide, the survey questioned whether over the past 12 months, “You had thoughts of taking your own life, even if you would not really do it?”
and whether the respondent made a specific suicide plan. Participants with a suicide plan were asked about the primary method planned, as well as whether they had ever attempted suicide (past 12 months and lifetime). All participants were asked what they would do if they felt life were not worth living; we categorized these responses into seeking another person’s help versus relying on prayer or self-coping methods.

A total of 201 (2.2%) responses were omitted from analysis because of missing data for key variables, including firearm presence in the home (n = 135), suicidal thoughts (n = 10), suicide plan (n = 22), lifetime suicide attempt (n = 5), or a combination of these (n = 29).

Data Analysis

Data analysis proceeded in two steps. First, we described the demographic characteristics and suicide thoughts, plans, and attempts of respondents with versus without firearms at home. We summarized the data using proportions and 95% confidence intervals (CI), with Pearson chi-square analyses to test for differences by firearm access. Second, among respondents with a suicide plan, we tested for demographic and situational predictors of having a plan involving a firearm (vs. other method). To measure the strength of these relationships, we calculated odds ratios (OR) with 95%CI, both in bivariate logistic regression and in a multivariate model adjusting for gender and age group.

RESULTS

The overall, weighted ICARIS-2 response rate was 48% using standard calculations from the American Association for Public Opinion Research (U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2007). Approximately one third of all respondents (35.0%, 95%CI 33.7–36.2; n = 2,915) reported having a firearm in their home (Table 1), of whom 63.3% (95%CI 61.1–65.6) reported being the firearm owner. In bivariate analysis, men (OR 1.51, 95%CI 1.35–1.69), non-Hispanic Whites (OR 2.86, 95%CI 2.48–3.30), those with a household income above the poverty level (OR 2.32, 95%CI 1.77–3.04), and those in a relationship (OR 2.06, 95%CI 1.83–2.32) were more likely to report having a firearm in the home, while those who said they would seek external help if feeling life was not worth living were less likely to report a home firearm (OR 0.81, 95%CI 0.69–0.94; Table 1). Compared to those aged 18–34 years, adults aged 35–54 (OR 1.37, 95%CI 1.19–1.58) and 55 years and older (OR 1.58, 95%CI 1.37–1.85) were more likely to have a firearm in the home (Table 1). Those with a firearm in the home were not more or less likely to report suicidal thoughts (OR 1.20, 95%CI 0.98–1.47). This result held in a multivariate model (with suicidal ideation as the dependent variable) controlling for nonmodifiable demographic factors associated with both suicidal ideation and firearms in the home (age group, gender, and race/ethnicity; Adjusted OR [AOR] 1.22, 95%CI 0.98–1.50). Those with a firearm were also no more likely than those without a firearm in the home to report a lifetime history of a suicide attempt (OR 0.93, 95%CI 0.72–1.20; Table 1). Suicide attempts within the past 12 months were reported by about 0.5% of both those with and those without firearms at home.

Of those with suicidal thoughts, 21.5% (95%CI 17.5–25.5) said they had made a specific suicide plan in the past 12 months. The most commonly reported plans were to overdose (34.4%; n = 63), use a firearm (13.4%; n = 20), or jump from a height (12.2%, n = 15; Table 1). Few plans involved hanging or asphyxiation (4.0%; n = 8). In bivariate logistic analysis, characteristics significantly associated with a suicidal plan involving a firearm were having a firearm in the home (OR 7.07, 95%CI 2.09–23.4), reporting a suicide attempt in the past 12 months (OR 0.10, 95%CI 0.01–0.79), and living in a metropolitan area (OR 0.23, 95%CI 0.06–0.91; Table 2). Multivariate analysis adjusting for gender and age group...
did not significantly change the odds ratios; those with a firearm in the home remained seven times as likely (AOR 7.39, 95% CI 2.04–26.84) to have a suicide plan involving a firearm (Table 2). A multivariate model adjusting simultaneously for firearm in the home and recent suicide attempt found similar odds ratios. A model adjusting simultaneously for firearm in the home and metropolitan residence resulted in metropolitan residence dropping out as a significant predictor.

**DISCUSSION**

Approximately one third of respondents in this national, community-based sample reported having a firearm in the home, consistent with prior estimates (Miller & Hemenway, 1999; Sorenson & Vittes, 2008). The observed demographic differences between those with and without firearms at home—with more men and Whites reporting firearms at home, for example—are also in line with previous findings, as is the...
lack of an association between firearm presence and suicidal ideation (Ilgen et al., 2008; Miller et al., 2009; Sorenson & Vittes, 2008). In the current study, however, unlike in prior work—which found that people with firearms at home were less likely to have attempted suicide (Ilgen et al., 2008; Miller et al., 2009)—there was no association between firearm presence and lifetime or recent suicide attempts.

To our knowledge this is the first study to examine the relationship between firearm presence and the “nature” of suicidal plans. Specifically, we found that—among those with a suicidal plan—those without a firearm in the home were significantly more likely to have a plan to overdose on medication, while those with a firearm were significantly more likely to have a plan to use a firearm.

The prevalence of suicidal thoughts in ICARIS-2 (7.4%) was more than twice that reported by the National Survey of Drug Use and Health (NSDUH, 3.7%; Office of Applied Studies, Substance Abuse and Mental Health Services Administration, 2009) and NCS-R (3.3%; Kessler, Berglund, Borges, Nock, & Wang, 2005); however, the latter surveys ask about “serious thoughts” of suicide, whereas ICARIS-2 set a lower threshold (“Thoughts of taking your own life, even if you would not really do it”). The 12-month prevalence of suicide attempts (0.5%) was the same as in NSDUH and slightly higher than in NCS-R (Kessler et al.,

### TABLE 2
**Characteristics of ICARIS-2 Participants with a Suicide Plan in Past 12 Months, by Type of Plan**

<table>
<thead>
<tr>
<th>Plan with firearm (n = 20)</th>
<th>Plan other than firearm (n = 155)</th>
<th>OR, adjusted for age and sex (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weighted %b (95%CI)</td>
<td>Weighted %b (95%CI)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>59.2 (28.7–89.7)</td>
<td>49.4 (38.6–60.2)</td>
</tr>
<tr>
<td>Mean age</td>
<td>38.0 (28.2–47.7)</td>
<td>39.0 (35.3–42.7)</td>
</tr>
<tr>
<td>Age group (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18–34</td>
<td>49.7 (19.8–79.5)</td>
<td>43.3 (32.5–54.1)</td>
</tr>
<tr>
<td>35–54</td>
<td>35.2 (9.5–60.8)</td>
<td>41.4 (31.2–51.6)</td>
</tr>
<tr>
<td>≥55</td>
<td>15.1 (0.0–33.2)</td>
<td>15.3 (6.8–23.8)</td>
</tr>
<tr>
<td>Non-Hispanic White</td>
<td>84.2 (68.6–99.8)</td>
<td>78.5 (70.1–86.8)</td>
</tr>
<tr>
<td>Metropolitan area*</td>
<td>58.5 (27.5–89.5)</td>
<td>86.0 (79.5–92.5)</td>
</tr>
<tr>
<td>Currently employed*</td>
<td>29.9 (4.2–55.7)</td>
<td>59.9 (49.5–70.2)</td>
</tr>
<tr>
<td>Household income below poverty threshold</td>
<td>8.3 (0.0–018.7)</td>
<td>12.8 (6.6–19.0)</td>
</tr>
<tr>
<td>Above high school education</td>
<td>47.7 (18.2–77.2)</td>
<td>60.2 (49.8–70.6)</td>
</tr>
<tr>
<td>Currently in a married or unmarried couple</td>
<td>55.8 (25.8–85.9)</td>
<td>54.3 (43.7–64.9)</td>
</tr>
<tr>
<td>Firearm in home***</td>
<td>81.4 (64.6–98.2)</td>
<td>38.3 (27.3–49.2)</td>
</tr>
<tr>
<td>Suicide attempt, past12 months**</td>
<td>2.2 (0.0–6.6)</td>
<td>18.6 (10.8–26.5)</td>
</tr>
<tr>
<td>Suicide attempt, ever</td>
<td>39.5 (9.1–70.0)</td>
<td>54.9 (44.4–65.4)</td>
</tr>
<tr>
<td>Seek external help for suicidal thoughtsa</td>
<td>75.3 (53.3–97.3)</td>
<td>73.1 (63.6–82.6)</td>
</tr>
</tbody>
</table>

CI, confidence interval; OR, odds ratio.

aParticipants were asked what they would do if they felt life “was not worth living.”
bSurvey data includes weighting variables for generation of national estimates.

cOmitted.

*p ≤ .05, **p ≤ .01, ***p ≤ .001 under Pearson chi-square tests; numbers may not add to 100% due to rounding.
Limitations

There are several important limitations in the current study. First, the overall survey response rate was 48%. Response rates by age groups or other demographic characteristics are not available, but participation in the study might have varied by demographic or mental health characteristics. However, the weighting variable attempts to adjust for non-participation and over- or under-sampling in certain populations, and—as discussed earlier—many of the results are consistent with prior work. In addition, the survey had a wide sampling frame, including English- and Spanish-speaking households in all 50 states and the District of Columbia, which strengthens its external validity to the population of community-dwelling adults. Second, the survey relies on self-report of suicidal thoughts and behaviors and of firearm access; there is no external verification or assurance that participants’ responses are accurate. Participants may have had differential recall of suicidal thoughts or behaviors, and social desirability may have biased responses to suicide questions and to reporting of legal or illegal firearms. In addition, the survey does not provide information about how long the firearm has been in the home or whether, for those without a firearm, there was previously a firearm in the home. ICARIS-2 data are cross-sectional and cannot establish a temporal sequence, causal relationships, or predictive validity. The total number of respondents with suicide plans involving a firearm was small, limiting the power of our analyses. Finally, the relationship between the methods that a person says he or she would use in an attempt and the method he or she would actually use is unknown.

Implications

Despite these limitations, the authors of this study opine that it sheds light on the association between firearm access and suicide risk that has been observed in suicide case-control research. First, the data did not support the hypothesis posed by the NRC report that firearms may serve as a marker for an unmeasured suicide risk factor (NRC, 2005). Suicide attempts were no more prevalent among those living in homes with firearms versus those without firearms, and whereas we found a somewhat higher prevalence of suicidal thoughts among those with a gun at home, the difference was not statistically significant either in bivariate analysis or when controlling for age, gender, and race/ethnicity. Firearm ownership is more prevalent in rural areas, and it has been suggested that it is rurality, not firearm access, that drives the relationship between firearms and suicide (Shrira & Christenfeld, 2010). However, we found that the prevalence of suicidal thoughts was virtually identical among respondents living in metropolitan and nonmetropolitan counties.

Second, there is evidence to support the hypothesis that a firearm in the home is a risk factor for suicide in large part because those with firearms at home are more likely to die in their attempt, rather than being more likely to make an attempt. The ICARIS-2 data indicate that the odds of planning to use a gun in a suicide attempt are sevenfold higher among suicidal people in homes with (vs. without) firearms. While some of the reported plans may be frivolous, even a doubling of the odds of using a firearm (vs. another method) in an actual attempt can impact the suicide rate among those living with firearms, given the greater lethality of guns (Vyrostek, Annest, & Ryan, 2004). People in homes without guns were more likely to plan an overdose, a method far less likely to prove lethal than guns.

Our results underscore the importance of reducing a suicidal person’s access to firearms. For example, parents and spouses of people at high risk for suicide should be urged to temporarily store household firearms somewhere other than at home or to lock them securely out of the suicidal person’s reach until the situation improves.
Studies have found that family members who are so counseled are more likely to take protective action than family members who are not so counseled (Kruesi et al., 1999).

Similar to other recent work, we found that people in homes with firearms were no more likely to attempt suicide, and not significantly more likely to consider suicide, than people in homes without firearms (Ilgen et al., 2008; Miller et al., 2009; Sorenson & Vittes, 2008). This finding tentatively suggests that one factor driving the relationship between household gun access and suicide risk may be the higher proportion of suicide plans that involve a firearm among people who live in homes with firearms. This latter finding is more tentative and should be tested in other data sets. However, relatively few large surveys ask about firearm access; the timing, duration, and severity of suicidal ideation; the specific nature of suicide plans; and the incidence of attempts. Such information is vital to better understanding of the nature of more lethal suicidal risk.

**CONTRIBUTIONS**

Marian E. Betz, MD, MPH, participated in study concept and design, acquisition of data, analysis of data, interpretation of data, and preparation of manuscript, and she takes responsibility for the manuscript as a whole.

Catherine Barber, MPA, and Matthew Miller, MD, MPH, ScD, participated in study concept and design, analysis of data, interpretation of data, and preparation and revision of the manuscript.

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