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Who owns guns and how do they keep them? The influence of household characteristics on firearms ownership and storage practices in the United States

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ABSTRACT

Our paper aims to describe firearm-related behavior among American households and to quantify the influence of household characteristics on the probability of firearms possession and storage practices. Applying logistic regression techniques to data from the 2004 Behavioral Risk Factor Surveillance Survey (BRFSS), we use separate models to estimate the effect of an array of respondent demographic characteristics factors on the likelihood that households will have a gun at home and, if so, whether they will keep it at either of two levels of risk. We find that rates of firearm ownership vary widely by household characteristics, including the state in which they reside. Simultaneously controlling for all of these factors scarcely diminishes variation in odds for ownership. Differences in the likelihood that owners will store guns unsafely are narrower and significant for fewer factors. Having children in the home scarcely affects the propensity to possess firearms but greatly reduces the chances a domestic firearm will be stored loaded and unsecured. Our findings support a consensus on the demographics of ownership but show more and stronger predictors of storage behavior than previous work. Differing dynamics of ownership and storage reveal the existence of two regional gun cultures. From these findings, we conclude that to mitigate mortality risks associated with guns in the home, encouraging safer storage by owners may be as effective as controlling sales. States and localities should test a range of promising but largely unproven interventions.

1. Introduction

1.1. Background

More Americans own more guns than do citizens of any other modern democratic state (Small arms survey, 2007). No other advanced industrial nation treats private ownership of deadly weapons as a birthright, enshrined in its constitution, as reinterpreted by the United States Supreme Court in 2008 (Waldman, 2014). Whether because of its revolutionary origins, frontier history, or culture of individualism which places high value on self-help, including self-defense, the United States remains exceptional in its acceptance of civilian possession of firearms. Here, as nowhere else, debate rages over whether guns in the home, and now in public places, afford necessary protection or pose unnecessary dangers to gun owners, their families, and others around them.

The risks associated with guns in the home and how they are kept are multiple and well documented (Kposowa and Hamilton, 2016; Angelmyer et al., 2014; Miller et al., 2005; Dahlberg et al., 2004; Grossman et al., 2005; Kellerman et al., 1993), only the issue of whether or not unsafe storage adds measurably to the risk of choosing to keep a domestic firearm in the first place. Whatever their relative importance, firearm risk is not evenly distributed across American society (Hamilton and Kposowa, 2015). Neither are rates of household possession or storage practices uniform across society. If Americans overall are uniquely attached to their guns compared with most other peoples, not all are equally attached, and not all who own guns keep them the same way (Morin, 2014; Jones, 2013; Cook and Ludwig, 1997).

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1.2. Research questions and objectives

In this paper, we examine how Americans differ in their inclination to arm and likelihood of storing domestic firearms safely by demographic characteristics and where they live. We seek to answer the following questions: What are the individual and household characteristics that influence the likelihood of having a gun in the home, storing it loaded and, if so, keeping it unlocked? After controlling for all these influences, how does the state (or region) where people reside affect their firearm decisions?

Our objectives are to (1) draw a more accurate and comprehensive picture of the firearm-related behavior of American households; (2) quantify the relative influence of household characteristics and place of residence on the likelihood of firearms possession and how unsafely they are stored; and (3) place our findings in the context of current public policy debates over gun regulation and gun rights.

1.3. Previous research

Numerous surveys and published studies provide estimates of rates of ownership (Morin, 2014; Drake, 2013; Azrael et al., 2004; Azrael et al., 2017; Cleveland et al., 2017), numbers of guns in private hands, and how these numbers have changed in the past 25 years (Azrael et al., 2017; Smith and Son, 2015). Many also describe the demographic characteristics of gun owners (Jones, 2013; Drake, 2013; Celinska, 2007; Parker et al., 2017). Fewer examine how owners of varying socioeconomic characteristics store their weapons (Johnson et al., 2006; Schuster et al., 2000).

The existing literature, especially the series of recently published studies based on the 2015 National Firearm Survey (NFS), reveals much but is limited by data or form of analysis—sometimes both. Several studies published since 2017 are based on survey data much more current than ours. These include four papers based on the 2015 National Firearm Survey (Azrael et al., 2017; Cleveland et al., 2017; Azrael et al., 2018; Simonetti et al., 2018), another from a 2016 survey (Crifasi et al., 2018), and a report of a 2017 Pew Research survey (Parker et al., 2017). Only the last deals both with ownership and storage behavior, and it is purely descriptive, as are the two NFS studies that estimate ownership rates (Azrael et al., 2017; Cleveland et al., 2017). Three recent papers that apply multivariate methods, as we do, focus exclusively on how owners keep their weapons. None of this recent work uses a dataset large enough to support state-level comparisons. Only three of > 30 earlier studies of gun behavior do, two based on the 2002 Behavioral Risk Factor Surveillance Survey that are purely descriptive (Azrael et al., 2004; Okoro et al., 2005), the other on even older BRFSS data covering only 22 states (Powell et al., 1998). No previous study that we are aware of applies multivariate analysis to so large a sample to estimate the concurrent effects of household characteristics, including resident state, on the likelihood of both owning a firearm and storing it unsafely.

2. Methods

2.1. Data

We have based the present study entirely on data from the 2004 Behavioral Risk Factor Surveillance Survey (Simonetti et al., 2018). That year the annual BRFSS had a sample size of 293,992, excluding Hawaii, which did not ask gun-related questions, and the District of Columbia. Eliminating missing responses on relevant questions reduced the number of subjects included to 244,983.

2.2. Variables

Our outcome variables derive from three firearm-related survey questions: “Are any firearms kept in or around your home?” If so, “Are any of these firearms now loaded?” If “yes,” “Are any of these loaded guns unlocked?,” meaning not secured by a key or combination. Response rates to these questions were 94.1, 98.0, and 99.0%, respectively.

Our initial set of predictor variables, selected for their theoretical or empirical importance, included sex, race/ethnicity, age, educational attainment, labor force participation, veteran, marital, and mental health status of respondents along with their household's income level, inclusion of minor children, and state of residence. For clarity of analysis, we recoded some variables to reduce the number of categories in the original data. Rather than select one state as a reference, we coded dummy variables to compare each with the geometric mean for all (Crifasi et al., 2018).

2.3. Analysis

To measure the relative influence of respondent characteristics on firearm-related behaviors, we constructed two logistic regression models, adjusting all survey-data with design and post-stratification weights described in BRFSS documentation to more accurately reflect the population sampled (Crifasi et al., 2018). Model 1 estimates the contribution of selected demographic factors and state of residence to the odds a household will have a gun in the home. Comparing owners with non-owners, this model has a single binary dependent variable, where outcome Y = 0 if a household does not possess any guns, and Y = 1 if it does. Model 2 uses the same independent variables to compare owners who store their guns loaded but secure and those who keep them loaded and unlocked with owners whose guns are kept unloaded. We fit a three- level multinomial logistic regression model in which Y = 0 if a gun in the home is unloaded; Y = 1 if it is loaded but locked (Risk level 1); and Y = 2, if a gun in the home is both loaded and unlocked (Risk level 2). To test the robustness of our two models, we substituted Census Division for state in each. All calculations were carried out in Stata, version 13.

3. Results

3.1. Summary statistics

Table 1 displays estimated rates of household gun ownership and storage practice by selected individual and household characteristics of survey respondents. Columns A and B indicate the percentage of the sample in each demographic category before and after survey adjustment. Column C shows the proportion of each sub-population in the weighted sample reporting guns in the home. Column D displays the number of gun owners who say they store their guns loaded, and column E shows the percentage of those having loaded guns who report leaving them unlocked. Column F presents the percentage of *all* subjects in each demographic category who have a loaded gun in their homes, calculated by multiplying the percent of gun owners (C) by the percent who leave them loaded (D). Column G—the percent of all households with loaded guns that are unlocked— is the product of the percentages in columns E and F.

3.1.1. Population characteristics

We see from the table that close to one-third (32.6%) of all U. S. households reported owning a gun in 2004. More than one in five (22.3%) gun-owning households kept at least one of their guns loaded. Of those, three-fifths (60.7%) stored their loaded weapons unlocked. Altogether, one in 14 American households (7.3%) had a loaded firearm in or around their homes, and nearly one in 20 (4.4%) lived with a gun that was unsecured. Based on U.S. population estimates for the time and average size of sampled households, these rates represent 107 million Americans, including 26 million children, living with guns at home in 2004; over 21 million—4.5 million of them children—exposed to the hazard of a loaded gun; and over 10 million adults and 2.3 million