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The Stock and Flow of U.S. Firearms: Results from the 2015 National Firearms Survey



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Since the mid-1990s, the U.S. civilian gun stock has grown from approximately 192 million (65 million handguns) to approximately 265 million (113 million handguns). In 2015, gun owners owned more weapons and were more likely to own both handguns and long guns than in 1994. As in 1994, ownership in 2015 was highly concentrated: the median owner owned two, but the 8 percent of all owners who owned ten or more accounted for 39 percent of the stock. Approximately seventy million firearms changed hands within the past five years (from 2011 to 2015); most were purchased. Two and a half percent of Americans had guns stolen within the past five years, accounting for an estimated five hundred thousand guns per year.

Keywords: firearms, guns, gun stock, handguns

In 2015, 36,252 people died of a firearm-related injury in the United States, approximately the same number of deaths as occurred in motor vehicle crashes. The same year, more than eighty thousand people were nonfatally injured (CDC 2017). The distribution of firearm deaths in 2015 is typical of the distribution over

the past several decades: the majority of firearm deaths were suicides (22,018), followed by homicides (13,463) and then unintentional firearm injuries (fewer than one thousand). By contrast, of the more than eighty thousand nonfatal firearm injuries, 60,470 were assault related, 15,928 were unintentional (self or

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other) injuries, and fewer than 3,320 were acts of deliberate self-harm that proved nonlethal.

The firearms involved in these injuries, and the millions more not involved in any injuries, all start out as legally manufactured or imported guns introduced into the primary market through federally licensed dealers. Subsequently, these firearms may exchange hands through private sales, some of which involve federally licensed dealers, or through gifts, inheritance, or nonpurchase transfers such as theft or borrowing, arrangements that characterize the underground gun market (as Cook and Pollack describe in the introduction).

Beyond that, little more is known about these guns than that they are owned by roughly one in five U.S. adults and can be found in approximately one of three U.S. households. In fact, the most recent peer-reviewed nationally representative survey that focused on details about firearms other than these two basic measures of exposure was conducted in 2004 (Hepburn et al. 2007). Between 2004 and today, we know that the proportion of adults who personally own firearms (and the proportion who live in households with guns) has continued to decline, modestly but steadily, largely because of a decline in personal gun ownership by men. In 2014, for example, the National Opinion Research Center's General Social Survey, an annual survey that every other year or so includes the same two questions (about personal and household firearm ownership) estimated that 22 percent of U.S. adults personally owned a firearm (35 percent of men and 12 percent of women) and that 31 percent of American households included at least one firearm, compared with 28 percent of U.S. adults (50 percent of men and 10 percent of women) and 47 percent of U.S. households in 1980 (Smith and Son 2015).

Although the National Opinion Research Center's General Social Survey and other surveys have asked respondents whether they personally own a firearm or live in a home with firearms, few have asked about the *number* of guns respondents own, let alone more detailed information about these firearms and the people who own them, such as reasons for firearm ownership, where firearms were acquired, how much firearms cost, whether they are carried

in public, and how they are stored at home (Smith and Son 2015; Gallup 2016; Morin 2014). Because of this, the best and most widely cited estimates of the number of firearms in civilian hands are derived from two national surveys dedicated to producing detailed, disaggregated, estimates of the U.S. gun stock, one conducted in 1994, the other in 2004 (Cook and Ludwig 1997, 1996; Hepburn et al. 2007). In the 1994 survey, sponsored by the National Institute of Justice, Philip Cook and Jens Ludwig estimated that American civilians owned approximately 192 million firearms, approximately one-third of which (sixty-five million) were handguns. In 2004, using a random-digit dial survey toward the end of an era when most Americans had land lines and answered their telephones, we estimated that U.S. adults owned approximately 283 million firearms (more than four per owner), 40 percent of which were handguns. These two surveys, taken together, suggested several important trends in firearm ownership between 1994 and 2004: a steady increase in the number of firearms in civilian hands, a growing proportion of the U.S. gun stock represented by handguns, and concentration of firearms among fewer gun owners.

Less is known about the movement of firearms between people than about the gun stock. Firearm manufacturing data provide one measure of the annual number of new guns available to be purchased (flow of new guns into the market); other data collected by the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) provide a related, but overlapping measure: the annual number of adults who undergo a background check before acquiring (or attempting to acquire) one or more guns. Other movements of firearms, such as dispositions by the police and military, are not centrally recorded (Wright, Rossi, and Daly 1983; Cook and Ludwig 1996). The National Crime Victimization Survey (NCVS) collects information on firearm theft (Langton 2012; Rand 1994). Recent estimates suggest that between 2005 and 2010 approximately 250,000 guns were stolen annually (Langton 2012). No single source provides an estimate of the flow of guns, however. In consequence, as with the gun stock, the best available evidence to date regarding the frequency of gun transfers and

the number of guns transferred comes from the 1994 and 2004 surveys.

To learn more about private ownership and use of firearms in the United States today, as well as to characterize where and the extent to which new and used firearms have exchanged hands over the past five years, we conducted the first nationally representative survey of firearm ownership and use in more than a decade—the 2015 National Firearms Survey (NFS). In this article, we focus on features related to the gun stock (such as its size, composition, and distribution and the reasons for private gun ownership) and on salient aspects of firearm transfers between parties, such as where current firearm owners acquired their most recent firearm, by type of gun and recency of acquisition.

METHODS

Data for this study come from the NFS, a national web-based survey (N=3949) designed by the authors and conducted in January 2015 by the survey research firm Growth for Knowledge (GfK). Respondents were drawn from GfK's KnowledgePanel (KP), an online panel that includes approximately fifty-five thousand U.S. adults.¹ The KP panel is selected on an ongoing basis, using an equal probability of selection design, to provide samples, after minor adjustments for deviations from equal probability se-

lection (base weights), that are representative of the U.S. population. Prior to selection of a study sample, GfK adjusts panel base weights to account for any discrepancies between panel composition and the distribution of key demographic characteristics of the U.S. population as reflected in the most recent Current Population Survey (GfK 2013).²

KP panel members complete an initial demographic survey and then periodic subsequent surveys, answers to which allow efficient panel sampling and weighting for future surveys. For the NFS, the study target population comprised adults eighteen years or older who fell into one of three groups: gun owners, non-gun owners living in a gun-owning household, or non-gun owners living in a non-gun-owning household, ascertained from the demographic surveys. An additional target population was veterans, who could fall into any of the three groups. To sample this population, GfK targeted respondents who met the criteria in GfK profile surveys and reconfirmed their gun ownership and veteran status within the survey. The final study weights provided by GfK combined pre-sample weights with a set of study-specific poststratification weights accounting for oversampling and for survey non-response.³

For this survey, 7,318 KP panel members received an invitation to participate. Of these,

1. As discussed at greater length later, historically, most estimates of gun ownership come from either random-digit dial telephone surveys or, in the case of the General Social Survey, in-person interviews of respondents. Online panels such as KP have been used increasingly in the social science literature to overcome the cost and response rate limitations of these survey modalities.
2. GfK structures recruitment for the KP with the goal of having the resulting panel represent the adult population of the United States with respect to a broad set of geodemographic distributions including particular subgroups of hard-to-reach adults (for example, those without a landline telephone or those who primarily speak Spanish). Panel members are randomly recruited through probability-based sampling, and participating households are provided with access to the Internet and hardware if needed. GfK recruits panel members by using address-based sampling (previously, GfK relied on random-digit dialing methods). For selection of general population samples from KP, GfK uses an equal probability of selection method design by weighting the entire KP to the benchmarks from the latest March supplement of the U.S. Census Current Population Survey. The geo-demographic dimensions used for weighting the entire KP typically include sex, age, race, ethnicity, education, census region, household income, home ownership status, metropolitan area, and Internet access. Using these weights as the measure of size for each panel member, in the next step a probability proportional to size procedure is used to select study specific samples. Application of the proportional to size procedure methodology with the above measure of size values produces fully self-weighting samples from KP, for which each sample member can carry a design weight of unity.
3. After the study sample was selected and fielded and all of the survey data were edited and made final, design weights were adjusted for any survey nonresponse (to the initial and to the supplemental survey) as well as for

3,949 completed the survey, yielding a survey completion rate of 54.6 percent.⁴ In contrast, nonprobability, opt-in, online panels typically achieve a survey completion rate between 2 percent and 16 percent (Callegaro and DiSogra 2008). All panel members except those serving in the U.S. armed forces at the time were eligible to participate. Invitations to participate were sent by email; one reminder email was sent to nonresponders three days later. Participants were not given any specific incentive to complete this survey, although GfK has a point-based program through which participants accrue points for completing surveys and can later redeem them for cash, merchandise, or participation in sweepstakes. The final sample consisted of gun owners ($n=2,072$), non-gun owners in gun households ($n=861$), and non-gun owners ($n=1,016$). The sample also included 1,044 veterans, distributed across the three gun ownership groups.

Following earlier work, our estimates of the

magnitude and distribution of the U.S. gun stock, as well as gun transfers and theft, come from the reports of those who personally own guns (Cook and Ludwig 1997; Hepburn et al. 2007). Gun owners were identified through two questions: “Do you or does anyone else you live with currently own any type of guns?” followed by, among all respondents who answered in the affirmative, “Do you personally own a gun?” Gun owners were then asked about the types of guns they owned (handguns, divided into pistols and revolvers), long guns, and other guns) and the number of each type. Respondents were also asked about the main reasons they owned guns, as well as about their most recent firearm acquisition, including whether they bought the gun or acquired it in some other way (such as an inheritance), and whether, and if so how many, guns had been stolen from them in the past five years.⁵ Data for this article come from respondents who personally own guns.

any under- or overcoverage imposed by the study-specific sample design. For this study, the following strata of gun ownership from weighted KP data and veteran status from the 2014 veteran supplemental survey of the census Current Population Survey were used for the raking adjustment of weights: gender by age (eighteen to twenty-nine, thirty to forty-four, forty-five to fifty-nine, sixty to sixty-nine, or seventy and older); census region (Northeast, Midwest, South, West) by metropolitan area (yes or no); gender by veteran status (yes or no); age (eighteen to twenty-nine, thirty to forty-four, forty-five to fifty-nine, sixty to sixty-nine, or seventy and older) by veteran status (yes or no); race-Hispanic ethnicity (white or non-Hispanic, black or non-Hispanic, other or non-Hispanic, two or more races and non-Hispanic, Hispanic) by veteran status (yes or no); census region (Northeast, Midwest, South, West) by veteran status (yes or no); metropolitan area (yes or no) by veteran status (yes or no); education (less than high school or high school, some college, bachelor's or greater) by veteran status (yes or no); household income (less than \$25,000, \$25,000 to less than \$50,000, \$50,000 to less than \$75,000, \$75,000 or more) by veteran status (yes or no); Internet access (yes or no) by veteran status (yes or no); veteran serving year (less than two years, two to three years, four to nine years, or ten or more years); armed services branch (Air Force, Army, Coast Guard or Marines or other, Navy). An iterative proportional fitting (raking) procedure was used to produce final weights aligned with respect to all strata simultaneously. In the final step, calculated weights were examined to identify and, if necessary, trim outliers at the extreme upper and lower tails of the weight distribution. The resulting weights were then scaled to the sum of the total sample size of all eligible respondents.

4. The 55 percent participation rate, according to GfK, is within the expected range for its surveys and does not signal that recruitment for this survey was particularly difficult. We did not add incentives because the participation rate was unexceptional. In surveys of this sort the participation rate can be artificially inflated by waiting a longer time for eligible parties to respond or contacting eligible members of the panel with reminders. We did not need to do so as we hit our target number of participants within a short period.

5. Each gun-owning respondent was asked separately for handguns and long guns: “What are the main reasons you own . . . ?” Response categories were as follows: “1) For protection against strangers; 2) For protection against people I know; 3) For protection against animals; 4) For hunting; 5) For other sporting use; 6) For a collection; 7) For some other reason.” Respondents could check multiple responses and provide a free text answer if they indicated that a main reason for owning guns was “other.” Respondents who reported that they owned other guns were asked to indicate a single primary reason they owned these guns.

A supplement to our survey was conducted by GfK in November 2015. For the supplement, all gun owners from the original survey (n=2072) who were still in the KP panel (n=1880) were invited to answer an additional set of questions about the timing of their most recent gun acquisition, the number of guns they had acquired in the previous five years, and the number of guns stolen from them in the previous five years.⁶

Of those eligible for the survey (n=1,880), 1,613 responded (86 percent). The respondents to the supplemental survey did not differ from respondents to the original survey with respect to age, gender, race, type of gun most recently acquired, or acquisition patterns. Nonresponders (n=267) were more likely than responders to be younger and female and to have acquired their most recent firearm as a gift or inheritance than by purchase. Respondents to the original survey who were no longer in the GfK panel (n=192) were more likely to be younger and have refused to describe the type of gun they most recently acquired than those in the original sample. They were also less likely to have purchased their most recent firearm. These differences did not affect the overall similarities between the supplemental and original samples. We use a supplemental survey weight provided by GfK for analyses using the supplemental survey.

The Northeastern University Institutional Review Board approved this study.

RESULTS

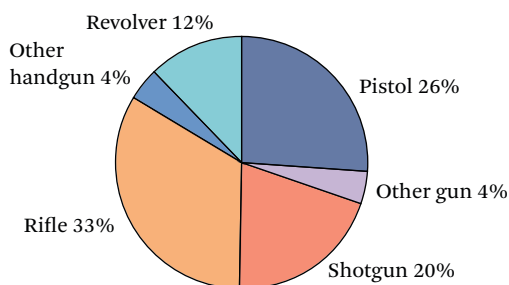
Results from the NFS detail the U.S. gun stock, including its size, distribution, and reasons for gun ownership, as well as gun transfers, including sales and theft.

6. Respondents were asked “When you completed the prior national firearms survey, sponsored by Northeastern University, in April 2015, you said that the gun you acquired most recently was a [insert type based on type noted in the April 2015 survey]. Thinking about this gun, approximately when did you acquire it?” Three options were offered: “1) Within the past two years; 2) Between two and five years ago; 3) More than five years ago.” The second question was “What was the exact year that you acquired this gun?” Respondents were asked to specify the exact year or to report that they did not know what year.

7. Including or excluding those who reported being a gun owner but reported owning no guns, or calculating the mean number of guns per gun owner including those who reported owning no guns, does not materially change our estimates (21.8 percent personal gun ownership; mean number of guns, 4.7).

8. We did not ask respondents to specify what type of gun. Other guns might include single-shot “black powder” guns or machine guns.

Figure 1. U.S. Gun Stock by Gun Type



Source: Authors' tabulations based on the National Firearms Survey.

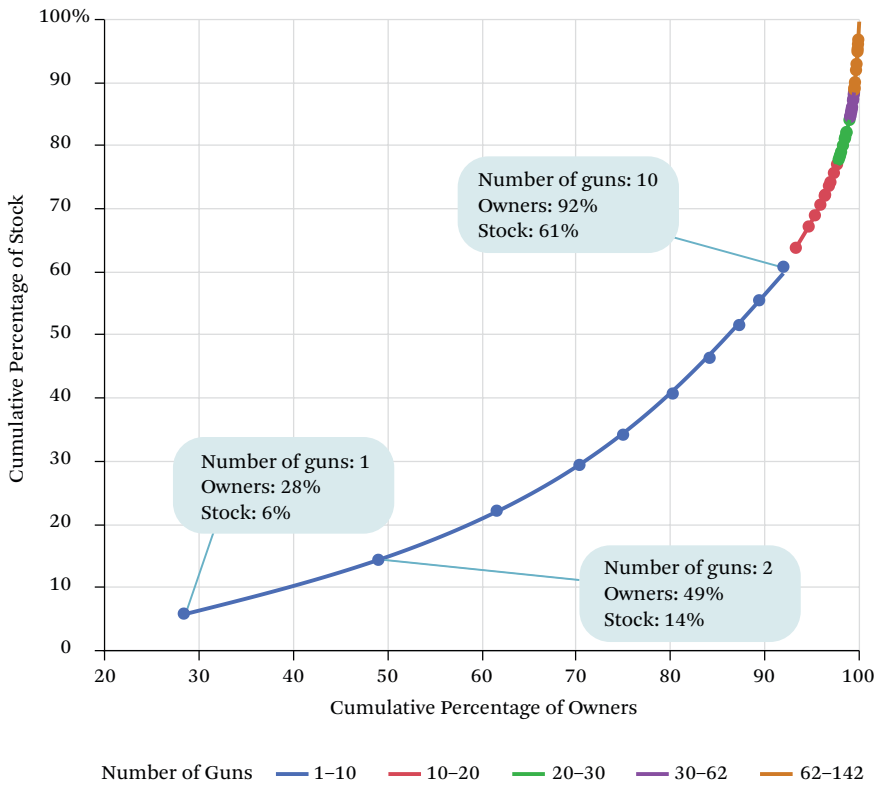
The Gun Stock

Twenty-two (22) percent of our sample reported that they personally owned a gun. Extrapolating to the U.S. population of adults age eighteen and older (245,157,000 in 2014) (Colby and Ortman 2015), we estimate approximately 54.7 million gun owners in the United States (CI: 50.7–58.8). Sixty respondents who said that they owned guns did not answer our questions about how many guns they owned. We use results from the 2012 respondents who did provide an answer to estimate the mean number of guns owned by gun owners: 4.8 (CI: 4.37–5.32), yielding a gun stock of 265 million (CI: 245 million to 285 million).⁷

Number and Types of Guns in U.S. Gun Stock

Of the estimated 265 million guns in civilian hands in the United States, approximately four in ten (42 percent) are handguns, the remainder primarily (53 percent) long guns (4 percent are “other” guns).⁸ Among handguns, the majority are semiautomatic pistols (62 percent) and revolvers (29 percent); the remainder are described by respondents as “other” hand-

Figure 2. Cumulative Distribution of Gun Stock



Source: Authors' tabulations based on the National Firearms Survey.

guns. Approximately six in ten long guns (62 percent) are rifles and four in ten (38 percent) are shotguns (see figure 1).

Distribution of Gun Ownership

Gun-owning respondents owned an average of 4.8 firearms (range: 1 to 140); the median gun owner reported owning approximately two guns. As seen in figure 2, approximately half (48 percent) of gun owners report owning one or two guns, accounting for 14 percent of the total U.S. gun stock, while those who own ten or more (8 percent), own 39 percent. Put another way, half of the gun stock (approximately 130 million guns) is owned by approximately 86 percent of gun owners, and the other half

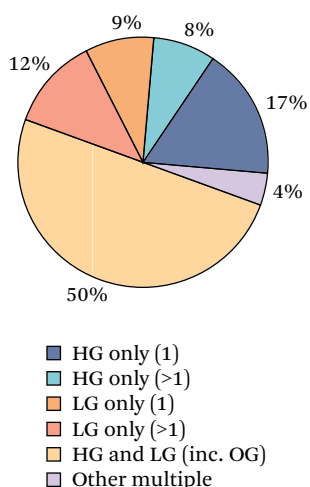
is owned by 14 percent (14 percent of gun owners equals 7.6 million adults, or 3 percent of the adult U.S. population).⁹

Distribution of Gun Ownership, by Gun Type

Although the majority of guns in the U.S. gun stock are long guns, in terms of the distribution of gun types, only one in five gun owners (21 percent) own long guns only, 25 percent of gun owners own handguns only (2 percent report own “other guns” only), and half of gun owners own both handguns and long guns (44 percent) or handguns, long guns, and other guns (6 percent). The remainder of gun owners (4 percent) reported owning either “other guns” along with handguns or long guns, or

9. About one quarter (22 percent) of gun owners reported that one of the primary reasons they owned a firearm was as part of a collection, although the large majority of those who cited owning guns for a collection also cited other reasons for owning (for example, 72 percent of collectors also said they owned guns for protection). Not surprisingly, gun collectors owned more guns than those who do not collect guns (ten versus three guns), and gun collectors accounted for most of the upper range of number of guns owned (noncollectors owned one to forty-three guns; collectors owned between one and 140).

Figure 3. U.S. Gun Ownership by Number and Type of Firearm



Source: Authors' tabulations based on the National Firearms Survey.

did not specify.¹⁰ Among those who own handguns only, two-thirds (67 percent) own one gun; for those owning long guns only, 43 percent own only a single gun (see figure 3).

Distribution of Gun Ownership by Gun Owner Demographics

Table 1 describes the demographic characteristics of respondents who own handguns only, long guns only, and both handguns and long guns (for simplicity of presentation, it does not include the small number of respondents (ninety-one) who are not in one of these three categories). The demographic characteristics of gun owners have been well established in multiple surveys. Consistent with these surveys, we find that gun owners overall are disproportionately male, white, older, non-urban, and from the South.

Differences among gun owners emerge, however, when those who own handguns only and those who own long guns only are compared with those who own both types. Handgun-only owners, in particular, appear to be a distinct group: they are more likely to be female, nonwhite, and living in urban areas, and are less likely to have grown up in a house

with a gun compared to other gun owners. For example, whereas approximately 20 percent of long gun owners are female, among gun owners who own handguns only, 43 percent are women, versus 13 percent of long gun owners and 14 percent of those who own both.

Reasons for Gun Ownership

Almost two in three gun owners (63 percent) reported that one of the primary reasons they own their guns is for protection against people (not shown). Three-quarters of handgun owners (76 percent) reported that they owned one primarily for protection (not shown). Other reasons include hunting (40 percent), collecting (34 percent), sporting use (28 percent), protection against animals (20 percent), and some other reason (40 percent). Other reasons volunteered by respondents included gift or inheritance or the right to have them (see table 2).

Reasons for ownership varied significantly depending on the types of guns respondents owned (handguns only, long guns only, or both) and demographic characteristics. Overall, those who own only handguns or both handguns and long guns were similar to one another with respect to protection, whereas those who own only long guns and those who own both were similar with respect to hunting and sporting use. For example, almost 80 percent of people who own handguns cite protection against strangers as a reason for ownership, as do 72 percent of those who own both handguns and long guns, but only 31 percent of those who own only long guns do. Likewise, 2 percent of those who only own handguns report that hunting is a primary reason for gun ownership, while 57 percent of those who only own long guns and 55 percent of those who own handguns and long guns do.

Across demographic characteristics, female gun owners were more likely than their male counterparts to report owning any gun for protection and less likely to report owning a gun for any other reasons (see table 2). Reasons for ownership were relatively consistent across age groups, although owning a gun for protection was less common among older gun owners,

10. Other guns may include single-shot black powder guns or machine guns.

Table 1. Demographic Characteristics of Gun Owners

Demographic (Percent Total Survey Population)	Any Firearm	Handgun Only	Long Gun Only	Both
All respondents	22	6	5	11
Age				
Eighteen to twenty-nine (19.1)	13	3	4	6
Thirty to forty-four (23.5)	21	6	4	10
Forty-five to fifty-nine (28.2)	24	6	5	13
Sixty or older (29.2)	25	6	5	14
Sex				
Male (48.3)	32	7	8	18
Female (51.7)	12	5	2	5
Race				
White (70.5)	25	5	6	13
Hispanic (11.7)	16	6	3	7
Black (11.0)	14	8	1	5
Multiracial (1.4)	25	4	6	15
Other (5.5)	8	3	<1	5
Marital status				
Married (54.0)	26	6	6	14
Never married (23.6)	12	3	3	5
Divorced (9.2)	23	6	5	12
Living with partner (6.9)	19	6	4	9
Widowed (5.4)	21	5	4	12
Separated (1.0)	24	14	2	8
Community				
Urban (23.0)	15	6	3	7
Suburban (50.3)	19	6	4	10
Rural (26.1)	33	5	9	19
Education				
Less than high school (10.5)	11	4	3	5
High school (29.5)	23	6	5	12
Some college (28.6)	26	6	5	15
College (31.4)	20	5	5	10
Annual income				
Less than 25,000 (16.9)	13	4	3	6
25,000–59,999 (29.2)	22	6	5	11
60,000–99,999 (27.6)	24	7	4	12
100,000 or more (26.3)	25	5	6	14
Military service				
Veteran (9.7)	44	10	9	25
Non-veteran (90.3)	19	5	4	10
Political views				
Liberal (20.2)	14	5	3	7
Moderate (46.3)	19	6	4	9
Conservative (31.5)	30	6	7	17

(continued)

Table 1. (continued)

Demographic (Percent Total Survey Population)	Any Firearm	Handgun Only	Long Gun Only	Both
Region				
Northeast (18.3)	15	3	4	7
Midwest (22.4)	23	4	6	12
South (36.9)	25	8	4	13
West (22.4)	20	5	4	11
Child under eighteen				
Yes (29.8)	19	5	7	9
No (70.2)	23	6	5	12
Grew up with a gun				
Yes (47.5)	35	7	8	20
No (48.0)	9	4	2	3
Don't know (3.2)	17	9	4	4

Source: Authors' compilation based on the National Firearms Survey.

Note: Reported values are percentage of respondents indicating ownership of the specified firearm.

Table 2. Given Reasons for Gun Ownership

	Protection From			Other Sporting Use	Collection	Other
	People	Animals	Hunting			
Gun type						
Handgun only, 1	0.78	0.10	0.03	0.00	0.16	0.03
Handgun only, >1	0.83	0.12	0.01	0.00	0.18	0.01
Long gun only, 1	0.36	0.14	0.46	0.17	0.11	0.46
Long gun only, >1	0.27	0.20	0.65	0.41	0.21	0.65
Handgun and long gun	0.72	0.27	0.55	0.47	0.36	0.55
Sex						
Male	0.60	0.20	0.49	0.32	0.37	0.44
Female	0.69	0.21	0.32	0.21	0.28	0.32
Age						
Eighteen to twenty-nine	0.60	0.21	0.38	0.26	0.39	0.38
Thirty to forty-four	0.67	0.18	0.41	0.30	0.38	0.41
Forty-five to fifty-nine	0.65	0.24	0.41	0.27	0.33	0.41
Sixty or older	0.58	0.18	0.41	0.29	0.32	0.41
Census region						
Northeast	0.53	0.18	0.40	0.29	0.37	0.40
Midwest	0.55	0.16	0.51	0.38	0.36	0.51
South	0.73	0.23	0.37	0.25	0.28	0.37
West	0.56	0.18	0.35	0.25	0.42	0.35

Source: Authors' tabulations based on the National Firearms Survey.

and more common among those from the South.

Gun Transfers

In addition to characterizing the stock of firearms in civilian hands, our survey provided information on the flow of guns in the United States over the past five years, including gun acquisitions, dispositions, and theft.

Firearms Acquisitions

We asked current gun owners a series of questions about the firearm they had acquired most recently. Approximately half said within the past five years (28 percent within the past two years, 21 percent between three and five years ago) and half (50 percent) more than five years ago (see tables 3, 4, and 5). Extrapolating to the U.S. population, we estimate that U.S. firearm owners acquired approximately seventy million guns in the past five years.¹¹

The large majority of gun owners purchased their most recently acquired gun, with purchase more common for guns acquired in the past one to two years (86 percent) than for those acquired more distally (79 percent two to five years ago, 61 percent more than five years ago). Across all three periods, the most commonly acquired firearm was a handgun, with handguns constituting almost six of ten guns acquired in the past five years, and five of ten guns acquired more than five years ago. Stores (gun

stores, sporting good stores, and so on) were the most common source of purchased guns, while gifts and inheritance were the most common form of nonpurchase transfer.

Firearms most recently acquired by gun owners tended to be new rather than used (see tables 6, 7, and 8). The proportion of new guns was higher among those acquired more recently; used guns account for four of ten firearms acquired more than five years ago, but only three of ten acquired in the past two years. The majority of new guns were purchased (89 percent in the past two years, 91 percent two to five years ago, 78 percent more than five years ago). Among used guns, nearly six of ten acquired more than five years ago were not purchased, versus only one-third of those acquired within the past two years. Inherited guns constitute 40 percent of used guns acquired more than five years ago, but only 16 percent of those acquired in the past two years, mirroring a decrease in the overall share of guns obtained by inheritance from 21 percent of those acquired more than five years ago to 4 percent of those acquired in the past two years.

The cost of the most recent firearm purchased (among respondents whose most recently acquired gun was purchased) was relatively evenly distributed around the mode of \$250 to \$500 (see table 9). Overall, used guns were less expensive than new guns and guns acquired longer ago were less expensive than

11. The NFS asked respondents who reported that they were current gun owners to describe when they acquired their most recently acquired firearm still in their possession and, separately, how many guns they had acquired in the past five years (regardless of whether those guns were still in their possession). Some respondents reported that they had acquired one or more guns during the past five years even though they had previously indicated that their most recent firearm acquisition (among the guns they currently owned) took place more than five years ago. Overall, when directly asked when they had most recently acquired a gun in their possession, 49 percent of people reported doing so within the past five years, whereas 62 percent said that they had acquired one or more firearms in the past five years when prompted to provide the number of firearms acquired (irrespective of whether those guns were still in their possession). In estimating that seventy million firearms were acquired over the past five years, we privileged the stem question to mitigate the well-established phenomenon of telescoping (that is, we excluded from our five-year estimate the 23 percent of respondents who reported acquiring at least one gun in the past five years yet also indicated their last acquisition was more than five years ago) (see table A1). Including respondents who initially reported that their most recent acquisition was more than five years ago increases our estimate of the total number of guns acquired over the past five years to eighty-five million. One possible explanation for this discrepancy is the tendency to telescope, which may have inflated the latter estimate. Alternatively, since only the second question explicitly asked respondents to consider guns that are no longer in their possession, these guns may have been excluded when respondents considered the first question.

Table 3. Distribution of Where Current Owners Acquired Most Recent Firearm, Less Than Two Years (28 Percent)

	All Guns (100%)	Handguns (59%)	Long Guns (40%)
Percent purchased at or from			
Any store	62	65	54
Family	2	3	1
Friend or acquaintance	6	6	7
Gun show	4	3	5
Pawn shop	5	4	6
Online	2	2	2
Other	3	3	4
All purchased firearms	84	86	79
Percent nonpurchased transfers			
Gift	8	8	9
Inheritance	4	3	8
Trade	0	0	0
Other	5	4	6
All nonpurchased firearms	17	15	23
All transfers	100		

Source: Authors' tabulations based on the National Firearms Survey.

Table 4. Distribution of Where Current Owners Acquired Most Recent Firearm, Two to Five Years Prior (21 Percent)

	All Guns (100%)	Handguns (60%)	Long Guns (39%)
Percent purchased at or from			
Any store	54	48	58
Family	3	2	4
Friend or acquaintance	9	11	8
Gun show	3	4	2
Pawn shop	6	7	3
Online	1	1	2
Other	3	3	4
All purchased firearms	79	76	81
Percent nonpurchased transfers			
Gift	11	16	8
Inheritance	8	6	9
Trade	1	0	0
Other	1	2	6
All nonpurchased firearms	21	24	19
All transfers	100		

Source: Authors' tabulations based on the National Firearms Survey.

Table 5. Distribution of Where Current Owners Acquired Most Recent Firearm, More Than Five Years Prior (50 Percent)

	All Guns (100%)	Handguns (51%)	Long Guns (48%)
Percent purchased at or from			
Any store	42	42	42
Family	3	2	3
Friend or acquaintance	7	9	5
Gun show	2	3	2
Pawn shop	3	4	2
Online	<1	1	0
Other	3	4	2
All purchased firearms	61	65	57
Percent nonpurchased transfers			
Gift	15	13	15
Inheritance	21	17	25
Trade	0	0	1
Other	3	4	2
All nonpurchased firearms	39	34	43
All transfers	100		

Source: Authors' tabulations based on the National Firearms Survey.

Table 6. Percentage of Where Current Owners' Most Recent Transfer Occurred, Less Than Two Years (28 Percent)

	Percent Transfers (100%)	New (71%)	Used (26%)
Percent purchased at or from			
Any store	62	78	16
Family	2	0	6
Friend or acquaintance	6	1	19
Gun show	4	3	6
Pawn shop	5	2	11
Online	2	1	5
Other	3	3	4
All purchased firearms	84	89	67
Percent nonpurchased transfers			
Gift	8	6	12
Inheritance	4	0	16
Trade	0	0	0
Other	5	5	5
All nonpurchased firearms	17	11	33
All transfers	100		

Source: Authors' tabulations based on the National Firearms Survey.

Table 7. Percentage of Where Current Owners' Most Recent Transfer Occurred, Two to Five Years Prior (21 Percent)

	Percent Transfers (100%)	New (61%)	Used (37%)
Percent purchased at or from			
Any store	54	79	10
Family	3	1	6
Friend or acquaintance	9	1	23
Gun show	3	3	3
Pawn shop	6	3	10
Online	1	1	2
Other	3	3	2
All purchased firearms	79	91	56
Percent nonpurchased transfers			
Gift	11	9	20
Inheritance	8	0	20
Trade	1	0	1
Other	1	1	0
All nonpurchased firearms	21	10	41
All transfers	100		

Source: Authors' tabulations based on the National Firearms Survey.

Table 8. Percentage of Where Current Owners' Most Recent Transfer Occurred, More Than Five Years Prior (50 Percent)

	Percent Transfers (100%)	New (71%)	Used (26%)
Percent purchased at or from			
Any store	42	69	9
Family	3	0	6
Friend or acquaintance	7	1	15
Gun show	2	3	2
Pawn shop	3	1	5
Online	1	1	0
Other	3	4	3
All purchased firearms	61	78	40
Percent nonpurchased transfers			
Gift	15	14	15
Inheritance	21	3	41
Trade	0	0	1
Other	3	3	2
All nonpurchased firearms	39	20	59
All transfers	100		

Source: Authors' tabulations based on the National Firearms Survey.

Table 9. Cost of Purchased Firearms, in U.S. Dollars

	\$0–99	\$100–249	\$250–499	\$500–999	\$1,000 or more
All	4.2	18.0	48.1	25.1	4.6
Handguns	3.1	14.3	50.3	29.6	2.7
Long guns	5.1	22.8	45.4	19.3	7.5
New	2.5	14.3	49.9	28.0	5.3
Used	9.1	29.1	41.9	17.3	2.7
Five years or less	2.3	11.6	48.6	30.2	7.4
More than five years	6.9	26.1	46.7	18.6	1.7
Protection from strangers	3.6	15.3	51.0	27.1	3.1
Hunting	4.2	24.5	45.7	18.9	6.7
Sport shooting	6.7	15.3	48.9	25.2	5.0
Collection	2.6	17.7	42.4	28.2	9.0

Source: Authors' tabulations based on the National Firearms Survey.

Note: All figures in percentages.

those purchased more recently. The most commonly cited reason for buying a firearm was self-protection, a reason more common for those purchased within the last five years (43 percent) than more than five years ago (35 percent).

Firearm Dispositions

Approximately 5 percent of gun owners reported that they had sold or otherwise gotten rid of a gun in the past five years (the average number of guns disposed of was two). Of these, the large majority (71 percent) had sold the gun they disposed of most recently, 13 percent had given the gun as a gift, and 10 percent had traded it for something else. A few who had disposed of a gun (1 percent) reported having gotten rid of it in a buy-back program. When gun owners sold guns, they most often sold them to a friend directly (35 percent) or to a gun dealer (32 percent), 12 percent reporting that they had sold the gun via an online advertisement and another 14 percent having sold it to a family member (not shown).

Firearm Theft

Approximately 2.4 percent of gun owners (CI: 1.6–3.6) reported having had one or more stolen from them in the past five years, the mean number at 1.9 (a range of 1 to 6). Assuming that theft was evenly distributed across the years, we estimate that approximately 2.3 million

guns were stolen over the past five years (five hundred thousand annually).

DISCUSSION

In 1994, when the National Survey of Private Ownership of Firearms (NSPOF) was conducted, Philip Cook and Jens Ludwig estimated an approximate 192 million guns in the hands of U.S. civilians (1997). In 2015, we estimate that that number has grown by more than seventy million to approximately 265 million. The guns acquired over the past twenty years are disproportionately handguns, the share of which in the total gun stock is now 42 percent, versus approximately 33 percent in 1994.

The shift we observe in the gun stock toward a greater proportion of handguns may reflect the decline in hunting and a change in motivations for firearm ownership and use (Smith 2001). Indeed, a perceived, and growing, need for self-protection appears to drive contemporary gun ownership in the United States (Pew Research Center 2013). Consistent with our finding that the majority of the guns that have been added to the gun stock are handguns and that gun owners in 2015 were more likely than gun owners in 1994 to report that they owned any handgun primarily for self-protection (76 percent versus 48 percent), we find that almost 70 percent of gun owners report that a primary reason for owning a gun is protection against people. Consistent with this

trend, we find that respondents who owned only handguns were just as likely to live in an urban environment as a rural one, and to be demographically more diverse than owners of long guns (who, as a group, are more likely to be white, male, and rural).

Not only are there many more guns overall, there are also more gun owners (approximately 55 million from the NFS compared to approximately 44 million from the NSPOF), although the percentage of the adult population that owns guns has declined from 25 percent in the 1994 NSPOF (no confidence interval provided), to 22 (CI: 21–24) percent in 2015.¹² Indeed, gun owners today each own, on average, more guns (4.8 in the NFS versus approximately 4.3 in the NSPOF). Moreover, gun ownership appears to be somewhat more concentrated in 2015 than it was in 1994: the top 20 percent of gun owners owned 55 percent of the gun stock in 1994; they now own 60 percent.

In the absence of a gold standard against which to compare our estimates (of the sort that would render survey-based estimates largely unnecessary), two sources of administrative data—from the ATF and FBI—provide an opportunity to grossly validate results (ATF 2015; FBI 2016). Firearm manufacturing and import-export data available from the ATF suggest that, from 1899 through 2013 (the last year for which data are available), approximately 363 million firearms have been available for sale in the United States (see table A1).¹³ Although guns are highly durable, it is reasonable to ex-

pect that every year some fraction is permanently removed from the marketplace through seizure, irrecoverable loss, or breakage. Following Cook, applying a 1 percent per year depreciation (permanent removal from use) rate to the available manufacturing data yields an estimated gun stock in 2013 of approximately 270 million (Cook 1993; Cook and Goss 2014). Assuming the number of guns was added to the market in 2014 (the last full year before our survey) was the same as the number added in 2015 (sixteen million, the largest number of guns manufactured or imported in U.S. history), the estimate of the U.S. gun stock (using the ATF data) increases to 285 million, close to the 265 million we estimate from our survey.¹⁴

Our estimate that approximately seventy million firearms changed hands within the past five years is also broadly consistent with estimates derived separately using—first—ATF data on firearm manufacturing, imports, and exports (which should track our estimates of new firearms acquired), and—second—National Instant Criminal Background Check System (NICS) background check data (which should correspond to the number of people who acquired firearms and underwent a background check). Given the percentage of people in the NFS who report that their most recently acquired gun was new (rather than used) and assuming that new guns correspond to the firearms that the ATF report enumerates, the total number of firearms acquired over the past five years should be approximately eighty-two mil-

12. A similar decline has been reported from the General Social Survey, in which personal gun ownership declined from 28 percent in 1994 to 22 percent in 2014 (Smith and Son 2015).

13. The data series presented in table A1 combines a summary (1899–1968), assembled from ATF reports on manufacturing plus imports (Newton and Zimring 1968), ATF data compiled by Gary Kleck (1969–1986, 1991), and the remainder from online ATF data (ATF 2015).

14. The NSPOF estimate of 192 million guns in 1994 is also remarkably consonant with ATF data up to 1994, applying the same 1 percent annual removal from market estimate. However, our estimate is 30 percent, not 15 percent lower than ATF figures. The estimate of approximately 270 million guns from our 2004 random digit dial telephone survey, appears to be an overestimate. Extrapolating from surveys to the U.S. population, especially for relatively rare events (such as owning an extremely large number of guns), has been shown to have the potential to lead to large overestimates. In the 2004 survey, two factors came into play: first, by 2004 RDD surveys were increasingly plagued, as our survey was, by low response rates, suggesting the possibility that even with the application of poststratification weights, results may not have been generalizable (and thus suitable for extrapolation) to the U.S. population. Second, because ownership of large numbers of guns is relatively uncommon, our estimates of the gun stock were sensitive to the inclusion (or exclusion) of respondents who reported that they owned large numbers of guns.

lion.¹⁵ Our estimates based on ATF data may be an underestimate because they were calculated based on commerce data from a five-year period ending in 2013, the most recent year for which ATF data were available (and sales have been accelerating upward). Nonetheless, our estimates using NICS data are remarkably similar: eighty-three million (derived using our published finding that approximately 75 percent of gun owners who acquired their most recent firearm within the past five years underwent a background check for that acquisition, not shown).¹⁶

Our estimate of the number of guns stolen annually also squares well with external data sources, although our estimate that five hundred thousand guns are stolen annually is somewhat higher than the most recent gun theft estimate (233,000) reported from the NCVS. Overall, however, the number of guns stolen appears to have remained relatively stable over time. In the late 1980s, the NCVS estimated that approximately 340,000 firearms were stolen each year. Using data from the NSPOF, combined with data from a state-level survey that estimated the number of guns stolen per theft incident in that state, Cook and Ludwig estimate that slightly fewer than five hundred thousand guns per year were stolen in the United States in the mid-1990s.

The NFS used an existing probability-based online panel (KnowledgePanel) to examine U.S.

gun ownership, whereas our 2004 survey and the NSPOF both relied on random digit dialing. It is possible that online panel surveys and random-digit dial (RDD) surveys elicit systematically different responses from survey participants, suggesting that comparisons over time (and across survey modes) should be undertaken with some caution. Even if it were possible (or desired) to conduct an RDD survey about gun ownership today, such a survey would be unlikely to be comparable to surveys from 1994 or 2004 due to increasingly poor response rates on telephone surveys (Link et al. 2008). Moreover, probability-based online samples have been found to reduce social desirability bias and yield more accurate results than telephone surveys (Chang and Krosnick 2009).

Although the NFS is thus likely to produce a good estimate of firearms in civilian hands, as well as to accurately characterize the flow of guns and other characteristics of gun ownership, some gun owners may nevertheless have chosen not to report their gun ownership on a survey, and some non-gun owners may have reported owning guns when in fact they do not. What evidence there is, however, suggests that gun owners appear to respond accurately with respect to their firearm ownership on surveys. Studies that have validated survey reports of gun ownership against administrative data have reported low levels of

15. Missing answers as to whether the most recently acquired gun was new (as opposed to used) were imputed, based on the assumption that the 3 percent of respondents with missing data with respect to whether their most recently acquired firearm was new or old, were missing at random. The estimate we arrive at using ATF data is higher (ninety-one million versus seventy million) if we do not restrict respondents to those who indicated in a stem question that they had acquired the last firearm currently in their possession within the past five years. The reason for this is that some of these respondents indicated that they had acquired a nonzero number of firearms in the past five years when asked directly how many firearms they had acquired regardless of whether they still had the firearm in their possession. Incorporating these respondents' answers into our estimate of the gun flow increased the estimate we arrived at using ATF data because the flow of all guns (both new and used) is derived by dividing the ATF enumeration of new guns by the percentage of new guns that our respondents reported were acquired in the past five years (and, ignoring the stem question restriction decreased the percentage of new guns from 68 percent to 62 percent).

16. If respondents were not required to indicate in the stem question that their most recently acquired firearm was acquired within the past five years, 69 percent of gun owners reported having undergone a background check with respect to their most recently acquired gun (and therefore the estimate of the number of firearms acquired over the past five years increases to ninety-one million). This number is likely to be an underestimate given that each NICS background check may result in the acquisition of more than one firearm (for additional details regarding background check data, see Miller, Hepburn, and Azrael 2017).

false negative reports (approximately 10 percent), and virtually no false positive reports (Kellermann et al. 1990; Rafferty et al. 1995). In the NFS, fewer than 1 percent of respondents refused to answer our stem question about household gun ownership, and none refused the subsequent question regarding whether they personally owned a gun. Nonetheless, it is likely that some groups of gun owners (such as those who possess firearms illegally, such as someone with a felony conviction), are not reflected in our estimates, and possible that nonresponse to some questions may affect the validity of our findings if those choosing not to answer a question differed systematically from those who did. Given that 2 percent or fewer of respondents refused to answer the vast majority of our questions about firearms, nonresponse bias among those in our survey is unlikely to have had a material influence on our findings.

CONCLUSION

As of 2015, we estimate approximately 265 million guns in the U.S. civilian gun stock, an increase of approximately seventy million guns since the mid-1990s. Over that time, the proportion of handguns in the gun stock—most often bought for self-protection—has grown (to more than 40 percent), as has the proportion of gun owners who own both handguns and long guns (to more than 75 percent). Although the proportion of U.S. adults who report owning guns has declined only modestly, from 25 percent in 1994 to 22 percent in 2015, fewer men own them (32 percent in 2015 versus 42 percent in 1994), slightly more women do (12 percent in 2015 versus 9 percent in 1994), and owners in general are more likely to have

more guns (the mean number increased from four to five). Despite the increase in the average number of guns, the median owner owns only two (28 percent own one and 31 percent own two, accounting for 14 percent of the total U.S. stock); the 8 percent of all owners who own ten or more account for 39 percent of the gun stock (and 14 percent of owners own half the U.S. stock).

With respect to firearm transfers, we estimate that approximately seventy million firearms changed hands within the past five years, a number broadly consistent with manufacturing data from the ATF, the large majority of which were purchased, more so in the past two years (86 percent) than for those acquired more remotely (79 percent two to five years ago; 61 percent more than five years ago). Across all three periods, the most commonly acquired firearm was a handgun.

Guns not only move into but also out of the hands of owners. Five percent of gun owners in our sample reported having disposed of a gun within the past five years, most often (35 percent) through a sale to family or friends. Another 2.4 percent report having had a gun stolen within that time, accounting for an estimated five hundred thousand guns per year.

The National Firearms Survey provides the first nationally representative data about the stock and flow of guns in the United States since 2004 (and the second such since 1994). These data have the potential to ground public health, public safety and public policy discussions about guns and gun transfers in what we assume is largely the legal firearms market, which is where firearms, even those that end up in the gray or black market, all start out.

APPENDIX

Table A1. Estimation of Gun Stock Using Gun Manufacturing Data

Year	Total Guns (Millions)	Δ	Adjusted Estimate (.99)	Year	Total Guns (Millions)	Δ	Adjusted Estimate (.99)
1899–1945	47			1980	168	6	140
1946	48	1	48	1981	173	5	144
1947	51	3	50	1982	178	5	147
1948	53	2	52	1983	182	4	150
1949	55	2	53	1984	186	4	152
1950	58	3	56	1985	191	5	156
1951	60	2	57	1986	194	3	157
1952	62	2	58	1987	198	4	160
1953	64	2	60	1988	203	5	163
1954	66	2	61	1989	209	6	167
1955	67	1	62	1990	213	4	170
1956	69	2	63	1991	217	4	172
1957	71	2	64	1992	223	6	176
1958	73	2	66	1993	231	8	182
1959	75	2	67	1994	238	7	188
1960	78	3	69	1995	243	5	191
1961	80	2	71	1996	247	4	193
1962	81	1	71	1997	252	5	196
1963	84	3	73	1998	256	4	198
1964	86	2	75	1999	261	5	201
1965	89	3	77	2000	265	4	203
1966	93	4	80	2001	270	5	206
1967	97	4	83	2002	274	4	208
1968	102	5	87	2003	279	5	211
1969	107	5	92	2004	284	5	214
1970	112	5	96	2005	289	5	217
1971	117	5	100	2006	295	6	220
1972	122	5	104	2007	301	6	224
1973	128	6	109	2008	308	7	229
1974	135	7	115	2009	316	8	235
1975	140	5	118	2010	325	9	241
1976	146	6	123	2011	334	9	248
1977	151	5	127	2012	347	13	258
1978	156	5	131	2013	363	16	272
1979	162	6	135				

Source: Authors' compilation based on Newton and Zimring 1968, Kleck 1991, and ATF 2015.

Note: We apply a 1 percent depreciation (permanent removal from use) rate to each year's adjusted stock. Pre-1969 figures do not appear to include import (and net out export) data.

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