

# Regional differences in firearm ownership, storage and use: results from a representative survey of five US states

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## ABSTRACT

**Background** Firearm access and storage practices influence risk for injury and death; however, prior research has considered only national and regional differences on these variables, overlooking state-level differences.

**Objectives** To analyse and describe statewide differences in firearm ownership, storage and use in a representative sample of five US states.

**Design** Variables were assessed via an online self-report survey administered between 29 April 2022 and 15 May 2022.

**Setting** Surveys were completed online.

**Participants** Participants (n=3510) were members of knowledge panel, a probability-based sample recruited to be representative of US adults. All participants were aged 18+ and resided in one of five states: Colorado, Minnesota, Mississippi, New Jersey or Texas.

**Measurements** We used  $\chi^2$  tests to examine state differences in firearm ownership, childhood firearm experiences and purchasing. A series of analyses of covariance were then used to assess differences in firearm storage, firearms owned and carrying behaviours while adjusting for pertinent demographic characteristics.

**Results** We found significant differences in firearm ownership across states. There were significantly more first-time firearm purchasers during the firearm purchasing surge in New Jersey. Both Mississippi and Texas have elevated rates of unsecure storage practices and firearm carrying outside of the home.

**Limitations** Results are cross-sectional and self-report. Findings may not generalise beyond the five states assessed in this survey.

**Conclusions** Public health messaging around firearm safety should account for differences in key firearm behaviours related to ownership, storage and use to ensure effective communication and reduce the risk of gun injury and death across states.

## WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Firearm owners vary in their purchasing, storage and carrying practices. Many firearm owners store their firearms unsecured and unsecure firearm storage and frequent firearm carrying increase the risk for firearm injury and death.

## WHAT THIS STUDY ADDS

⇒ We leveraged probability-based sampling, thereby optimising representativeness and extending beyond prior work in this area. Unlike prior work that focused only on national and regional differences on related variables, we examined statewide differences within a diverse selection of US states.

## HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ These findings may influence how policy and messaging on secure firearm storage and carrying is adapted at a statewide level by providing a basis for varying approaches to fit local needs and preferences.

In the USA, over 81 million residents own firearms<sup>1</sup> and there are approximately 393 million privately owned firearms (eg, firearms purchased by individuals rather than provided to them for their occupation).<sup>2</sup> Handguns are the most common type of firearm owned (42%), followed by rifles (33%) and shotguns (20%).<sup>3</sup> Although knowledge about national firearm ownership has helped characterise American firearm ownership,<sup>4</sup> understanding how ownership varies across smaller geographic regions would enable us to better capture differences between communities and inform local

policies. Across numerous fields, state-level focus has provided valuable information regarding local variations relevant to policy decisions.<sup>5–8</sup>

Prior research has demonstrated firearm ownership rates vary between states. For instance, a study examining firearm ownership throughout the USA (N=293 992) found 59.3% of Alaskan households own firearms, compared with 36.5% in Texas and 11.2% in Massachusetts.<sup>9</sup> Firearm ownership also differs by demographic characteristics and geographical region. In one nationally representative study (N=3494), women were more likely than men to own firearms for protection and those from the Midwest reported owning a firearm for hunting at higher rates.<sup>3</sup>

How firearms are maintained—including storage and carrying practices (being armed with a firearm while outside the home)—also impact risk for firearm-related violence. Along these lines, firearm storage habits differ by geographical region.<sup>9 10</sup> In one national study, 71.0% of firearm-owning South Dakota households reported storing their firearms unlocked, compared with 50.1% in New Jersey.<sup>9</sup> Additionally, 34.1% of firearm-owning Florida households stored a firearm loaded, compared with 8.9% in Vermont. Other studies have leveraged nationally representative samples and reported broad regional differences in storage practices<sup>11 12</sup>;



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however, such analyses are incapable of speaking to the differences between specific states, resulting in comparisons of large heterogeneous geographical regions rather than state-level variability. To our knowledge, although carrying practices have been considered recently on the national level,<sup>13</sup> no studies have examined statewide differences in firearm carrying tendencies.

Several gaps in the literature impede our understanding of firearm ownership, storage and carrying practices across diverse communities. First, prior research has largely focused on national samples or considered only broad regional differences. Second, assessments of firearm storage have prioritised gun safe use and load status, limiting knowledge about other storage methods. Third, few studies have used probability-based sampling, which optimises representativeness.<sup>14</sup> Fourth, we are unaware of any studies examining statewide variability in firearm carrying. And finally, prior research in this area largely predated the firearm purchasing surge that began in 2020, potentially limiting the applicability of prior findings to the current moment. Approximately 50% of new firearm owners between 2019 and 2021 were female.<sup>15</sup> Similarly, since 2019, 21% of new firearm owners have identified as black. Further supporting shifts in the composition of firearm owning communities, recent work shows that those who purchased their first firearm during the purchasing surge are more likely than non-firearm owners and other firearm owners to experience suicidal ideation.<sup>16 17</sup>

This study addresses each of these gaps by using a large sample of US firearm owners and non-firearm owners from five diverse states (Colorado, Minnesota, Mississippi, New Jersey and Texas) collected via probability-based sampling in Spring 2022. These states were chosen specifically because they differ widely from one another geographically, demographically, culturally and politically, and also vary substantially with respect to rates of gun violence and the legislation currently in place regulating the acquisition and use of firearms. For example, 4.7% of Colorado residents identify as black compared with 38.0% of Mississippi residents<sup>18 19</sup>; and 39% of Texas residents identify their political beliefs as conservative, while 29% of New Jersey residents identify as conservative.<sup>20</sup> Additionally, the firearm mortality rate in New Jersey is 5 per 10 000 compared with 28.6 per 100 000 in Mississippi, and 15.4 per 100 000 in Colorado.<sup>21</sup>

This study seeks to describe current firearm ownership and the extent to which states differ on domains relevant to firearm ownership, including demographic characteristics, number/type of firearms owned, reason for ownership, recent firearm purchasing behaviours and storage and carrying habits.

## METHOD

### Participants and procedures

The Rutgers Biomedical and Health Sciences institutional review board approved procedures and participants provided informed consent prior to completing the survey. Participants (N=3510) were US residents (age 18+) from five states: Colorado (N=415), Minnesota (N=673), Mississippi (N=178), New Jersey (N=540) and Texas (N=1704), recruited from knowledge panel (KP) via Ipsos between 29 April 2022 and 15 May 2022. KP is a probability-based web panel designed to be representative of the USA.<sup>22</sup> Inclusion criteria were being aged 18 or above and residing in one of the five recruitment states. Patients and the public were not involved in the design or conduct of this study. A total of 6710 responses were fielded (91% qualified, 58% completed). See [table 1](#) for all sample descriptive statistics.

For this study, data weighting involved three steps. In step 1, design weights for all KP assignees were computed to reflect

selection probabilities. In step 2, design weights for KP screened respondents were raked to geodemographic distributions of the five states, with finer geodemographic adjustments within the states, and with benchmarks obtained from the 2019 American Community Survey. In step 3, resulting weights were trimmed and scaled to add up to the total number of qualified respondents. Each participant received both a total sample weight and a state weight that corresponded to their state of residence. For these analyses, state weights were used.

## MEASURES

### Demographics

Demographics were assessed using standard KP demographic items. These data are included in KP panel member profiles.

### Firearm ownership, storage and behaviour

Firearm ownership was assessed via a single item that asked, 'Do you currently own a firearm?'

Firearm purchasing since March 2020 was assessed with an item that asked, 'Have you purchased a firearm since March 2020?' Those who responded 'yes' were then asked, 'Was the firearm(s) you purchased since March 2020 the first firearm(s) you ever acquired?'

Presence of firearms in childhood homes was assessed with a single item that asked, 'Were there any firearms in your childhood home?'

Types of firearms owned was assessed with an item that asked, 'How many of each type of firearm do you currently have in or around your home?' Firearm types included 'handgun', 'shotgun' and 'rifle'.

Primary reason for firearm ownership was assessed by first asking firearm owners, 'What are your reasons for keeping a firearm at home?' Participants could select all that applied. Participants were then presented with all items they endorsed in the previous item and asked, 'Which of the following is your primary reason for keeping a firearm at home?'

Firearm storage practices were assessed using two series of items (see [table 2](#)). The first included a list of storage approaches and asked firearm owners, 'Which of the following storage practices do you use for the firearms currently located in or around your home?' Participants selected each storage approach that applied to them and items were thus scored categorically. A second series of items asked firearm owners to, 'Please use the following scale to indicate how often you use specific firearm storage practices.' Scale options included 'never (0%)', 'rarely (1%–25%)', 'occasionally (26%–50%)', 'often (51%–75%)', 'almost always (76%–99%)', 'always (100%)' and 'prefer not to answer'. Those who selected 'prefer not to answer' were excluded from analyses.

Firearm carrying was assessed with a single item that asked firearm owners, 'How frequently do you carry a firearm on your person outside of your home?' Answer choices included 'never', 'rarely', 'sometimes', 'frequently', 'almost always' and 'always'.

### Analytical plan

We used  $\chi^2$  tests for analyses examining differences between states on the percentage of state population that endorsed firearm ownership, firearms in their childhood home, purchasing firearms since 2020 (and whether that firearm was their first), dichotomous firearm storage practices and reasons for firearm ownership. We then used a series of analyses of covariance (ANCOVAs) to examine between-state differences on number of firearms owned, frequency of use of firearm storage

Table 1 Sample demographics

	New Jersey	Minnesota	Mississippi	Texas	Colorado	
<b>Full sample</b>						
<b>Sample size</b>	540	673	178	1704	415	
	%	%	%	%	%	V
<b>Gender</b>						0.02
Male	47.8 <sub>a</sub>	49.2 <sub>a</sub>	44.9 <sub>a</sub>	48.4 <sub>a</sub>	49.6 <sub>a</sub>	
Female	52.2 <sub>a</sub>	50.8 <sub>a</sub>	55.1 <sub>a</sub>	51.6 <sub>a</sub>	50.4 <sub>a</sub>	
<b>Race</b>						0.17
American Indian/Alaskan Native	0.0 <sub>a</sub>	0.4 <sub>a,b</sub>	0.0 <sub>b</sub>	1.3 <sub>b</sub>	0.5 <sub>a,b</sub>	
Asian	10.2 <sub>a</sub>	3.7 <sub>b</sub>	2.2 <sub>b</sub>	5.1 <sub>b</sub>	2.9 <sub>b</sub>	
Black/African American	14.1 <sub>a</sub>	3.1 <sub>b</sub>	39.9 <sub>c</sub>	11.6 <sub>a</sub>	2.4 <sub>b</sub>	
Caribbean Black	1.7 <sub>a</sub>	0.0 <sub>b</sub>	0.0 <sub>a,b</sub>	0.2 <sub>b</sub>	0.0 <sub>b</sub>	
Indo Caribbean	0.7 <sub>a</sub>	0.0 <sub>b</sub>	0.0 <sub>a,b</sub>	0.4 <sub>a,b</sub>	0.0 <sub>a</sub>	
Native Hawaiian/Pacific Islander	0.6 <sub>a</sub>	0.0 <sub>a</sub>	0.0 <sub>a</sub>	0.2 <sub>a</sub>	0.0 <sub>a</sub>	
White	66.7 <sub>a</sub>	88.7 <sub>b</sub>	55.6 <sub>c</sub>	69.2 <sub>a</sub>	82.1 <sub>d</sub>	
Other	5.9 <sub>a</sub>	4.0 <sub>a</sub>	2.2 <sub>a</sub>	12.1 <sub>b</sub>	12.1 <sub>b</sub>	
<b>Rurality</b>						0.25
Non-Metropolitan Rural	10.0 <sub>a</sub>	50.5 <sub>b</sub>	89.9 <sub>c</sub>	42.8 <sub>d</sub>	36.6 <sub>e</sub>	
Metropolitan Rural	40.6 <sub>a</sub>	30.0 <sub>b</sub>	7.9 <sub>c</sub>	28.9 <sub>b</sub>	27.5 <sub>b</sub>	
Urban	49.4 <sub>a</sub>	19.5 <sub>b</sub>	2.2 <sub>c</sub>	28.3 <sub>d</sub>	35.9 <sub>e</sub>	
<b>Political beliefs</b>						0.08
Highly conservative	6.2 <sub>a</sub>	8.4 <sub>a,b</sub>	15.5 <sub>c</sub>	13.5 <sub>c</sub>	10.9 <sub>b,c</sub>	
Somewhat conservative	19.4 <sub>a</sub>	22.9 <sub>a,b</sub>	20.1 <sub>a,b</sub>	21.6 <sub>a</sub>	27.8 <sub>b</sub>	
Moderate	40.7 <sub>a</sub>	39.9 <sub>a</sub>	43.7 <sub>a</sub>	43.1 <sub>a</sub>	32.9 <sub>b</sub>	
Somewhat liberal	22.8 <sub>a</sub>	17.7 <sub>b</sub>	13.8 <sub>b</sub>	15.0 <sub>b</sub>	18.4 <sub>a,b</sub>	
Highly liberal	11.0 <sub>a</sub>	11.1 <sub>a</sub>	6.9 <sub>a,b</sub>	6.7 <sub>b</sub>	10.1 <sub>a</sub>	
<b>Employment status</b>						0.06
Working full time	51.5 <sub>a</sub>	50.1 <sub>a</sub>	46.9 <sub>a</sub>	52.2 <sub>a</sub>	52.2 <sub>a</sub>	
Working part time	13.1 <sub>a,b</sub>	18.1 <sub>c</sub>	9.6 <sub>b</sub>	13.3 <sub>b</sub>	17.6 <sub>a,c</sub>	
Not working	35.4 <sub>a,b,c</sub>	31.8 <sub>c</sub>	43.5 <sub>b</sub>	34.6 <sub>a,c</sub>	30.2 <sub>a,c</sub>	
<b>Household income</b>						0.09
Less than US\$10 000	2.0 <sub>a</sub>	2.4 <sub>a,b</sub>	7.8 <sub>c</sub>	6.4 <sub>c</sub>	4.3 <sub>b,c</sub>	
US\$10 000–US\$24 999	7.4 <sub>a</sub>	6.1 <sub>a</sub>	13.4 <sub>b</sub>	6.7 <sub>a</sub>	5.1 <sub>a</sub>	
US\$25 000–US\$49 999	13.0 <sub>a</sub>	14.4 <sub>a</sub>	20.7 <sub>b,c</sub>	18.8 <sub>c</sub>	14.7 <sub>a,b</sub>	
US\$50 000–US\$74 999	13.0 <sub>a</sub>	17.1 <sub>b</sub>	20.1 <sub>c</sub>	18.4 <sub>b</sub>	16.6 <sub>a,b</sub>	
US\$75 000–US\$99 999	13.1 <sub>a</sub>	16.3 <sub>a</sub>	14.0 <sub>a</sub>	14.2 <sub>a</sub>	14.5 <sub>a</sub>	
US\$100 000–US\$149 999	21.3 <sub>a</sub>	21.7 <sub>a</sub>	16.8 <sub>a</sub>	18.2 <sub>a</sub>	21.2 <sub>a</sub>	
US\$150 000 or more	30.2 <sub>a</sub>	22.0 <sub>b</sub>	7.3 <sub>c</sub>	17.2 <sub>d</sub>	23.6 <sub>b</sub>	
<b>Education</b>						0.11
No high school diploma or GED	5.4 <sub>a</sub>	4.9 <sub>a</sub>	15.7 <sub>b</sub>	11.6 <sub>b</sub>	0.0 <sub>c</sub>	
High school diploma or GED	28.5 <sub>a</sub>	25.7 <sub>a</sub>	26.4 <sub>a</sub>	28.7 <sub>a</sub>	29.6 <sub>a</sub>	
Some college or associate's degree	24.8 <sub>a</sub>	32.4 <sub>b</sub>	36.5 <sub>b</sub>	30.4 <sub>b</sub>	29.6 <sub>a,b</sub>	
Bachelor's degree or Hhigher	41.3 <sub>a</sub>	37.0 <sub>a</sub>	21.3 <sub>b</sub>	29.3 <sub>c</sub>	40.7 <sub>a</sub>	
<b>Age</b>						0.05
18–29	18.7 <sub>a,b,c,d,e</sub>	16.7 <sub>d,e</sub>	14.5 <sub>c,e</sub>	21.1 <sub>b</sub>	16.1 <sub>a,c,d,e</sub>	
30–44	22.0 <sub>a</sub>	27.1 <sub>b</sub>	30.2 <sub>b</sub>	28.5 <sub>b</sub>	32.5 <sub>b</sub>	
45–59	28.0 <sub>a</sub>	25.3 <sub>a</sub>	24.0 <sub>a</sub>	25.1 <sub>a</sub>	24.1 <sub>a</sub>	
60+	31.3 <sub>a</sub>	31.0 <sub>a</sub>	31.3 <sub>a,b</sub>	25.4 <sub>b</sub>	27.2 <sub>a,b</sub>	
<b>Sexual identity</b>						0.06
Heterosexual	92.0 <sub>a</sub>	86.5 <sub>b</sub>	87.6 <sub>a,b</sub>	86.6 <sub>b</sub>	85.3 <sub>b</sub>	
Gay or lesbian	2.2 <sub>a,b</sub>	4.0 <sub>b</sub>	2.2 <sub>a,b</sub>	2.4 <sub>a</sub>	2.2 <sub>a,b</sub>	
Bisexual	1.5 <sub>a</sub>	2.7 <sub>a,b</sub>	3.9 <sub>b,c</sub>	4.5 <sub>c</sub>	5.3 <sub>c</sub>	
Pansexual	0.6 <sub>a</sub>	1.0 <sub>a</sub>	0.0 <sub>a</sub>	0.4 <sub>a</sub>	1.2 <sub>a</sub>	
Asexual	0.6 <sub>a</sub>	2.1 <sub>b,c</sub>	0.0 <sub>a,c</sub>	0.9 <sub>a</sub>	2.2 <sub>b</sub>	
Other	0.9 <sub>a</sub>	1.5 <sub>a,b</sub>	3.9 <sub>c</sub>	1.7 <sub>a,b</sub>	2.7 <sub>b,c</sub>	
Do not wish to disclose	2.2 <sub>a,b</sub>	2.2 <sub>a,b</sub>	2.2 <sub>a,b</sub>	3.4 <sub>b</sub>	1.2 <sub>a</sub>	

Note: Items in rows that do not share subscripts differ significantly from one another ( $p < 0.05$ ). V=Cramer's V, a measure of effect size for  $\chi^2$  analyses. GED, General Educational Development test.

**Table 2**  $\chi^2$  analyses of differences on firearm ownership, exposure, storage practices and reasons for firearm ownership

	New Jersey	Minnesota	Mississippi	Texas	Colorado	
<b>Full sample</b>						
<b>Sample size</b>	538	669	171	1676	411	
	n (%)	n (%)	n (%)	n (%)	n (%)	V
Firearm owner	71 (13.2) <sub>a</sub>	213 (31.8) <sub>b</sub>	78 (45.6) <sub>c</sub>	535 (31.9) <sub>b</sub>	129 (31.4) <sub>b</sub>	0.17
Firearms in childhood home	97 (18.0) <sub>a</sub>	332 (49.3) <sub>b</sub>	93 (53.4) <sub>b</sub>	693 (41.1) <sub>c</sub>	193 (46.7) <sub>b</sub>	0.25
Purchase since March 2020	30 (5.6) <sub>a</sub>	51 (7.6) <sub>a</sub>	11 (6.3) <sub>a</sub>	136 (8.1) <sub>a</sub>	30 (7.3) <sub>a</sub>	0.03
First ever firearm?	18 (60.0) <sub>a</sub>	15 (29.4) <sub>b</sub>	1 (10.0) <sub>b</sub>	30 (22.2) <sub>b</sub>	4 (11.4) <sub>b</sub>	0.30
<b>Among firearm owners</b>						
<b>Sample size</b>	69	194	69	497	121	
<b>Firearm storage practices (yes/no)</b>	%	%	%	%	%	V
Gun safe	36 (52.2) <sub>a</sub>	75 (38.7) <sub>a</sub>	29 (42.0) <sub>a</sub>	200 (40.2) <sub>a</sub>	49 (40.5) <sub>a</sub>	0.07
Locking device	19 (27.5) <sub>a</sub>	27 (14.0) <sub>b</sub>	12 (17.4) <sub>ab</sub>	116 (23.3) <sub>a</sub>	32 (26.2) <sub>a</sub>	0.11
Closet or drawer, unloaded	20 (29.0) <sub>a</sub>	56 (28.9) <sub>a</sub>	27 (39.1) <sub>a</sub>	162 (32.6) <sub>a</sub>	38 (31.4) <sub>a</sub>	0.06
Closet or drawer, loaded	2 (2.9) <sub>a</sub>	24 (12.4) <sub>b</sub>	25 (36.2) <sub>c</sub>	145 (29.2) <sub>c</sub>	17 (14.0) <sub>b</sub>	0.23
In vehicle, locked container	0 (0.0) <sub>a</sub>	3 (1.5) <sub>ab</sub>	4 (5.8) <sub>bc</sub>	28 (5.6) <sub>c</sub>	7 (5.7) <sub>c</sub>	0.10
In vehicle, unlocked	0 (0.0) <sub>a</sub>	7 (3.6) <sub>ab</sub>	11 (15.9) <sub>c</sub>	34 (6.8) <sub>b</sub>	3 (2.5) <sub>ab</sub>	0.15
	%	%	%	%	%	V
<b>Primary reason for firearm ownership</b>						0.27
Received as a gift or inheritance	2 (2.9) <sub>a</sub>	17 (8.8) <sub>ab</sub>	6 (8.7) <sub>ab</sub>	35 (7.0) <sub>a</sub>	18 (14.6) <sub>b</sub>	
Family heirloom	1 (1.4) <sub>a</sub>	6 (3.1) <sub>a</sub>	3 (4.3) <sub>a</sub>	15 (3.0) <sub>a</sub>	3 (2.4) <sub>a</sub>	
Safety at home	49 (70.0) <sub>a</sub>	62 (32.0) <sub>b</sub>	35 (50.7) <sub>c</sub>	342 (68.4) <sub>a</sub>	63 (51.2) <sub>c</sub>	
Safety away from home	0 (0.0) <sub>a</sub>	3 (1.5) <sub>a</sub>	11 (15.9) <sub>b</sub>	28 (5.6) <sub>c</sub>	3 (2.4) <sub>ac</sub>	
Competition	1 (1.4) <sub>a</sub>	2 (1.0) <sub>a</sub>	0 (0.0) <sub>a</sub>	1 (0.2) <sub>a</sub>	1 (0.8) <sub>a</sub>	
Hunting	3 (4.3) <sub>abc</sub>	73 (37.6) <sub>d</sub>	8 (11.6) <sub>c</sub>	26 (5.2) <sub>b</sub>	16 (13.0) <sub>ac</sub>	
Other recreation	6 (8.6) <sub>ab</sub>	14 (7.2) <sub>ab</sub>	0 (0.0) <sub>c</sub>	27 (5.4) <sub>b</sub>	14 (11.4) <sub>a</sub>	
Expression of freedom	6 (8.6) <sub>a</sub>	6 (3.1) <sub>a</sub>	1 (1.4) <sub>ab</sub>	4 (0.8) <sub>b</sub>	0 (0.0) <sub>b</sub>	
Firearm belongs to someone else	0 (0.0) <sub>ab</sub>	5 (2.6) <sub>bc</sub>	5 (7.2) <sub>c</sub>	3 (0.6) <sub>a</sub>	2 (1.6) <sub>ab</sub>	
Don't know how to get rid of firearm	1 (1.4) <sub>a</sub>	0 (0.0) <sub>ab</sub>	0 (0.0) <sub>ab</sub>	0 (0.0) <sub>b</sub>	2 (1.6) <sub>a</sub>	
Other	1 (1.4) <sub>a</sub>	6 (3.1) <sub>a</sub>	0 (0.0) <sub>a</sub>	19 (3.8) <sub>a</sub>	1 (0.8) <sub>a</sub>	

Note: Items in rows that do not share subscripts differ significantly from one another ( $p < 0.05$ ). V=Cramer's V, a measure of effect size for  $\chi^2$  analyses.

practices and frequency of firearm carrying. For analyses examining number of firearms, we covaried for gender, age and race. For the remaining ANCOVAs, we also covaried for number of types of firearm owned. (Covariates were selected to account for the varying demographics between states and the potential impact of such factors on firearm ownership and use. Analyses were rerun without covariates and results remained unchanged with respect to statistical significance and nearly identical with respect to effect size). Pairwise comparisons based on estimated marginal means were used to examine differences between individual states.

## RESULTS

### Full sample analyses

As shown in table 2, states differed significantly in their proportion of firearm ownership ( $\chi^2=97.06$ ,  $p < 0.001$ ,  $\Phi=0.17$ ). Mississippi (45.6%) reported the highest level of firearm ownership, differing from all other states. Colorado (31.4%), Texas (31.9%) and Minnesota (31.8%) did not differ from one another, but all reported significantly higher firearm ownership than New Jersey (13.2%).

States also differed on the percentage of their population that reported firearms in their childhood homes ( $\chi^2=215.94$ ,  $p < 0.001$ , Cramer's  $V=0.25$ ). Minnesota (49.3%), Mississippi (53.4%) and Colorado (46.4%) did not differ from one another, but all reported higher frequencies than did Texas (41.1%) and

New Jersey (18.0%), who also significantly differed from one another.

States did not differ on the percentage of their population who reported purchasing firearms since March 2020 ( $\chi^2=4.14$ ,  $p=0.388$ ,  $V=0.03$ ). They did, however, differ on the percentage of recent purchasers for whom the firearm was the first they had ever purchased ( $\chi^2=22.48$ ,  $p < 0.001$ ,  $V=0.30$ ). New Jersey (60.0%) reported the highest percentage of first-time firearm owners, whereas Minnesota (29.4%), Mississippi (10.0%), Texas (22.2%) and Colorado (11.4%) did not differ from one another.

### Analyses of firearm owners

Among firearm owners ( $n=950$ ; table 2), states did not differ on the percentage of residents who reported storing their firearms in a gun safe ( $\chi^2=4.16$ ,  $p=0.384$ ,  $V=0.07$ ) or unloaded in a closet or drawer ( $\chi^2=2.88$ ,  $p=0.579$ ,  $V=0.06$ ). However, states differed significantly on all other storage practices. For locking devices ( $\chi^2=11.16$ ,  $p=0.025$ ,  $V=0.11$ ), Minnesota reported a significantly lower percentage (14.0%) than any other state except Mississippi (17.4%), which did not differ from any other states (New Jersey: 27.5%, Texas: 23.3%, Colorado: 26.2%). For storing firearms loaded in a closet or drawer ( $\chi^2=52.02$ ,  $p < 0.001$ ,  $V=0.23$ ), Mississippi (36.2%) and Texas (29.2%) reported higher percentages than all other states. Minnesota (12.4%) and Colorado (14.0%) reported higher percentages than did New Jersey (2.9%). For storing firearms in a vehicle



**Table 3** Analyses of covariance examining differences in number of firearms owned, firearm storage practices and firearm carrying frequency

	New Jersey	Minnesota	Mississippi	Texas	Colorado	
<b>Among firearm owners</b>						
Sample size	67	195	65	453	119	
Firearm ownership*	M (SE)	M (SE)	M (SE)	M (SE)	M (SE)	$\eta^2$ †
# of handguns	1.64 (.23) <sub>a,b</sub>	1.48 (.14) <sub>b</sub>	2.00 (.24) <sub>a,b</sub>	2.05 (.09) <sub>a</sub>	1.92 (.17) <sub>a</sub>	0.02
# of shotguns	0.73 (.19) <sub>a,c</sub>	1.68 (.11) <sub>b</sub>	1.20 (.19) <sub>a</sub>	1.09 (.07) <sub>a</sub>	0.73 (.14) <sub>c</sub>	0.04
# of rifles	0.96 (.26) <sub>a</sub>	1.87 (.15) <sub>b</sub>	1.94 (.27) <sub>a,b</sub>	1.49 (.10) <sub>a</sub>	1.53 (.19) <sub>a,b</sub>	0.01
<b>Firearm storage/use frequency‡</b>						
1+firearms loaded	2.63 (.26) <sub>a</sub>	2.58 (.16) <sub>a</sub>	3.70 (.27) <sub>b</sub>	3.89 (.10) <sub>b</sub>	2.84 (.20) <sub>a</sub>	0.07
All firearms w/locking device	3.42 (.28) <sub>a,b</sub>	3.00 (.17) <sub>a</sub>	3.05 (.30) <sub>a,b</sub>	3.65 (.11) <sub>b</sub>	3.27 (.22) <sub>a,b</sub>	0.01
All firearms in locked location	5.10 (.26) <sub>a</sub>	4.00 (.16) <sub>b</sub>	4.14 (.27) <sub>b</sub>	4.32 (.10) <sub>b</sub>	4.33 (.21) <sub>b</sub>	0.02
Carry firearms on person	0.85 (.18) <sub>a</sub>	0.95 (.11) <sub>a</sub>	1.83 (.18) <sub>b</sub>	1.46 (.07) <sub>b</sub>	1.07 (.13) <sub>a</sub>	0.04

\*Analyses covary for gender, age and race;  
†Analyses covary for gender, age, race, number of handguns owned, number of shotguns owned and number of rifles owned. Storage items scored as follows: (1) (never, 0%), (2) rarely (1%–25%), (3) occasionally (26%–50%), (4) often (51%–75%), (5) almost always (76%–99%), (6) always (100%). Carrying frequency scored as follows: 0 (never), 1 (rarely), 2 (sometimes), 3 (frequently), 4 (almost always), 5 (always). Note: Items in rows that do not share subscripts differ significantly from one another ( $p < 0.05$ ).  $\eta^2$  = partial eta squared, a measure of effect size for ANCOVA analyses. Pairwise comparisons based on estimated marginal means were used to examine differences between states for ANCOVA analyses with significant ( $p < 0.05$ ) omnibus tests.  
‡ANCOVA, analyses of covariance.

in a locked container ( $\chi^2=9.54$ ,  $p=0.049$ ,  $V=0.10$ ), Colorado (5.7%) and Texas (5.6%) reported higher percentages than all states except Mississippi (5.8%), which reported a higher percentage than New Jersey (0.0%) but not Minnesota (1.5%). Lastly, for storing firearms in a vehicle not in a locked container ( $\chi^2=22.48$ ,  $p < 0.001$ ,  $V=0.15$ ), Mississippi (15.9%) reported a higher percentage than all other states. Texas (6.8%) differed from New Jersey (0.0%), but not from Minnesota (3.6%) or Colorado (2.5%).

The five states differed significantly in the percentage of firearm owning residents endorsing specific primary reasons for firearm ownership ( $\chi^2=267.61$ ,  $p < 0.001$ ,  $V=0.27$ ). Within New Jersey (70.0%), Mississippi (50.7%), Texas (68.4%) and Colorado (51.2%), safety at home was the most commonly endorsed primary reason for ownership. In contrast, only 32.0% of Minnesota firearm owners endorsed this as their primary reason, while hunting (37.2%) served as the most commonly endorsed reason.

The final set of results (table 3) leveraged ANCOVAs to examine between state differences in number of handguns, shotguns and rifles owned, as well as differences in frequency of various firearm storage practices and frequency of firearm carrying. Among firearm owners, states differed in the average number of handguns owned ( $F=3.44$ ,  $p=0.008$ ,  $\eta^2=0.02$ ), with Minnesota residents owning fewer handguns ( $m=1.48$ ,  $SE=0.14$ ) than Texas ( $m=2.05$ ,  $SE=0.09$ ) and Colorado ( $m=1.92$ ,  $SE=0.17$ ) residents. The states also differed in the number of shotguns ( $F=9.63$ ,  $p < 0.001$ ,  $\eta^2=0.04$ ) and rifles ( $F=3.19$ ,  $p=0.013$ ,  $\eta^2=0.01$ ) owned. Minnesota residents owned more shotguns ( $m=1.68$ ,  $SE=0.11$ ) than residents in any other state and more rifles ( $m=1.87$ ,  $SE=0.15$ ) than residents of New Jersey ( $m=0.96$ ,  $SE=0.26$ ) and Texas ( $m=1.49$ ,  $SE=0.10$ ).

With respect to storage and use practices, states differed from one another in the frequency of storing one or more firearms loaded ( $F=17.31$ ,  $p < 0.001$ ,  $\eta^2=0.07$ ), with a locking device in place ( $F=3.09$ ,  $p=0.015$ ,  $\eta^2=0.01$ ) and in a locked location ( $F=3.27$ ,  $p=0.011$ ,  $\eta^2=0.02$ ), as well as the frequency of carrying firearms ( $F=8.74$ ,  $p < 0.001$ ,  $\eta^2=0.04$ ). Residents in Mississippi ( $m=3.70$ ,  $SE=0.27$ ) and Texas ( $m=3.89$ ,  $SE=0.10$ ) stored firearms loaded more frequently than firearm owners in other states. Firearm owners in Minnesota ( $m=3.00$ ,  $SE=0.17$ )

stored firearms with a locking device in place less often than firearm owners in Texas ( $m=3.65$ ,  $SE=0.11$ ). Firearm owners in New Jersey stored firearms in a locked location ( $m=5.10$ ,  $SE=0.26$ ) more frequently than firearm owners in other states. Lastly, firearm owners in Mississippi ( $m=1.83$ ,  $SE=0.18$ ) and Texas ( $m=1.46$ ,  $SE=0.07$ ) carry firearms more frequently than firearm owners in other states.

## DISCUSSION

This study sought to characterise firearm ownership, storage and carrying behaviours across five states: Colorado, Minnesota, Mississippi, New Jersey and Texas. Results yielded three main findings. First, we uncovered differences in proportion of firearm ownership across the five states. Second, there was substantial variation across states in first-time firearm purchases. Finally, we found significant differences in firearm storage practices, reasons for ownership, number of firearms owned and carrying habits.

Firearm ownership proportions differ significantly by state and New Jersey is a clear outlier. Since firearm ownership in the Northeast is typically lower than other regions,<sup>9,23</sup> we anticipated New Jersey would report lower firearm ownership. While true, there has been a clear surge in first-time firearm purchasing among New Jersey residents since March 2020. This is of particular concern in a state like New Jersey, where firearm ownership is low and people may have fewer personal experiences with using, carrying and storing firearms securely.

Although the primary reason for firearm ownership has shifted nationally from recreational purposes to self-protection,<sup>24,25</sup> residents in Minnesota still report owning firearms primarily for hunting. This signifies a potentially distinct cultural aspect of ownership in Minnesota and aligns with the more common ownership of long guns in Minnesota, which are mainly used for hunting.<sup>3</sup> This result highlights the importance of considering these variables on the state level, thereby facilitating an understanding of smaller pockets of firearm owners who own different firearms for different reasons and may thus respond differently to interventions aimed at promoting secure firearm storage and other safe firearm-related behaviour.

Unsecure firearm storage practices also varied across states. Storing a loaded firearm in a drawer or closet was significantly more common in Texas and Mississippi, both states where ownership for self-protection is common. Similarly, Mississippi reported higher proportions of unlocked storage in a vehicle, a practice that can lead to unintended shootings, violent assaults and theft.<sup>26</sup> Heightened proportions of unsecure storage practices and firearm ownership for self-protection may contribute to Mississippi's high rate of firearm deaths compared with all other states.<sup>27</sup> Similarly, residents of Mississippi and Texas are more likely than those in other states to store firearms loaded and carry firearms outside of the home, which can lead to unintentional injuries, assaults and thefts.<sup>26</sup>

Our findings also indicated that firearm owners in Mississippi and Texas carry firearms outside of their homes more frequently. Although we were unable to assess reasons for carrying or the locations in which individuals most frequently carry, our findings nonetheless represent the first to consider how this risky behaviour varies at the state level. It may be that aspects of the cultures of these states (eg, honour ideology<sup>28</sup>) in combination with the high prevalence of firearm access and limited regulation on carrying practices encourages a set of social norms within which individuals are more inclined to keep firearms on their person outside their homes. Recent research has highlighted that loosening restrictions on concealed carry results in increases in both fatal and non-fatal violent crime.<sup>29</sup> As such, the environment fostered within states like Mississippi and Texas with respect to firearm carrying may directly influence gun violence incidence in those areas.

States vary considerably not only in the stringency of their firearm policies but also firearm behaviours among their residents.<sup>30</sup> As such, public health outreach to reduce firearm injuries and deaths must account for statewide differences in everyday firearm practices. For instance, a surge of new owners in New Jersey, where firearm ownership is generally low, necessitates outreach and messaging that provides training assistance, education on secure storage and information on protecting children in homes with firearms.<sup>31</sup> Because residents of Minnesota cite hunting as the primary reason for ownership, messaging to encourage the use of gun lockers and cabinets may be more accepted than the use of cable locks. Conversely, states such as Mississippi and Texas, with high rates of ownership for self-protection, may require different messaging to encourage secure storage practices. A coalition of credible messengers (eg, law enforcement) may be most effective for establishing a strategy to communicate to firearm owners across states.<sup>32–34</sup>

This study is not without limitations. First, findings are only generalisable to the five states included in the study. Our choice of states was intentional; however, any number of other combinations could have been chosen instead and future work should aim to consider those possibilities while maintaining a focus on local differences rather than simple national or regional findings. Second, the data are cross-sectional and therefore all relationships described are associational in nature. Finally, the findings are based on self-report survey items, which may lead to reporting bias regarding firearm behaviours. Third, several of our comparisons involved extremely small cell sizes that complicate or preclude clear interpretation. As such—and particularly with respect to the vehicle storage findings—caution should be used in drawing conclusions. Relatedly, comparisons between states for several reasons for firearm ownership included numerous instances of extremely low cell sizes. We believe it is important to include these data for descriptive purposes, but encourage caution in interpreting comparisons for reasons other

than safety at home and hunting. Despite these limitations, this study provides a recent and nuanced look at firearm ownership, storage and carrying behaviours across five states following a period of significant change and new firearm purchasing. Messaging related to firearm safety should consider the state-wide differences examined here to ensure effective communication and increase the likelihood of safe firearm behaviours.

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