Title: Handgun Acquisition in California during the Pandemic: Patterns by Demographic and Prior Ownership

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Abstract: We describe patterns of licit handgun acquisitions before (01/2017-02/2020) and during (03/2020-09/2021) the COVID-19 pandemic using administrative records from California. Handgun acquisitions doubled soon after the pandemic began, returning near pre-pandemic levels over 19 months. The early increase in handgun sales was largely attributable to first-time acquirers. The largest percentage increases in first-time handgun acquisition occurred among women and racial and ethnic minorities (e.g., first-time acquisitions among Black women increased by 350%). The overall demographic composition of California's handgun owners changed little, however, because White men continued to dominate handgun acquisition and ownership throughout the pandemic.

One-Sentence Summary: First-time handgun acquisitions more than doubled over the pandemic, with larger relative increases for women and minorities.

Main Text: The onset of the COVID-19 pandemic coincided with the largest sustained increase in firearm acquisition on record in the United States (*1*). Data from the National Instant Criminal Background Checks System ("NICS"), a widely used proxy for aggregate firearm sales, suggest that 8.4 million more firearms were acquired in the first year of the pandemic than in the previous year (*2*). However, NICS is an imperfect proxy for acquisition volume and provides no information about the demographics or prior firearm ownership of firearm acquirers (*3*).

More detailed profiles of firearm acquirers during the pandemic have come from surveys and interviews. Survey data show that the pandemic-era spike in firearm acquisitions included many first-time acquirers, who, as a group, are more likely to be younger, non-white, and female than firearm owners generally (*1, 4-7*). However, these survey studies were not designed to identify temporal dynamics of firearm acquisition across the pandemic.

We extend prior work by leveraging 26 years of acquisition-level administrative records from California to examine patterns of firearm acquisition and ownership during the pandemic. In addition to covering virtually all licit handgun acquisitions in California, these data allowed us to observe each acquirer's demographics and their sequence of handgun acquisitions over time. Using this information to construct monthly histories of handgun acquisition and ownership at the individual level, we were able to compare trends in pandemic-era handgun acquisitions between repeat and first-time handgun acquirers, across demographic groups, and with acquisitions and ownership in the pre-pandemic period (*8*). Although our administrative records pertain only to California, the state's over-time patterns of firearm acquisitions in NICS data are remarkably similar to those of the U.S. as a whole (**Fig. S1**).

Results

Characteristics of Acquisitions and Acquirers

Our core analytic dataset comprised 4,174,687 licit firearm acquisitions in California between January 1, 2017 and September 30, 2021 (**Table 1**). Acquirers were disproportionately likely to be male, non-Hispanic White, and 26-45 years in age.

First-time handgun acquirers accounted for 37% of all handgun acquisitions in the study sample. Women and racial or ethnic minorities accounted for disproportionately large shares of these first-time handgun acquisitions. For instance, although women only accounted for 10% of total firearm acquisitions, they accounted for 22% of first-time handgun acquisitions. Moreover, 46% of all handgun acquisitions among women were first-time acquisitions, compared to 18% among men.

Time Trends in Firearm Acquisitions Overall

California experienced relatively flat trends in firearm acquisition during the three years prior to March 2020, when the WHO declared a pandemic due to the rapidly-spreading SARS-CoV-2 virus and the state's Governor Gavin Newsom declared a state of emergency (**Fig. 1**). On average, there were approximately 120 handgun acquisitions and 90 long gun acquisitions per 100,000 adults per pre-pandemic month. In the month following the emergency declaration, acquisitions nearly doubled, from 210 firearms (120 handguns, 90 long guns) per 100k adults in February, to 430 firearms (260 handguns, 170 long guns) in March. After this initial spike, firearm acquisitions began to slowly approach their pre-pandemic level, returning to the general range of pre-pandemic levels after 19 months.

Time Trends in Handgun Acquisitions Among First-time Handgun Acquirers

The spike in handgun acquisitions at the beginning of the pandemic was largely attributable to first-time acquirers (**Fig. 2)**. Prior to the pandemic, people who owned at least one handgun acquired more at approximately double the (monthly) acquisition rate of people who had owned none. At the onset of the pandemic, acquisitions among first-time acquirers more than tripled, far exceeding the rate among repeat acquirers. The handgun acquisition rate among first-time acquirers remained at or above the rate among repeat acquirers for 5 more months. Approximately 19 months after onset of the pandemic, both groups had reverted to acquisition rates resembling the pre-pandemic period.

Figure 3 shows percentage changes in acquisitions by first-time handgun acquirers over the study period, according to the acquirer's gender and racial or ethnic group. The percentage changes shown are relative to the mean rate in the pre-pandemic period (January 1, 2017–February 29, 2020). The flat trends prior to March 2020 demonstrate that there were no major changes in first-time handgun acquisition within any of these demographic groups in the 3 years leading up to the pandemic. However, during the first month of the pandemic, there were large increases in first-time handgun acquisitions among men and women in every racial or ethnic group we examined. These increases ranged from approximately 200% among White men to 750% and 1,200% among Asian men and women, respectively. Handgun acquisition rates among Black and Hispanic men increased over 400%, and rates among Black and Hispanic women increased approximately 600%.

Throughout the first 19 months of the pandemic, women and racial and ethnic minorities maintained larger percentage increases in first-time handgun acquisitions than men and Whites, relative to each group's pre-pandemic rate. The reversion towards pre-pandemic rates of first-time acquisition also occurred more quickly for Whites. By contrast, 19 months into the pandemic, women in racial and ethnic minorities continued to become new handgun owners at more than double their pre-pandemic rate. **Table S1** provides additional details on the changes depicted in Fig. 3, including their expression as counts of first-time handgun acquisition and as comparisons to demographic-specific population and total firearm acquisitions.

First-time Handgun Acquisitions and Levels of Handgun Ownership

Overall, 469,757 adults in California acquired their first handgun during the pandemic, which we estimated as increasing handgun ownership by 19% in the state. (The Supplemental Material details our method for translating the level of first-time handgun acquisitions into changes in handgun ownership.)

We found an inverse relationship between the size of a demographic group's spike in first-time handgun acquisition during the pandemic and their rate of handgun ownership prior to the pandemic (**Fig. 4**). White men are at one extreme of this inverse relationship. Approximately 177,000 White men in California acquired a handgun for the first time during the first 19 months of the pandemic, representing a 130% increase in monthly first-time handgun acquisition. This was the smallest percentage increase of any demographic group we examined. However, given the prevalence of White men in California's adult population, and their relatively high rates of handgun acquisition prior to the pandemic, the absolute number of first-time handgun acquirers who were White men was far larger than the number of first-time acquirers in any other group. Overall, White men had the highest rate of handgun ownership—both at the start of the pandemic and at the end of our study period.

Black women are at the other extreme of the inverse relationship. Approximately 14,000 Black women became handgun owners for the first time during the pandemic, representing a 350% increase in first-time acquirers. This was the largest relative increase of any demographic group we examined. Nonetheless, the number of handgun acquisitions among Black women was small relative to other demographic groups. This statistical result is due to the combination of two factors: Black women account for a small share of the California population (diminishing their size as a consumer segment), and they had low rates of handgun ownership prior to the pandemic (enlarging their potential for first time acquisitions). Overall, handgun ownership among Black women remained below 5% throughout the study period, among the lowest of any group we examined.

We also observed an inverse relationship between a demographic group's total handgun acquisitions during the pandemic and the group's percentage increase in handgun ownership (**Fig. S2**).

In sum, we found that the percentage increases in first-time handgun acquisitions among women and racial and ethnic minorities did not materially alter the demographics of handgun ownership in California. For example, Whites accounted for 65% of handgun owners prior to the pandemic and 63% at the end of our study period, and the proportion of men among handgun owners held steady at approximately 85% (Table S1). The pandemic-era spikes in first-time handgun acquisitions among women and racial and ethnic minorities were overwhelmed by the level of handgun ownership prior to the pandemic and the raw quantity of first-time handgun acquisitions among men and Whites.

Discussion

We characterized the magnitude and dynamics of firearm acquisition in California between early 2020, when the COVID-19 pandemic took off, and late 2021, when rates of acquisition returned near pre-pandemic levels. Compared with pre-pandemic levels, increases in handgun acquisitions were especially large among first-time acquirers and in demographic groups—particularly women and racial and ethnic minorities—that have historically had relatively low rates of firearm acquisition and ownership (*10, 11*).

The surge in firearm acquisitions we documented in California mirrors findings from several national studies of the pandemic-era firearms market (*1–7*). Collectively, these studies indicate a spike in firearm acquisitions of unprecedented size and duration. Previous studies document spikes in firearm acquisitions of up to 50% after mass shootings (9, *12–14*), around elections (*15*), and before the 1994 Assault weapons ban (*16*), with heightened levels of acquisition persisting for a few weeks to several months. By contrast, in the first month of the pandemic, firearm acquisitions in California increased by more than 100%, and then remained above their pre-pandemic level for 19 months.

Decomposing the surge according to individual acquisition histories showed that many Californians became handgun owners for the first time during the pandemic. In previous research, we estimated that first-time handgun acquisitions in California increased by 50–75% in the 6 weeks following 2 major mass shooting events (*9*). By contrast, the rate of first-time handgun acquisition in California rose by more than 100% for the first 7 months of the pandemic.

Further decomposing the surge by demographics, the largest percentage increases in first-time handgun acquisitions occurred among women and racial and ethnic minorities, groups typically associated with low rates of firearm acquisition and ownership (*17, 18*). Yet, in absolute levels, these first-time acquisitions were overshadowed by handgun ownership among non-Hispanic White men, both its level prior to the pandemic and its increase during the pandemic-era. As such, the demographic groups with the largest percentage increases in handgun ownership during the pandemic tended to account for the lowest levels of handgun ownership overall.

Handgun owners are at higher risk of suicide than non-owners, and people who live with them face higher risks of dying by homicide and suicide (*19–22*). Hence, the 19% increase in first-time handgun ownership during the pandemic is likely to place hundreds of thousands of Californians at increased risk of violent death. Since we found especially large increases in handgun ownership among women and racial and ethnic minorities—for example, a 27% increase among Asian men and a 56% increase among Black women—our results suggests that there may be a disproportionately large increase in the risk of firearm injury within these subpopulations.

Our study had several limitations. Our measure of handgun ownership is imperfect. It relies on administrative records of historical handgun acquisitions since 1996. Hence, some people we classified as first-time acquirers may in fact have acquired a handgun prior to 1996 and then not again until the acquisition we observed. In addition, our measure neither accounts for ownership arising from intra-family bequests and illicitly acquired firearms, nor for the termination of ownership due to divestment and the deaths of owners over time. However, our prior work suggests first-time handgun acquisition is a reasonably good proxy for changes in handgun ownership—due in part to the facts that divestment is rare and mortality changes are modest over the time scales of our analyses (*19, 23, 24*). Overall, our ownership measure implies that 8 percent of adults in California owned a handgun in 2018, which is 2 percentage points lower than survey-based estimates of the same population (*18*).

The demographic measures we analyzed were limited by the resolution of our data. In the raw data, race and ethnicity are coded together as a single variable and gender is coded as a male/female binary (**Fig. S3**). This coding scheme prevents us from analyzing demographics according to contemporary best-practices or the schemes currently available from the U.S. Census. The Supplemental Materials discusses our demographic measures in greater detail.

Most of our analyses used firearm acquisition data restricted to handguns in California. In considering whether the patterns we documented may hold more broadly, it is noteworthy that the time series of handgun acquisition quantities in California correlates strongly with proxy measures of the national market from NICS data (Pearson's $\rho>0.9$, **Fig. S1, Fig. S4**) and that the demographic and ownership patterns we observed are similar to patterns from nationally representative surveys (*1–7, 10, 11, 17*).

A final limitation arises from the descriptive nature of our study, which prevented us from assigning specific causes to the patterns of handgun purchasing we observed. Although many momentous events occurred over our study period—including the death of George Floyd and the 2020 Presidential Election—we did not attempt to disentangle their effects from one another, or from the pandemic as a whole.

The COVID-19 pandemic coincided with an unprecedentedly large and sustained increase in firearm acquisitions across the U.S. In California, many of these acquisitions were made by individuals new to handgun ownership, a phenomenon particularly evident among women and minorities. However, these patterns are modest in magnitude relative to the size of the pre-pandemic firearm stock, the dominance of typical firearm acquirers during the pandemic, and the reversion towards pre-pandemic rates of handgun acquisition after their initial spike. As such, the prevalence and demographics of handgun ownership in California changed only modestly after the first 19 months of the pandemic.

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Funding: Provide complete funding information, including grant numbers, complete funding agency names, and recipient's initials. Each funding source should be listed in a separate paragraph.

Examples:

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Methodology: AMR, DS, MM

Formal Analysis: AMR

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Data and materials availability: Data used in this study may be accessed through the California Department of Justice via their prescribed process for research data requests. Our data use agreement requires us to store information on secure servers and prevents us from sharing the data with other individuals and organizations.

Supplementary Materials

Materials and Methods

Figs. S1 to S4

Tables S1

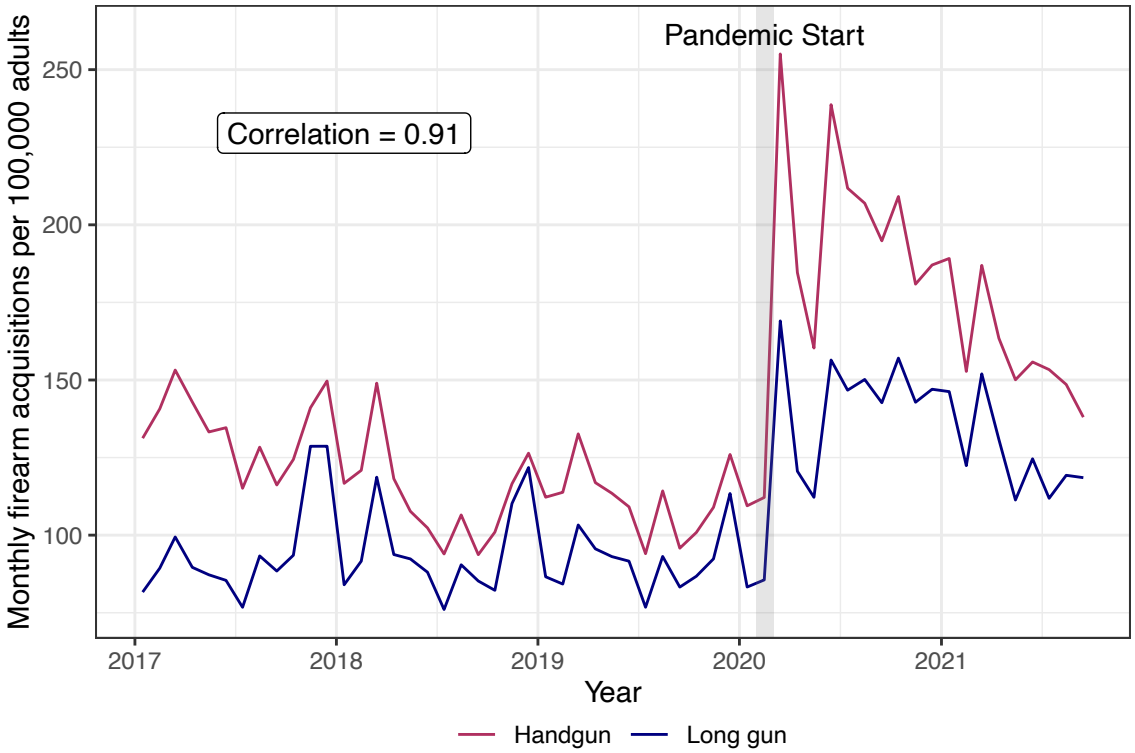

Fig. 1. Time Trends in Handgun and Long Gun Acquisitions per capita in California. Monthly trends in firearm acquisitions per 100,000 adults from January 1, 2017–September 30, 2021 in California. Red series is the trend of handguns and blue series of long guns. Correlation is the Pearson correlation coefficient between the two series. Gray bar denotes a range of pandemic start dates from the WHO emergency declaration (January 31, 2020) to the California state of emergency declaration (March 2, 2020).

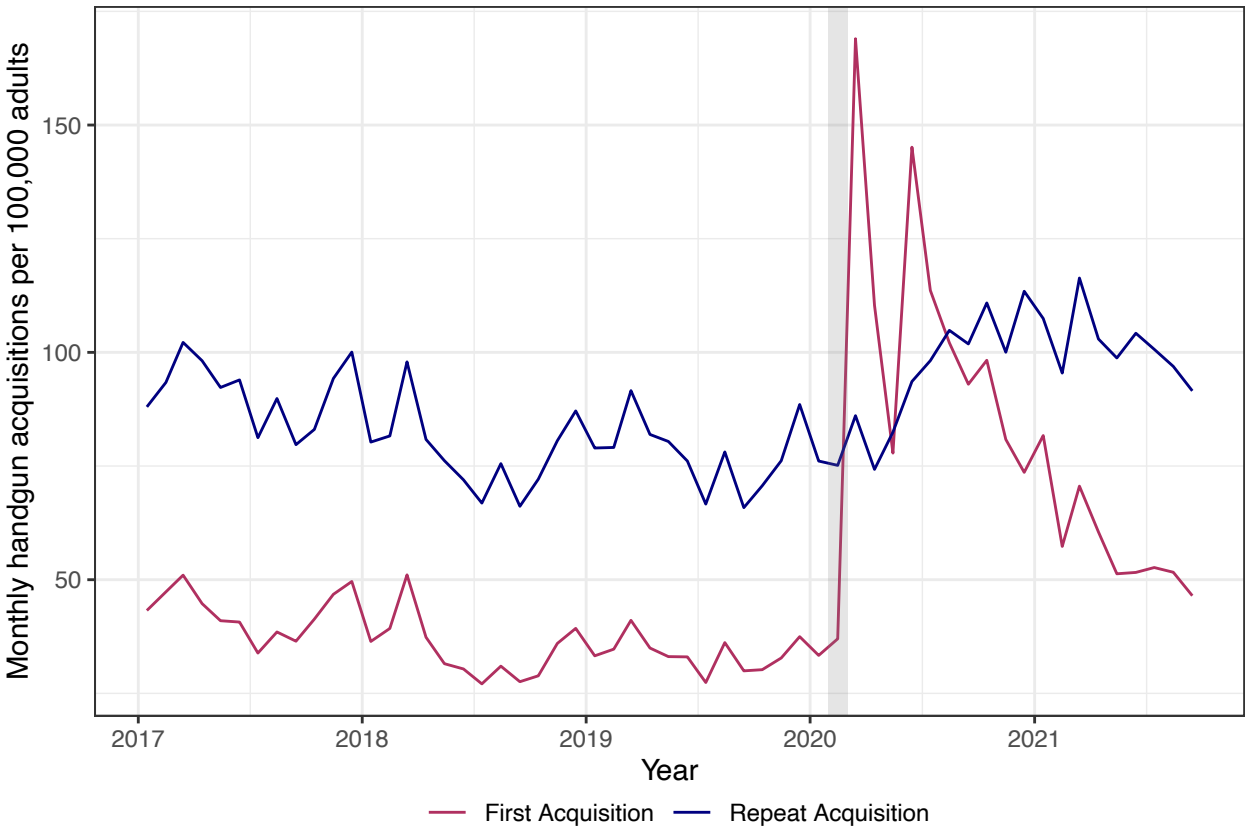

Fig. 2. Time Trends in First-time and Repeat Handgun Acquisitions per capita. Monthly trends in handgun acquisitions per 100,000 adults in California from January 1, 2017–September 30, 2021. Red series is the trend in acquisitions in which the acquirer has no record of a handgun acquisition in California between January 1, 1996 and the acquisition date. Blue series is the trend from all other acquisitions. Gray bar denotes a range of pandemic start dates from the WHO emergency declaration (January 31, 2020) to the California state of emergency declaration (March 2, 2020).

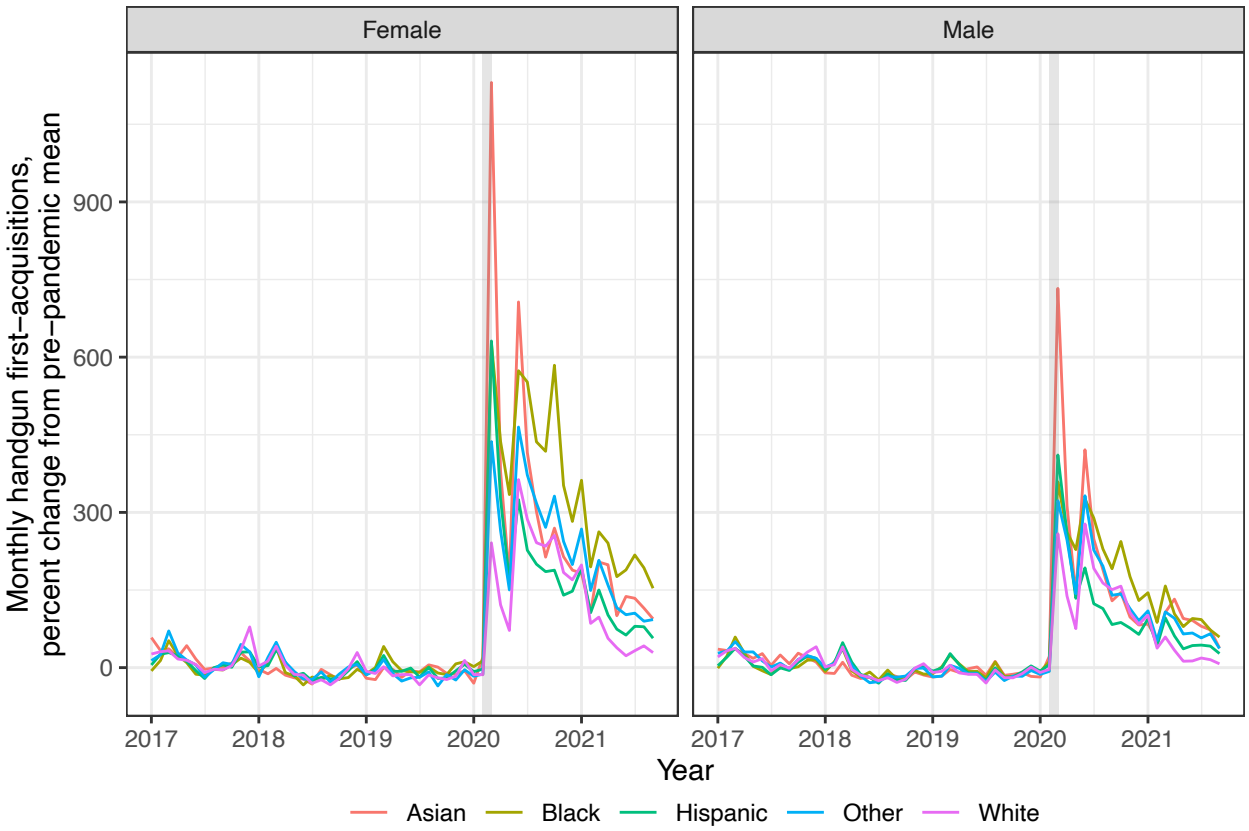

Fig. 3. Time Trends in First-Time Handgun Acquisitions per capita by Race/Ethnicity and Gender. Monthly trends in first-time handgun acquisitions in California from January 1, 2017–September 30, 2021 by race or ethnicity and gender. Trends are presented as percent change from the pre-pandemic monthly rate of first-time acquisition, calculated from January 1, 2017–February 29, 2020. Left panel is women and right panel is men. Series color corresponds to racial or ethnic group. Gray bar denotes a range of pandemic start dates from the WHO emergency declaration (January 31, 2020) to the California state of emergency declaration (March 2, 2020).

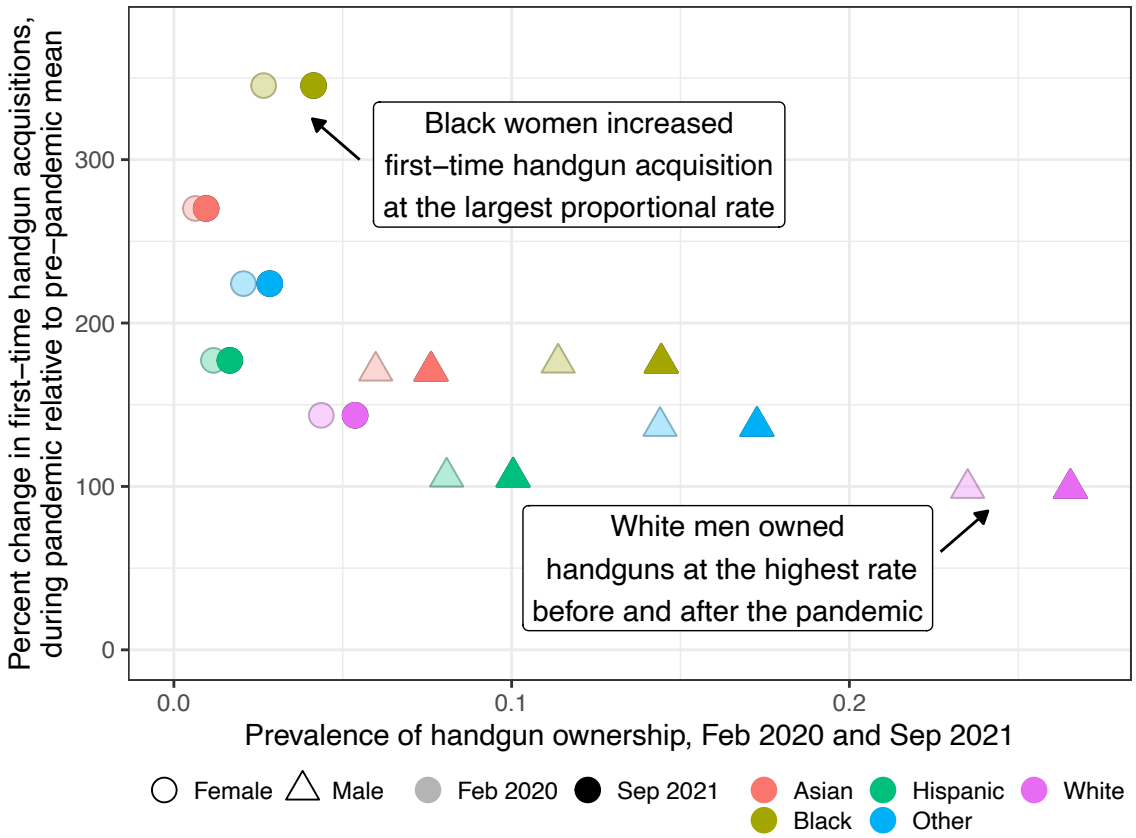

Fig. 4. Percent Changes in Handgun First Acquisitions and Levels of Handgun Ownership by Race/Ethnicity and Gender, before and after the Pandemic. Percentage increase in first-time handgun acquisitions during the pandemic (vertical axis) by absolute level of handgun ownership per capita (horizontal axis) in February 2020 verses September 2021. Each point represents a combination of a gender (shape), racial/ethnic group (color), and observation date (shading). Vertical axis presents the percentage increase in monthly first-time handgun acquisitions during the pandemic (March 1, 2020–September 30, 2021), relative to the pre-pandemic period (January 1, 2017–February 29, 2020).

	All Acquisitions		First-time Handgun Acquisitions		First-time Handgun Acquisitions / All Acquisitions
	Count	**Share**	**Count**	**Share**	
Gender					
Female	407550	10%	188937	22%	46%
Male	3767137	90%	682427	78%	18%
Race/Ethnicity					
Asian	358540	9%	77159	9%	22%
Black	192810	5%	70395	8%	37%
Hispanic	862964	21%	219919	25%	25%
Other	239576	6%	48962	6%	20%
White	2520797	60%	454929	52%	18%
Age					
<26	455026	11%	155367	18%	34%
26-45	1958811	47%	424735	49%	22%
46-65	1415324	34%	237753	27%	17%
>65	345526	8%	53509	6%	15%
Gun type					
Long gun	1811834	43%	———	———	———
Handgun	2362853	57%	871364	———	37%

Table 1. Characteristics of Firearm Acquisitions in California 01/2017–09/2021. Columns 2 and 3 presents the count and distribution of firearm acquisition. Columns 4 and 5 present the count and distribution for the subset of first-time handgun acquisitions. Column 6 presents the ratio of first-time handgun acquisitions to total firearm acquisitions (and are percentages of row counts).