# Waiting Periods and Firearm Suicides

## The Effects of Waiting Periods on Firearm Suicides in the U.S.

Hussain Hadah        Gael Compta

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Section 1

# Background

# Stylized facts

- Suicides by firearms constitute the majority of gun deaths in the U.S. (approximately 60%)

- Suicides in the U.S. have been on the rise after a steady decline in the 1990s

- Men are more likely to use firearms to commit suicide (more on this in a few slides)

# Suicides in the U.S have been on the rise

# Suicides by firearms have also been on the rise
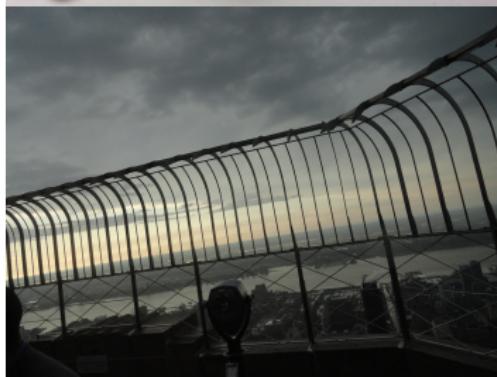
# The medical and psychiatric literature

- Previous studies in medicine and psychiatry attempted to study the effect of waiting periods on suicides

- Most of the estimates are non-causal and use cross country analysis

  - e.g. comparing the U.S. to Australia and Europe

# Most major medical and psychiatric organizations support waiting periods to reduce suicides

- The evidence are mixed, and most studies are non-causal
  - Waiting-period requirements were associated with reductions in firearm suicide rates (Edwards et al., 2018; Luca, Malhotra, and Poliquin, 2017)
  - States with Brady Act waiting periods saw firearm suicide declines (Ludwig and Cook, 2000)
  - Gun-related suicides correlated with gun ownership across 21 countries (Killias et al., 2001; Victimization Surveys, N=16–18)
  - Australian gun law reforms reduced firearm suicides but not overall suicides (Baker & McPhedran, 2007; Time-series: 1979–2004)
  - Waiting periods were advocated to mitigate gun-related suicides (Lewiecki & Miller, 2013)
  - Indiana's firearm seizure law was linked to a 7.5% drop in suicides (Kivisto & Phalen, 2018; State-level data: 1981–2015)
  - Gun ownership positively related to firearm suicides in 11 countries (Killias, 1993; Survey, N=28,000)

# Suicide is often considered an impulsive decision that can be prevented by restricting access to means



**Golden Gate Bridge's half-built suicide barrier already working**
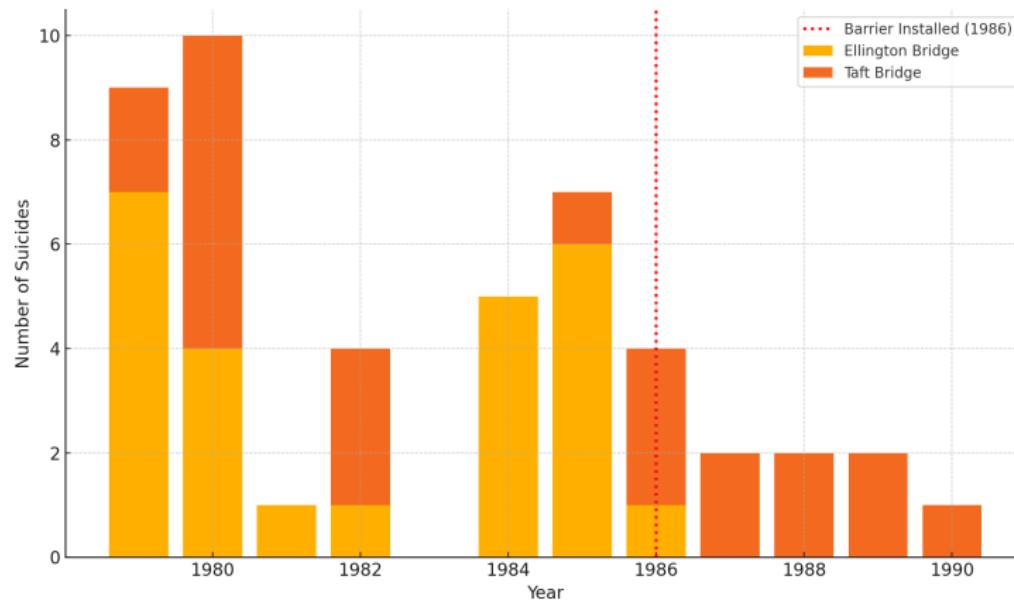


The Golden Gate Bridge suicide barrier's netting has been installed on the bridge's east and west sides between the two towers. | Courtesy Golden Gate Bridge, Highway and Transportation District

By *George Kelly* and Bay City News
Published Aug. 04, 2023 • 7:16am

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# Example from DC



Source: O'Carroll and Silverman (1994)

# In an Op-Ed, Ronald Reagan supported the passage of the Brady Act and mentioned suicide as a reason

# Using the development in the Difference-in-Differences literature, we will answer the following question

- Is there a causal effect of waiting periods on suicides by firearms in the U.S.?

Section 2

# Data

# Suicide and state-level gun control data

- My primary data source is the National Vital Statistics System (National Center for Health Statistics, 2020)

  - The National Center for Health Statistics collects data for the U.S. government to monitor and improve the nation's death rates
  - The Multiple Cause of Death files provide the cause of death of every mortality that occurs in the U.S.
  - The data is at the county level and from 1959 to 2019 and has information on sex, age, race, etc.

- For state level gun control policies, I use the RAND state firearm law database (RAND, 2022)

  - This dataset has information on all gun control policies, including waiting periods
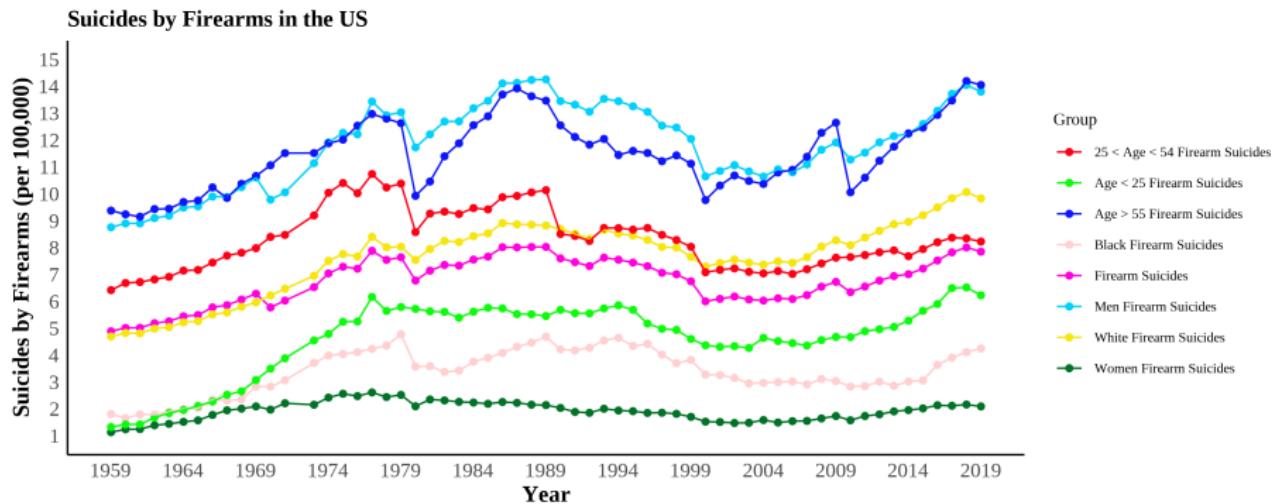
Firearm Suicides and Treatment Trends    Suicides and Treatment Trends    Firearm Suicides by Dem Vote
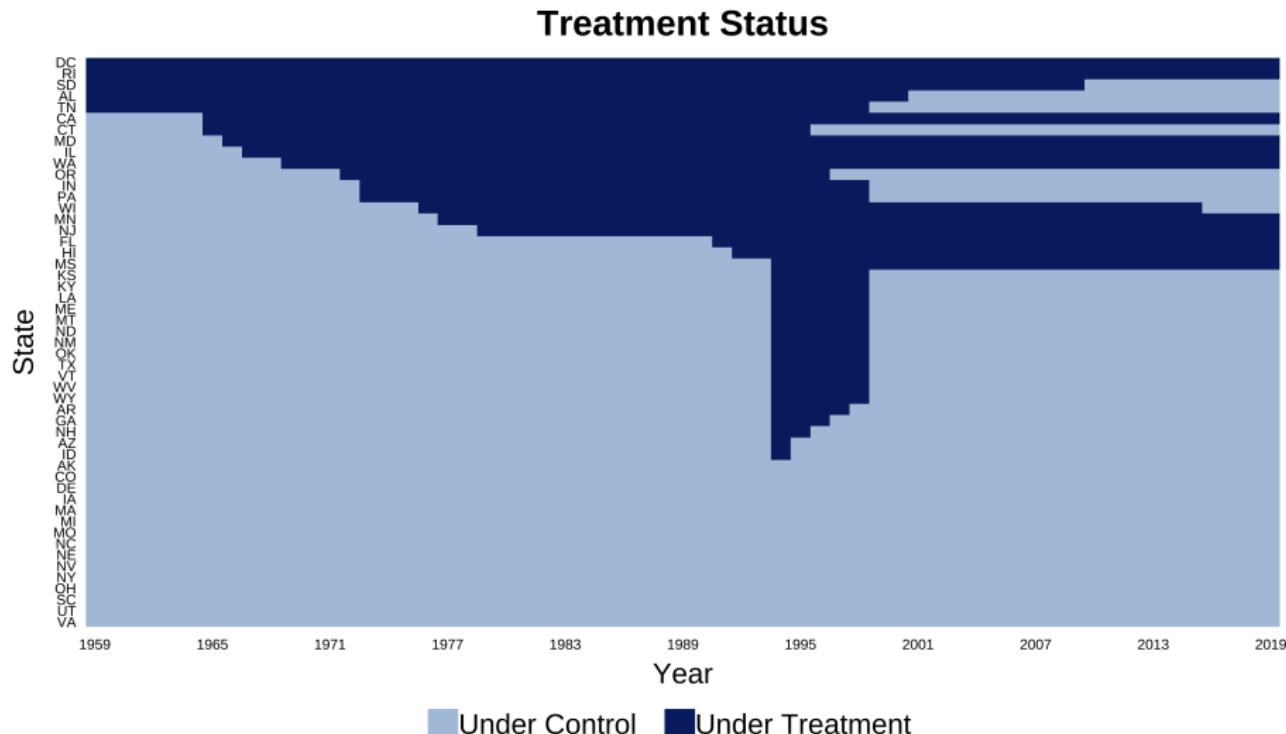
Firearm Suicides by Density
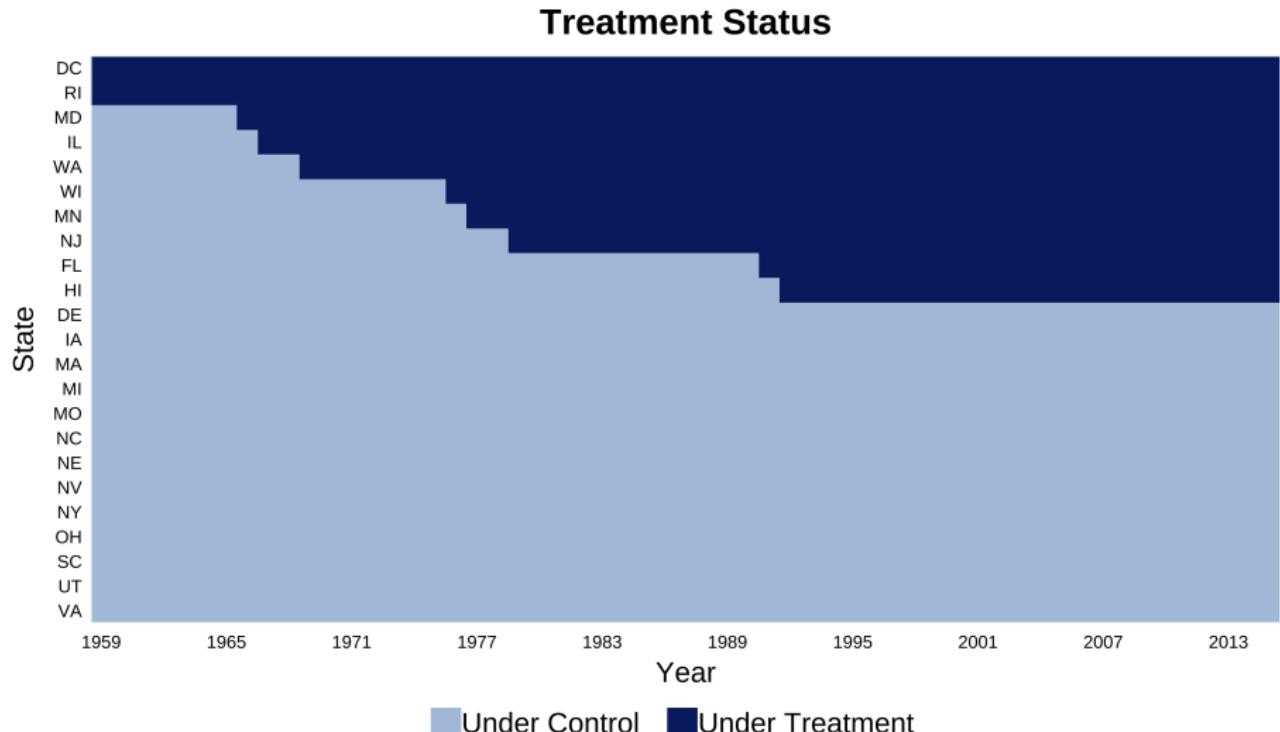
# Firearms suicide by sex, age, and race

**Suicides by Firearms in the US**



Group

- 25 < Age < 54 Firearm Suicides
- Age < 25 Firearm Suicides
- Age > 55 Firearm Suicides
- Black Firearm Suicides
- Firearm Suicides
- Men Firearm Suicides
- White Firearm Suicides
- Women Firearm Suicides
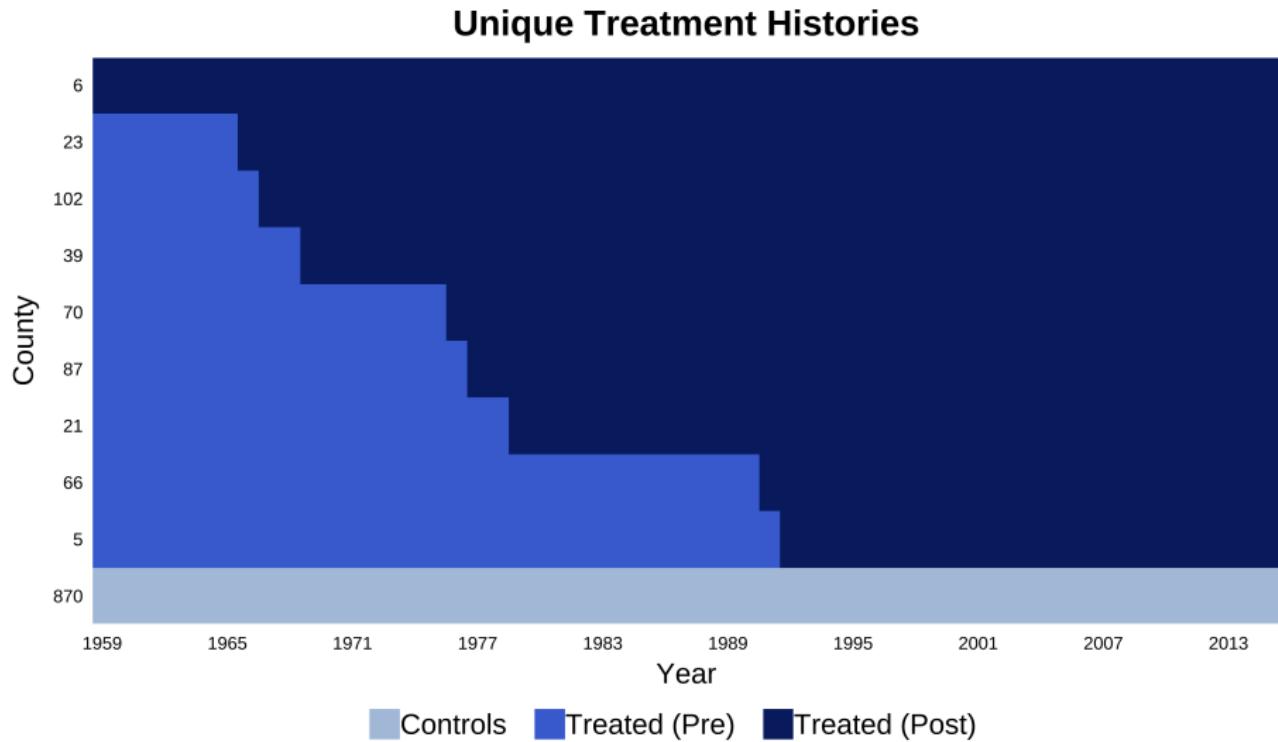
# State-level variation in waiting period policies



**Treatment Status**

State

Under Control  Under Treatment

# I will use a subsample of states and years where states do not switch back to untreatment

**Treatment Status**

# Number of clusters per treatment history

Section 3

# Empirical Strategy

# Event Study Specification

$$Y_{ist} = \sum_{l=-K}^{L} \beta_l \mathbb{1}\{t - E_s = l\} + \theta_i + \lambda_t + \varepsilon_{ist}$$

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where:

- $Y_{ist}$ is the number of firearm suicides per 100,000 in county $i$ in state $s$ at time $t$
- $E_s$ is the time period when state $s$ implemented a waiting period
- $\mathbb{1}\{t - E_s = l\}$ is an indicator variable equal to 1 when time $t$ is $l$ periods away from the implementation of waiting periods in state $s$

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- For $l < 0$, $\beta_l$ captures the differences in firearm suicides between treated and control counties before the implementation of waiting periods

- For $l \geq 0$, $\beta_l$ captures the post-treatment effect of waiting periods

- To identify causal estimates of $\beta_l$, we need the parallel trends and no anticipation assumptions to hold $\boxed{\text{ATT(g, t)}}$

# Brady Act and the Parallel Trends Assumption
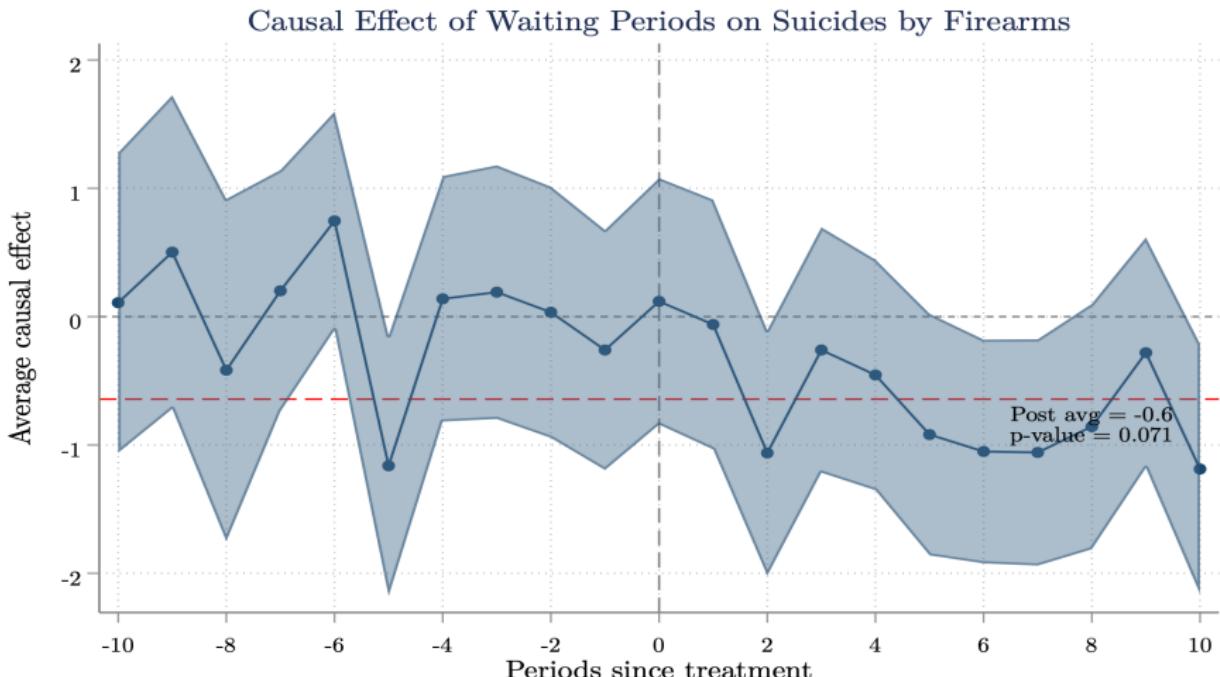
- The Brady Act was signed into law in 1993 and required a five-day waiting period for the purchase of a handgun

- Supreme Court ruled that the Brady Act was unconstitutional in 1997
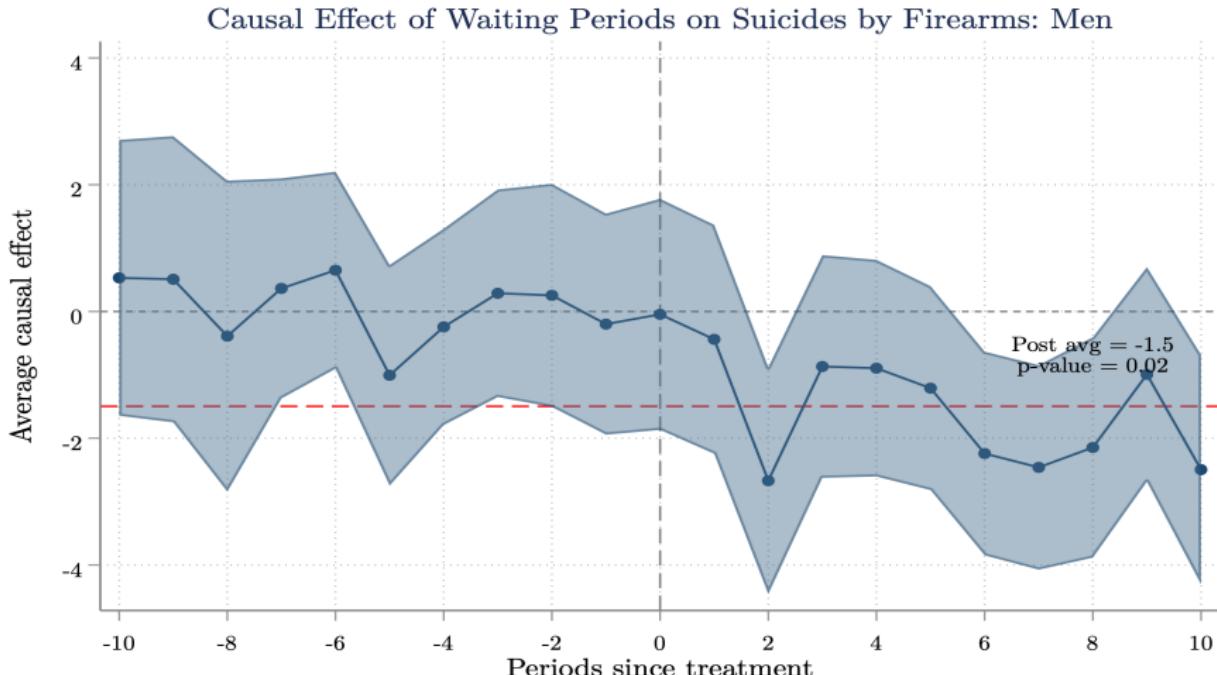
Section 4

# Results
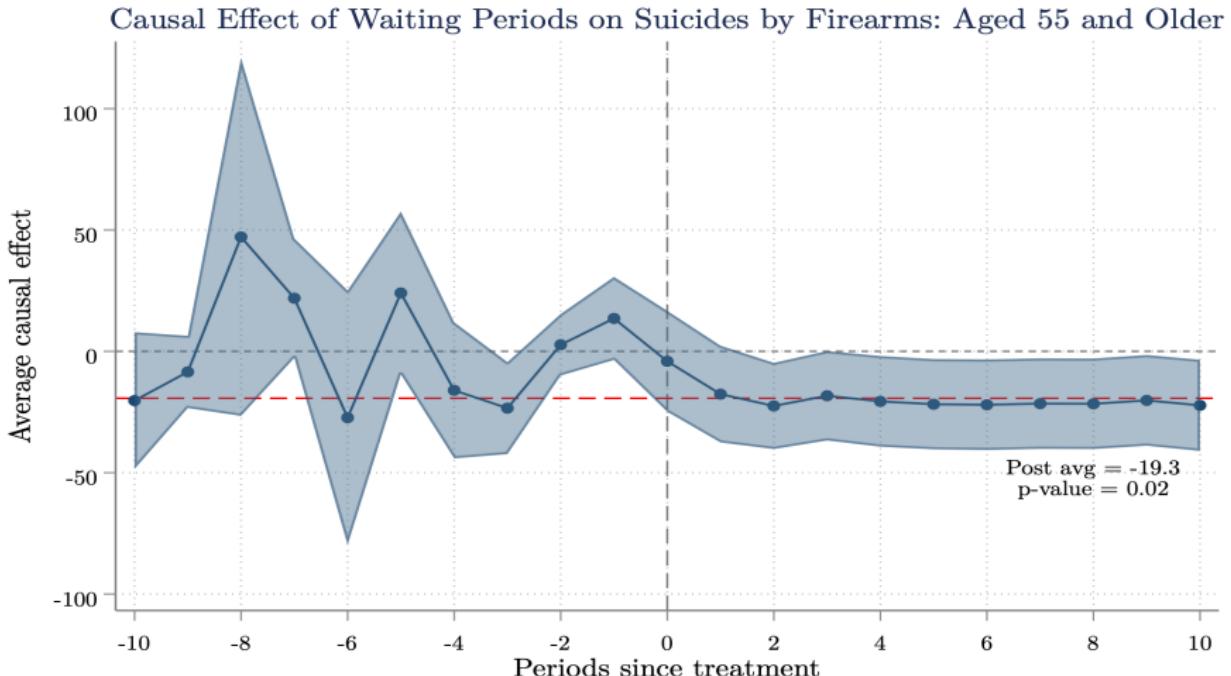
# I find that waiting periods cause a small reduction in firearm suicides



Causal Effect of Waiting Periods on Suicides by Firearms

Post avg = -0.6
p-value = 0.071
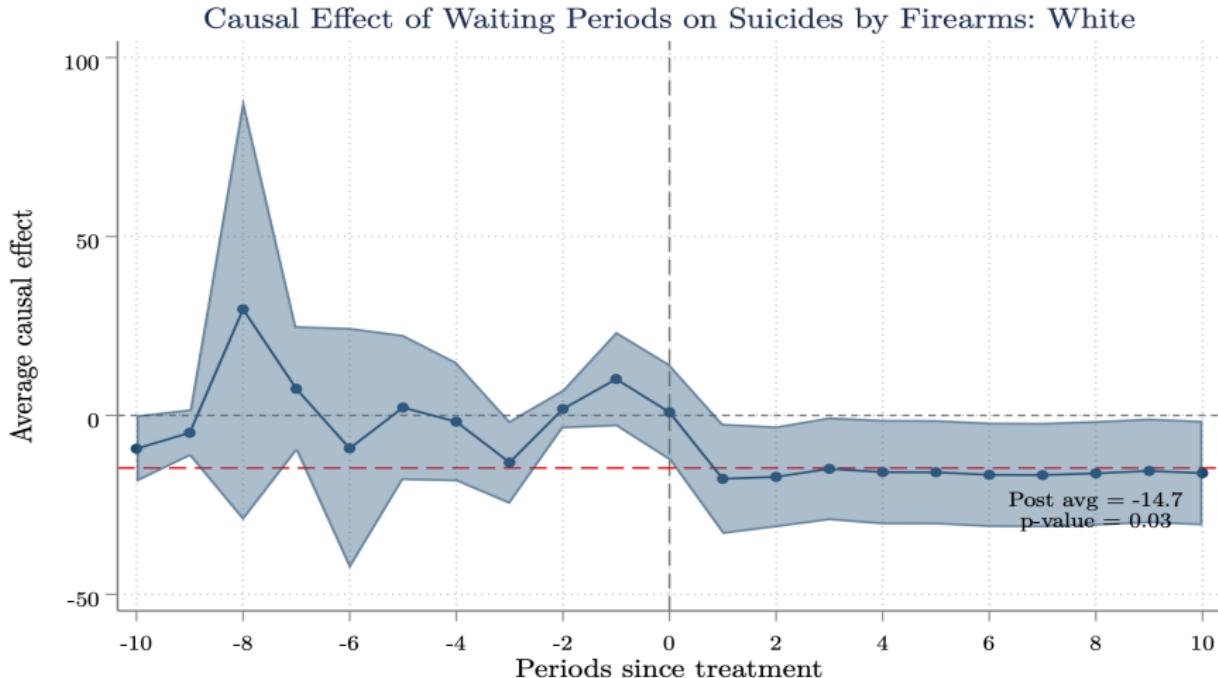
# I find more significant effects of waiting periods on male firearm suicides



Causal Effect of Waiting Periods on Suicides by Firearms: Men

Post avg = -1.5
p-value = 0.02

# I find large and significant effects of waiting periods on firearm suicides among individuals aged 55+



Causal Effect of Waiting Periods on Suicides by Firearms: Aged 55 and Older

Post avg = -19.3
p-value = 0.02

# I find large and significant effects of waiting periods on firearm suicides among white individuals
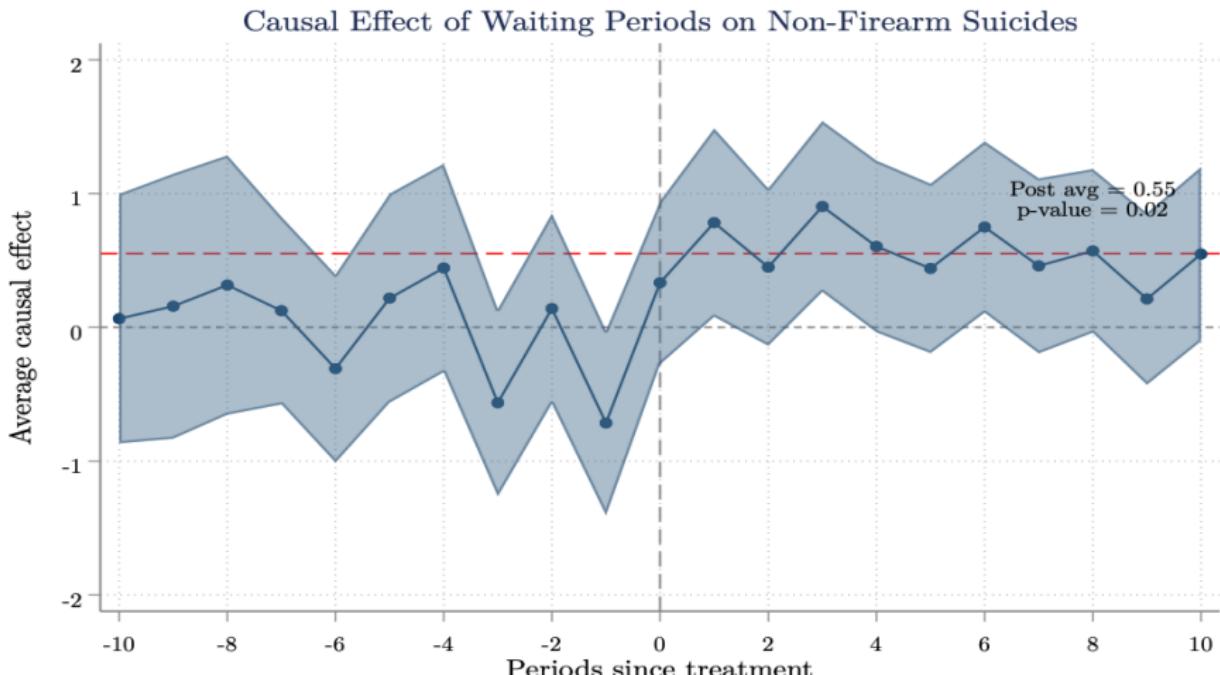


Causal Effect of Waiting Periods on Suicides by Firearms: White
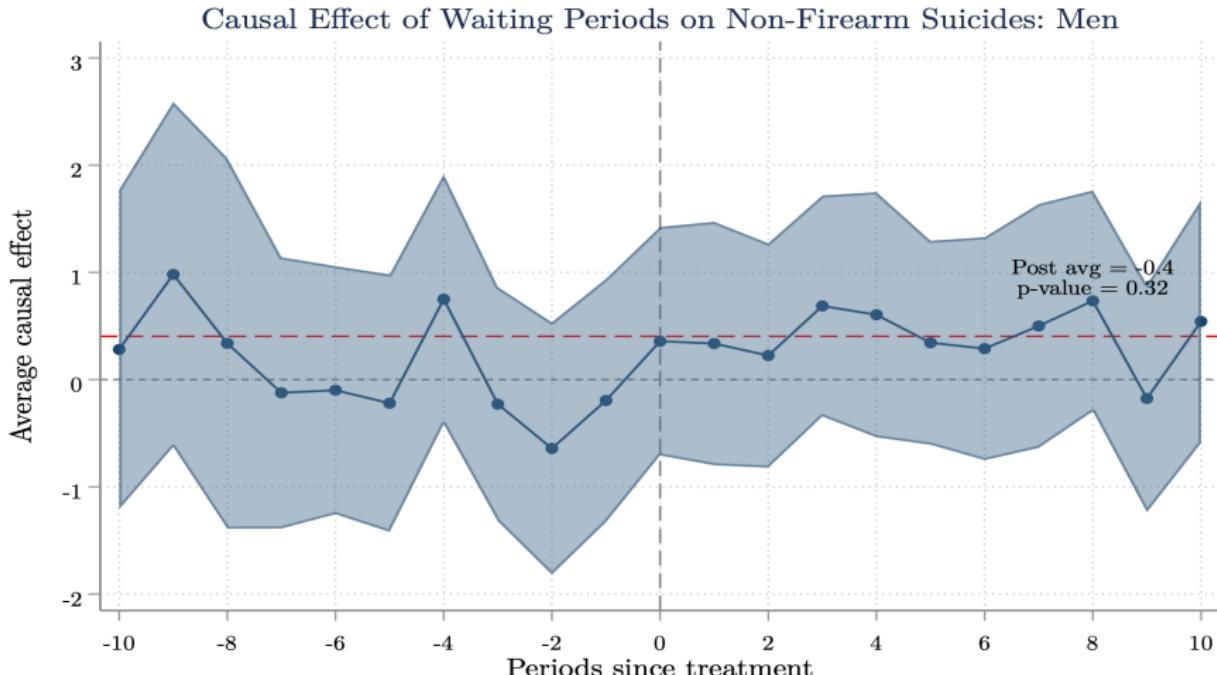
Section 5

# Results: Non-Firearm Suicides
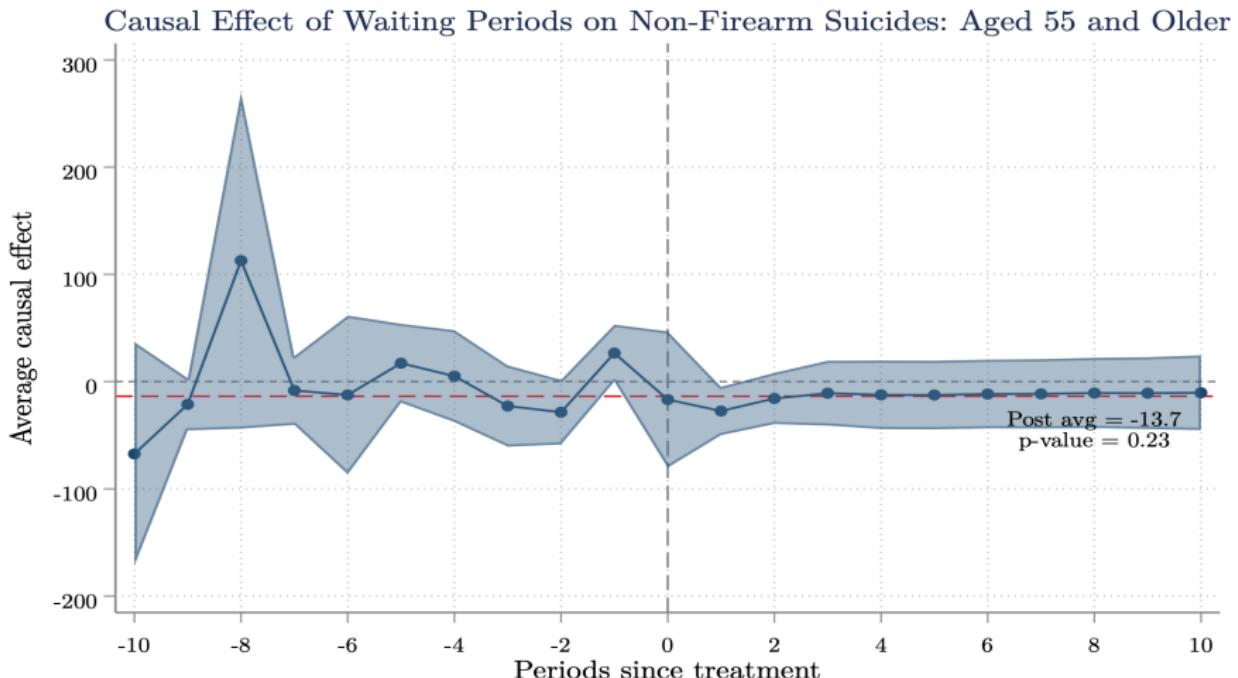
# I find that waiting periods do increase non-firearm suicides
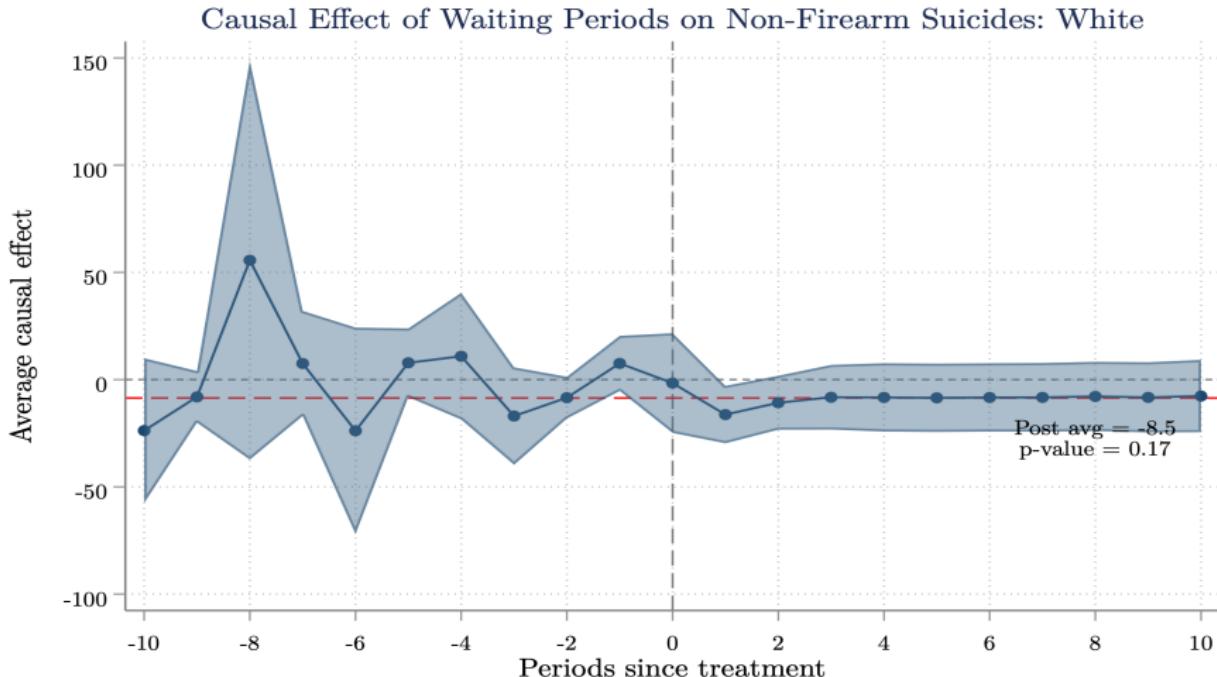


Causal Effect of Waiting Periods on Non-Firearm Suicides

Post avg = 0.55
p-value = 0.02

# I find that waiting periods do not increase non-firearm suicides among men



Causal Effect of Waiting Periods on Non-Firearm Suicides: Men

Post avg = -0.4
p-value = 0.32

# I find that waiting periods do not increase non-firearm suicides among individuals aged 55+



Causal Effect of Waiting Periods on Non-Firearm Suicides: Aged 55 and Older

Post avg = -13.7
p-value = 0.23

# I find that waiting periods do not increase non-firearm suicides among white individuals



Causal Effect of Waiting Periods on Non-Firearm Suicides: White

Post avg = -8.5
p-value = 0.17

Section 6

# Conclusion

# Back of the envelope calculations

- Waiting periods decrease firearm suicides by 0.6 deaths per 100,000 people
  - That is an 8% decrease in firearm suicides
  - That is a reduction of 1,924 firearm suicides per year

- The benefits of waiting periods could range from $11.7 to $37.9 billion per year
  - Value of statistical life = ranges from $6.4 to $19.7 million (HHS, 2024)

# Waiting periods are effective in reducing firearm suicides

- Waiting periods reduce firearm suicides by 0.6 deaths per 100,000 people

- These effects are larger among men, individuals aged 55+, and white individuals

- Waiting periods do not increase non-firearm suicides

- The benefits of waiting periods could be as high as $37.9 billion per year

Thank you!

Section 7

# Appendix

# Average Treatment Effect Using Callaway and Sant'Anna (2021)

- I estimate the average treatment effect of waiting periods on firearm suicides by using the not-yet-treated counties as a control group

- The average treatment effect is given by:

$$ATT(g, t) = \mathbb{E}[Y_{is,t} - Y_{is,g-1} \mid G_i = g] - \mathbb{E}[Y_{is,t} - Y_{is,g-1} \mid G_i \in \mathcal{G}_{comp}]$$

where:

- $\mathbb{E}[Y_{is,t} - Y_{is,g-1} \mid G_i = g]$ is expected change in outcome for cohort $g$ between periods $g - 1$ and $t$
- $\mathbb{E}[Y_{is,t} - Y_{is,g-1} \mid G_i \in \mathcal{G}_{comp}]$ is the expected change in outcome for the comparison group that is not-yet-treated at time $t$
- $G_i$ is the cohort of counties that are treated at time $t$
- $\mathcal{G}_{comp}$ is the set of cohorts that are not-yet-treated at time $t$

# Average Treatment Effect Using Callaway and Sant'Anna (2021) (Cont'd)

$$ATT(g, t) = \mathbb{E}[Y_{is,t} - Y_{is,g-1} \mid G_i = g] - \mathbb{E}[Y_{is,t} - Y_{is,g-1} \mid G_i \in \mathcal{G}_{comp}]$$

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- $G_i$ is the cohort of counties that are treated at time $t$
- $\mathcal{G}_{comp}$ is the set of cohorts that are not-yet-treated at time $t$
- $\widehat{ATT}(g, t) = \hat{\beta}_l$ if the parallel trends and no anticipation assumptions hold

Back

# Average Treatment Effect Using Callaway and Sant'Anna (2021): Example
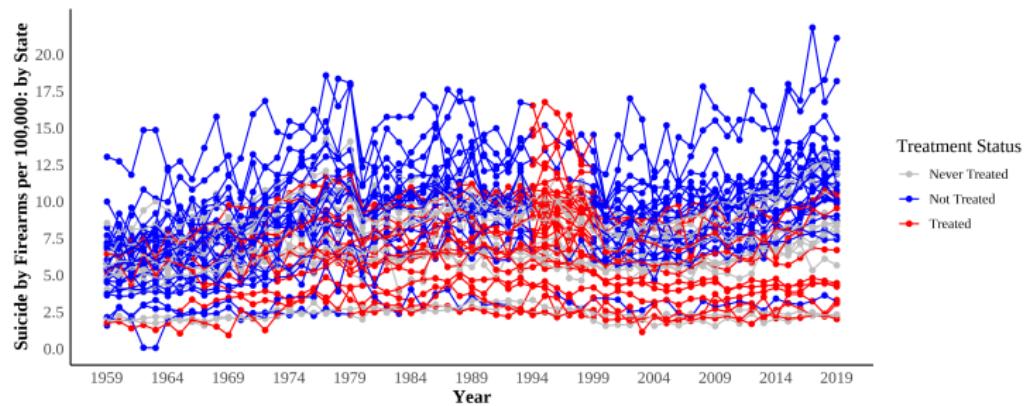
$$ATT(g, t) = \mathbb{E}[Y_{is,t} - Y_{is,g-1} \mid G_i = g] - \mathbb{E}[Y_{is,t} - Y_{is,g-1} \mid G_i \in \mathcal{G}_{comp}]$$

where:

- $G_i = \{$Group A (treated in 2020), Group B (treated in 2022), Group C (never treated)$\}$
- $ATT(A, 2021) = \mathbb{E}[Y_{is,2021} - Y_{is,2020} \mid G_i = A] - \mathbb{E}[Y_{is,2021} - Y_{is,2020} \mid G_i = B]$
- $ATT(B, 2023) = \mathbb{E}[Y_{is,2023} - Y_{is,2022} \mid G_i = B] - \mathbb{E}[Y_{is,2023} - Y_{is,2022} \mid G_i = C]$

Back

# Trends in Suicide by Firearms: Treatment and Control States Over Time
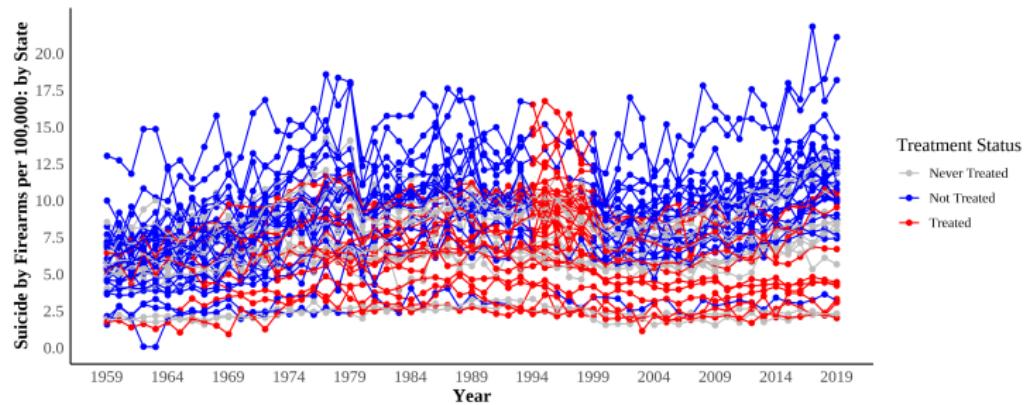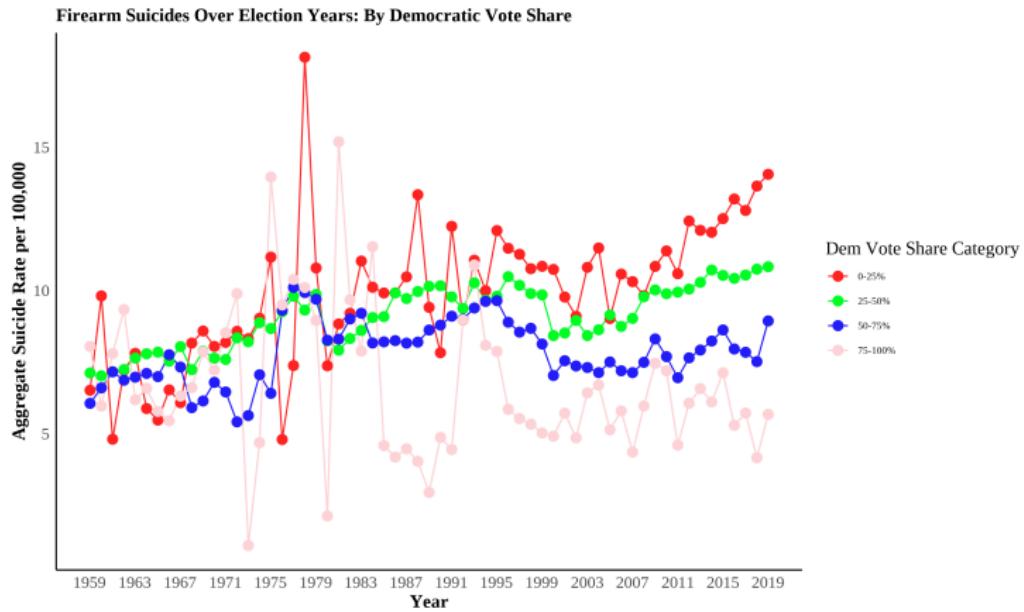
# Trends in Suicide by Firearms: Treatment and Control States Over Time



Back
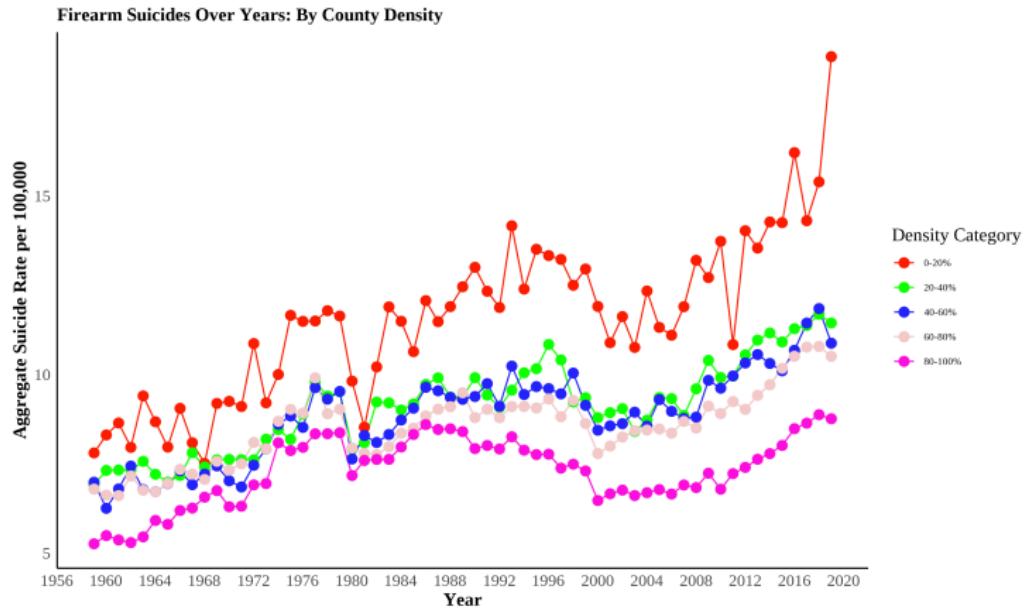
# Trends in Suicide by Firearms: By Democratic Vote Share Over Time



Firearm Suicides Over Election Years: By Democratic Vote Share

# Trends in Suicide by Firearms: By Density Over Time



Firearm Suicides Over Years: By County Density