

## **Supplemental Material**

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eMethods: Selecting Counties for the Donor Pool, County-Level Predictor Details, and Controlled Interrupted Time Series

eTable 1: ICD-9 and ICD-10 Codes Used to Identify Firearm Violence

eTable 2: Donor Pool Weights by Model

eTable 3. Synthetic Control Results, Secondary Analyses

eTable 4: Synthetic Control Results, Sensitivity Analysis: More Restrictive Donor Pool (n=20)

eTable 5: Synthetic Control Results, Sensitivity Analysis: 2018 Intervention

eTable 6: Controlled Interrupted Time Series Results, Sensitivity Analysis

References

## eMethods

### Selecting Counties for the Donor Pool

Following CDC guidelines for unstable rates,<sup>1</sup> we excluded 26 counties from the donor pool for having, on average, fewer than 20 firearm violence injuries per year in the pre-GVRO period. To ensure we did not include exposed counties in the donor pool, we removed an additional 4 counties with a ratio of GVROs to expected firearm violence injuries > 0.1 (calculated as: total GVRO respondents 2016-2019 / [mean annual firearm violence injuries\*4]). We determined the number of GVRO respondents per county using California Restraining and Protective Order System data, maintained by the California Department of Justice (CA DOJ). The 0.1 cutoff was guided by Swanson and colleagues' finding that 1 firearm suicide was prevented for every 10-20 cases of firearm removal pursuant to a risk-warrant in Connecticut and Indiana.<sup>2,3</sup> Based on this figure, if 10% of the population that went on to harm themselves with a firearm was first served a GVRO, we would expect a 1% reduction in firearm self-harm. We are assuming any lesser measure of association would be undetectable at a population level, such that these counties can be considered unexposed. This left us with 27 control counties in the primary analysis.

### County-Level Predictor Details

Biannual demographic characteristics were measured directly using the interpolated denominators. Biannual crime rates were estimated with annual publicly available Crimes & Clearances data from CA DOJ,<sup>4</sup> which we divided by two. Biannual firearm sales data were measured with CA DOJ's Dealer Record of Sales (DROS) data, which contain records of nearly all legal handgun transfers in California. We were missing the last 3 months of DROS data in 2015, so we used the last 3 months of 2014 in its place. We used our interpolated denominators for the crime and firearm sales data to calculate rates per 1,000. Unemployment data was measured with the ACS 5-year estimates for 2005-2009 and 2010-2014.<sup>5</sup> Urbanicity was measured with the 2013 Rural-Urban Continuum Codes created by the US Department of Agriculture.<sup>6</sup>

### Controlled Interrupted Time Series

As an additional sensitivity analysis and to test for a change in slope after GVROs were implemented, we evaluated changes in firearm assault and self-harm in San Diego relative to its synthetic control with controlled interrupted time series analyses. These took the following form:

$$Y_t = \beta_0 + \beta_1 T + \beta_2 X_t + \beta_3 T X_t + \beta_4 G + \beta_5 G T + \beta_6 G X_t + \beta_7 G X_t T$$

$Y_t$  is the firearm assault or self-harm rate at time  $t$ ;  $T$  is a linear time trend;  $X$  is a dummy variable for the intervention, pre- or post-GVRO implementation; and  $G$  is a dummy variable for the treated (San Diego) and control group (synthetic San Diego). The coefficients of interest are  $\beta_6$  and  $\beta_7$ . The former provides the estimated difference in the level change post-GVROs between San Diego and synthetic San Diego, and the latter provides the estimate difference in the change in slope between the two groups after the GVRO law went into effect. We used Newey-West confidence intervals to account for autocorrelation.<sup>7</sup>

eTable 1: ICD-9 and ICD-10 Codes Used to Identify Firearm Violence

Description	Injury Data		Mortality Data
	ICD-9 Code (1/2005-9/2015)	ICD-10 Code (10/2015-12/2019)	ICD-10 Code
<i>Homicide &amp; assault by:</i>			
Handgun	E965.0	X93	X93
Shotgun	E965.1	X94	X94
Hunting rifle	E965.2	X94	X94
Military firearms	E965.3	X94	X94
Other and unspecified firearm	E965.4	X95.8, X95.9	X95
<i>Suicide &amp; self-inflicted injury by:</i>			
Handgun	E955.0	X72	X72
Shotgun	E955.1	X73	X73
Hunting rifle	E955.2	X73	X73
Military firearms	E955.3	X73	X73
Other and unspecified firearm	E955.4	X74	X74

eTable 2: Donor Pool Weights by Model

<b>Donor County</b>	<b><u>Model Outcome</u></b>	
	<b>Annual Firearm Assault</b>	<b>Annual Firearm Self-Harm</b>
El Dorado	0.163	0
Los Angeles	0.162	0
Placer	0.001	0.061
San Francisco	0.008	0
San Luis Obispo	0.259	0.100
Shasta	0.021	0
Sonoma	0.386	0
Alameda	0	0.148
Kings	0	0.026
Orange	0	0.160
Sacramento	0	0.002
San Bernardino	0	0.186
Ventura	0	0.318
Butte	0	0
Contra Costa	0	0
Fresno	0	0
Humboldt	0	0
Kern	0	0
Madera	0	0
Merced	0	0
Monterey	0	0
Riverside	0	0
San Joaquin	0	0
San Mateo	0	0
Solano	0	0
Stanislaus	0	0
Tulare	0	0

eTable 3: Synthetic Control Results, Secondary Analyses

		Outcome <sup>a</sup>			
		Biannual Firearm Violence	Annual Firearm Assault, Black and Hispanic	Annual Firearm Assault, NH White	Annual Firearm Self-Harm, NH White
<b>San Diego</b>	<b>Rate in post-intervention period (per 100,000)</b>	5.05	8.85	2.05	8.67
<b>Synthetic San Diego</b>	<b>Rate in post-intervention period (per 100,000)</b>	5.11	12.22	2.70	9.08
<b>Rate difference</b>		-0.06	-3.37	-0.66	-0.41
<b>Percent difference</b>		-1%	-28%	-24%	-5%
<b>Pseudo P-value<sup>b</sup></b>		18/28=0.64	11/28=0.39	7/28=0.25	3/28=0.11
<b>Model fit (MSPE)</b>		0.42	4.51	0.12	0.13

a. NH=Non-Hispanic

b. The proportion of counties (donor pool plus San Diego) with a root mean square prediction error ratio post-to pre-GVRO greater than or equal to San Diego's ratio.

eTable 4: Synthetic Control Results, Sensitivity Analysis: More Restrictive Donor Pool (n=20)

		Outcome	
		Annual Firearm Assault	Annual Firearm Self-Harm
<b>San Diego</b>	<b>Rate in post-intervention period (per 100,000)</b>	4.87	5.23
<b>Synthetic San Diego</b>	<b>Rate in post-intervention period (per 100,000)</b>	5.83	4.73
<b>Rate difference</b>		-0.96	0.51
<b>Percent difference</b>		-16%	+11%
<b>Pseudo P-value<sup>a</sup></b>		13/21=0.62	1/21=0.05
<b>Model fit (MSPE)</b>		1.10	0.03

a. The proportion of counties (donor pool plus San Diego) with a root mean square prediction error ratio post- to pre-GVRO greater than or equal to San Diego's ratio.

eTable 5: Synthetic Control Results, Sensitivity Analysis: 2018 Intervention

		<b>Outcome</b>	
		<b>Annual Firearm Assault</b>	<b>Annual Firearm Self-Harm</b>
<b>San Diego</b>	<b>Rate in post-intervention period (per 100,000)</b>	4.72	5.43
<b>Synthetic San Diego</b>	<b>Rate in post-intervention period (per 100,000)</b>	5.52	5.61
<b>Rate difference</b>		-0.81	-0.19
<b>Percent difference</b>		-15%	-3%
<b>Pseudo P-value<sup>a</sup></b>		12/28=0.43	16/28=0.57
<b>Model fit (MSPE pre-GVRO)</b>		0.62	0.06

a. The proportion of counties (donor pool plus San Diego) with a root mean square prediction error ratio post-to pre-GVRO greater than or equal to San Diego's ratio.

eTable 6: Controlled Interrupted Time Series Results, Sensitivity Analysis

	<b>Annual Firearm Assault</b>	<b>Annual Firearm Self-Harm</b>
Level change difference post-GVRO implementation <sup>a</sup>	3.32 (-1.02, 7.67)	-1.06 (-3.02, 0.90)
Slope change difference post-GVRO implementation <sup>a</sup>	-0.23 (-0.71, 0.25)	0.10 (-0.09, 0.29)

a. Difference is between San Diego and synthetic San Diego.



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