

State-Level Gun Legislation and its Effects on Homicide and Suicide

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## **I. Introduction**

Suicide and homicide are two of the largest public health concerns in the United States which result from unnatural causes. In 2016, an estimated 17,250 people were victims of murder (“2016 Crime Statistics Released,” 2017). In 2015, suicide was labeled the 10th leading cause of overall death in the United States; it is the second leading cause of death, only behind accidental injury, in those aged 15-34 (NIMH, 2017). Many of these deaths stem from firearms, with over half of suicides attributed to firearms (Anestis et al., 2017). In addition to the human cost at hand, hospital costs due to fatal and non-fatal firearm injuries have been estimated to be between \$112 and \$599 million in the United States in a given year (Fleegler et al., 2013). Using a dataset of firearm legislation collected by Siegel et al. (2017), I analyze the effects of various categories of gun legislation on homicide and suicide rates, both by firearm and by other means. I find that the passage of assault weapons/high-capacity magazine regulations, gun trafficking laws, and domestic violence-related laws are associated with significant decreases in homicide and suicide rates while buyer and possession regulations appear to increase homicide rates by other means while producing no effect on homicide or suicide rates by firearm. Further, I find impulsivity as measured by the proxy of binge average binge drinking behavior within a state to be a significant factor in the decision to commit homicide or suicide.

## **II. Background**

### **Homicide and Suicide in Relation to Gun Legislation**

The effect of gun legislation as a means of reducing homicide and suicide has received attention from several academic disciplines, including public health, economics, and legal studies, the latter two of which tend to focus on gun ownership and its relationship to violent crimes such as homicide. Some of this research postulates that increases in gun ownership

allow potential victims of crimes to retaliate. This renders the success of any particular crime more variable and would lead to less crime. This is the ultimate theory to explain the findings of Lott and Mustard (1998), who find that the enactment of concealed weapons laws lead to significant decrease in homicide rates as well as types of violent crime. This implies gun legislation attempting to decrease gun ownership may have a backfire effect.

This point of view is countered by findings that an increase in gun ownership will itself lead to more violent crimes and homicide. This argument receives theoretical strength from a model devised by Donohue and Levitt (1998). In the paper, the authors construct a model for assessing dominance and allocation of resources in absence of enforceable legal contracts. Such a scenario, they postulate, would result in fighting ability determining the allocation of resources. Their model suggests that decreases in predictability of outcome ultimately increase expected outcome for all individuals, thus leading to more conflicts. This could be the case with respect to firearms. Increases in gun ownership ultimately facilitate unpredictability in any fight, leading to more altercations and, by extension, more homicide.

Empirically, this theory is bolstered by the findings of Duggan (2001), who uses a robust proxy variable, namely the county-level sales of the magazine *Guns & Ammo*, and a lagged regression technique to study the effects of gun ownership in the United States. He finds that a 10% increase in gun ownership in a particular region increases the homicide rate by approximately 2%. In addition, Duggan (2001) also refutes the findings of Lott and Mustard (1998), concluding that regions with high gun ownership in states that pass relaxed concealed weapons laws see no resultant decrease in crime. This implies that the pathway of causality asserted by Lott and Mustard (1998) is ultimately unfounded.

Moody (2001) conducts an analysis that partially confirms the findings of Duggan (2001). He attempts to correct errors made by Lott and Mustard (1998), including the use of

incorrect regression techniques and underestimated standard errors. When the regressions are corrected, most effects are statistically insignificant.

Gun legislation has been studied in the health policy literature as a means of decreasing homicide and suicide rates in recent decades. Lester and Murrell (1982) are the first to examine gun laws in the United States in a comprehensive manner. They conduct a cross-sectional analysis using gun laws in effect in 1968 in order to compare 1960 and 1970 homicide and suicide rates. They find that states with stricter gun laws experience a larger decrease in homicide and suicide rates, with the caveat that these states also experience an increase in suicide rate by other means (Lester and Murrell 1982). This “suicide backfire effect” is later contested due to an inability of other researchers to find the same increase (Anestis et al. 2017). Increases in specificity and size of study have taken place over time in the literature. Fleegler et al. (2013) use data from the years 2007-2010 to analyze the effect of five categories of gun legislation across states. They find significant decreases in suicide rates associated with four of the five gun laws (strengthening background checks, legislation affecting child safety, assault weapons bans, and legislation affecting open carry), while one is significantly associated with a decrease in homicide rates (strengthening background checks).

Subsequent analyses have increased specificity by examining laws targeting handguns and their effect on suicide rates. These studies indicate that restriction in purchase, background checks, and waiting periods were significantly associated with decreases in suicide in the affected states (Anestis and Anestis 2015; Anestis et al. 2015).

## **Impulsivity**

A potential contributor to homicide and suicide that adds strength to the argument that more guns will lead to more violence is impulsivity. This is bolstered by an overall trend of neuroscientific findings that many stimuli (thoughts, sounds, etc.) are actively suppressed by the brain rather than simply ignored (Bari and Robbins, 2013). This necessity of the brain to suppress stimuli causes some individuals to be vulnerable to impulsive actions if these inhibition mechanisms are flawed. This potential vulnerability is confirmed in the literature.

At the chemical level, mood regulation is largely regulated by the interaction between two particular classes of substances: monoamine oxidases (MAOs) and monoamine neurotransmitters. MAOs are a class of enzyme that breaks down monoamine neurotransmitters. For our purposes, MAO-A is of particular importance, as it plays an important role in the breakdown of serotonin, epinephrine, norepinephrine, and dopamine (NIH, 2018).

Variation in MAO activity within individuals has been studied by comparing subjects with genetic variations leading to varying levels of MAO activity. Manuck et al. (2000) observe significant variation in a particular region of the MAO-A gene labeled the MAOA-uVNTR. They find that genetic variations leading to more MAO-A activity are associated with decreased responsivity to serotonin, increased impulsivity, and increased aggression. Lung et al. (2011) study the same region of the MAO-A gene (MAOA-uVNTR) and find an association between increased MAO-A activity and suicide attempts in those with major depressive disorder. In addition to this, increased MAO activity is associated with a decrease in overall serotonin as measured by the level of cerebrospinal 5-Hydroxyindoleacetic acid (5-HIAA) (Schalling, 1993). Decreases in serotonin as measured by 5-HIAA are inversely correlated with risk of suicide by violent means as well as lifetime aggressiveness (Brown et al., 1979). Similar associations are found using other measures of serotonin levels and activity (Coccaro et al., 1997; Tiihonen et al., 1997). In other words, the levels of neurotransmitters within the brain

appear to have significant effects on the levels of impulsive behaviors among individuals. These findings present evidence that impulsivity, aggression, and suicidality share a neurochemical pathway, implying that impulsivity influences the predisposition to both homicide and suicide.

These findings at the neurochemical level are further confirmed when zooming out to study regions of the brain. Specific regions are known to be responsible for impulsivity regulation. In particular, the frontal lobe appears to play a considerable role in this process. Lesions to the ventromedial prefrontal cortex (vmPFC), a subsection of the frontal lobe, are associated with disinhibited aggression and suicidal behavior (Arango et al., 1998; Volavka, 1995; Grafman et al., 1996). Further, postmortem analyses of victims of suicide have found serotonin receptor abnormalities in the same region (Arango et al., 1998). In a study of the brain activity of violent offenders, Raine et al. (1998) find lower glucose consumption in the prefrontal lobe in those who commit impulsive murders when compared to those who commit premeditated murders.

The conclusions in research at both the neurochemical and neurobiological levels are also present in the literature of neurophysiology. A commonly used measure of impulsivity in decision-making is the P300 wave captured by electroencephalography (EEG). P300 wave amplitude is measured as a response to stimuli introduced to subjects in psychological experiments. Generally, higher P300 amplitude in response to stimuli is observed in individuals with lower overall impulsivity, while lower P300 amplitude is observed in individuals with higher impulsivity (Chen et al., 2007). In addition to impulsivity more generally, a systematically lower P300 amplitude is also associated with self-reported aggression, an increased risk of mental illnesses characterized by disinhibition (Antisocial Personality Disorder, Oppositional-Defiant Disorder, Obsessive-Compulsive Disorder) (Chen et al., 2007),

increased risk of alcoholism (Justus et al., 2006; Chen et al., 2007), and increased risk of suicide attempts among those with major depression (Urcelay-Zaldua et al., 1995).

The associations between impulsivity and homicidal/suicidal behavior also manifest in self-reports and epidemiological data more generally. Suicide attempts as well as violence and drug addiction are associated with higher self-reported impulsivity (Wang et al., 2014; Corruble et al., 1999; Bari and Robbins, 2013), with those who attempt suicide multiple times reporting a significant lack of agency (Byng et al., 2015). Further, impulsivity predicts increased medical severity of suicide attempts (Swann et al., 2005). Most significantly for the purposes of this study, in analyzing a survey of 5,245 university students, Wang et al. (2014) find two characteristics of students that are able to differentiate between those who reported suicidal ideations and suicide attempts: positive family history of suicide and high motor impulsivity.

The findings regarding associations between impulsivity and both homicide and suicide described herein are consistent across three areas of neurological study as well as epidemiological study. They necessitate the consideration of irrational suicide. In order to consider this, a proxy is required to measure an individual's predisposition to irrational behavior. Further, there is substantial evidence that 'rash impulsivity,' or an inability to suppress behavior despite potentially negative consequences, is a strong predictor of the development of binge drinking as well as substance use disorders more generally (Dawe and Loxton, 2004; Gullo et al., 2011). As such, binge drinking should be under consideration as a behavioral proxy for impulsivity.

### **III. Data Description**

Data are collected from multiple sources to construct a dataset spanning years 1992 through 2016. State-level age-adjusted homicide and suicide rates by firearm and by other means are retrieved from the WONDER Database provided by the Centers for Disease Control (CDC). These represent the four response variables of interest to my analysis.

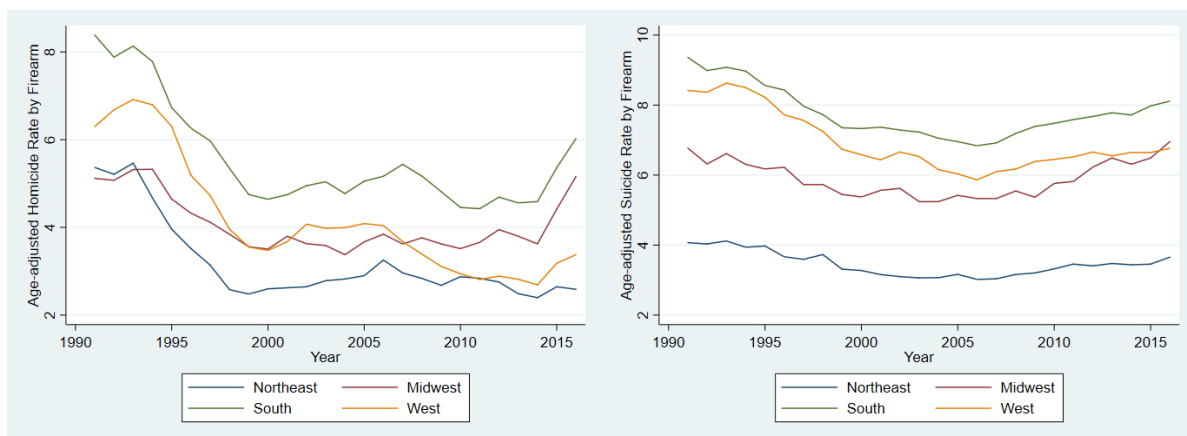
Gun law passage years and gun law categories come from an extensive gun legislation dataset created by Siegel et al. (2017), which consists of 133 firearm laws in each state between 1991 and 2016. Because I am using percentage of overall laws within a category, this creates issues in the interpretation of concealed carry laws. Since Siegel et al. (2017) include laws within this category that both relax and restrict gun laws, an effect could not be determined from a percentage of overall laws, in contrast to categories including laws that only restrict access or use of weapons. As such, I do not include concealed carry laws in my analysis. Additionally, the definition of stand your ground law proposed for the sake of coding by Siegel et al. (2017) is not reflective of the general definition regarding a lack of duty to retreat on public property. Because they include states that have the ‘castle doctrine,’ in which one can defend one’s own private property, the effect of allowing individuals to defend themselves without the duty to retreat on public property cannot be determined from this binary coding. This category is also removed. From the remaining categories, I select those that have a simple mechanism of causality in order to avoid potential issues of dual causality. My regressions include the categories of buyer regulations, prohibition of high-risk gun possession, background checks, possession regulations, assault weapons and large-capacity magazine regulations, gun trafficking laws, and domestic violence regulations.

To control for demographic characteristics of each state, I use the state percentage of non-Hispanic African Americans from Intercensal population estimates published by the US Census. For socioeconomic characteristics, I use state poverty levels and unemployment rates



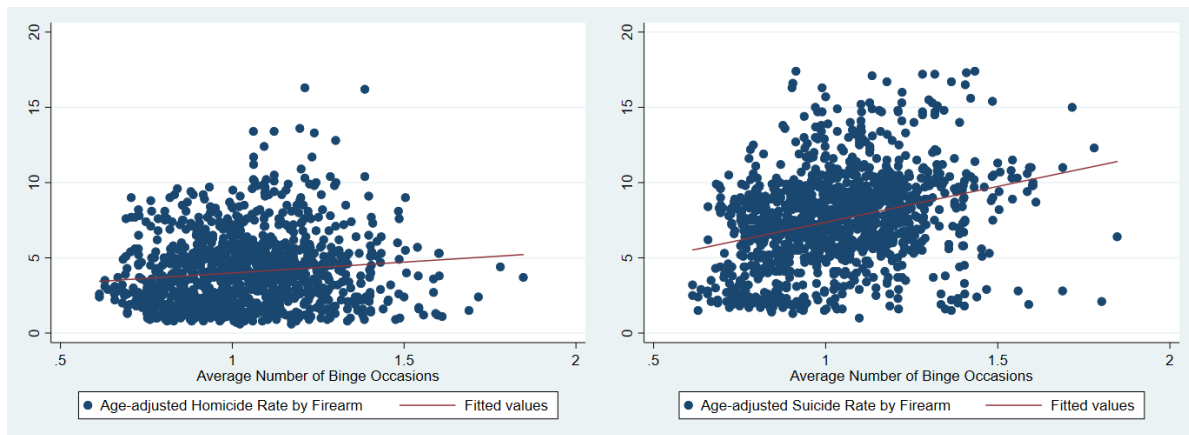
collected from the US Small Area Income and Poverty Estimates (SAIPE) program from the US Census and the Bureau of Labor Statistics (BLS), respectively.

In order to approximate impulsivity, I use the average number of binge drinking occasions in the previous month reported by state-year as reported from surveys conducted by the Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS is the most robust and longest enduring survey analyzing health of residents in the United States by telephone. It is overseen by the CDC.



**Figure 1: Age-adjusted Homicide and Suicide Rates by Firearm by Census Region**

Figure 1 displays age-adjusted homicide (left) and suicide (right) rates per 100,000 by census region over time from 1992 to 2016. It appears that the homicide rate in each region is generally more volatile, with a larger number of intersections of homicide rate trends in particular regions, with a sharp increase in both the South and Midwest beginning in about 2014. In contrast, suicide trends across time appear to be more stable, with fewer intersections of census trends and a more consistent pattern of general decrease between 1992 and 2006 and general increase between 2006 and 2016.



**Figure 2: Correlations of Binge Drinking and Outcome Variables**

Figure 2 displays the scatterplots and correlations between the state-year average number of binge occasions and homicide and suicide rates. Suicide (right) has a relatively high correlation with binge drinking, but homicide (left) has a weaker correlation. While both have a positive association, giving strength to the potential necessity of this proxy, the disparity implies that homicide rates are affected significantly by other factors not included in this correlation.

	1991	1992	1993	1994	1995	1996	1997	1998	1999
Homicide by Firearm	5.1	5.01	5.09	5.31	4.96	4.48	4.22	3.96	3.62
Homicide by Other Means	3.01	2.68	2.52	2.42	2.46	2.29	2.21	2.1	2.04
Suicide by Firearm	8.36	8.14	8.51	8.25	8.12	7.98	7.63	7.42	6.98
Suicide by Other Means	4.91	4.82	4.81	4.89	4.91	4.84	5.05	5.09	4.91
% Black	0.095	0.096	0.097	0.097	0.098	0.99	0.099	0.099	0.1
Unemployment	0.064	0.068	0.062	0.056	0.052	0.051	0.047	0.043	0.041
Average Binges	1.1	1.1	1.04	0.99	0.94	0.99	1.01	1	0.98
% Buyer Regulations	.105	.106	.107	.118	.122	.128	.129	.129	.131
% High-Risk Possession Regulations	.186	.192	.192	.226	.236	.240	.242	.248	.246
% Background Checks	.087	.089	.089	.105	.113	.124	.135	.133	.138
% Possession Regulations	.157	.170	.183	.203	.208	.210	.212	.217	.220

% Assault Weapons Regulations	.023	.023	.030	.035	.035	.035	.035	.043	.045
% Gun Trafficking Regulations	.040	.040	.046	.071	.071	.071	.071	.071	.071
% Domestic Violence Regulations	.01	.013	.021	.053	.069	.081	.082	.09	.095

**Table 1(a): Summary Statistics – 1991-1999**

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Homicide by Firearm	3.6	3.71	3.81	3.72	3.56	3.87	3.89	3.9	3.69
Homicide by Other Means	2.05	1.95	1.96	1.88	1.87	1.82	1.9	1.84	1.75
Suicide by Firearm	6.94	6.96	7.14	6.92	6.78	6.85	6.64	6.7	7.05
Suicide by Other Means	4.9	5.24	5.3	5.4	5.71	5.57	5.88	6.07	6.17
% Black	0.102	0.102	0.102	0.103	0.104	0.104	0.104	0.105	0.106
Unemployment	0.039	0.045	0.053	0.056	0.052	0.049	0.044	0.043	0.053
Average Binges	1.51	1.1	1.09	1.04	0.987	0.939	0.99	1.01	0.996
% Buyer Regulations	.132	.133	.134	.135	.133	.133	.133	.131	.131
% High-Risk Possession Regulations	.246	.246	.246	.254	.260	.262	.268	.268	.278
% Background Checks	.156	.164	.164	.164	.164	.167	.178	.173	.173
% Possession Regulations	.223	.227	.225	.230	.230	.230	.232	.232	.230
% Assault Weapons Regulations	.063	.063	.063	.063	.063	.063	.063	.063	.063
% Gun Trafficking Regulations	.097	.10	.10	.103	.103	.103	.103	.103	.106

% Domestic Violence Regulations	.121	.126	.131	.141	.148	.149	.151	.152	.158
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**Table 1(b): Summary Statistics – 2000-2008**

	2009	2010	2011	2012	2013	2014	2015	2016
Homicide by Firearm	3.43	3.49	3.35	3.59	3.5	3.47	3.95	4.47
Homicide by Other Means	1.64	1.58	1.65	1.6	1.56	1.55	1.52	1.54
Suicide by Firearm	7.08	7.36	7.42	7.72	7.86	7.8	8.048	8.25
Suicide by Other Means	6.21	6.57	6.66	6.88	6.73	7.25	7.59	7.52
% Black	0.106	0.107	0.128	0.129	0.129	0.13	0.13	0.131
Unemployment	0.085	0.087	0.081	0.073	0.067	0.057	0.05	0.046
Average Binges	0.978	0.947	1.06	1.1	1.11	1.054	1.078	1.16
% Buyer Regulations	.131	.134	.134	.131	.135	.141	.141	.141
% High-Risk Possession Regulations	.284	.294	.296	.296	.306	.304	.314	.314
% Background Checks	.173	.173	.173	.173	.204	.224	.231	.233
% Possession Regulations	.230	.228	.225	.227	.220	.213	.215	.213
% Assault Weapons Regulations	.063	.063	.063	.063	.093	.093	.093	.093
% Gun Trafficking Regulations	.106	.106	.106	.103	.106	.109	.111	.111
% Domestic Violence Regulations	.168	.176	.176	.176	.184	.197	.208	.217

**Table 1(c): Summary Statistics – 2009-2016**

Tables 1(a), 1(b), and 1(c) display simple means of response variables, selected control variables, and the proportion of total legislation within given categories by year. In any given year, it appears as if the suicide rate is twice as high as the homicide rate regardless of means.

#### IV. Methodology

In order to attribute variation of state homicide and suicide rates to gun legislation, I use a similar methodology to that of Fleegler et al. (2013), who perform their analysis by category of gun legislation. In order to do this, the percentage of gun laws within a category in a state-year observation is calculated using the categories provided by Siegel et al. (2017). Because I am using percentage of overall laws within a category, this creates issues in the interpretation of concealed carry laws.

I assume the relationship between the enacting of gun legislation and homicide and suicide rates is linear and can be represented as:

$$Y_{it} = \beta_0 + \beta_j R_{jit} + \beta_r X_{rit} + \mu_i + \delta_t + \varepsilon_{it}$$

where  $Y$  represents the outcome variables of age-adjusted state-level homicide and suicide rate in state  $i$  in year  $t$ .  $R$  is a vector representing each law category percentage  $j$  (where  $j = 1, 2, \dots, 8$ ).  $X$  is a vector of controls  $r$  (where  $r = 1, 2, 3, 4$ ) to account for demographic and socioeconomic variation as well as impulsivity. Additionally, I use state and year fixed effects to control for any time trends and differences across states.

## V. Results

### *Homicide*

	By Firearm		By Other Means	
	(1a)	(1b)	(2a)	(2b)
Reg-Buyer	1.09 (0.669)	0.650 (0.692)	1.03*** (0.329)	0.759** (0.364)
Reg-High-risk	0.984** (0.384)	0.220 (0.379)	0.146 (0.190)	0.035 (0.198)
Reg- Background	0.161 (0.236)	0.023 (0.228)	-0.101 (0.114)	-0.069 (0.117)
Reg-Possession	1.05* (0.580)	0.084 (0.615)	0.850*** (0.289)	1.10*** (0.328)

Reg-Assault	- 2.51*** (0.403)	-1.62*** (0.391)	-0.347* (0.199)	-0.317 (0.205)
Reg-Trafficking	- 1.62*** (0.425)	-1.76*** (0.444)	-0.752*** (0.210)	- 0.534** (0.234)
Reg-Domestic Violence	-0.275 (0.304)	-0.176 (0.306)	-0.229 (0.150)	-0.267* (0.160)
% Black		9.99*** (2.42)		-0.680 (1.28)
Unemployment		-9.78*** (3.37)		- 5.38*** (1.77)
Avg. Binges		0.588** (0.249)		0.128 (0.129)
Poverty Rate		0.120*** (0.033)		0.020** (0.017)
Observations	1183	1010	1208	1034
Groups	50	50	49	49
Adj. R-Squared	.882	.900	.774	.768

**Table 1: Age-adjusted Homicide by Firearm and Other Means**

Table 1 displays the results of both baseline and control regressions with respect to both homicide by firearm and by other means, with columns (1a) and (1b) representing baseline and control regressions for homicide by firearm, and (2a) and (2b) representing baseline and control regressions for homicide by other means. Two types of gun legislation reach significance: assault weapons/high-capacity magazine regulations and gun trafficking regulations. Regarding the former two types of legislation, enacting a law within one of these categories is associated with a decrease in the homicide rate. Because the coefficients are interpreted as percentages of all gun laws within a category, I interpret the results using a one-law increment within each category. For example, the assault weapons category contains eight laws, so an increase of one law is a 12.5% increase. Multiplying this by the coefficient present in the table implies a predicted decrease of 0.203 homicides by firearm per 100,000. Similar calculations are computed for the remaining results. Enacting a law within the gun trafficking category leads to a predicted decrease of 0.252 homicides by firearm per 100,000.

Four categories of laws reach significance with respect to homicide by other means. These are buyer regulations (an additional law increases homicide rate by other means by 0.05 per 100,000), possession regulations (increase of 0.09), trafficking laws (decrease of 0.08), and domestic violence (decrease of 0.013).

These results demonstrate that fewer types of gun legislation are effective than previously imagined, with only gun trafficking and assault weapons legislation significantly decreasing homicide by firearm when enacted. Although assault weapons legislation only affects homicide by firearm, gun trafficking laws appear to significantly affect all homicide. This could be due to gun trafficking legislation's potential impact on organized crime, which would have otherwise contributed to homicide by any means.

Some types of legislation are ineffective in their deterrence of homicide by firearm while having a significant unintended increase in homicide by other means, leading to a net negative impact of the legislation. This is likely due to the substitution effect for those planning to commit homicide but not willing to acquire a firearm.

### *Suicide*

	By Firearm		By Other Means	
	(1a)	(1b)	(2a)	(2b)
Reg-Buyer	-0.227	-0.932	0.092	-0.374
	0.695	0.774	0.545	0.645
Reg-High-risk	-0.429	0.064	-0.411	-0.275
	0.397	0.416	0.312	0.347
Reg-Background	-0.037	-0.157	0.006	-0.073
	0.240	0.247	0.188	0.206
Reg-Possession	-0.694	-0.280	-0.018	0.431
	0.597	0.686	0.468	0.572
Reg-Assault	-0.523	-0.476	-0.740**	-0.621*
	0.419	0.436	0.329	0.363
Reg-Trafficking	0.003	0.396	-1.33***	-0.790*
	0.443	0.497	0.348	0.414

Reg-Domestic Violence	-	-	-	-
	0.618**	1.01***	-0.977***	0.930***
	0.313	0.338	0.245	0.282
% Black		-		-
		8.02***		-15.2***
		2.67		2.23
Unemployment		-		-
		10.6***		8.00***
		3.59		2.99
Avg. Binges		0.644**		0.222
		0.266		0.221
Poverty Rate		-0.005		-0.024**
		0.035		0.029
Observations	1300	1111	1300	1111
Groups	50	50	50	50
Adj. R-Squared	.921	.933	.839	.848

**Table 2: Age-adjusted Suicide by Firearm and Other Means**

Table 2 displays the results of regressions with respect to suicide by firearm and by other means, where the column arrangement is identical to that of Table 1. Domestic violence-related regulations are the only regulations that reach significance with respect to suicide by firearm. The passage of one law within this category is associated with a decrease of 0.048 homicides by firearm per 100,000. Three categories reach significance with respect to suicide by other means: gun trafficking laws (decrease of 0.11), assault weapons/high-capacity magazine regulations (decrease of 0.078), and domestic violence-related regulations (decrease of 0.04). Since women are significantly less likely to commit suicide using a firearm and women are most often victims of domestic violence committed by males, the significant effect of domestic violence laws on suicide by other means may be a result of the confiscation of firearms from perpetrators of domestic violence, removing the implicit threat for survivors and providing escape as a feasible and preferable alternative to suicide, which may otherwise seem like the only means of escape.

The small decrease in suicide by other means following the implementation of assault weapons and gun trafficking laws could be the result of individuals otherwise involved in



organized crime seeking standard employment. Because ‘foot soldiers’ generally appear to earn wages equivalent to or less than the minimum wage (Levitt and Venkatesh, 1998), this could provide an improvement in living conditions, lessening the risk of suicide.

### *Other factors*

The average number of binges in a given month is significantly associated within increases of homicide and suicide by firearm, but not by other means, with an increase of one average binge leading to firearm-homicide and firearm-suicide rate increases of 0.58 and 0.64 per 100,000, respectively. This is likely because homicide and suicide by firearm can be committed quickly without much recourse for prevention once a decision has been made, which lend themselves to usage by those already afflicted with impulse control issues. This result is strong evidence for impulsivity as a contributing factor to both homicide and suicide as well as evidence for binge drinking as a proxy for impulsivity.

An additional factor worth considering is that an increase in unemployment rate of 1% is associated with a decrease in suicide by firearm of 0.11 per 100,000, but is associated with an increase in suicide by suicide by other means of 0.08 per 100,000. This may be a result of financial insecurity in that those without the disposable income to afford a firearm seek alternatives.

### **Conclusion**

My results with respect to the effects of gun legislation on homicide indicate that previous studies that neglect to incorporate fixed effects to control for trends or state differences may overestimate the potential effects of gun legislation on homicide and suicide. However, my results also imply that the retort that assault weapons bans will not have an effect on homicide because criminals are not following laws anyway is an unfounded one.

Suicide rates appear to have a similar rate of response to different categories of gun legislation, contrasting with the findings of Fleegler et al. (2015), who find more categories of gun legislation significantly associated with decreases in suicide rates. Further, it appears that there is a significant gap in the means by which individuals commit suicide, potentially as a result of one's amount of disposable income in addition to a history of mental illness (Stone et al., 2018). This implies that effects of suicide prevention from gun legislation may be largely confined to those with higher incomes.

The significance of binge drinking as an explanatory variable of homicide and suicide rates by firearm indicates that the variable presents a relatively strong proxy for impulsivity. Further, its significance implies that homicide and suicide are not necessarily a rational choice of an individual. Further introduction of impulsivity as a component of decision-making may prove helpful in explaining the decisions of individuals in future research.

These results also have implications for public policy. Specifically, laws pertaining to gun trafficking, assault weapons/high-capacity magazines, or perpetrators of domestic violence appear to be optimal choices in order to decrease homicide and suicide, both by firearm and by other means. However, it is also clear that gun legislation will not be able to address suicide as a general issue. Because unemployment is positively associated with suicide by other means, gun legislation may only have effects confined to those able to afford a firearm. Further, suicide by methods of strangulation and poisoning are higher among those with documented histories of mental illness (Stone et al., 2018). I believe the associations of general unemployment and suicide by other means and the association of mental illness and suicide by other means are not necessarily coincidental. Further research must be conducted on economic precarity as a potential risk factor of suicide.

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