HOW EXPERIENCING GUN VIOLENCE IN U.S. SCHOOLS IMPACTS STUDENT ACADEMIC ACHIEVEMENT

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Abstract

This study examines how the experience of school gun violence, a topic of national and international concern, effects the academic achievement of students who have survived such traumatic events. Academic achievement is measured through GPA, a common metric for university admissions and job positions for students entering the workforce. The study utilizes updated 2018-2019 academic year data to measure the impact, and finds that experiencing school gun violence yields a statistically significant shortfall of almost half of a point in GPA for victimized students compared to those who do not experience it. The study further explores regional effects of this impact, revealing that the shortfall experienced by a victimized student can depend on the region of the United States a student attends school in.

Framework

On February 14th, 2018, seventeen student and staff deaths and seventeen other serious injuries occurred on the campus of Marjorie Stoneman Douglas High School at the hands of a lone gunman [Wikipedia, 2023]. The gunman was a former student who utilized an AR-15-style semi-automatic rifle and demonstrated clear, organized planning to maximize the killing potential of their attack. The attack became what is currently the deadliest high school shooting in United States history, and garnered national and international media and political attention.

These events play a central part in the moral panic experienced in the United States regarding safety in schools [Curran, Fisher, & Viano, 2019] and the district, local, state, and national policy response to gun prevalence and prevention. Despite limited research into the effectiveness of policy implementations, an entire industry targeting the demand for school

safety measures has emerged to give short and long-term attempts at protecting children from the potential fear and harm that school gun violence can cause [Jonson, 2017]. The use of Student Resource Officers (SROs) and metal detectors, as well as the implementation of organized plans and practices for dealing with potential gun violence, such as 'lockdown' drills, have become the cornerstone of what it means to make a school feel "safe."

While these physical measures have created a debatably safer school environment, they have also contributed to an issue of making schools feel more like prisons than places for nurturing the young mind [Jonson, 2017]. This contributes to antisocial feelings and poor mental health development in students. More recent forays into research on the subject of school safety have found that environmental prevention of the characteristics which go into creating a school shooter can systemically prevent similar scenarios to what happened at Marjorie Stoneman Douglas from occurring [Flannery et al., 2021]. This, in addition to decreasing the manners in which students and young Americans can access firearms, creates a powerful barrier between students and the possibility of encountering gun violence within their school while preserving the prosocial learning environment.

The insights created by this body of research, however, fails to account for all instances of gun violence in schools perpetrated by non-students, and does not consider the influence of gang activity and violence already present in a community. Such occurrences are a significant fraction of school gun violence incidents noted in the United States the Center for Homeland Defense and Security School Shooting Safety Compendium (SSSC). Additionally, most research on this subject focuses primarily on the factors that lead to school gun violence and prevention of its occurrence. Only recently has research turned toward the effects of mass gun violence on the

survivors, particularly focusing on mental health outcomes such as PTSD and depression [Lowe & Galea, 2016].

An economic perspective is seldom taken to look at the meaningful impacts occurring from experiencing school gun violence. As education adds economic value to society through the enhancement of human capital in workers, gun violence within United States schools could be a potential hindrance to the economic value that each survivor brings once they enter the workforce due to already observed factors like PTSD. In the United States, one of the common measures of importance for a student's human capital, especially one who is considering furthering their education or entering the workforce in a skilled labor position, is the Grade Point Average (GPA). University and employer acceptance of a potential student/employee is greatly influenced by the GPA they held in school, particularly high school. If a student who experiences school gun violence is shown to have a GPA different from the average, then this could demonstrate a meaningful difference in economic value brought to the workforce.

An insightful 2016 study by Beland & Kim, *The Effect of High School Shootings on Schools and Student Performance*, discusses the effects of school gun violence on the standardized test scores of survivors, and thus attempts to show the economically meaningful impact of school gun violence on human capital creation for students. Beland & Kim found that student performance on state administered standardized tests decreases significantly in schools that have experienced gun violence. However, the economically meaningful effects of this study are hard to extrapolate. The data Beland & Kim use is confined to the 2002-2010 academic years in California high schools alone, utilizing the state administered test. Because of this methodology, certain limitations are present: the effects cannot be generalized to the experiences of the nationwide student population, potentially greater quality datasets are available due to the

increasing trend of school gun violence incidents happening over the course of the 2010s, the standardized test format does not measure academic performance culminating over time, and the study itself only uses instances of school gun violence resulting in at least one death.

This study seeks to add to the value previous research has created on multiple dimensions. First, this study will utilize the impact of school gun violence on GPA, which is a consistent, nationwide measure of student success over time that has meaningful implications for higher education and workforce outcomes for students, and thus their future economic output. Second, it will utilize information from the 2018-2019 academic year, the peak year in the 2010s for school gun violence incidents which generates the greatest number of potential instances where the impact can be measured to improve ability to generalize results to the nationwide student population. Third, this study will not exclude cases of gun brandishing and physical threats made from the impact on student performance, as even being threatened visibly with a gun can create similar psychological effects as witnessing a death on a student. Finally, this study will bring specificity to regional effects of school gun violence on GPA. Gun policies and accessibility vary depending on where a student goes to school in the United States, and this creates different possibilities to experience school gun violence.

Data

The main data source for this study is the 2019 National Crime Victimization Survey: School Crime Supplement (SCS), administered by the U.S. Bureau of Justice Statistics to a random sample of U.S. families and students once every two years. This student-level data is designed to obtain information about school-related victimizations from which research and

policy formation can be derived. The data is weighted to obtain national figures. The method of administration utilizes a rotating panel of households, where all eligible persons in a household are administered the SCS every six months over a period of three years [Burns et al., 2022]. Because the survey was administered to students from January through June of 2019 and asks about the previous six months in their education, the responses can apply to the entire 2018-2019 academic year. The sampling is split 60/40 into two versions for the 2019 edition, which controls for potential question phrasing selection biases.

The secondary data source is the United States the Center for Homeland Defense and Security School Shooting Safety Compendium (SSSC) database. This database details every publicly available instance from the beginning of 1970 through June of 2022 in which a gun is brandished, is fired, or a bullet hits school campus for any reason, regardless of the number of victims, time of day, or day of the week. This incident level data includes reported causes for the gun violence, number and injuries of the victims, and exact location of the incident on or off the school campus.

To create the dataset for the 2018-2019 academic year time period being observed by the study, the SSSC is filtered to only include entries from July 1st, 2018 – June 30th, 2019. This allows the study to account for year-round and private school schedules. An instance of experiencing school gun violence is defined as a gun being brandished or fired by a perpetrator on the school campus during or immediately after the school day or at a sporting or school event such as a concert. This condenses the number of incidents of school gun violence down to sixty-six within the 2018-2019 academic year.

The SCS contains the measurement variable, GPA, through a question asked "during this school year, across all subjects have you gotten mostly-" and is coded to letter grade responses

A, B, C, D, and F. From this, the data was recoded to the GPA scale of 4.0, 3.0, 2.0, 1.0, and 0.0, respectively.

The variable of interest, being the status of a student as a victim of school gun violence, does not directly exist in the data. Because of this, a proxy variable was generated using responses to two questions asked on the survey. The first question is asked, "during this school year, how often have gangs been involved in fights, attacks, or other violence at your school?" This question is coded to responses of: never, once or twice this school year, once or twice a month, once or twice a week, or almost every day. Responses of "never" were coded to "no" and all other responses were coded to "yes" to create a binary variable of having experienced some type of violence outside of experiences of bullying at school. The second question is asked, "have you actually seen another student with a gun at school during this school year?" and is a binary yes or no variable. If a student response returns "yes" for both of these variables, the student is identified as having been a victim of school gun violence during the 2018-2019 academic year.

The selection of students to be included in the Victim treatment group through this method is valid due to the interrelation between the negative effects of having experienced an attack on your school in some form and having physically seen a gun. This creates instances fitting for the definition of experiencing gun violence in school which include a gun either being brandished or fired on school property. For instance, gang activities are a common cause of gun brandishing and shootings on school property as seen in the SSSC. This is more valid in comparison to other questions in the SCS which account for knowing that another student has brought a gun to school. While there is a potential psychological impact of that situation being combined with having experienced gang attacks, those situations do not include instances of a

student empirically verifying that there is a gun present and that it is likely being used against them and their peers in a threatening manner. Many students across the United States, for instance, could know about a student who does bring guns to school and that there have been gang attacks at some point, but never have experienced any of this for themselves.

Methodology

This study will utilize a linear regression to assess the impact that the status a student has as a victim of experiencing school gun violence has on their GPA. This will be performed on an eligible sample of the SCS. The SCS is a subset of the National Crime Victimization Survey which includes only eligible households. Of the 14,273 eligible households, the response rate to the SCS was 7,005 (49.1%). Of the 7,005 respondents to the SCS, 386 respondents had responses suitable for this study to both the presence of gang attacks and having seen another student with a gun. This will become the sample size for the naïve linear regression (lm1). Out of this maximum sample size, descriptive analysis finds that seventeen instances of student victimization from school gun violence occur.

Controls will be added progressively to assess the collective impact of different factors affecting the model. The first round of controls (lm2) will include variables relating to the type of school attended by a student. This is the school locality (metropolitan, suburban, township, or rural), the school size (300-599, 600-999, 1,000-1,499, 1,500-1,999, 2,000+), the school grade level (sixth, seventh, eighth, ninth, tenth, eleventh, twelfth), and the school status (public, private with no religious affiliation, private Roman Catholic, private with a religious affiliation, private with no religion reported). The second round of controls (lm3) will relate to the racial and gender

demographics of the students. The third round of controls (lm4) will add the student involvements within the school environment, such as athletics or fine arts, and future plans for continuing education and specifically attending a four-year university. The fourth round of controls (lm5) will add the conditions of the school and classroom, specifically around the perception that rules are fair, punishment is the same, if teachers and other students listen and care, and level of distraction in class. The fifth round of controls (lm6) for security and crime surrounding the school environment, including the presence of security guards or Student Resource Officers, crime in the student's home neighborhood, and crime in the neighborhood in which the student goes to school.

After assessing all controls, an additional regression (lmreg) will be performed which includes dummy variables for the region in which the student goes to school. The SCS divides the United States into four distinct regions along state lines: Northeast, Midwest, South, and West. Through this regression, the difference in impact of experiencing school gun violence can be determined for students living in a region. The locations and size of effects of instances of school gun violence are included in figure 1a and 1b below, which detail these instances in their segmented regions of the United States for both the 2018 and 2019 portions of the 2018-2019 academic year.
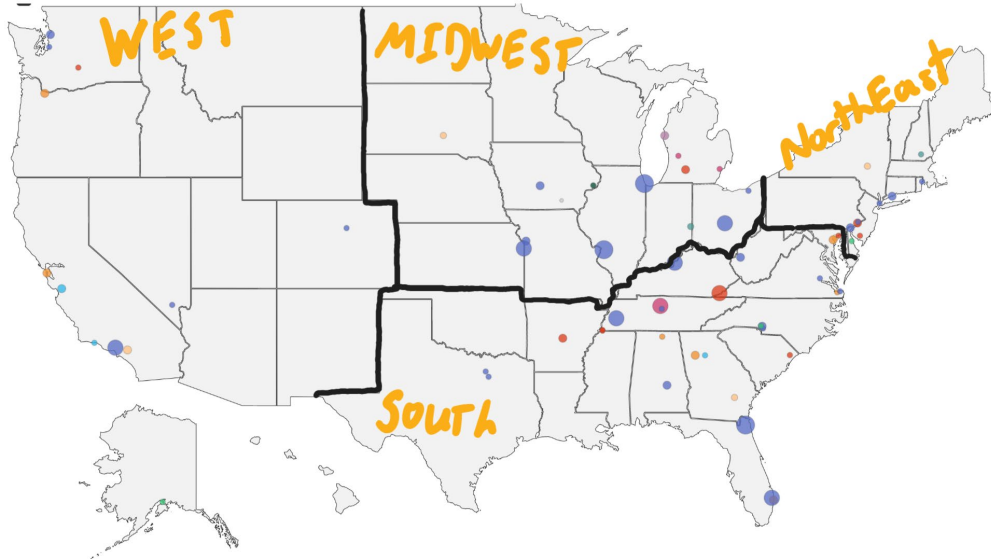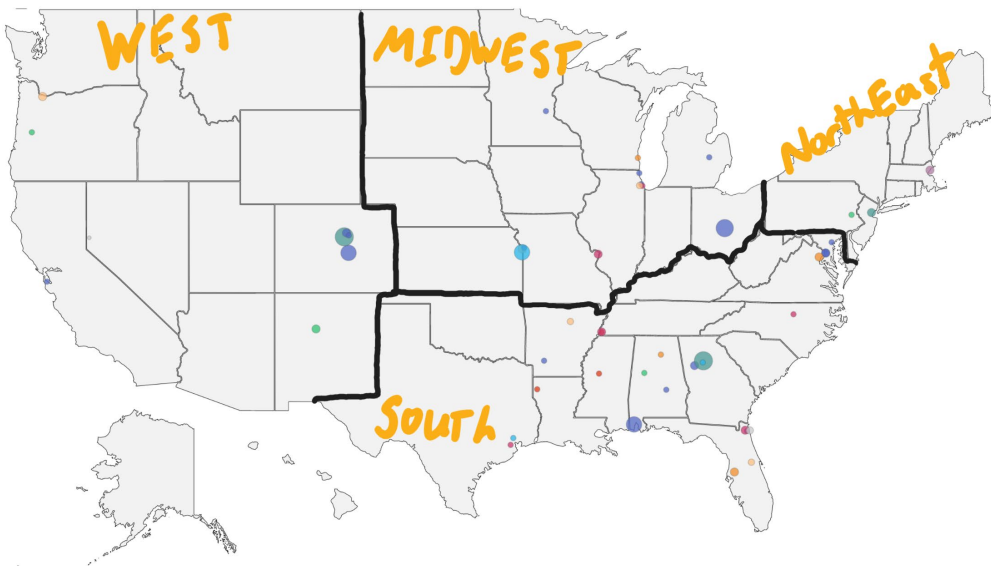
Figure 1a: 2018 U.S. Map

Figure 1b: 2019 U.S. Map

Through conducting these progressive linear regression models, the goal of this study is to specifically state, 'a student going to school in X region experiences X point change in GPA if they have experienced school gun violence in the last academic year.'

Results

Taking the averages of the grades for students victimized through experiencing school gun violence and those students who have not been victimized in the SCS, the victimized students hold an average GPA of 2.35, whereas the non-victimized students hold an average GPA of 3.06. This difference of 0.71 points is demonstrated in Figure 2 below:
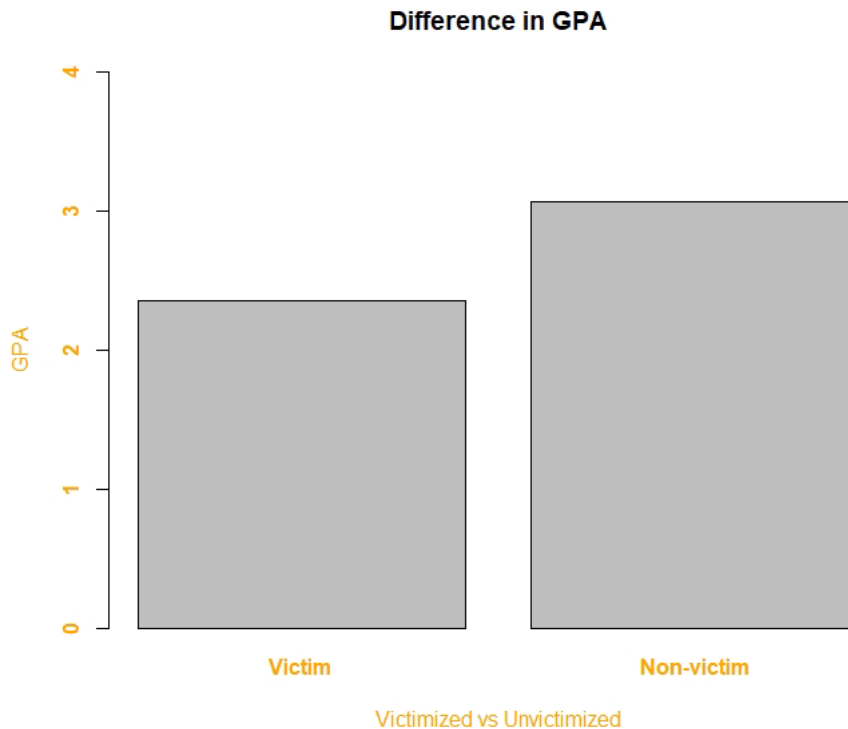
Figure 2: Victimized vs Unvictimized

This is backed up by the naïve regression (lm1) in Table 1, which reveals that a student victimized by school gun violence experiences a .712 GPA shortfall compared to non-victimized

students, significant at the .1% level and explaining approximately 3.2% of variation of GPA. This fits with the difference between GPA of 3.06 and 2.35, which are 0.71 points apart.

Statistics	lm1
Coefficient	-0.712***
R-squared	0.032
N	386

Table 1: Naïve Regression

The regression then controls progressively for multiple factors present in the SCS, demonstrated in Table 2. Controlling for the type of school attended by a student in lm2 yields a shortfall of .676 points in GPA, significant at the .1% level. Adding controls for racial and gender demographics in lm3 yields a .649 point lower GPA, significant at the 1% level. Lm4 controls for student extracurricular involvement and plans for higher education, revealing a .577 lower GPA for victimized students, significant at the 1% level. Victimized students experience a .410 shortfall in GPA after controlling for school and classroom conditions, significant at the 5% level. And the final round of controls for security and crime surrounding the school environment in lm6 reveals a .432 lower GPA for victimized students, significant at the 5% level. Lm6 holds an R-squared of .384, explaining just over a third of the variance in GPA for the SCS sample. The sample size trends modestly downward as more controls are added to the model, minimizing possible skewing effects from invalid data.

Statistics	lm2	lm3	lm4	lm5	lm6
Coefficient	-0.676***	-0.649**	-0.577**	-0.410*	-0.432*
R-squared	0.096	0.107	0.292	0.366	0.384
N	365	365	344	344	344

Table 2: Added Controls

The regression for regional effects (lmreg) was then performed on lm6 by adding the regional dummy variables to the model. This yielded a -0.424 point shortfall for students in the Northeast region, followed by less severe shortfalls in the Midwest, South, and West regions.

Statistics	Northeast	Midwest	South	West
Coefficient	-0.424	-.283	-.262	-0.371

Table 3: Regional Impacts

Finally, a comparison is drawn between lm6 and lmreg to find any changes between the models. Controlling for the region that victimization through school gun violence occurs in changed the coefficient to -0.424 points in GPA and raised the R-squared minimally to 0.388.

Statistics	lm6	lmreg
Coefficient	-0.432*	-0.424*
R-squared	0.384	0.388

N	344	344

Table 4: lm6 and lmreg

Discussion

The shortfall in academic achievement, quantified through GPA, experienced by students victimized through school gun violence is .432 points. For a student who previously was on the path towards a 4.0, that could be the difference between receiving an academic scholarship to a state school and bearing a large tuition burden if they only achieve at a 3.568. A student hoping to just be accepted to a university who previously held a 3.0 is now potentially completely out of the running. And for the student who has been victimized and did not plan to attend a university, this difference in GPA severely damages their credibility when attempting to get into a trade school or be hired on for some other form of skilled labor in a competitive labor market.

This impact is significant, and it comes from the effects of gun violence in schools. An incredibly well publicized stain on the United States education system that has been clearly demonstrated to be increasing in frequency and atrocity. The shortfall could result from common symptoms of PTSD for students, teachers and friends moving away from the school or area, or any other number of factors, but it is a shortfall with an economically meaningful impact on lives. Education is the primary factor to determining the level of human capital a worker brings to the market, and if this upward trend of school violence continues an increase in the reach of its negative effects can be expected.

For regional effects, the clearly most severe impacts on GPA from victimization by school gun violence is for students in the Northeastern United States, experiencing a shortfall of .424 points. The explanation for why is unclear from the sample, however a possible explanation

for this could be the difference in chances of experiencing school gun violence within each region of the United States. During the 2018-2019 academic year, the South region had the greatest number of students in grades 6-12 in the United States with an estimated 11.77 million students, followed by the West with 7.37 million, Midwest with 6.22 million, and Northeast with 4.69 million. Dividing this number by the number of incidents in each region during the academic year observed in the SSSC (South with 33, West with 12, Midwest with 14, and Northeast with 7) yields the chances of being victimized by school gun violence as the highest in the highest in the South, then the Midwest, then the West, then the Northeast. The exact order of least to greatest severity in GPA shortfall experienced by the victims in the sample. For a student in the Southern United States, especially given primarily pro-gun culture and legislation of the region, there could be less of an impact because of a greater previous experience with guns and gun violence over the lifetime of the student. Because of this, experiencing school gun violence may not psychologically impact their academic ability as much as it would a student in the Northeast region, where gun laws are more restrictive and the culture on average does not create interactions with them as frequently.

These values were all computed through utilizing the United States Census Bureau's 2018 student enrollment Table 2 data to get the public and private enrollment through all grades. These values were proportionally adjusted for sixth through twelfth graders to fit regionally grouped data gathered from the National Center for Education Statistics 2018 enrollment data, and included adjusted figures from the Census Bureau's estimate of the number of specifically private school enrolled students for 2018. By adding up the adjusted public and private enrollment numbers for each region, and dividing that by the number of incidents occurring in

each region taken from the SSSC, a percentage chance of experiencing school gun violence was obtained.

The sample itself, however, leaves something to be desired in its applicability to the regional effects for the United States. Having only seventeen instances of a student being victimized by school gun violence in the 2018-2019 academic year out of the 14,000 eligible households for the SCS has meant that only two students are represented from the Northeast, three students are from the Midwest, eight students are from the South, and four students are from the West. This small number of instances also leads to lacking the ability to drill down further into locality based effects, as there were not enough instances of victimization through school gun violence to cover the metropolitan, suburban, township, and rural localities of all four regions. Surely there are some similarities between students who all go to school in the same region, especially if they receive similar education and cultural values based on that region, but the differences between a student who attends school in a metropolitan locality and a student who attends school in a rural locality may yield different academic impacts from victimization.

There are potential issues with getting responses to a survey such as the SCS. Many questions involve sensitive topics for students and families, not even including the obviously painful topics of asking about gang attacks and experiencing school gun violence. The reluctance of respondents to answer these questions may have contributed to the severe drop in potential sample size for this study and other studies which revolve around school gun violence. Such reluctance is understandable and sympathized with, but at the least the efforts of this study have found that with the current best available data for answering the research question that there is a statistically significant effect present on the economic value of survivors of such tragedies. Their

lives are changed, and that will follow them through their future academic feats and entry into the workforce.

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